

Re: A question of discrete space–time, part 3

Source: <http://sci.tech–archive.net/Archive/sci.physics.research/2005–06/msg00550.html>

- *From:* robert bristow–johnson <rbj@xxxxxxxxxxxxxxxxxxxxxxxx>
 - *Date:* Sun, 26 Jun 2005 16:43:08 +0000 (UTC)
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in article [d9j53b\\$1oe6\\$1@xxxxxxxxxxxxxxxxxxxxxxxx](mailto:d9j53b$1oe6$1@xxxxxxxxxxxxxxxxxxxxxxxx), Ed Hanna at stq50@xxxxxxxx wrote on 06/25/2005 04:37:

> Igor Khavkine wrote:

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>> People have been thinking about lattices and cellular automata for a
>> long time (think Stephen Wolfram, Ed Fredkin, etc.). There's even been a
>> newsgroup created to discuss discrete physics models
>> (sci.physics.discrete). If you hope to get some of your work published,
>> you must first make sure that it is indeed original. For that, there is
>> no substitute beside doing an extensive literature search.

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> I also know of Ed Fredkin, and that he used to be a frequent newsgroup
> contributor. However, I haven't seen any newsgroup postings by him
> since 2003. Is he still active? I would like to have had his comments
> on this thread.

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> I also know about sci.physics.discrete and have tried to post there,
> but that newsgroup seems to have died out in January 2005, and is no
> longer active.

i just want to add that Ed Fredkin seemed to have no use for the
gravitational constant, G , in his theory (not sure why). his unit of
discrete–time was many orders of magnitude larger than the Planck Time.

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> It bears repeating that I'm not trying to convince anyone of the merits
> of a discrete space–time over continuum physics,

i am an agnostic regarding discrete vs. continuous physics, but if reality
turned out to be discrete, i would not be surprized if the discrete units of
time and length turned out to be the Planck units, possibly scaled by
 $\sqrt{4\pi}$ ("rationalized Planck units").

i am not an agnostic about the notion of Planck units (or better yet,
rationalized Planck units). i truly believe that nature is inherently
scaled by them and there is no magic universal quantity defined by c or G or

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\hbar or ϵ_0 (or Boltzmann, either, for that matter). on the Planck scale they just don't exist as concepts of quantity which is one reason i think that Michael Duff is absolutely right about the "operationally meaningless" of VSL or varying G theories (or a varying \hbar theory if anyone puts one out). there is no way we could know the difference if they did vary, we would still measure them and perceive them to be the same as before.

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- > This seems to provide hope of
- > finding a basis for unifying relativity and quantum mechanics, by
- > proposing a discrete space–time at the Planck scale.

the Planck Time and Planck Length are so ridiculously small (from the POV of our human existence) that i can't see how any meaningful accuracy is lost if all of these differential equations (Schrodinger, Maxwell's, GR or GEM) were expressed in discrete form (a la Euler) as one would do if trying to simulate these equations on a computer. might not be the true representation of reality, but i can't see how it would be measurably different. well, i wouldn't want light or gravitational propagation to be in the shape of an expanding cube or tetrahedron (instead of spherical expansion), so somehow i think these discrete "cells" could not have some absolute fixed orientation. i dunno how to model it so that no direction in space appears to be preferred over another.

so, to take advantage of an opportunity to spout off a personal theory (and at risk of having a real physicist like JJ Lodder label this Platonic aestheticism, not physics), i just want to repeat that it still seems obvious that Nature (whoever she is) has shown us (from our anthropocentric measurements of c , G , \hbar , and ϵ_0) a preference of units that are defined in accord to these four definitions:

1. One unit of mass is equivalent to one unit of energy (or equivalently, the unit velocity is the speed of light).
2. A particle or photon with a wave function of one unit of radian frequency shall have one unit of energy.
3. The force applied to a unit mass in one unit of gravitational flux density shall be one unit of force and a single unit of gravitational flux density shall result from a unit mass distributed over a unit area.
4. The force applied to a unit charge in one unit of electrostatic flux density shall be one unit of force and a single unit of electrostatic flux density shall result from a unit charge distributed over a unit area.

so then, what you get for the four base units (and their relationship to the Planck units):

$$T = \sqrt{\hbar(4\pi G)/c^5} = \sqrt{4\pi} * T_P$$

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$$L = \sqrt{(\hbar \cdot (4\pi \cdot G) / c^3)} = c \cdot T = \sqrt{4\pi} \cdot L_P$$

$$M = \sqrt{(\hbar \cdot c / (4\pi \cdot G))} = 1 / \sqrt{4\pi} \cdot M_P$$

$$Q = \sqrt{(\hbar \cdot c \cdot \epsilon_0)} = 1 / \sqrt{4\pi} \cdot Q_P$$

$$= e / \sqrt{4\pi \cdot \alpha}$$

(both the speed of propagation, c , and the characteristic impedance, Z_0 , in free space for both E&M or gravity waves turn out to be 1 in these units. this is why i just don't understand why either Planck, regarding G , and the CGS system, regarding ϵ_0 , did not "rationalize" the system of units.) if you discretize space and time with cell size of L and T (and measure mass and charge in units of M and Q), there are no scaling constants that nature would be using to express or implement those difference equations taken from the well known differential equations of QM, E&M, GR (or GEM). and that is attractive because the alternative is saying that for some hard to explain reason, nature takes this amount of, say, electric charge flux diverging from some point and scales it with some number pulled out of the air like 4π or $4\pi \cdot \alpha$ (if "e" is the unit charge) to get the E field, and i think it would be difficult to explain why this mindless mechanism of nature, whether operating in a continuous or discrete manner, would bother to be using any such seemingly contrived constants in just implementing physical reality.

admittedly, JJ, this is more philosophy than physics. but it gets me wondering. sorry to pile on a little more speculation onto your thread, Ed.

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"Imagination is more important than knowledge."

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• *Follow-Ups:*

- ◆ **Re: A question of discrete space–time, part 3**

◇ From: John C. Polasek

- ◆ **Re: A question of discrete space–time, part 3**

◇ From: Ed Hanna

• *References:*

- ◆ **A question of discrete space–time, part 3**

◇ From: Ed Hanna

- ◆ **Re: A question of discrete space–time, part 3**

◇ From: Ed Hanna

Re: A question of discrete space–time, part 3

- Prev by Date: *Re: currents or charges densities*
- Next by Date: *Re: Small, slow AC machines: surface to volume ratio?*
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