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# Anniversary Cuts

***B G Sidharth***

## MANY UNIVERSES !

In the 1970s Dr. B G Sidharth proposed that there was a universe and an anti universe defined by each point. Time would go one way for one universe and the opposite way for the other. Some of the difficulties of such an idea were that how could a metric in spacetime define both a time going backwards and a time going forwards. This could be done as shown by the author several decades later in the form of a two Weiner process. Much has been written on this aspect. All this would take place within the Compton time [Sidharth, B.G., The Thermodynamic Universe, World Scientific, Singapore, 2008]. Using the two Weiner process and a formalism due to Feshbach and Villars he has argued in the past that the positive energy and negative energy that is particles and antiparticle solutions form two separate classes. This would be the answer to the conceptual problems of the 1970s theory. Next he generalized this to consider n which could even be (continuum number) universes which are described within the Compton time rather like the many worlds interpretation. This brings us quite close to the many worlds interpretation of Everett and Dewitt [Misner, C.W., Thorne, K.S. and Wheeler, J.A., Gravitation, W.H. Freeman, San Francisco, USA, 1973] all be it from a completely different direction.

## TRACKING DOWN DARK ENERGY

Dr. B G Sidharth had reintroduced Dark Energy, in 1997, after it was dumped much earlier. His model for the universe was one of acceleration rather than retardation as was previously believed. This bold prediction was confirmed the very next year thanks to the observational work of Perlmutter, Schmidt and Riess, all three of whom observed a certain type of supernovae to come to this conclusion. Surely this is the fastest confirmation for a theory. Nevertheless there has been no clear fix on the nature of Dark Energy itself. Dr. Sidharth himself had proposed that it is the ubiquitous Zero Point Field. Though this energy is

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infinite in Quantum Theory it is taken to be zero with some reasons given. Dark Energy is really a vacuum energy. To understand this we must appreciate that the vacuum is a sizzling broth of particles, anti particles, disappearing particles and what not, unlike the classical concept of a vacuum. This Quantum vacuum had been studied by Miloni.

If however we consider these short-lived charged particles winking in and winking out of existence, as in the case of zitterbewegung, a trace is left behind namely transient wave functions and the energy they carry, though in a very random and disorderly fashion. This energy can be characterized as Dark Energy as described by Dr. Sidharth in his thought experiment of a pendulum suspended in a "perfect" vacuum. Contrary to what one might suspect that such a pendulum would remain stationary, it actually executes totally chaotic motion due to the Quantum vacuum energy or Dark Energy.

## B M BIRLA SCIENCE CENTRE ASTRONOMY NEWS

We are now at the Vernal or Spring Equinox when the length of the day equals the length of the night. For many countries like Zoroastrians and from Islamic countries, this is the beginning of the New Year or Navroz. In large parts of India this is close to the New Year called Ugadi, Gudi padwa and so on in different parts.

## REPORT ON PARTICLE CONDENSATION

The author had shown more than twenty years back in a paper in the well known American Journal, Journal of Statistical Physics,that in two dimensions particles behave in a very odd manner (Cf.refs.[1, 2]). What happens is that there is a two dimensionality which in fact was discovered several years later by Andre Geim and Konstantin Novoselov. This analysis leads to the situation as discussed in detail in the references given, where there is a threshold momentum for example

$$p_0 \approx \frac{4\pi^{5/2}}{1.4e-1} \tag{1}$$

Or,

$$p_0 \approx \frac{4\pi^{5/2}}{e} \tag{2}$$

where, the behaviour in two dimensions of bosons (and also Fermions) where there is a condensation or a infinite dilution that takes place. This condensation resembles the Bose-Einstein condensation. We can look upon it in another way. In these two dimensional situations (for example Graphene, Stanene) and so

on we have the equation like

$$\frac{d^2u}{dr^2} + \left\{\frac{2m}{\hbar^2}[E - V(r)] - \frac{l(l+1)}{r^2}\right\}u = 0 \tag{3}$$

(Cf.above references). This is the radial two dimensioinal Schrodinger equation. *V (r)* in equation (3) is the usual potential. With a suitable magnetic field it is known that *V (r)* is proportional to. With a suitable choice of a magnetic field

$$V(r) \propto Br \tag{4}$$

Equation (4) resembles a confining potential like the one we encounter in QCD and this confinement is directly related to the condensation. In fact it has been argued by the author that quarks themselves are these low dimensional particles and that fits in very well in the quark confinement.

## REFERENCES

[1] Sidharth, B.G. (2001). Chaotic Universe: From the Planck to the Hubble Scale (Nova Science, New York).

[2] Sidharth, B.G. (2008). The Thermodynamic Universe (World Scientific, Singapore, 2008) pg.264-265.

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Very recently it has been commented that jet streams in the cosmos or even for that matter solar wind show a departure from the laws of physics in that there are streams perpendicular to the main stream. As shown by BG Siddhartha quite some time back such an effect could be caused by a perpendicular magnetic field. This is perhaps the explanation for these cosmic jet puzzles.

The latest issue of futurism quotes University of California physicists as saying that there does not appear to be dark matter (rather attributing this to the decay of a sterile neutrino). For several years now the author, Dr. B G Sidharth, has been pointing out that dark matter is merely an artifice of a slowly varying G, the gravitational constant. He has argued that this explains all the dark matter relations without actually invoking dark matter.

The world is desperate about how to contain Covid-19. All sorts of measures are being tested. One measure coming from an entirely different quarter could be this. After all these viruses are DNA molecules and they have complex emission and rotation spectra. So if they could be irradiated by a relatively harmless radiation then they would be made dysfunctional. This option can be explored.

Latest studies indicate (as reported for example in the latest issue of Scientific

American) that we may have to revisit the accepted model of matter antimatter asymmetry. In this context it may be pointed out that Dr. Sidharth's work of a few years back harmoniously expresses all this because as he explained the four component Dirac spinor is really made up of the negative energy two spinors coupled with the positive energy two spinor. At very high energies he argued that it is the negative energy components which predominate. That is we see antimatter whereas as the energy falls it is the positive energy spinors which begin to predominate, that is we see ordinary matter. This simple explanation may hold the key to the reopened questions.

## THE SECRET MYSTERY OF THE QUANTUM WORLD

Quantum Mechanics has been a very counter intuitive, one might say even counter common sense topic. Even Albert Einstein could not get to accept it wholeheartedly and wrote papers exploring why it is wrong or incomplete as he put it. The work of Dr. B G Sidharth, Director, B M Birla Science Centre, Hyderabad, brings out this secret and mysterious nature of Quantum Mechanics. In several peer reviewed standard journals of physics he has argued that Quantum Mechanics has a new feature unknown to previous physics. This is that the universe is jittery that is not very definite and clear at ultra small levels. This feature has been called Zitterbewegung for donkey's years and there has been much speculation about it. What Sidharth argues is that ordinary physics with the addition of this jittering or Zitterbewegung physics goes over into the mysterious Quantum Mechanics. This is like adding a cloud of uncertainty and probability to ordinary physics and this leads to all the mysteries. The work started with a paper in Foundations of Physics 18 years ago and is still ongoing. With co-worker Abhishek Das new insights are still being obtained. These change the very nature of spacetime at the microscopic level.

There is another formulation by Hestenes, student of the celebrated Richard Feynman in which Zitterbewegung is described as an electron rapidly executing a Solenoid in space. We can interpret this in the following manner: A solenoid would exhibit a magnetic field in bits and pieces exactly as in the case of the Dirac Zitterbewegung. In any case we have this symbolic equation quantum mechanics which is equal to classical mechanics plus Zitterbewegung.

## THE QUATERNIONIC DESCRIPTION OF QUANTUM MECHANICS

It was pointed out by Ezra Newman in the sixties that an imaginary shift of the coordinate in purely Classical equations leads to the purely Quantum Mechanical gyromagnetic ratio $g = 2$. Newman puzzled about it for decades and finally could not explain this enigmatic finding. The author, Dr. B G Sidharth, Director, B M

Birla Science Centre, Hyderabad, has been working on this for a few decades and has concluded the following: 1. The explanation lies at very small scales where the square of the Compton scale is retained and 2. When a complex coordinate is generalized to three dimensions, as Sachs had pointed out we end up with a four dimensional space, which moreover has a Minkowski invariant thrown in.

On a further analysis the author noted that in this quarternionic description the spacetime is rather different to the simple Minkowski spacetime. To put it pictorially the former resembles the curly spiral binding while the latter is more like the smooth paper The author also concluded that this was the reason why despite a century of efforts Einstein's gravitation could not be reconciled with Particle Physics.

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Moving on we consider the second order representation of the quarternions in terms of the 2 x 2 Pauli matrices. This time the line element will be given by σ_(i ) x^i. We get again an invariant but unlike in the 4 x 4 matrix consideration, this time there is no invariance under the reflection symmetry.

We consider the different situations like neutrinos, noncommutative geometry and two dimensional surfaces like Graphene where this latter case applies.

The Indian Institute of Technology, Delhi is collaborating with a Japanese institute to see if the Ayurvedic drug Aswagandha is useful in the context of the Covid-19. Already a few people in the US are taking Aswagandha pills as a prophylactic. This brings us to another interesting aspect namely water collected from Gangotri, the source of the river Ganges in the upper Himalayas. Many in India store a few ounces of this in small copper containers and the water remains without getting spoilt for decades and more. A prevailing theory some decades back was that this upper Himalayan water contains the low radioactive Ceasium atoms which purify the water. More recently another line of thinking developed namely that this water contains some Himalayan plants or herbs which fight the bacterial content in the water. In fact the Himalayan herbs are well known in Mythology. For example the hero Hanuman carrying a mountain of Himalayan herbs to revive the epic heroes Rama and Lakshmana who swooned because of the Mohini astra, a weapon that induces a comatose type of a situation. The smell of these plants revived the epic heroes. May be some of the herbs or plants mixed with the water in the upper regions of the Himalayas could provide a curative or prophylactic effect for Corona Virus too.

## LUNAR ECLIPSE

On the 5th of June about 15 minutes before midnight a Penumbral Eclipse of the Moon begins. It lasts for just a few hours and is over in the early hours of the 6th of June.

A Penumbral Eclipse takes place when the region of partial shadow of the Moon grazes past the Earth. So it is not a special sight. In fact lay people will find no difference.

## SECRET OF THE KERR-NEWMAN METRIC

As we say the Kerr-Newman metric can be written as

$$ds^2 = -\frac{\Delta}{\rho^2}[dt - asin^2\Theta d\phi^2] + \frac{sin^2\Theta}{\rho^2}[(r^2 + a^2)d\phi - adt]^2 + \frac{\rho^2}{\Delta}dr^2 + \rho^2 d\Theta^2,$$

where

$$\Delta = r^2 - 2Mr + a^2 + Q^2, \qquad \rho^2 = r^2 + a^2 cos^2\Theta$$

Even for distances much smaller than the Compton Wave length $a$, as above, this goes over to,

$$-dt^2 + a^2 sin^2\Theta d\phi^2 + cos^2\Theta dr^2 + a^2 cos^2\Theta d\phi^2,$$

where, $\Theta = \pi/2$ . Now let us specialize to the case $\Theta = 0$. We get a simple metric $r^2 - \rho^2 =$ Let us analyze what this means. Following the calculation of Moller, [Sidharth, B.G.,Chaotic Universe: From the Planck to the Hubble Scale, Nova Science, New York, 2001], we have argued that an elementary particle can be modelled as a ball of tiny what are called particlets all in a transient relativistic motion. But there is a plane in which all the centres of gravity are distributed. The case $\Theta = 0$ corresponds to this case.

Given this model, it is possible that an ultra high energy gamma ray could pierce the particle and of course its energy would be released.

## A NEW TWISTED RELATIVITY

Einstein's relativity has stood the test of time for many decades but it does not provide a full description of many of the much later developments. One example is that of an accelerating universe by what we today call Dark Energy. This was first pointed out by Dr. B G Sidharth in 1997. Just a year later came the confirmation for this theory. Then more recently there has been Noncommutative Geometry playing a big role and two dimensional material like Graphene. All these require a twisted relativity. This twisted new relativity has been proposed by Dr. B G Sidharth to the International

Association for Relativistic Dynamics Conference in Prague, Czech Republic.

**ASTRONOMICAL EVENTS IN JUNE:**

June 4 - Mercury at Greatest Eastern Elongation. The planet Mercury reaches greatest eastern elongation of 23.6 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the evening sky. Look for the planet low in the western sky just after sunset. June 5/6 - Penumbral Lunar Eclipse. A penumbral lunar eclipse occurs when the Moon passes through the Earth's partial shadow, or penumbra. During this type of eclipse the Moon will darken slightly but not completely. The eclipse will be visible throughout most of Europe, Africa, Asia, Australia, the Indian Ocean, and Australia. The Penumbral eclipse begins at about 23:15 (IST) on 5th and ends at about 02:34 (IST) on 6th June . The maximum phase of the Eclipse will be at about 00:54 (IST) on 6th. The eclipse will be visible from India. June 21 - Longest day in the year, Summer Solstice. The Summer solstice occurs at 03:13 IST. The North Pole of the earth will be tilted toward the Sun, which will have reached its northernmost position in the sky and will be directly over the Tropic of Cancer at 23.44 degrees north latitude. This is the first day of summer (summer solstice) in the Northern Hemisphere and the first day of winter (winter solstice) in the Southern Hemisphere. June 21 – Annual Solar Eclipse: There is an Annular Solar Eclipse on Sunday, 21 June. A solar eclipse occurs when the moon passes between the sun and the earth. When this happens, the moon blocks the light of the sun from reaching the earth. The shadow of the moon is then cast on the earth.

Since the moon is farther away from the earth, it seems smaller and does not block the entire view of the sun. Instead, the moon in front of the sun looks like a dark disk on top of a larger disk and appears like a ring of fire.

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The eclipse will be visible from parts of Africa, including Central African Republic, Congo and Ethiopia, South of Pakistan, Northern India and China. The eclipse will begin at 9.15 am IST and will end at 15.04 pm. The maximum eclipse will be visible at 12.10 pm.

The world is desperate about how to contain Covid-19. All sorts of measures are being tested. Recently Dr. B G Sidharth, Director, B M Birla Science Centre, Hyderabad put up a post how rather than heat (infrared) radiation as suggested by many molecular biologists, it is the ultra violet radiation that would be detrimental to the virus. Confirmation for this has come (Courtesy: Colleague, M V Altaisky)

who says that already Covid patients are being treated with ultra violet radiation. This is done by inhaling some gases with long-lived atomic/ molecular level relaxation, so that the excited atoms stay long enough in the excited states and then irradiate the lung tissue. The opposite side of the radiofrequency method is the diagnostics. In the case of long biomolecules the particular spectral lines are in THZ frequency range or even lower. The research is going on in many countries, including India, but the signal to noise ratio is very low and the problem is difficult to tackle.

## THE UNIVERSE IS "FLAT"

Astronomers at Portsmouth have concluded after an observation of millions of galaxies that the Universe is "Flat" and not curved as the standard big bang cosmology had assumed. This paper has been accepted for publication in Physical Review Letters. It may be recalled that Dr. B G Sidharth, Director, B M Birla Science Centre, had in 1997 proposed that the Universe is in fact not static or contracting but rather accelerating driven by Dark Energy. This was confirmed the very next year by astronomers observing Type 1 supernovae. Three teams in fact. Actually in Dr. Sidharth's model there is no room for concepts like curvature of space which were a left over of the earlier big bang cosmology. The acceleration or some type of inflation smoothens out the universe. This fact was even noted by Nobel prize winner Sir Tony Leggett. So it does not come as any surprise that the Universe is "flat" even though it may be anathema to most cosmologists.

## MORE ON COVID AND ULTRA VIOLET RADIATION

It was suggested by Dr. B G Sidharth, Director, B M Birla Science Centre, that not so much heat but it is the Ultra Violet radiation (UV) that can destroy the Covid molecule or virus. Confirmation for this has come from the fact as pointed out in Russia some patients are made to inhale metastable molecules which decay releasing ultra violet radiation which in turn destroy the virus inside the patient. Now further confirmation for this has come from no less than the Columbia University where they have found that ultra violet radiation of 220 nano metres wavelength does indeed destroy the virus molecules. It can be speculated that as the higher latitudes get more ultra violet radiation than the lower ones, it is possible that they play the role in decreasing the covid cases in countries of Europe and also some in North America. Although on the flip side ultra violet radiation can cause sun burn and in severe cases even cause skin cancer from which the lower latitudes are shielded by the ozone layer. Ultra violet radiation it seems helps the usual measures of social distancing and face masks.

## ANNUAL SOLAR ECLIPSE

On the 21st of June which happens to be the longest day in the year with the shortest night, there will be an Annular Solar Eclipse which is a rare event. The Annular Eclipse is a beautiful sight when the Sun appears like a bangle. Unfortunately the full annularity of the eclipse can be seen only from the northern parts of India like Dehradun, Chamoli, Kurukshetra, Joshimath. For most of India including Hyderabad it is a Partial Solar Eclipse.

The Partial Eclipse in Hyderabad begins on Sunday 21 June 2020 at 10.14 a.m. and reaches its maximum at 11.55 a.m. with 0.60 magnitude, that is 60% of the sun would be covered. The eclipse ends at 13.44 hours. The total duration of the eclipse is 3 hours and 29 minutes.

These eclipses occur when the Moon comes in front of the Sun and blocks it fully or partially or in other words the shadow of the Moon falls on the Earth. For most of India it is the moon partially blocking the sun so that it is a partial Solar Eclipse.

The June 21 Annular solar eclipse is also visible from Pakistan, Africa and China and if the weather is favourable, people in these areas will see the characteristic ring of fire. Utmost precaution needs to be taken for viewing this eclipse. Only doctor certified eclipse goggles should be used. Alternatively the eclipse could be projected on a screen and only the projection should be seen. This is because the sun's ultra violet light is very harmful to the eyes if it leaks. Over exposed photographic films, x ray plates, blackened glass are all very unsafe and not recommended. With the above precautions one could go ahead and enjoy the nature's wonderful rare spectacle.

## RESEARCH NEWS

1. Dr. B G Sidharth of the B M Birla Science Centre had several years ago described a model of the electron which is purely Classical, in his book "The Chaotic Universe". This follows from Moller's description of an elementary particle as a sphere filled with transient ultra relativistic particles. In this mathematical deduction there is a plane along which the various centres of masses of these transitory particles would lie. This description also follows from a purely Quantum Mechanical analysis of what is called Zitterbewegung, described by Dirac. Here too there would be an ensemble of transitory particles. Dr. Sidharth now further argues that if this what may be called composite particle is bombarded by ultra high energy gamma rays at very high frequency of the order of the particle's Compton frequency, then the

particle would disintegrate releasing huge amounts of energy. This would be far more than in ordinary nuclear fission. The question is can this be achieved in the laboratory or is it something that happens in cosmic phenomena. 2. Earlier Dr. Sidharth had argued that not so much the temperature as the frequency of radiation is what destroys the Corona Virus molecules. In fact experiments have shown that this is indeed so, particularly in Columbia University, US. We need low frequency ultra violet rays which are relatively harmless to the human skin or eye. We could now think of a helmet which can be filled much like those of doctors treating Covid patients. In this helmet which could also contain proper protection to the eye ultra violet rays are released, killing any Covid viruses.

## RESEARCH NEWS (CONTINUED)

We have argued at length that low frequency ultraviolet rays can kill the Covid virus as has been proved experimentally subsequently. Furthermore there is a Company in Boston which is manufacturing such devices which emit these ultraviolet rays which are otherwise harmless to human beings. So this type of equipment can be placed in enclosed spaces, for example theatres or aircraft. Without harm to the people inside, the Covid virus would be destroyed.

## PENUMBRAL LUNAR ECLIPSE

A Penumbral Lunar Eclipse will take place on 05 July 2020. The eclipse will start at around 8.37 a.m. and will go on till 11.22 a.m. reaching its maximum at 9.59 a.m. This eclipse is not visible from India. A Penumbral eclipse occurs when Earth's outer shadow falls on the moon's face and is not a very noticeable sight. A Lunar Eclipse takes place on a Full Moon day when the Moon rises in the East exactly as the Sun sets in the West. The most serious effect would be a rise in tide so that fishermen or others going to the sea will have to be careful.

## COMET NEOWISE

Comet C/2020 F3 (NEOWISE) was discovered on March 27, 2020 , from some 326 miles (525 km) above Earth's surface by NEOWISE, the Near Earth Object Wide-field Infrared Survey Explorer, which is a space telescope launched by NASA in 2009.

Comet NEOWISE was closest to the sun on July 3, 2020, passing at about 26.7 million miles (43 million km) from the sun, or a bit closer than the average distance from the sun to Mercury.

In Hyderabad Comet Neowise will be visible on July 13, 2020 in Northwest in the Constellation Lynx at about 7.45 p.m. (IST) five degrees from the horizon. On successive nights the comet will grow fainter but setting late and visible in darker sky. Dark places with clear horizon will be the best place to witness this Comet.

If the comet remains relatively bright, it might be easier to see in the second half of July during evening dusk, because, at that time, it will appear somewhat higher in the sky.

Discovered earlier this year, the comet is currently nearly 200 million kilometres from Earth and is bright enough to be seen in the clear dawn sky. However, after around 12-15 July, up until sometime in August, it will be visible at night.

Though bright enough to be seen with the naked eye, in places without clear skies, a pair of basic binoculars will necessary.

As of early July, reports indicated that Comet NEOWISE has a visual magnitude between 1 and 2. If you know the magnitude scale, where smaller numbers indicate brighter objects, that may sound very bright! However, stars are pinpoints of light, whereas the light of comets is diffuse (spread out). So, for comets, a magnitude of 1 or 2 is fainter than it would be for a star of equal magnitude. The reason is, the comet's light is distributed over a relatively wide area, instead being concentrated in a single point.

And forget about making plans to view this comet's next apparition in Earth's skies. Comet NEOWISE might be visible again from Earth, but not until around the year 8,786!

How big is Comet NEOWISE? "From its infrared signature, we can tell (its nucleus) is about 5 km [3 miles] across… and is covered with sooty, dark particles left over from its formation near the birth of our solar system 4.6 billion years ago," said Joseph Masiero, NEOWISE deputy principal investigator at NASA's Jet Propulsion Laboratory.

**COMET FORMATION AND VISIBILITY**

The comet's infrared signature reveals that its nucleus or the main body is about 5km across. The comet is covered with ice and dust, leftover from when it was formed along with our solar system, 4.6 billion years ago.

Comets are made of rock, dust, and ice, and are typically a few meters or kilometres in diameter, but less than 30km. They are thought to form either in the Kuiper belt, beyond Neptune's orbit, or in the Oort Cloud, billions of

kilometres beyond the Kuiper belt in a theorised sphere surrounding the plane of the solar system.

The former kind of comets are called short-period comets and complete an orbit around the sun in less than 200 years. The latter kind are long-period comets that take beyond 200 years.

As passing comets near the sun, the mineral and water ices on them begin to sublimate. Gases and ice escape in a process called outgassing, creating a visible atmosphere, called coma, around it. The coma can actually be larger than the sun in size.

Due to solar wind or the movement of ionised particles from the sun in space, the cometary dust gets dispersed beyond the coma, forming tails that stream out in different directions.

NEOWISE currently has two tails, one that is made of dust and another made of gas.

Because cometary tails are created by the solar wind and radiation from the sun, they always flare out in the direction opposite to the sun, irrespective of the direction of the comet's orbit. As the comet moves away from the sun, cometary tails lead the nucleus, like they do for NEOWISE today.

While it is estimated that we can see one comet a year with our naked eye, 'major' comets like NEOWISE occur on an average of every five to 10 years.

Comet Hale-Bopp was visible for a year and a half in the northern hemisphere in 1995-97 with high brightness, while the Southern Hemisphere saw Comet Lovejoy in 2011-12 for three months.

Interestingly there was a theory that Comets could bring viruses down to the Earth, perhaps by broken bits. This theory doesn't have much of a following.

A few months back Dr. B G Sidharth of B M Birla Science Centre had suggested that not so much heat but the frequency of radiation specifically ultraviolet radiation would kill the virus. Confirmation for this immediately came from two widely separated locations, one from Russia and one from Columbia University. Dr. Sidharth went on to elaborate that with such low frequency ultraviolet emitters one could have a room, an auditorium or an aeroplane interior or any close space virus free. Since then a premier Indian Institute claims to build exactly such a hall.

Another application of the specified low frequency ultraviolet radiation that is harmless to human beings is the following: Drones could ply at a suitable height into Covid clusters and shoot out the ultraviolet rays to ill the viruses.

**A UNITARY CLASSICAL DESCRIPTION OF PARTICLES AND FIELDS**

The Ultra small world is divided broadly into two categories. One is particles or elementary particles as they are called and the other are fields like the electromagnetic field etc. These are generally described within the ambit of Quantum Mechanics and its apparatus like prohibiting amplitudes, wave packets and so on. Let us now try a purely Classical description of the same phenomena without invoking Quantum Theory and its complications.

**Case 1:**

Our starting point will be the following considerations (Cf.[1]) where

$$m\frac{dv}{dt} = -\alpha v + F'(t)$$

Where the coefficient of the frictional force is given by Stokes's Law [2]

$$\alpha = 6\pi\eta a$$

$\eta$ being the coefficient of viscosity, and where we are considering a sphere of radius $a$. This then leads to two cases:

**Case (i):**

For $t$, there is a cut off time $\tau$. It is known (Cf.[3]) that there is a characteristic time constant of the system, given by

$$\frac{m}{\alpha} \sim \frac{m}{\eta\alpha},$$

so that, from Stoke's Law, as

$$\eta = \frac{mc^2}{a}\ or, m = \frac{\eta a^2}{c}$$

we get

$$\tau \sim \frac{ma^2}{mca} = \frac{a}{c},$$

that is $\tau$ is the Compton time. The expression for $\eta$ which follows from the fact that

$$F_x = \eta(\Delta s)\frac{dv}{dt} = m\dot{v} = \frac{\eta a^2}{c}\dot{v},$$

shows that the intertial mass is due to a type of "viscosity" of the background Zero Point Field (ZPF). (Cf. also ref.[4]).

To sum up case (i), if there is a cut off the stochastic formulation leads us back to the minimum space time intervals ~ Compton scale.

To push these small scale considerations further, we have, using the Beckenstein radiation equation [5],

$$t = \tau = \frac{G^2m^3}{\hbar c^4} = \frac{m}{\eta\alpha} = \frac{a}{c},$$

which gives

$$a = \frac{\hbar}{mc}, if\ \frac{Gm}{c^2} = a$$

In other words the Compton wavelength equals the Schwarzchild radius, which automatically gives us the Planck mass. Thus as noted the inertial mass is thrown up in these considerations. We will also see that the Planck mass leads to other particle masses.

On the other hand if we work with $t \geq \tau$ we get

$$ac = \frac{2KT}{\eta\alpha}$$

whence

$$kT \sim mc^2,$$

Thus we get the Compton Scale or Planck Scale which is the particle description.

**Case 2:**

If there is no cut off time as is known we get the equation

$$\Delta x = v\sqrt{\Delta t}$$

from where the usual non particle descriptions follow, for example as in Nelson's Theory.

In other words we have got both a particle and a wave (or radiation) description starting from the Langevin equation.

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A few years ago Dr. B G Sidharth and Co-worker A Das had given detailed mathematical calculations on the following: If there is a vast body of water for example as in the Assam floods and a high explosive device is dropped into it, then the water would evaporate relieving the flood. Conversely if a few kilograms of cryogenic Helium is dropped into the vast body of water, the water would freeze, again relieving the flood. This work has appeared in the Italian Journal of Pure and Applied Mathematics. Later simulations have borne out the conclusion. So this may well be a solution not only for the Assam floods but in general.

## COSMIC ACCIDENT

According to the famous Astronomer Sir Fred Hoyle and his colleagues, diseases could be brought down to the Earth from Comets. They ascribed the earlier flu to have been brought down by a Comet. It is a strange coincidence that now as we battle Covid-19 the Comet Neowise is there in the sky. May be it is nothing more than a coincidence.

Several years ago Dr. B G Sidharth, Director, had pointed out that if we are working the Fokker-Planck equation, the Langevin equation and other statistical mechanical inputs, then the evolution of the solution or system of particles would be described by two parts. The first part, let us call it A x where A is non-Markovian, and x tends to 0 with time or as the time tends to infinity, in the sense that the past and influence the present. Then there is a second part which is given by B . Markovian where B is Markovian. As the system evolves x tends to 0 that is the system becomes Markovian. In other words there is no memory of the past. It is as if time becomes demented.

Further Dr. Sidharth has shown at great length that in a sense the universe is short sighted like a Manet or a Monet painting. So these are interesting what may be called asymptotic properties of space and time.

It was recently pointed out by Dr. B G Sidharth, Director, that working with Statistical Mechanics in particular equations like the Fokker-Planck equation, a solution would split into a part Ax where X tends to 0 (as t tends to infinity) + B. A is the non-Markovian part where there is correlation between the various particles whereas B is Markovian. In this latter case it is impossible to predict what comes next. Now remembering that viruses are also particles, in the above scenario we could interpret it as there being a strong correlation between the hosts of the virus, that is infected patients and their histories. But with the passage of time the situation becomes Markovian, that is the memory of the past is wiped out and they become ordinary stochastic particles.

## A NOTE ON "PASTEURIZATION" TOY MODEL FOR EXTREME WEATHER

submitted to Journal of Indian Geophysical Union

**ABSTRACT**

*We consider a model built on an earlier communication in the Italian Journal of Pure & Applied Mathematics. In this model we consider a combination of a positive delta function and a negative delta function and apply the results to a climate change problem, one in which we are seeing on a global scale alternate heavy downpours at some places and drought like conditions at other places.*

*KEYWORDS: extreme; weather; climate; change; toy; model.*

In an earlier communication we had considered a delta function variation in the heat equation leading to some very interesting conclusions [Sidharth].

Let us consider the heat equation

α (∂^2 u)/(∂x^2 👱∂u/∂t (1)

We next consider a modified version of (1) namely

viz.,α (∂^2 u)/(∂x^2 )=(1- δ (t)) ∂u/∂t (2)

We further consider the following modification of (2) namely we replace the coefficient of the time derivative in (e2) by

δ (t)- bδ (t- ϵ) (3)

This would represent a Pasteur like situation where as we will see below the temperature goes down and immediately up (This is used in Pasteurization).

So we are dealing with effectively the equation

u^"= ϵu¨ (4)

Let us use the usual method of separation of variables and write

u=U (x)·V (t) (5)

As is well known this leads to

U^"/U= ϵ V¨/(V (t))= λ (6)

where λ on the right side arises because the left side of equation (6) is exclusively a function of x and the right side is exclusively a function of t. λ in (6) is independent of x and t. A simple solution of (6) is immediately available namely

u= e^mx,m= ± √λ

V= e^nt, n=± √(λ/ϵ) (7)

Clearly in (7) n > > m as ϵ is small. So V can remain large but finite if t is very very small. That is in the limiting case V itself is of the form

V ~ ± δ (t) (8)

This is what we expect in a Pasteurization process.

Remembering that the space intervals are all relative, looking at it from a global perspective, what has been described above could equally well be a toy model for climate change, in the sense that due to the chaotic changes in climate, some places get extremely hot and other places become extremely cold. This in turn would lead to effects like deficit and excess rainfall in unexpected ways or even interfere with the elnino type phenomena.

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## A BRIEF NOTE ON ACCELERATED GLACIER MELTING

Submitted to Current Science

**ABSTRACT**

We proposed a toy model which nevertheless illustrates the accelerated melting of glaciers as witnessed today.

Let us start with the one dimensional heat equation

$$\frac{\partial\psi(r,t)}{\partial x} = \nabla.[D(\psi,r)\nabla\psi(\mathrm{r},\mathrm{t})] \tag{1}$$

As is well known $\psi(r; t)$ is the density of the diffusing material at the space-time point $(r; t)$ and $D$ is the collective diffusing coefficient for the density $\Phi$ at the point $(r; t)$.

We now consider the solution by the usual methods but replace $t$ by $\alpha t$. The rationale will become clear. Effectively the diffusion equation now becomes

$$\frac{\partial\psi}{\partial t} = \alpha D\frac{d^2\psi}{dx^2} \tag{2}$$

with a well known replacement

$$\psi = \phi(t)\omega(x) \tag{3}$$

Thus we get

$$\frac{\dot{\phi}}{\phi} = D\alpha\frac{\omega''}{\omega} = \lambda$$

where, $\lambda$ is independent of $r$ and $t$, whence

$$\phi = e^{\lambda t}, D\alpha\omega'' = \lambda\omega$$

Therefore,

$$D\alpha\beta^2 = \lambda$$

where

$$\beta = \sqrt{\frac{\lambda}{\alpha D}} \tag{4}$$

It can be seen that with $\alpha = 1$ we have the normal case where for usual intervals of time we have the general ice melt. However if we use this balance is changed. In particular for a normal interval of time the ice melt contained in $\omega$ can be very large if $\alpha$ is small. In other words the ice melt is contained in the diffusion constant D. By introducing $\alpha$ (<< 1) we have made a short cut to come to an explanation of accelerated ice melt.

If in the above gives an idea of the extra or accelerated melt of glaciers apart from the usual diffusion coefficient D, we can get a rough idea of the value of this factor.

In the words of an expert Fagre, things that normally happen in geological time are happening during the span of a human life time. This cuts across the whole world from the snows of Kilimanjaro and Alps to the glaciers in the Garhwal Himalayan regions of India. It is speculated that at this rate the Himalayan glaciers could all but disappear by 2035.

To put numbers glaciers in the Alps retreated 1150 metres since 1870. The Mer de Glace, the largest glacier in France has receded 500 metres between 1994 and 2008 that is thirty metres per year. Another example is that of glaciers in Switzerland which have retreated 350 metres in just two years between 2003 and 2005 and so on. If the average in the whole world is taken to be about thirty metres per year then this gives a rough estimate of. Needless to add that all this is happening due to global warming as the IPCC points out [1, 2, 3].

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## RESEARCH NEWS

1. Breaking News: As we speak huge chunks of glacial ice blocks from the alps have detached themselves from the main glacier and are falling down into the valley threatening Italian towns like Cortina. It may be remembered that Dr. B G Sidharth, Director, had pointed out in his paper "A Brief Note on Accelerated Glacier Melting" communicated to Current Science on November 29, 2019, that the glacial ices are melting at an accelerated rate and these incidents bear it out.

2. Perseid Meteor Shower: Around 12th August the debris of the Comet Swift-Tuttle can be seen falling down to the Earth and getting burnt up in the atmosphere in the pre-dawn period. These are the Annual Perseid Meteor Showers. All these meteors seem to originate from the Constellation of Perseus or Parasu Mandal.

## "BREAKING" NEWS

It is now reported that even the Antarctica ice shell is melting at an alarming

pace. This accelerated melt of glaciers was discussed in Dr. Sidharth's paper "A Brief Note on Accelerated Glacier Melting" communicated to Current Science on November 29, 2019. After that, the ice shells in the alps started crumbling endangering several Italian cities as was pointed out in our note on August 10, 2020.

There may be one freak remedy in this though. One could dumb cryogenic material like liquid Helium on to the places where the cracks are appearing. This may slow down or even halt, at least temporarily the melt. This was noted in Dr. Sidharth and A Das' earlier paper that appeared in Italian Journal of Pure and Applied Mathematics.

## RESEARCH NEWS

1. A recent and thorough study of the neutrinos emitted by Supernova 1987a has finally found that there are no sterile neutrinos. Sterile neutrinos are hypothetical neutrinos which interact only through the gravitational force. They have been considered to be an important constituent of dark matter. So this latest finding gives a dent to the dark matter theory. It may be pointed out that Dr. B G Sidharth, Director, had not only discussed sterile neutrinos (particularly in the context of the MINOS experiments of Fermi Lab) but also has been arguing all these years that dark matter is not a necessary hypothesis. It will be recalled that dark matter was hypothesized nearly a hundred years ago, several candidates for dark matter have been suggested: From Brown Dwarf stars to sterile neutrinos. However dark matter as noted by Dr. Sidharth for the past several years could be just an artefact of a gravitational constant that is slowly decreasing with time.

2. Dr. Sidharth has argued that a particle spin could be more a statistical or thermodynamic effect or property in the following sense: The temperature of a gas is taken to be proportional to the root mean square velocity (like the average in a group). Yet no particular molecular need have this velocity. It is a broadly representative statistical number. If we look at the concept of spin in elementary books like Bjorken and Drell, we come across a confusing dichotomy: Is spin an intrinsic property or is it more a statistical property and this latter is what Dr. Sidharth says.

3. It has been recently found that one can have electromagnetic pulses using graphene. It may be recalled that graphene was predicted on theoretical grounds as early as 1995, but was discovered experimentally ten years later in

2005 which won the discoverers the Nobel Prize. The interesting point here is that according to Dr. Sidharth's calculations the various properties of graphene are not limited to graphene per se, but rather to the noncommutative structure of the two dimensional sheet,. For example shortly after this was pointed out it was found that Stanene (tin) also exhibited similar properties. The essential point is that these properties like magnetic pulses would be shared by any two dimensional sheet, not just graphene.

## APPENDIX

Earlier we have seen how the Zitterbewegung region can in principle be penetrated with the release of the entire particle energy. Remembering that at this level as discovered in detail earlier, there is a situation which can be modelled by a two Weiner process with time momentarily flipping forward and backwards. In this process it is possible that some of the Zitterbewegung energy from the destruction of a particle could once again form another particle. This would be a rare flip flop event because it could go on. It may be mentioned that as elaborated in earlier papers, it is this two Weiner process that leads to Special Relativity and Mass.

## EPILOGUE

### The Jittery Universe

We have been trying to stress that dark energy leads to a jittery universe what has been called Zitterbewegung almost universally. Let us consider time. The effect is that time would be flickering constantly backward and forward. This can be modelled by the Weiner process. It leads to as explained in detail ten years ago in several papers and the author's book "The Thermodynamic Universe" (World Scientific) at one shot, the Special Theory of Relativity and also Mass.

On the other hand in terms of space this leads to a region of transient wave functions. At a classical level this has been explained in detail by Moller in his "Special Theory of Relativity". If we have such a region then as explained a very powerful gamma ray perhaps could penetrate this region (which represents a particle) and destroys the particle with the release of energy. Of course because of the Weiner process in operation the reverse could also happen.

In the author's formulation symbolically speaking, Classical Physics plus Zitterbewegung equals Quantum Mechanics.

It should be mentioned that this Zitterbewegung has been studied from different angles by scholars like Dirac, Hestenes and others.