Is Ratio 3:1 a comprehensive principle of the Universe ?
(Logic of Tetrahedron)

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Abstract

 Examples of physical evidences supporting the Ratio 3:1 are given.
Concept of Metasymmetry and Broken Metasymmetry (BM) is introduced.
The 3:1 Ratio has been found as a numerical measure of BM.
An attempt have been made for explanation of BM as total effect   Bose - Fermi mixture.

 There are several different physical facts, which have the same abstract property.

We call these facts   "broken tetrads". In the broken tetrad 4 elements are splitting to Ratio of 3:1.

Examples of the broken tetrads:

1. Space is 3-dimensional, Time is 1-dimensional.

2. Only 3 elementary particles in nature are stable with a half-integer spin (fermions): (proton, electron, neutrino) and 1 is stable with an integer spin (boson)-photon.

3. Hydrogen is the most abundant of the chemical elements.
Helium is the second lightest element and is the second most abundant in the observable Universe.
System from **n** fermions behaves as a fermion or a boson depending on an even or odd number of **n**.
Such approach stresses predisposition of Hydrogen or Helium to correspond to fermions or bosons.
Hydrogen and Helium are estimated to make up roughly 74% and 24% of all baryonic matter in the Universe respectively. Total 98%!

Almost 3:1 Ratio...

4. Beta minus decay where 1 neutron converts into a proton, an electron and an antineutrino.
   Beta plus   decay where 1 proton converts into a neutron, an positron and neutrino.
   Again 3:1 Ratio
  All are fermions.

5. In the Standard Theory of electroweak interaction bosons (W+, W-, Z) have a mass but a photon doesn't.
   Again the 3:1 Ratio.
   All are bosons.

6. 3 of 4 fundamental interactions (strong, electromagnetic, weak) are relatively close by their values, but are greatly different from gravitational Again the 3:1 Ratio.

7. The contents of the Universe include 4% atoms, the building blocks of stars and planets (NM-Natural Matter). Dark Matter (DM) (comprises 22% of the Universe. 74% of the Universe, is composed of "Dark Energy"(DE) that acts as a sort of an anti-gravity. This energy, distinct from dark matter, is responsible for the present-day acceleration of the universal expansion.
 NM=4%; DM=22%; DE=74%; NM+DM=26%;
Approximately DE/NM+DM=3:1.   Energy vs Matter.

Is Ratio 3:1 a fundamental property of the Universe?

Is there one reasonable foundation for all these testimonies?
This is an attempt to show it.

 Consider a concept of discrete-continuous symmetries..
We have 2 different kinds of symmetries: discrete and continuous.
Basic difference between them:
Discrete symmetry transformations are static symmetry (reflections, parity, etc).They are not demanding motion, change in time.
Continuous symmetry transformations are dynamic symmetry. They are demanding motion (rotations, translations, shifts,etc), change in time.
Does there exist a universal symmetry, which includes both symmetries, discrete and continuous?
I have tried to introduce the concept of a unified symmetry, which includes both symmetries, discrete and continuous, and call it Metasymmetry.
Now to Metasymmetry. Idea inspired by John Wheeler's article "It from bit"{1} We will try to represent discrete symmetry and continuous symmetry by minimal means, using at

least two symbols. We can use signs 0 and 1 Then the minimal discrete symmetry may be represented as 1 0 or 0 1 and minimal continuous symmetry as 1 1. We used some approximation without which our reasoning would be impossible. Now, going back to symmetry between the discrete and the continuous we may use representations as 01 11 or 10 11 or 11 01 or 11 10. General conclusion is as follows: total number of unities to zero makes up invariant Ratio of 3:1. Best model of Metasymmetry is Tetrahedron, which has 4 faces and each face is a triangle. This means there is 1 closed side and 3 open sides when a tetrahedron comes to rest on a flat surface. 3 vertexes lie in one plane, while the fourth is not. Any Tetrahedron can also be proof of the ratio of 3:1.
I call this effect "Logic of Tetrahedron ".

At first glance, a concept of discrete-continuous symmetries and a concept of symmetry-antisymmetry have nothing in common , but when we try to compactly describe them, we can see that the two concepts are the same. A pair of discrete-continuous symmetry looks like a pair of symmetry (1 1)- antisymmetry (0 1or1 0) , if represented in the same symbolic form 01 11 ; 10 11; 11 01; 11 10.

What can be said about Metasymmetry ? Metasymmetry is a metastable symmetry. When it is falling apart, then the effect 3:1 emerges. The effect emerged probably simultaneously with the origin of the Universe.
Ratio 3:1 is the numerical measure of Broken Metasymmetry.

I suggest that 3:1 (examples #1,#2,#3) is enclosed in a total interaction of Bose and Fermi particles or fields, and it is a bootstrapping relationship between mentioned evidences.

Surprisingly, the container(space-time), content(fermions-bosons), content (energy-matter) obey the same law 3:1.

Examples #4, #5 are confirmations of ratio 3:1 for fermions and bosons respectivly. Ratio 3:1 (example # 6) maybe mean gravitationial force is different (not fundamental), as "induced gravity" proposed by Andrei Sakharov.

Maybe the puzzle of example # 7 is explained by all above mentioned examples?

I set up a hypothesis that an effect of 3:1 consists in total interaction between symmetric (Bosons) and antisymmetric (Fermions) wave functions.
I point out to an analogy of these fields with geometrical concepts which were published in my article "Geometry of microworld" {3}. In this article, the formal analogy between the properties of non-euclidian geometries was shown on one hand, and the properties of fermions and bosons on the other hand.
Below is the essence of this analogy. Translation from Russian:

"According to contemporary ideas the spin of elementary particle is a mysterious intrinsic angular momentum of a particle, for which it is impossible a somewhat real physical picture to create. The absence of spin visual picture, in opinion of a number

of authors leaves the regrettable gap in quantum mechanics interpretation. On the other hand, there are highly developed geometrical disciplines which are difficult to apply to specific physical theories owing to the fact that it is not always possible to point out the objects to which the geometrical notions could be corresponded to. We point out one analogy, which, in our view, can testify to the geometrical interpretation of spin as a sign of curvature of space.

According to Pauli principle the two identical particles with half-integer spin (fermions) can't (NO - 0) occupy the same quantum state. MANY(Infinity) particles with integer spin(bosons) can occupy the same quantum state.   Two similar fermions can't be found in the same point. For bosons the situation is opposite.

The remarkable fact: in one case the same place of space can't put more than one particle and in the other-infinitely many, which gives a hint that spin has some geometrical sense. Speaking metaphorically the spin in one case creates very "tight", and in the other case - very "spacious" space. Why so? Need to search for the answer in geometric concepts .

 We proceed to geometry and recall some facts reminding us of the situation with fermions and bosons. It is well-known that besides Euclidean geometry there are other geometrical systems (Hyperbolic, Elliptic).
According to Klein's interpretation, based on the projective geometry, the Euclidean, Hyperbolic and Elliptic geometries are in the unified scheme. The most known indication to identify the two geometries are: in the Elliptic geometry there exists NO (0) parallel to a given line which couldn't cross the given straight line (analogy with fermions), in the Hyperbolic geometry ....MANY(Infinity) other extending straight lines pass.. (analogy with bosons).There is (0,1,infinity) number 1 correspond Euclidean case".

Summary of a twofold analogy.

Fermions---antisymmetric wave function; Elliptic geometry - Positive Gauss curvature surface (membrane).

Bosons--symmetric wave function; Hyperbolic geometry - Negative Gauss curvature surface (membrane).

There is nothing in common between same quantum state (physics) and parallel (geometry). The analogy is not proof. The suspicion arises that spin is the sign of elementary particle pointing out to its non-Euclidean nature. Maybe the zero curvature and 3 dimensions of space develop from mixing positive and negative curvatures of surfaces(membranes) created by fermions and bosons? Maybe this is a key to understand "space foam" contrary to "spacetime foam."
I admit that this records are sketchy, nevertheless they deserve attention.

Of course, the additive approach of (3+1) D Space-Time let has resolved many problems of modern physics and was very fruitful.
But recognition of splitting approach   3:1 can give a better understanding of Nature.

John A. Wheeler was characterized as a physicist, philosopher, poet, visionary, guru in "New Scientist", April 15, 2008.

I would like to remind of a quote by John Wheeler:

"Behind it all is surely an idea so simple, so beautiful, that when we grasp it - in a decade, a century, or a millennium - we will all say to each other, how could it have been otherwise? How could we have been so stupid?"{4} Other version from is :" How can we have been so blind for so long?"

"Some day a door will surely open and expose the glittering central mechanism of the world in its beauty and simplicity."

Another version: "I don't know whether it will be one year or a decade, but I think we can and will understand. That's the central thing I would like to stand for. We can and will understand."

Perhaps all of what we said   above confirms the predictions of Great Visionary?

References

1.John Wheeler "It from Bit" p.295-311 "At Home in the Universe" (Masters of Modern Physics) 1992

2.Химия и жизнь, Геометрия микромира, 1982, № 9, p.40

3.Ch.W.Misner, K.S.Thorne, J.A.Wheeler "Gravitation",p.1197, 1972

Replacement