LETTERS TO PROGRESS IN PHYSICS

Cosmological Cold Dark Matter and Dark Energy Match Icosahedron Symmetry

Felix Tselnik
E-mail: tselnik@bgu.ac.il

A charge analogous though different from the usual electric charge is introduced with the same kind of gauge but applied to the icosahedron. This "cosmocharge" might be a source of the accelerating expansion of universe in cosmology (Dark Energy).

In a unmetric approach [1], *contact* is the prime concept defined by the point-like — yes/no — condition, and all predictions in a Contact Problem are made by means of counting top-velocity signal oscillations numbers between *bodies* moving along their trajectories. In so doing, we need no intermediaries like rulers, clocks, or reference frames that could introduce all of their own or hide something. Therefore only direct motion-to-motion measurements should be used. Then even the concept of body is introduced solely as something, for which Contact Problem makes sense.

Suggesting free motion to be rectilinear and uniform, we ascribe acceleration to external forces. However, as mentioned by Einstein, this picture leads to a vicious circle, since the absence of forces itself is verified just by this kind of motion. There is nothing intrinsic for an individual straight line. Moreover, how can we be sure in practice that rulers are straight and clocks click uniformly? And are such features of these auxiliary devices actually necessary for Contact Problem predictions? Can integration required to construct the trajectory in a field be carried out without approximation with such segments?

Metric-less approach makes it possible to dispense with these artificial schemes. Rather than consider particular lines, we could first work with classes of lines provided with some particular rules for mutual intersections and then develop full space-time geometry out of these. To this end, let us define first a special class of trajectories with the following property: Any two of these either do not intersect, or intersect in a single point. We *define* free trajectories as members of this class. Assuming their intersections to mark contacts, we can consider Contact Problem *for this class only*, implying its further application to the full Contact Problem with external forces. For this to be possible, general trajectories, which can have multiple contacts as mutual, so also with free trajectories, must satisfy some conditions:

i. They contact some of free trajectories at each points;

ii. At each point a next point exists, such that a free trajectory connecting these two points has no other contacts with this general trajectory. As shown in [1], we can define parallel trajectories and predict contacts using them by means of counting top-signal oscillations ratios.

The reaction of the body's motion on external influences depends on its *charge* pertained to a particular *field*. Any Contact Problem can be specified by means of oscillations numbers and their ratios, provided the standard of charge can be transported to all points of a trajectory in question. It is just the availability of this procedure that provides the list of relevant fields as compatible with it. To this end, some particular arrangements of test trajectories — *spheres* — are used. Sphere is defined as a finite or infinite set of trajectories having common contact (the sphere center) with some definite ratios of (infinite) oscillations numbers in order to introduce a measure for operations such as field determining integration. Some kinds of spheres — *regular stars*, the trajectories of which are distributed according to the vertices of the Platonic solids, provide a basis for the electric charge gauge by means of detecting the related symmetries of their motions toward the star center solely under their interaction.

In particular, the cube symmetry defines the charge gauge for the electroweak interaction. Considering the trajectories of the two cube comprising tetrahedrons, one of which consists of four electrons and another of four positrons, we can develop a full gauge framework for these interactions, yet additionally requiring the existence of neutrinos (with the resulting parity violation) [2]. In the same sense the dodecahedron star, comprising besides the cube also the 12-vertices set of "roofs", ascribed to the quarks, adds the strong interaction in accord with this additional symmetry. The set of roof trajectories might have a center on their own, provided the strong potential squarely increases (over a limited range) to form a strictly fine star. Their electromagnetic interaction with the cube sub-star of this dodecahedron (necessary to fix their position with respect to the cube) prevents the latter from being a strictly fine star. For this perturbation to fall within the range of the weak interaction, the quark masses must be accordingly small. The dodecahedron symmetry exhausts the list of interactions that could be ultimately registered with our electricity-based devices.

Of the five Platonic solids, only the cube and the icosahedron allow for arrangements of trajectories that can form strictly fine regular stars even for charged particles, provided these have equal masses and absolute values for oppositely charged particles (neither tetrahedron, nor octahedron can form these). Since the icosahedron cannot be included in the richest with sub-stars dodecahedron, its possible charges have nothing in common with electric or other charges of the dodecahedron. Hence, this charge cannot be detected with our customary devices.

Like the roofs of the dodecahedron, the set of 12 trajectories of the icosahedron corresponding to its 12 vertices can be decomposed into 3 reciprocally orthogonal rectangles (however, having a particular — "golden" — ratio of their sides' lengths for the star to be regular). Again, in each rectangle all these trajectories belong to test-bodies for the charge gauge, having equal masses and absolute values of some charge with opposite signs on their side vertices. Then mutual compensation of these charges lets these 3 rectangles be quite independent of each other due to compensation of effects of one charged rectangle on another.

Just as the usual electric charge in our ordinary situations creates a field that, in turn, is detectable due to charged bodies motion, this "cosmocharge" Q, though being not detectable with our conventional devices, still might be found in observations of far galaxies or their clusters [3]. If, analogously to baryon matter-antimatter asymmetry, one sign of cosmocharge has some larger density than its opposite one, then so created "cosmofield" will let our universe expand with acceleration now ascribed to the Dark Energy. Similarly to the rectangles of the strong interacting sub-star in the dodecahedron, the rectangles of the icosahedron can possess strictly fine center only for a force with a potential squarely increasing with distance. Consisting of opposite charges, such a "cosmoplasma" might fluctuate to have observable anisotropy in the universe expansion acceleration.

For basic electromagnetic interaction for the charge gauge in the dodecahedron, we had to restrict the strong interaction region to prevent adverse influence of 12 vertices subset on the cube symmetry. There is no need in this confinement now, since the charge of only one force is to be gauged. Hence the increasing field can exist over the whole universe keeping asymptotic freedom in our short range environment, while being effective far away.

Having no sub-symmetries in the icosahedron star, the cosmofield cannot involve other than strong-like interactions. However, its rectangles might have different values of Q and masses M, provided Q^2M are the same for all of them to form a regular icosahedron star. So, stable "cosmoatoms" might exist as combined of bodies with different Q's and M's to avoid annihilation.

Now, in general relativity, scalar action includes an artificially inserted baryon term, contributing to the momentum-energy tensor in the Einstein equation and basing only on a covariance argument. This source of space-time curvature looks natural for our local environment. Moreover, we can specify space-time scalar curvature as a violation of transitivity in the finite local oscillations numbers for sets of curved lines that are still regarded "parallel" in terms of our oscillations numbers. So defined, curvature should replace the scalar in the least action principle for Contact Problem. We then reverse the very definition of matter. Just as in Contact Problem a concept of body was introduced due to its participation in Contact Problem scheme, the concept of *matter* in cosmology is just a visualization of the observed curvature of space-time. Unlike baryon case of general relativity, there is no independent of curvature definition of matter now. Actually, no Cold Dark Matter, whether or not detectable, might exist there at all. Merely the empty space-time of the real universe is actually curved, while we ascribe the measured curvature to some imaginary Cold Dark Matter as its source in analogy to the Newton law.

Submitted on April 8, 2018

References

1. Tselnik F. Irony of the Method. *Progress in Physics*, 2016, v.12, issue 2, see p.95 in the paper.
2. Tselnik F. *Progress in Physics*, 2015, v.11, issue 1, 50.
3. Tselnik F. *Communications in Nonlinear Science and Numerical Simulation*, 2007, v.12, 1427.