

Why Does Time Exist? Why Does Space Exist?

ABSTRACT

Do time and space exist because there exist mathematical structures that determine the empirical facts about physics? Does time exist because  $2^{46}$  divides the order of the monster group? Does space exist because  $3^{20}$  divides the order of the monster group? This brief communication offers speculation concerning string theory and a possible unified theory of mathematics, theoretical physics, and theoretical computer science.

MOND

“It seems to me that in understanding MOND and its fundamentals we have only scratched the surface. If the developments of quantum mechanics and relativity are any lesson here, departures of such magnitude from long- and well-tested physics may bring with them completely new concepts, not summarized by mere modifications of the governing actions or the equations of motion.” — Mordehai Milgrom

<http://arxiv.org/abs/1404.7661> “MOND theory” by Mordehai Milgrom, 2014

Does MOND indicate that something is wrong with contemporary thought on the foundations of physics? Is there a unified theory of mathematics, theoretical physics, and theoretical computer science?

MOND AND STRING THEORY

I suggest that string theory with the infinite nature hypothesis implies Newtonian-Einsteinian gravitational theory, while string theory with the finite nature hypothesis implies Milgromian gravitational theory, i.e. the Fernández-Rañada-Milgrom effect — or perhaps a more complicated modification of general relativity theory. How might vibrating strings interact among alternate universes of quantum logic? The answer to the preceding question might require profound new developments. I posted several comments in the comments section of the following expository article:

<http://www.nature.com/news/the-biggest-mystery-in-mathematics-shinichi-mochizuki-and-the-impenetrable-proof-1.18509> “The biggest mystery in mathematics: Shinichi Mochizuki and the impenetrable proof” by Davide Castelvecchi, 7 October 2015, Nature News & Comment

The following two posts (POST A & POST B) were first made in the comments sections of the preceding article by Castelvecchi.

POST A

... “Physicists with a background in string theory or gauge theory dualities can understand my paper with Kapustin on geometric Langlands, but for most physicists, this topic is too detailed to be really exciting. On the other hand, it is an exciting topic for mathematicians but difficult to understand because too much of the quantum field theory and string theory background is unfamiliar (and difficult to formulate rigorously). That paper with Kapustin may unfortunately remain mysterious to mathematicians for quite some time.” — Edward Witten

<https://www.ias.edu/ias-letter/2015/witten-interview> Geometric Langlands, Khovanov Homology, String Theory I Institute for Advanced Study, Summer 2015

What is the main problem with string theory? What are string theorists unaware of? I say that the world’s 3 greatest living scientists are James D. Watson, Sydney Brenner, and Professor Milgrom of the Weizmann Institute.

<http://www.weizmann.ac.il/particle/milgrom/> Welcome letter I Mordehai (Moti) Milgrom, Weizmann Institute

Does the explanation of Milgrom's MOND require string theory and perhaps the physical analogue of Mochizuki's IUT and/or geometric Langlands? I say that string theory with the infinite nature hypothesis implies Newtonian-Einsteinian gravitational theory, while string theory with the finite nature hypothesis implies Milgromian gravitational theory, i.e. the Fernández-Rañada-Milgrom effect.

<http://www.premiodupont.org/c/fernandez.htm> Antonio Fernández-Rañada, Catedrático en la Facultad de Física de la Universidad Complutense de Madrid, Premio DuPont de la ciencia

According to Lestone's heuristic string theory, a lepton consists of 3 vibrating strings confined to a 2-sphere. Does a massive boson consist of 1 vibrating string confined to a 1-sphere? Does a quark consist of 9 vibrating strings confined to a 3-sphere? Is the Koide formula essential for understanding the foundations of physics? What will be the verdict of the history of science on Milgrom's MOND?

"I came to the subject a True Believer in dark matter, but it was MOND that nailed the predictions for the LSB galaxies that I was studying (McGaugh & de Blok, 1998), not any flavor of dark matter. So what I am supposed to conclude? ..." — McGaugh

"The currently (2010) widely accepted/believed description of the birth and evolution of the universe and of its contents is "Lambda Cold Dark Matter Concordance Cosmological Model" (LCDM CCM) ... My own research was very much confined to the early version of the LCDM CCM (mid-1990's) when I began performing numerical experiments on the satellite galaxies of the Milky Way. I was quite happy with the CCM, as everyone else, and did not bother with the fundamental issues raised by some. With time, however, it became apparent that the LCDM CCM accounts poorly for the properties of the satellite galaxies and their distribution about the Milky Way. Warm dark matter models fared no better." — Kroupa

I say that Milgrom is the Kepler of contemporary cosmology. If Milgrom's MOND were wrong, then there is no way that he could have convinced McGaugh and Kroupa. Is the person who can mathematically fathom the mathematical work of Mochizuki and Witten likely to be the Newton of contemporary cosmology? ...

POST B

"We had mathematics before Mochizuki's work — and now we have mathematics after Mochizuki's work." — Ivan Fesenko

If Professor Fesenko's statement is true, then is it likely that Mochizuki's work is important for the mathematics of string theory?

"How does string theory generalize standard quantum field theory? Why does string theory force us to unify general relativity with the other forces of nature, while standard quantum field theory makes it so difficult to incorporate general relativity? Why are there no ultraviolet divergences in string theory? And what happens to Albert Einstein's conception of spacetime?" — Edward Witten

<http://scitation.aip.org/content/aip/magazine/physicstoday/article/68/11/10.1063/PT.3.2980> "What every physicist should know about string theory" by Edward Witten, Physics Today, Nov. 2015

[http://en.wikipedia.org/wiki/String\\_theory](http://en.wikipedia.org/wiki/String_theory)

[http://en.wikipedia.org/wiki/Standard\\_Model](http://en.wikipedia.org/wiki/Standard_Model)

CONJECTURE 1: The most important mathematical structures for understanding the foundations of physics are the monster group, the 6 pariah groups, the Clebsch diagonal cubic surface, and 3 copies of the Leech lattice.

CONJECTURE 2: There exists a stringy formula which somehow compares one copy of the Leech lattice to the Clebsch surface and yields a formula:

$(W \text{ boson mass})/(Z \text{ boson mass}) = 24/27 - a(1) * \pi^{-4} + a(2) * \pi^{-8} - a(3) * \pi^{-12} + \dots$ ,  
where each  $a(n)$  is a positive rational number.

$80.387/91.1876 - 8/9 + (7 * 41/400) * \pi^{-4} = .0000332176... \text{ approx.}$

$80.390/91.1874 - 8/9 + (7 * 41/400) * \pi^{-4} = .0000680504... \text{ approx.}$

$80.385/91.1876 - 8/9 + (7 * 41/400) * \pi^{-4} = .0000112848... \text{ approx.}$

$80.387/91.1876 - 8/9 + (5/7) * \pi^{-4} = 2.19808 * 10^{-7} \text{ approx.}$

$\pi^{-8} = .00010539... \text{ approx.}$  (By "W boson" I mean either the  $W^+$  or  $W^-$  since they have the same mass, according to theory.)

continued fraction  $(7 * 41)/400 = [0; 1, 2, 1, 1, 5, 1, 3, 2]$

$[0; 1, 2, 1, 1] = 5/7$

CONJECTURE 3: Assume (A), (B), & (C): (A) String vibrations are approximately confined to 3 copies of the Leech lattice. (B) The symmetries of string vibrations are approximately governed by the monster group and the 6 pariah groups. (C) The Clebsch surface explains why there are 3 color charges for quarks and gluons. By assuming (A), (B), & (C) there are 4 stringy formulas that accurately predict all of the free parameters of the Standard Model of particle physics, namely the formulas for bosonic mass scale, fermionic mass scale, coupling constants' scale, and unified monstrous moonshine.

CONJECTURE 4: There exists a MOST PROFOUND OCCURRENCE of Euler's constant in Mochizuki's IUT. There exists a MOST PROFOUND OCCURRENCE of Euler's constant in monstrous moonshine. These two most profound occurrences are a key to understanding a unified theory of mathematics, theoretical physics, and theoretical computer science.

Are the preceding 4 conjectures absurd rubbish? Perhaps so. On 10 November 2015, Professor Bruce Berndt replied in a part to an email, "I do not know of any formula relating Euler's constant with monstrous moonshine. Such a formula would be surprising."

[http://en.wikipedia.org/wiki/Bruce\\_C.\\_Berndt](http://en.wikipedia.org/wiki/Bruce_C._Berndt)

## SYMMETRIES

Is it valid to think of Euler's constant as a link between continuum mathematics and non-continuum mathematics? What are the most profound symmetries in the mathematics of continua and in the mathematics of lattices?

"Many problems in quantum mechanics are characterised by discrete symmetries. At the heart of many of them lies Dirac quantisation where charges (e.g. electric or magnetic) of physical states are restricted to lie in certain lattices rather than in continuous spaces. The discrete symmetries preserving the lattice are often called dualities and can give very interesting different angles on a physical problem. This happens in particular in string theory, where such dualities mix perturbative and non-perturbative effects."

<http://arxiv.org/abs/1511.04265> "Eisenstein series and automorphic representations" by Fleig, Gustafsson, Kleinschmidt, & Persson, 2015

Could time exist because  $2^{46}$  divides the order of the monster group? Could space exist because  $3^{20}$  divides the order of the monster group?

The following is quoted from an email that I send to Professor Martin Huxley on 21

November 2015:

“... The Standard Model of particle physics has 36 quarks, 12 leptons, 4 massive bosons (Z, W $\pm$ , & Higgs), and 9 massless bosons (photon & 8 gluons). One might say that there are 6 basic quarks: up, down, charm, strange, top, & bottom — because quarks can occur in matter/antimatter pairs and have so-called color charge. My guess is that the basic 6 quarks occur because there are 6 pariah groups.

The order of the monster group is  $2^{46} * 3^{20} * 5^9 * 7^6 * 11^2 * 13^3 * 17 * 19 * 23 * 29 * 31 * 41 * 47 * 59 * 71$  — I believe that the multiverse contains matter time and antimatter time. We may write  $2^{46} = 4^{23}$  — my guess is that the 23 represents 23 “alternate moonshines” (reference:

<https://www.quantamagazine.org/20150312-mathematicians-chase-moonshines-shadow/> Mathematicians Chase Moonshine, String Theory Connections | Quanta Magazine)

that the monster group needs to somehow distribute to accommodate the 6 pariah groups and thus create the Standard Model of particle physics. In other words, my guess is that  $2^{46}$  is the correct number that allows the monster group to take 23 copies of 4-dimensional space-time and then establish a duality formula between the 92 dimensions (from the 23 copies) and 92 dimensions consisting of 64 dimensions of quantum uncertainty + 2 dimensions of time + 26 dimensions of bosonic string theory. The 64 dimensions of quantum uncertainty somehow predict 64 different types of particles in free space — the 61 known particles of the Standard Model + graviton + inflaton + axion. We may write  $3^{20} = 6^{10}$  — my guess is that the 6 represent 3 dimensions of linear momentum + 3 dimensions of angular momentum, while the 10 represents the dimension of the fundamental domain of string theory. The  $3^{20}$  allows precisely the amount of dimensional freedom needed for the monster group to distribute copies of 3 dimensions of space in creating bosonic string theory. However, I might be horribly confused and many of my ideas are foolish, crackpot ideas. It would be helpful if you can point out any obvious blunders in the preceding. I might be completely wrong on everything except the empirical validity of the work of Milgrom, McGaugh, Kroupa & Pawlowski.”