Exploration

Exploration of Scenario Prior to Big Bang

Miroslaw Kozlowski*

Abstract

In this paper, we study the evolution of consciousness. Considering the discrete structure of time, we calculate the life-time of the Universe including the epoch prior to Big Bang. The scenario prior to Big Bang deals with two branches described in low energy effective treatments. Both branches are string duality related but the former runs on negative time scales. With the help of Riemann Zeta function, we study here the negative time scenario prior to the beginning of the Universe. The beginning of the Universe is the beginning of consciousness and, thereafter, human consciousness started and evolved according to Zeta function.

Keywords: Big Bang, pre-Big-Bang, atomicity of time, consciousness, Riemann Zeta function.

1. Introduction

In 1859, B. Riemann published paper in which he defined Riemann function (Edwards ,1974)

$$\prod(s) = \int_0^{\infty} e^{-s} x^s dx, (s > -1)$$

$$\zeta(x) = \frac{\prod(-s)}{2\pi i} \int_{-\infty}^{\infty} \frac{(x)^s}{e^x - 1} \frac{dx}{x}$$

The epoch-making 8-pages paper "On the Number of Primes Less Than a Given Magnitude" inaugurated the revolution in number theory and recently in theoretical physics : quantum mechanics and cosmology. In the paper we for the time consider the application of Zeta function to the study of the human consciousness and especially , time recognition. We argue that time life of the Universe and the consciousness can be described as the product of Zeta function and Planck time. The possible scenario for the creation of consciousness is discussed.

2. Mathematical introduction

*The Zeta function - the dialogue between music and mathematics.*During his years in Paris in the 1820s, Dirichlet had become fascinated by Gauss's great youthful treatise *Disquisitiones*

* Correspondence: Miroslaw Kozlowski, Prof. Emeritus, Warsaw University, Poland. Email: m.kozlowski934@upcpoczta.pl

Aritlvneticae. Although Gauss's book marked a beginning of number theory as an independent discipline, the book was difficult and many failed to penetrate the concise style Gauss preferred. Dirichlet, though, was more than happy to battle with one tough paragraph after another. At night he would place the book under his pillow in the hope that the next morning's reading would suddenly make sense. Gauss's treatise has been described as a 'book of seven seals', but thanks to the labours and dreams of Dirichlet, those seals were broken and the treasures within gained the wide distribution the> deserved.

Dirichlet was especially interested in Gauss's clock calculator. In particular, he was intrigued by a conjecture that went back to a pattern spotted by Fermat. If you took a clock calculator with N hours on it and you fed in the primes, then, Fermat conjectured, infinitely often the clock would hit one o'clock. So, for example, if you take a clock with 4 hours there are infinitely many primes which Fermat predicted would leave remainder 1 on division by 4. The list begins 5, 13, 17, 29, . . .

In 1838, at the age of thirty-three, Dirichlet had made his mark in the theory of numbers by proving that Fermat's hunch was indeed correct. He did this by mixing ideas from several areas of mathematics that didn't look as if they had anything to do with one another. Instead of an elementary argument like Euclid's cunning proof that there are infinitely many primes, Dirichlet used a sophisticated function that had first appeared on the mathematical circuit in Euler's day. It was called the *zeta function*, and was denoted by the Greek letter ζ. The following equation provided Dirichlet with the rule for calculating the value of the zeta function when fed with a number x:

$$\zeta(x) = \frac{1}{1^x} + \frac{1}{2^x} + \frac{1}{3^x} + ... \frac{1}{n^x} + ...$$

To calculate the output at x, Dirichlet needed to carry out three mathematical steps. First, calculate the exponential numbers 1^x, 2^x,3^x, n^x , . . . Then take the reciprocals of all the numbers produced in the first step. (The reciprocal of 2^x is $1/2^x$) Finally, add together all the answers from the second step.

It is a complicated recipe. The fact that each number 1, 2, 3,. . . makes a contribution to the definition of the zeta function hints at its usefulness to the number theorist. The downside comes in having to deal with an infinite sum of numbers. Few mathematicians could have predicted what a powerful tool this function would become as the best way to study the primes. It was almost stumbled upon by accident.

The origins of mathematicians' interest in this infinite sum came from music and went back to a discovery made by the Greeks. Pythagoras was the first to discover the fundamental connection between mathematics and music. He filled an urn with water and banged it with a hammer to produce a note. If he removed half the water and banged the urn again, the note had gone up an octave. Each time he removed more water to leave the urn one-third full, then one-quarter full, the notes produced would sound to his ear in harmony with the first note he'd played. Any other notes which were created by removing some other amount of water sounded in dissonance with that original note. There was some audible beauty associated with these fractions. The harmony that Pythagoras had discovered in the numbers 1, 1/21/3, 1/4, . . . made him believe that the whole universe was controlled by music, which is why he coined the expression "*the music of the spheres"*.

Ever since Pythagoras' discovery of an arithmetic connection between mathematics and music, people have compared both the aesthetic and the physical traits shared by the two disciplines. The French Baroque composer Jean-Philippe Rameau wrote in 1722 that "*[n]ot withstanding all the experience I may have acquired in music from being associated with it for so long, I must confess that only with the aid of mathematics did my ideas become clear."* Euler sought to make music theory *"part of mathematics and deduce in an orderly manner, from correct principles, everything which can make a fitting together and mingling of tones pleasing".* Euler believed that it was the primes that lay behind the beauty of certain combinations of notes.

Many mathematicians have a natural affinity with music. Euler would relax after a hard day's calculating by playing his clavier. Mathematics departments invariably have little trouble assembling an orchestra from the ranks of their members. There is an obvious numerical connection between the two given that counting underpins both. As Leibniz described it, "*Music is the pleasure the human mind experiences from counting without being aware that it is counting"'* But the resonance between the subjects goes much deeper than this.

Mathematics is an aesthetic discipline where talk of beautiful proofs and elegant solutions is commonplace. Only those with a special aesthetic sensibility are equipped to make mathematical discoveries. The flash of illumination that mathematicians crave often feels like bashing notes on a piano until suddenly a combination is found which contains an inner harmony marking it out as different.

G.H. Hardy wrote that he was 'interested in mathematics only as a creative art'. Even for the French mathematicians in Napoleon's academies, the buzz of doing mathematics came not from its practical application but from its inner beauty. The aesthetic experiences of doing mathematics or listening to music have much in common. Just as you might listen to a piece of music over and over and find new resonances previously missed, mathematicians often take pleasure in re-reading proofs in which the subtle nuances that make it hang together so effort-lessly gradually reveal themselves. Hardy believed that the true test of a good mathematical proof was that 'the ideas must fit together in a harmonious way. Beauty is the first test: there is no permanent place in the world for ugly mathematics. For Hardy, *A mathematical proof should resemble a simple and clear-cut constellation, not a scattered Milky Way.*

Both mathematics and music have a technical language of symbols which allow us to articulate the patterns we are creating or discovering. Music is much more than just the minims and crochets which dance across the musical stave. Similarly, mathematical symbols come alive only when the mathematics is played with in the mind.

As Pythagoras discovered, it is not just in the aesthetic realm that mathematics and music overlap. The very physics of music has at its root the basics of mathematics. If you blow across the top of a bottle you hear a note. By blowing harder, and with a little skill, you can start to hear higher notes - the extra harmonics, the overtones. When a musician plays a note on an instrument they are producing an infinity of additional harmonics, just as you do when you blow across the top of the bottle. These additional harmonics help to give each instrument its own distinctive sound. The physical characteristics of each instrument mean that we hear different combinations of harmonics. In addition to the fundamental note, the clarinet plays only those harmonics produced by odd fractions: 1/3,1/5, 1/7, . . . The string of a violin, on the other hand, vibrates to create all the harmonics that Pythagoras produced with his urn - those corresponding to the fractions1/2,1/3,1/4…. . .

Since the sound of a vibrating violin string is the infinite sum of the fundamental note and all the possible harmonics, mathematicians became intrigued by the mathematical analogue. The infinite sum 1 + 1/2 +1/3+1/4+. . . became known as the *harmonic series*. This infinite sum is also the answer Euler got when he fed the zeta function with the number $x = 1$. Although this sum grew only very slowly as he added more terms, mathematicians had known since the fourteenth century that eventually it must spiral off to infinity.

So the Zeta function must output the answer infinity when fed the number $x = 1$. If, however, instead of taking $x = 1$, Euler fed the zeta function with a number bigger than 1, the answer no longer spiralled off to infinity. For example, taking $x = 2$ means adding together all the squares in the harmonic series:

$$1+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+.......$$

This is a smaller number as it does not include all possible fractions found when $x = 1$. We are now adding only some of the fractions, and Euler knew that this time the smaller sum wouldn't spiral off to infinity but would home in on some particular number. It had become quite a challenge by Euler's day to identify a precise value for this infinite sum when .x = 2. The best estimate was somewhere around 8/5. In 1735, Euler wrote that 'So much work has been done on the series that it seems hardly likely that anything new about them may still turn up . . . *I, too, in spite of repeated effort, could achieve nothing more than approximate values for their sums*.'

Nevertheless, Euler, emboldened by his previous discoveries, began to play around with this infinite sum. Twisting it this way and that like the sides of a Rubik's cube, he suddenly found the series transformed. Like the colors on the cube, these numbers slowly came together to form a completely different pattern from the one he had started with. As he went on to describe, *'Now, however, quite unexpectedly, I have found an elegant formula depending upon the quadrature of the circle' - in modern parlance, a formula depending on the number* $\pi = 3.1415...$

By some pretty reckless analysis, Euler had discovered that this infinite sum was homing in on the square of π divided by 6:

$$1+\frac{1}{4}+\frac{1}{9}+\frac{1}{16}+......=\frac{\pi^2}{6}$$

The decimal expansion of $\pi^2/6$ like that of π , is completely chaotic and unpredictable. To this day, Euler's discovery of this order lurking in the number $\pi^2/6$ ranks as one of the most intriguing calculations in all of mathematics, and it took the scientific community of Euler's time by storm. No one had predicted a link between the innocent sum 1+1/4+1/9+1/16 +…. and the chaotic number π. This success inspired Euler to investigate the power of the zeta function further. He knew that if he fed the zeta function with any number bigger than 1, the result would be some finite number. After a few years of solitary study he managed to identify the output of the zeta function for every even number. But there was something rather unsatisfactory about the zeta function. Whenever Euler fed the formula for the zeta function with any number less than 1, it would always output infinity. For example, for $x = -1$ it yields the infinite sum 1 + 2 + 3 + 4 + . . . The function behaved well only for numbers bigger than 1.

Euler's discovery of his expression for $\pi^2/6$ in terms of simple fractions was the first sign that the zeta function might reveal unexpected links between seemingly disparate parts of the mathematical canon. The second strange connection that Euler discovered was with an even more unpredictable sequence of numbers.

S. Ramanujan notebooks (1910) and the power of the Brahmin network had secured Ramanujan a job as an accountant with the Port Authority in Madras. He had begun to publish some of his ideas in the *Journal of the Indian Mathematical Society*, and by now his name had come to the attention of the British authorities. C.L.T. Griffith, who worked at the College of

Engineering in Madras, recognised that Ramanujan's work was that of a 'remarkable mathematician' but he felt unable to follow or criticise it. So he decided to get the opinion of one of the professors who had taught him as a student in London.

Without formal training, Ramanujan had evolved a very personal mathematical style. It is perhaps not surprising, then, that when Professor Hill of University College, London received Ramanujan's papers claiming to have proved that (Berndt,1985)

$$1 + 2 + 3 + 4 + \ldots = -1/12$$

He dismissed most of them as meaningless. Even to the untrained eye, this formula looks ridiculous. To add up all the whole numbers and get a negative fraction is clearly the work of a madman! 'Mr Ramanujan has fallen into the pitfalls of the very difficult subject of Divergent Series,' he wrote back to Griffith.

Ramanujan had recently been given a copy of Hardy's *Orders of Infinity* by Ganapathy Iyer, a Professor of Mathematics in Madras with whom he regularly discussed mathematics on the beach in the evenings. As he read Hardy, Ramanujan must have recognised that here at last was someone who might appreciate his ideas, but later he admitted that he had feared his infinite sums would prompt Hardy 'to point out to me the lunatic asylum as my goal'. Ramanujan was particularly excited by Hardy's statement that 'no definite expression has been found as yet for the number of prime numbers less than any given number'. Ramanujan had discovered an expression which he believed very nearly captured this number. He was very keen to find out what Hardy thought of his formula.

Hardy's first impression on finding in the morning post Ramanujan's envelope covered in Indian stamps was not immediately favorable. It contained a manuscript filled with wild, fantastic theorems about counting primes, alongside well-known results presented as if they were original discoveries. In the covering letter Ramanujan declared that he had 'found a function which exactly represents the number of prime numbers'. Hard) knew that this was a stunning claim, but no formula had been supplied. Worst of all - no proofs of anything! For Hardy, proof was everything. He once told Bertrand Russell across the high table at Trinity, 'If I could prove by logic that you would die in five minutes, I should be sorry you were going to die, but my sorrow would be very much mitigated by pleasure in the proof.'

According to C.P. Snow, Hardy, having quickly looked over Ramanujan's work, 'was not only bored, but irritated. It seemed like a curious kind of fraud.' But by the evening the wild theorems were beginning to work their magic, and Hardy summoned Littlewood for after-dinner discussions. By midnight they had cracked it. Hardy and Littlewood, equipped with the knowledge to decode Ramanujan's unorthodox language, could now see that these were not the outpourings of a crank but the works of a genius - untrained, but brilliant.

They both realized that Ramanujan's infinite sum was none other than the rediscovery of how to define the missing part of Riemann's zeta landscape. The clue to decoding Ramanujan's formula is to rewrite the number 2 as 1/ (2^{-1}) is another way of writing Applying the same trick to each number in the infinite sum. Hardy and Littlewood rewrote Ramanujan's formula as

$$1+2+3+4+ \ldots.=1 +1/2^{-1}+ 3^{-1}+4^{-1}+ \ldots=-1/12$$

Staring them in the face was Riemann's answer to how to calculate the zeta function when fed with the number — 1. With no formal training, Ramanujan had run the whole race on his own and reconstructed Riemann's discovery of the zeta landscape.

3. Atomicity of Time

It is well known that idea of discrete structure of time can be applied to the ``flow" of time. The idea that time has ``atomic" structure or is not infinitely divisible, has only recently come to the fore as a daring and sophisticated hypothetical concomitant of recent investigations in the physics elementary particles and astrophysics. Greek philosophers in the sixth and fifth centuries B.C. identified dual aspects of time—*being* (the Parmenidean continuity aspect) and *becoming* (the Heraclitean transience aspect)—that to this day remain unreconciled. Time extends continuously from the past to the future (the being aspect), and things change in time (the becoming aspect). Augustine's paradox of time is that things in time change in time. Do things actually change in time, or do they appear to change because we move in time? If we move in time, then we change in time. Evidently, temporal location does not exhaust the properties of time.

In theoretical physics, time is fully spatialized and time and space have no distinction in four-dimensional space-time. Events of the physical world are displayed in space-time; they are fixed and never change, and space-time decomposes into the different spaces and times of observers in relative motion. The becoming or transience aspect of time (the part that cannot be spatialized), which consists of an awareness of change in the sensible world, is banished from the physical world as a psychological or metaphysical characteristic of the observer. The problem for the physicist and the philosopher, in Whitrow's words, is "How do we get the illusion of time's transience without presupposing transient time as its origin?"

Zeno`s paradox and the birth of atomic time. Zeno the Eleatic, by devising paradoxes of motion, tried to prove that all apparent change in the sensible world is illusory. In one of Zeno's paradoxes, Achilles and a tortoise hold a race in which the tortoise starts with a lead of 100 units of distance. While Achilles runs the 100 units of distance the tortoise travels one unit, and while Achilles runs this further unit the tortoise travels 1/100 of a unit, and so on, without limit. Hence, said Zeno, because of the infinity of subdivisions of distance, Achilles never overtakes the tortoise, thus demonstrating the illusory nature of change in the sensible world. Although readers armed with infinitesimal calculus might find this argument unconvincing, philosophers still debate the significance of Zeno's paradoxes; at issue is the assumed mathematical continuity of time. Xenocrates, a student of Plato and his successor as head of the academy in Athens, developed the concept of atomic time, which has since occasionally figured in solutions of Zeno's paradox. If time consists of indivisible moments, often referred to as chronons, motion consists of imperceptible jerks that can, it is said, explain how Achilles overtakes the tortoise. Also, transition from time atom to time atom might explain our awareness of transience.

The Kalam Universe Perhaps Zeno's paradoxes and Xenocrates's atomicity of time influenced a school of Indian philosophers (a Buddhist sect) in the first century B.C. that developed a theory of momentary time, and probably inspired Bakillani, a medieval Arab scholar. In the tenth and eleventh centuries A.D. the ilm al-kalam, a religious school of Arab philosophers, rejected the Aristotelian philosophy of more orthodox Muslim theology. Using the atomic theory of the Epicureans of the Greco-Roman world, the scholars of the kalam, the mutakallimun, sought to demonstrate the total dependence of the material world on the will of the supreme being—the sole agent. Atoms, they said, are isolated by voids and their configurations are governed not by natural agents but by the will of the sole agent.

Bakillani of Basra, who lived in Baghdad where he died in 1013, proposed that time also is atomic. In each atom of time the sole agent dissolves the world and recreates it in slightly different form. The world is created not once but repeatedly. The twelfth-century *The Guide for the Perplexed* by Moses Maimonides, a Jewish scholar, serves as a primary source of information on the kalam theory of atomic time. Maimonides wrote, "An hour is divided into sixty minutes, the minute into sixty seconds, the second into sixty parts, and so on; at last, after ten or more successive divisions by sixty, time-elements are obtained, which are not subjected to division, and in fact are indivisible."

But continual recreation poses a problem. The countless creations are isolated in atoms of time and have no connection with one another. How then can human beings arrange them in an orderly sequence? The kalam solution anticipated the theory of occasionalism). In each atom of time, the sole agent creates not only a material world, but also a corresponding mental world of remembered events linking together the time atoms.

The mutakallimun sought to demonstrate the total dependence of the world on the will of the sole agent and unintentionally stumbled on a remarkable theory that unifies the dual aspects of time. In each "now," or atom of time, the material world stretches away in space and memories of the past and expectations for the future stretch away in time; everything exists in a frozen state of being. Then everything dissolves and in a new atom a new state of being exists. Transient acts of becoming transform whole states of being. Shorn of its extreme theism, the kalam theory accounts moderately well for our complex experience of time. A. N. Whitehead wrote, "In every act of becoming there is the becoming of something with temporal extension, but. . .the act itself is not extensive." In every act ob becoming is the becoming of something with temporal extension but… the act itself is not extensive" The atomic theory of time harmonizes the extensive and non –extensive aspects of time

Monads. Rene Descartes in the first half of the seventeenth century found by introspection that he possessed an immaterial mind: "I think, therefore I am." Yet his body was no more than a machine in a world of matter in motion. How could an immaterial mind interact with a material body? In *A Discourse on Method,* he argued that the supreme being repeatedly recreates both the material world and its coincident mental world (a theory known as occasionalism). Probably Descartes knew of the medieval kalam theory from the well-known work of Maimonides.

The kalam time atoms were also forerunners of the monads invented in the second half of the seventeenth century by Gottfried Leibniz. According to Leibniz, monads are the fundamental components of the world; they exist in isolation and their inner worlds are coordinated by pre-established harmony (a theory known as parallelism). Leibniz had a copy of *The Guide for the Perplexed,* and its marginal notes in his handwriting indicate that he was aware of the kalam atomic theory.

Whether physics will ever adopt the characteristics of atomic time, thus making the observer and transient time an integral part of the physical world, is a matter for speculation (Whitrow, 1980)

4. The Model of the time atomicity

In the recent years the growing interest for the source of Universe expansion is observed. After the work of Supernova detecting groups the consensus for the acceleration of the moving of the space time is established. Expansion of the Universe We will study the influence of the repulsive gravity ($G < 0$) on the temperature field in the universe and cosmological constant Λ. To that aim we will apply the quantum equations formulated in (Marciak-Kozlowska, Kozlowski, 2013) In the monograph it was shown that the quantum diffusion equation for Planck Era has the form (T= temperature field)

$$\tau_P \frac{\partial^2 T}{\partial t^2} + \frac{\partial T}{\partial t} = \frac{\hbar}{M_p} \nabla^2 T. \tag{1}$$

In equation (1) $\tau_P = \left(\frac{\hbar G}{c^5}\right)^{1/2}$ is the relaxation time, $M_p = \left(\frac{\hbar G}{c}\right)^{1/2}$ is the mass of the Planck particle, $\hbar$, c are the Planck constant and light velocity respectively and G is the gravitational constant. Now we will describe the influence of the repulsion gravity on the quantum thermal processes in the universe. To that aim we put in equation (1) $G \rightarrow -G$. In that case the new equation is obtained, viz.

$$i\hbar \frac{\partial T}{\partial t} = \left(\frac{\hbar^3 |G|}{c^5}\right)^{1/2} \frac{\partial^2 T}{\partial t^2} - \left(\frac{\hbar^3 |G|}{c}\right)^{1/2} \nabla^2 T. \tag{2}$$

For the investigation of the structure of equation (2) we put:

$$\frac{\hbar^2}{2m} = \left(\frac{\hbar^3 |G|}{c}\right)^{1/2} \tag{3}$$

and obtains

$$m = \frac{1}{2} M_p$$

with new form of the equation (2)

$$i\hbar \frac{\partial T}{\partial t} = \left(\frac{\hbar^3 |G|}{c^5}\right)^{1/2} \frac{\partial^2 T}{\partial t^2} - \frac{\hbar^2}{2m} \nabla^2 T. \tag{3}$$

Equation (3) is the quantum Heaviside equation .To clarify the physical nature of the solution of equation (3) we will discuss the diffusion approximation, i.e. we omit the second time derivative in equation (3) and obtain

$$i\hbar \frac{\partial T}{\partial t} = -\frac{\hbar^2}{2m} \nabla^2 T. \tag{4}$$

Equation (4) is the Schrödinger type equation for the temperature field in a universes with $G < 0$. Both equation (4) and diffusion equation:

$$\frac{\partial T}{\partial t} = \frac{\hbar^2}{2m} \nabla^2 T \tag{5}$$

are parabolic and require the same boundary and initial conditions in order to be “well posed”. The diffusion equation (4) has the propagator

$$T_D\left(\vec{R},\Theta\right)=\frac{1}{\left(4\pi D\Theta\right)^{3/2}}\exp\left[-\frac{R^2}{2\pi\hbar\Theta}\right], \tag{6}$$

where

$$\vec{R}=\vec{r}-\vec{r}\,', \quad \Theta=t-t\,'.$$

For equation (4) the propagator is:

$$T_S\left(\vec{R},\Theta\right)=\left(\frac{M_p}{2\pi\hbar\Theta}\right)^{3/2}\exp\left[-\frac{3\pi i}{4}\right]\exp\left[\frac{iM_pR^2}{2\pi\hbar\Theta}\right] \tag{7}$$

with initial condition $T_S(R, 0) = \delta(R)$

The anthropic argument In equation (7) $T_S((R), \Theta)$ is the complex function of R and Θ. For anthropic observers only the real part of T is detectable, so in our description of universe we put:

$$\operatorname{Im}T\left(\vec{R},\Theta\right)=0. \tag{8}$$

The condition (8) can be written as (bearing in mind formula (7):

$$\sin\left[-\frac{3\pi}{4}+\left(\frac{R}{L_p}\right)^2\frac{1}{4\tilde{\Theta}}\right]=0, \tag{9}$$

where $L_P=\tau_P c$ and $\tilde{\Theta}=\Theta/\tau_p$. Formula (9) describes the discretization of R

$$R_N=\left[\left(4N\pi+3\pi\right)L_p\right]^{1/2}\left(tc\right)^{1/2}, \quad N=0,1,2,3... \tag{10}$$

In fact from formula (38) the Hubble law can be derived

$$\frac{\dot{R}_N}{R_N}=H=\frac{1}{2\tau}, \tag{11}$$

independent of N. In the subsequent we will consider R (10), as the space-time radius of the $N-$ universe with "atomic unit" of space L_P. It is well known that idea of discrete structure of time can be applied to the "flow" of time. The idea that time has "atomic" structure or is not infinitely divisible, has only recently come to the fore as a daring and sophisticated hypothetical concomitant of recent investigations in the physics elementary particles and astrophysics. We define time T as

$$\mathrm{T}= M\ \tau_p,\ M = 0, 1, 2, \ldots \tag{12}$$

Considering formulae (9) and (12) the space-time radius can be written as

$$R(M,N)=\pi^{1/2}M^{1/2}\left(N+\frac{3}{4}\right)^{1/2}L_p, \quad M,N=0,1,2,3,.... \tag{13}$$

Formula (13) describes the discrete structure of space-time. As the $R(M, N)$ is time dependent, we can calculate the velocity, $\upsilon=dR/dt$, i.e. the velocity of the expansion of space-time

$$\upsilon = \left(\frac{\pi}{4}\right)^{1/2} \left(\frac{N+\frac{3}{4}}{M}\right)^{1/2} c, \tag{14}$$

where c is the light velocity. We define the acceleration of the expansion of the space-time

$$a = \frac{d\upsilon}{dt} = -\frac{1}{2}\left(\frac{\pi}{4}\right)^{1/2} \left(\frac{N+\frac{3}{4}}{M^3}\right)^{1/2} \frac{c}{\tau_p}. \tag{15}$$

Considering formula (15) it is quite natural to define Planck acceleration:

$$A_p = \frac{c}{\tau_p} = \left(\frac{c^7}{\hbar G}\right)^{1/2} = 10^{51}\,\mathrm{ms}^{-2} \tag{16}$$

and formula (43) can be written as

$$a = -\frac{1}{2}\left(\frac{\pi}{4}\right)^{1/2} \left(\frac{N+\frac{3}{4}}{M^3}\right)^{1/2} \left(\frac{c^7}{\hbar G}\right)^{1/2}. \tag{17}$$

It is quite interesting that for N, $M \to \infty$ the expansion velocity $\upsilon < c$ in complete accord with relativistic description. Moreover for N, $M >> 1$ the υ is relatively constant $\upsilon = 0.88\, c$. From formulae (38) and (42) the Hubble parameter H, and the age of our Universe can be calculated

$$\begin{aligned} &\upsilon = HR, \qquad H = \frac{1}{2M\tau_p} = 5\cdot 10^{-18}\ \mathrm{s}^{-1}, \\ &T = 2M\tau_p = 2\cdot 10^{17}\ \mathrm{s}\ \sim 10^{10}\ \text{years}, \end{aligned} \tag{18}$$

which is in quite good agreement with recent measurement .As is well known in de Sitter universe the cosmological constant Λ is the function of R, radius of the Universe,

$$\Lambda = \frac{3}{R^2}. \tag{19}$$

Substituting formula (38) to formula (47) we obtain

$$\Lambda = \frac{3}{\pi N^2 L_p^2}, \quad N = 0,1,2.... \tag{20}$$

The result of the calculation of the radius of the Universe, R, the acceleration of the spacetime, a, and the cosmological constant, Λ are presented in Figs. 1, 2, 3, 4 for different values of number N. As can be easily seen the values of a and R are in very good agreement with observational data for present Epoch. As far as it is concerned cosmological constant Λ for the first time we obtain, the history of cosmological constant from the Beginning to the present Epoch.

5. Riemann`s Zeta (x) function and human consciousness

Riemann`s Zeta function is described by formula

$$\prod(s) = \int_0^\infty e^{-s} x^s dx, (s > -1)$$

$$\zeta(x) = \frac{\prod(-s)}{2\pi i} \int_{-\infty}^{\infty} \frac{(x)^s}{e^x - 1} \frac{dx}{x}$$

In Figs.1 and 2 we present the shape of the Zeta (x) for different ranges of x

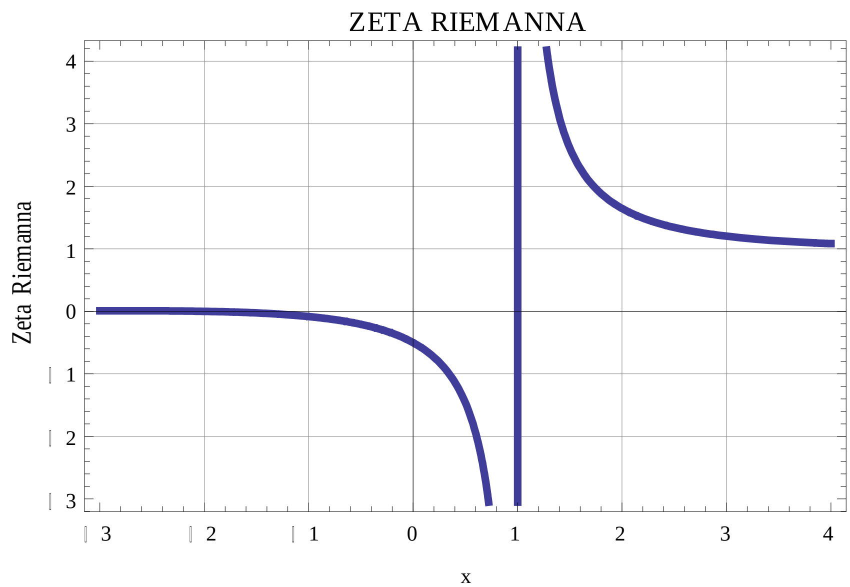

Fig.1. Riemann`s Zeta(x), for $-3 \le x \le 4$

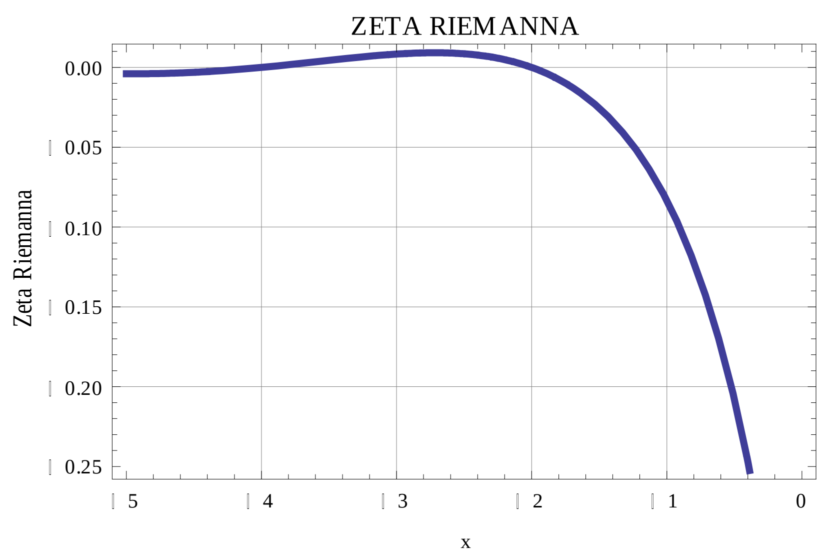

Fig.2. Riemann`s Zeta(x), for $-5 \le x \le 0$

For x=-1 we have the formula

$$\zeta(-1) = 1 + 2 + 3 + 4 + 5 + ... = -\frac{1}{12}$$

According to formula (12) the Universe life time can be written as

$$T = \zeta(-1)\tau_P = -\frac{1}{12}\tau_P \qquad (21)$$

where τ_P is Planck time.

Consequently we obtain for the Radius of the Universe

$$R = \zeta(-1)L_P = -\frac{1}{12}L_P \qquad (22)$$

Where L_P is Planck radius. From formulae (5) and (6) we conclude that in the Big End Universe returns to "negative" Planck Epoch.

For $T = \tau_P$ the Universe was born. According to Hameroff and Penrose (Hameroff, Penrose , 2013) theory of consciousness at the same time consciousness was born also. From formulae (21) and (22) we conclude that Universe ended with negative time

$$T(\to \infty) = -\frac{1}{12}\tau_P \quad (23)$$

Pre Big Bang models of the Universe (Gasperini, Veneziano , 2001) deals with two branches described in low energy effective treatments. Both branches are string duality related but the former runs on negative time scales (as in formula (23) At that time in New Universe the "negative consciousness" exists. As it is well known in the our "positive" Universe the characteristic energy is equal Planck Energy=$10^{19} GeV$. What is energy characteristic for " negative Universe?. From the above we conclude that for "negative Universe" $M_p^- c^2 = -10^{19} GeV$. Considering Dirac hypothesis for negative energy states:

$$E_{Dirac} = \sqrt{(pc)^2 + (M_P c^2)}^2$$
$$p = 0, E_{Dirac} = \pm M_P c^2$$

We argue that "negative Universe consists of negative Planck particles, with negative energies. The "positive " and "negative" Universes are separated by energy gap= $2 M_P c^2$ Moreover the negative consciousness is connected to " neurons" with negative mass $=-M_P c^2$. (Planck Mass equals the human neuron mass).

The transitions happened, we exist. The reverse process. I have no idea.

$$-M_P c^2 \rightarrow +M_{P,} c^2 Creation, BigBang$$

Conclusions

Riemann`s Zeta functions plays fundamental role in different branches of mathematics and mathematical physics. In the paper we argue that the Zeta function is important for the study of human consciousness.

References

Berndt B C. S Ramanujan`s Notebook, Part I, Springer 1985, p137
Edwards H.M Riemann`s Zeta Function, Academic Press New York, USA, 1974
Gasperini M, Veneziano G., Axiv : hep-th/0207130v1
Hameroff, S; Penrose, R). "Consciousness in the universe: A review of the 'Orch OR' theory". *Physics of Life Reviews* (Elsevier) 11 (1): 39–78. 2013
Marciak-Kozlowska J, Kozlowski M, From infinity to Infinity and Beyond, Nova Science Publishers, New York, USA 2013
Whitrow, G.J. *The Natural Philosophy of Time.* 2nd ed. Oxford: Clarendon Press, 1980.
Wigner, E. P. Physics and Explanations of Life. Foundations of Physics 1970;1:35-45.
Phillips, R. & Quake, S. R. The Biological Frontier of Physics. Physics Today 2006; 59(5): 38-43.
Josephson B. (2002) Beyond quantum theory: a realist psycho-biological interpretation of reality' revisited. BioSystems 44: 43-45.