The New Cosmology

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Abstract: Here, on the basis of the Scale-Symmetric Theory (S-ST), I present a recapitulation concerning evolution of our Cosmos. In details I described evolution of the quasars and pointed the main differences between the new cosmology and the mainstream cosmology. I described the origin of dark energy and dark matter. They both are associated with flows in the Einstein spacetime. The matter-antimatter asymmetry results from internal helicity of the vortices which, due to fluctuations, appear in the Einstein spacetime. The asymmetry has nothing with an asymmetry in behaviour of matter and antimatter. Due to the duality of relativity, the Universe is about 21.6 Gyr old (Ludwig *et al.* (2009) derived solar ages up to 22.3 Gyr) but we cannot see the initial period about 7.75 Gyr of evolution of the quasars. It is not true that the neutrons in neutron stars behave as a Fermi gas. There are at least three Chandrasekhar limits which leads to supernova explosions without neutron-star remnant.

Here, on the basis of the Scale-Symmetric Theory (S-ST) [1], I present a recapitulation concerning evolution of our Cosmos.

1. The inflation

We start from a collision of two big pieces of space. The cracked and expanding space was the superluminal Higgs field. Due to the succeeding phase transitions of the Higgs field, its main part transformed into the luminal Einstein spacetime composed of the neutrino-antineutrino pairs. It is very difficult to detect the neutrino-antineutrino pairs because their resultant weak charge is equal to zero whereas the gravitational mass is very small, about $6.7 \cdot 10^{-67}$ kg. There are only two species of neutrinos (four different neutrinos) and the third 'neutrinos' (four different tau 'neutrinos') composed of three different neutrinos.

2. The boundary of our Cosmos

In the expanding Einstein spacetime, there was an abstract sphere above which the gravitational pressure, which tried to collapse the Einstein spacetime, was higher than the dynamic pressure, which tried to expand the Einstein spacetime. It caused that the Einstein spacetime above the abstract sphere collapsed to stable boundary. Calculated radius of our Cosmos is about $2.3 \cdot 10^{30}$ m.

3. The matter-antimatter asymmetry

Due to the fluctuations in the Einstein spacetime, there appear left-handed and right-handed vortices. Our Universe evolved from left-handed vortex and it solves the matter-antimatter asymmetry in our Universe. The protons and neutrons have the left-handed resultant internal helicity whereas electrons are internally right-handed but their mass is much smaller than nucleons so resultant internal helicity is left-handed. Due to the initial left-handed internal helicity of 'our' vortex, the electron-positron pairs transformed into the electron-proton pairs and into neutrons.

4. The dark energy and the exit of the Universe from the black-hole state

The structure of the cosmic object before the beginning of expansion of our Universe follows from the succeeding phase transitions of the superluminal Higgs field which main part transformed into the luminal Einstein spacetime. Since gravity is associated with the Higgs field whereas electromagnetic, weak and strong interactions are associated with the Einstein spacetime so gravity is the very weak force.

The cosmic-object/Protoworld was a torus and a condensate in its centre and mass in d = 1 state (it is some analog to the relativistic pion in d = 1 state in nucleons) all built of nucleons. Our Universe appeared as the double cosmic loop inside the cosmic torus. Matter is built of confined (due to the Mexican-hat mechanism) and/or entangled (due to the exchanges of the superluminal entanglons the Einstein-spacetime components consist of; they are the binary systems of closed strings composed of the superluminal pieces of space the Higgs field consists of) Einstein-spacetime components.

Due to collapse of the superluminal entanglons responsible for the quantum entanglement (there appeared a new neutrino), the cosmic torus and the condensate in its centre transformed into the dark matter i.e. into the additional Einstein-spacetime components. Due to the inflows of the dark matter into the double-cosmic-loop/very-early-Universe, the loop exited from the black-hole state and there started the observed expansion of our Universe.

The dark-energy initial state was the field composed of virtual electron-positron pairs. The virtual pairs look as real pairs but are placed in regions with lowered mass density of the Einstein spacetime (they are the mass holes carrying negative mass. When there appeared the dark matter, the field composed of the virtual objects decayed to virtual photons with radial motions. Such ordered radial motions decrease local pressure in the Einstein spacetime so there appear the flows which increase local mass density of the Einstein spacetime – it is the dark energy. Calculated abundance of the dark energy is about 68.63%.

5. The very early Universe

The very early Universe was the double cosmic loop composed of disc-shape protogalaxies built of the neutron black holes. We cannot treat the neutron stars as a Fermi gas so the factors which appear in the Chandrasekhar limit are incorrect. Due to the strong interactions, in the neutron stars, so as well in the neutron black hole, there is the lattice with neutrons in its vertices but the nuclear binding energy is frozen inside the neutron stars. The theory of the neutron lattice leads to at least three Chandrasekhar limits i.e. about 24.8, 11.2 and 1.394 solar masses. The first mass is the mass of neutron black holes, the second is the mass of the SN 1987A supernova and the last mass is the mass of the Type Ia supernovae. They should explode without a neutron-star remnant.

Due to the inflows of the dark matter into a protogalaxy, its core transformed into black hole composed of the neutron black holes and neutron stars whereas the outer neutron black holes transformed into the Population III big stars (the first-generation stars) and next, due to their explosions, into gas composed of ions and electrons.

There were the mergers of protogalaxies. They transformed into the quasars. Typical quasars, due to the four-binary-systems symmetry ($N = 2 \cdot 4^d$, where d = 0, 1, 2, 4, 8, 16 and 32), had mass two (d = 0) or eight (d = 1) times greater than a protogalaxy.

6. The duality of relativity and age of the Universe

The speed of light c in 'vacuum' (i.e. in the Higgs field and Einstein spacetime) is the speed in relation to source or a last-interaction object. It is due to the quantum entanglement. Since detectors are the last-interaction objects so they always measure the speed c. But we can see that due to the quantum entanglement, detectors cannot see the duality of relativity i.e. that speed of light cannot be the c simultaneously in relation to all reference frames.

Due to the duality of relativity, the correct age of the Universe is about 21.6 Gyr (Ludwig *et al.* (2009) derived solar ages up to 22.3 Gyr) but we cannot see the initial period about 7.75 Gyr of evolution of the protogalaxies and of their common mergers.

7. The evolution of quasars into spiral and elliptic massive galaxies

The quasars transformed, generally, into the typical massive spiral (a merger of two protogalaxies) and elliptical (a merger of eight protogalaxies) galaxies. But due to the duality of relativity, we can see only the late period about 2.5 Gyr of the era of quasars (about 10 Gyr).

Evolution of a quasar is as follows.

Due to the inflows of dark matter into the merged protogalaxies, they swell. Temperature in centre of the disc was higher whereas of the outer shell lower. It causes that the outer shell transforms into torus whereas the neutron black holes transform into the Population III big stars. The explosions of the Population III supernovae transform them into gas composed of ions and electrons. The density of dark matter was lower in centre of quasar so there still are the neutron stars.

Internal helicity of quasars is defined by both toroidal and poloidal motions. Due to the left-handedness of the double-cosmic-loop/very-early-Universe, majority of quasars should be left-handed.

Due to the gravitational attraction of the central black hole composed of the neutron stars, there are flows of the gas towards the very hot accretion disc and next to the Schwarzschild surface of the central black hole.

On equators of the neutron stars are produced the energetic loops. They travel towards the poles of the neutron stars and their radius is reduced to the reduced Compton radius of bare electron ($\lambda\!\!\!^{-}_{C,bare\text{-}electron} = 3.8661 \cdot 10^{-13}$ m). Energy of such loop is equal to the rest mass of the electron. But due to the four-binary-systems symmetry, there appear electrons which initial energy is $2 \cdot 4^{32}$ times greater than the rest mass. Due to the lattice inside neutron stars, there is strong spin polarization of neutrons so neutron stars produce very strong collimated magnetic jets. The very energetic electrons are moving helically along the magnetic jets so they produce the synchrotron radiation in directions almost perpendicular to the magnetic jets.

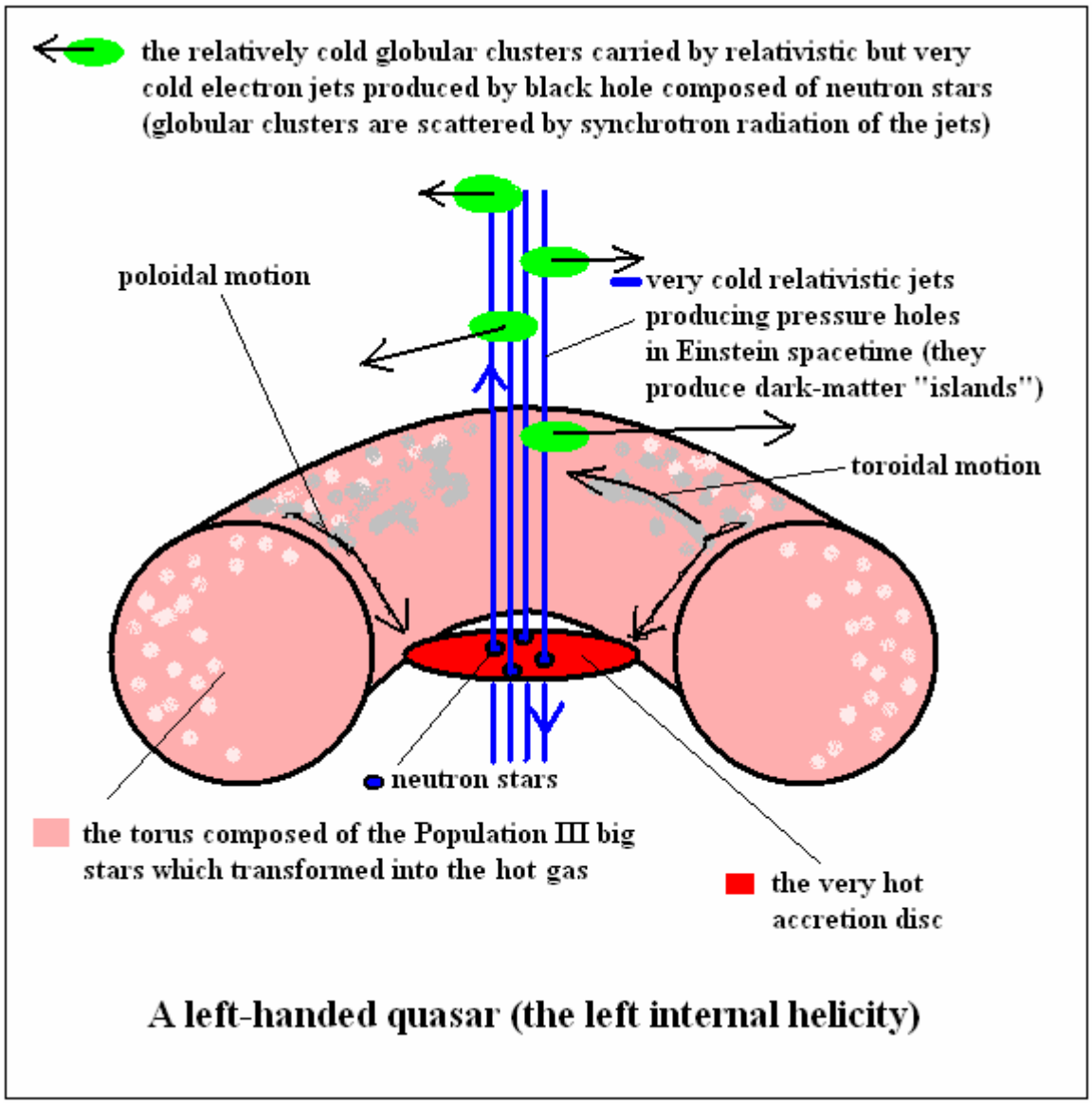
The electron magnetic jets, when cross the Schwarzschild surface of the central black hole, due to the advection, carry the clouds of plasma composed of the highly ionized gas. Such clouds, due to the synchrotron radiation, are dispersed in directions perpendicular to the electron magnetic jets. Next, they transform into the 'true' globular clusters composed of the Population II stars only. We can see that today the globular clusters should orbit centres of the massive galaxies and their orbits should lie in the halos of the massive galaxies. We should distinguish such globular clusters from other globular clusters which contain as well the Population I stars. In reality, such 'false' globular clusters are the satellite dwarf galaxies consumed by massive galaxies. The dwarf galaxies and satellite dwarf galaxies appeared due to the initial explosions of the protogalaxies. The upper limit for mass of the true globular

clusters depends on mass of quasar and is greater for more massive quasar. The calculated upper limit for mass of the true globular clusters in the Milky-Way Galaxy is 155,200 solar masses.

The electron magnetic jets are relativistic but in them the thermal motions are reduced almost to zero so they are the cold regions of the Universe. They as well cool down the carried true globular clusters. We can see that in the true globular clusters, due to the cooling, there appeared the Population I first stars which are the oldest observed stars.

Notice that the motions of nuclear plasma from the torus, via accretion disc, via electron magnetic jets to the true globular clusters, cool down quasars.

The initially coherent synchrotron radiation is scattered by the true globular clusters so we should observe incoherent radiation.



8. The dark matter and filaments in the large-structure of the Universe

The dark matter consists of the additional Einstein-spacetime components entangled with matter. It appeared due to the decay of the cosmic structure, precisely, due to the decay of the cosmic torus and the central condensate. Ordered motions of baryonic plasma (there were the orbital motions in the protogalaxies and the filamental motions between quasars along the jets in very early Universe) produced ordered motions of the dark matter so there appeared loops

and filaments composed of the dark matter which are entangled with matter. Due to the expansion of the Universe, sizes of the loops and filaments of the dark matter increased. The dark-matter loops in rotating galaxies cause that there appear the dark-matter orbital/spin speeds of stars.

9. Summary

There are the big differences between the new cosmology and the mainstream cosmology.

A. Due to the fluctuations in the Einstein spacetime, the protogalaxies appeared already before the expansion of the Universe and they already were grouped in larger structures.

B. Due to the duality of relativity, we cannot see the initial period about 7.75 Gyr of evolution of quasars but it is true that the most distant galaxies are in time distance about 13.866 ± 0.096 Gyr.

C. It is not true that cold matter flows into quasars whereas hot matter is flowing out. In reality, there is outflow of colder nuclear matter.

D. It is not true that the neutrons in neutron stars behave as a Fermi gas. There are at least three Chandrasekhar limits which leads to supernova explosions without neutron-star remnant.

E. Dark energy and dark matter do not consist of some exotic particles. Dark matter consists of additional Einstein-spacetime components entangled with matter whereas dark energy as well consists of additional Einstein-spacetime components but they are not entangled with matter. The dark energy appeared due to the mass holes in the Einstein spacetime associated with the virtual photons from the decays of the virtual electron-positron pairs produced by the initial cosmic structure. Due to the mass holes, there was the inflow of the Einstein spacetime from the outside of the expanding Universe. The dark energy causes that gravity does not decelerate the expansion of the Universe.

   The ordered motions of dark matter (loops and filaments), which is entangled with matter, cause that there appear the non-gravitational motions of cosmic objects as, for example, the orbital motions of stars in rotating galaxies.

F. It is not true that the matter-antimatter asymmetry follows from asymmetry in behaviour of matter and antimatter. The asymmetry follows from production in the Einstein spacetime the left-handed and right-handed vortices.

G. We cannot unify within the same methods gravity with electromagnetism and weak and strong interactions because there are the two very different spacetimes i.e. the superluminal Higgs field associated with gravity and the luminal Einstein spacetime associated with the other interactions.

H. It is not true that spacetime is still expanding. There is stable boundary of our Cosmos so the fundamental physical constants are constant. There expand the matter, dark matter, dark energy (maximum radial speed is 0.6415c) and CMB (maximum radial speed is c).

References

[1] Sylwester Kornowski (2012 – 2015).
http://vixra.org/author/sylwester_kornowski .