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THE NEW-OLD COSMOLOGY

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Abstract

The recently discovered physics discipline of cryodynamics, sister discipline to thermodynamics, enables a new picture of the cosmos. A stationary, infinite, eternal, fractal cosmos that can be called the Clifford-Zwicky-Mandelbrot (CZM) cosmos emerges. Many elements of the currently accepted cosmology are put up for replacement in a 12-point list.

Keywords: Cryodynamics, Hubble law, Zwicky, quasar hierarchy, Planck mission, black hole, Reeb foliation, Sinai billiard, libration manifold, Heraclitus

Introduction

Heraclitus' two-word cosmological statement reads "metabolizing it rests" (metabállon anapaúetai). This "Fragment # 70" which is one of his "dark" utterances gets revived after more than 2 ½ millennia by cryodynamics. Cryodynamics [Rossler, 2012; 2011] is a newly discovered fundamental physical discipline based on Poincaréan chaos theory which describes the deterministic statistical mechanics of mutually attractive particles. It mirrors good old thermodynamics which describes the deterministic statistical mechanics of mutually repulsive particles. Cryós means "cold," thermós means "hot" in Greek. Cryodynamics implies the existence of a second time's arrow in nature characterized by "ectropy" rather than entropy production (with only a sign change in the deterministic entropy formula [Diebner, Rossler, 1998; 2004] needed). Cryodynamics not only explains the famous Hubble law of a distance-proportional redshift in the cosmos from first principles, as anticipated by Zwicky in 1929 [Zwicky, 1929], it also enables controllable hot fusion down here on earth [Rossler et al., 2013].

The New Picture of the Cosmos in 12 Points

Cryodynamics alters many elements of the modern physical and cosmological world view. A number of new statements regarding the cosmos can already be offered:

1. Cryodynamics predicts a distance-dependent redshift of light traversing the cosmos (cf. [Rössler et al., 2003]). The Hubble law follows by implication [Rossler, 2006]. The distance-dependence is linear over large distances in a fractal cosmos, with eventually a wiggle occurring out of necessity [Rossler et al., 2007]. The beautiful empirical discovery made by Perlmutter, Schmidt and Riess in 1998 (cf. [Perlmutter, 2011], [Schmidt, 2011] and [Riess, 2011]) fits-in without requiring any added assumption – no "accelerated expansion," no "cold dark matter." .

2. The "microwave background radiation" (MBR) possesses a comparatively close-by origin in the absence of cosmic expansion. Thermally equilibrated remnant cold thin gas clouds and Oort-like clouds of debris, present in the more or less spherical halo of the Milky Way galaxy, are the likely source. Therefore, the MBR is no longer changeless in time – a testable prediction made 6 years ago [Rossler et al., 2007]. The blatant "anomalies" (two large stripes and a cool spot) recently discovered by the Planck mission [**esa**, 2013] can now be hoped to be understood in a straightforward manner.

3. Quasars are "electrogravitational engines" that come in all sizes spanning an unimaginable 50 orders of magnitude in diameter [Rossler, 2008a; 2008b]. They recycle a constant fraction of the matter they devour in the form of high-speed elementary particles, as is well known.

4. Black holes are in reality only "almost black holes" [Rossler et al., 1998]. This is because the horizon gets never finished in finite outer time since it cannot even be reached by an in-falling mass including photons during finite time. This fact the discoverers of black holes already saw in 1939 [Oppenheimer, Snyder, 1939]. The same fact was emphasized by Dirac [Dirac, 1975]: "The particle takes an infinite [outside] time to reach the critical radius r = 2m" (the word in brackets added for clarity here).

5. The spatial distance of the horizon, valid for the outside world, is just as infinite as is its temporal distance. This is because the speed of light, *c*, has become a global constant again [Rossler, 2013a]. Therefore, black holes do not Hawking evaporate (as in 1974 conjectured [Hawking, 1974]), are uncharged and grow exponentially when stuck inside matter [Rossler, 2008a] (except inside neutron stars [Rossler, 2008b]).

6. The famous "Kerr solution" for rotating black holes [Kerr, 1963] needs modification. The infinite time-slowdown valid at the horizon enforces a zero rotation rate of the horizon relative to the outside universe. Hence there exists a Reeb foliation of spacetime around every rotating black hole. That is, all in-cycling matter turns around midway to make as many retrograde revolutions on the way down as forward revolutions took place before. The implied "rotating Reeb foliation" is a new mathematical object [Rossler, 2012a].

7. In a merger of two black holes, both rotating, the heavier one predictably "recycles" the equally unfinished smaller one owing to the formation of a separatrix in real space. Hence the smaller (almost-) black hole's total mass gets re-injected into the universe in the form of elementary particles [Rossler, Fröhlich, 2011]. (This "libration manifold conjecture" is the weak brick in the proposed neo-Heraclitean cosmology.)

8. Point 7 implies that at every moment in global outer time, fifty percent of all cosmic matter exists in the form of almost black holes [Rossler, 2012b]. This prediction is amenable to observational falsification**.**

9. The new recycling of black hole matter explains the eternally ongoing metabolism of the cosmos glimpsed by Heraclitus. It replaces (along with the particle jets produced by quasars) the so-called "primordial nucleosynthesis" postulate of the Big-Bang cosmology.

10. "Wormholes" are closed for all practical purposes since the horizon in the middle is infinitely far away from the outside world. This holds true despite the fact that a wormhole can be reached and passed-through in finite astronaut time. An infinite outside time has by then been bridged by the in-falling astronaut traveler [Oppenheimer, Snyder 1939], and so has an infinite distance owing to the new global constancy of *c* [Rossler, 2012, 2013a,b,c]. This fact presupposes that no merger with another black hole has occurred in the infinitely long meantime, and that the universe has remained virtually unchanged. Any signal sent from the horizon by the in-falling astronaut then takes another infinity of outside time to arrive outside.

11. Longitudinal gravitational waves are ruled out if the speed of light is a global constant [Rossler, Fröhlich 2013], cf. also [Penrose 1965]. Previous "indirect empirical evidence" for gravitational waves, obtained on pairs of ultra-dense stars ([Hulse, 1993], [Taylor, 1993]) and on the famous double pulsar [Kramer, 2013], can be explained by tidal friction instead [Rossler, 2009] and by magnetofriction, respectively (in preparation).

12. The overwhelming prevalence of matter over antimatter in the cosmos can in light of the extended new time scale be explained from first principles. The "Seelig mechanism" – which explains the "optical abiogenesis" of left-handed chirality in the chemical evolution of terrestrial life as a symmetry-breaking bifurcation [Seelig, 1972] – can be applied by analogy (autocatalytic cross-inhibition).

Discussion

The recycling-cosmos model is as old as science itself. Anaxagoras initiated the pertinent transfinitely exact time-reversible chaotic thinking in his famous Fragment # 12 (see e.g. [Rossler, 1998, pp. 11-12]). Heraclitus blossomed soon after. One of his "dark" statements ("metabolizing it rests") suddenly makes excellent sense.

Many elements of the modern cosmological consensus are unfortunately incompatible with cryodynamics. (Note, however, that the discovery of a maximally old galaxy [Finkelstein et al., 2013] lends an almost unsurmountable empirical support to a very old cosmos.) At first sight, it appears rather unlikely that a new fundamental result – cryodynamics – can entail as many far-reaching "collateral consequences" as sketched above (partly obtained in conjunction with the "global-*c* general relativity" [Rossler, 2013a]). However, such richness is actually to be expected. The essential finding is the revival of Fritz Zwicky's [Zwicky, 1929] later so-called "tired-light" idea by cryodynamics. Once cryodynamics is accepted, even more new features are preprogrammed to surface.

But: Is cryodynamics really able to confirm from first principles the redshift-over-distance Hubble line (including its recently acquired reduced slope at the tip [Perlmutter, 2011, Schmidt, 2011, Riess, 2011]), not only qualitatively but quantitatively? This appears to be the most important question at first sight because otherwise, a "mess" (a "hybrid cosmology") results. A preliminary quantitative confirmatory estimate was offered in 2007 [Rossler et al., 2007].

Three recent theorems (the "gothic-R" of general relativity [Rossler, 20012a], the "Telemach" of the equivalence principle [Rossler, 2012b] and the "Olemach" theorem of angular-momentum conservation [Rossler, 2013c]) independently imply global constancy of c . This fact turns them into independent allies to the revived Zwicky mechanism in cosmology, since a global c excludes expanding solutions to the Einstein equation [Rossler, 2013a,b].

Despite this "lucky convergence," everything stands and falls with the existence of cryodynamics as a physical discipline. Recently an analytical treatment for an underlying pair encounter was provided by Movassagh [Movassagh, 2013]. A more general formal basis was offered by the "breathing plane-alley theorem" [Rossler, 2013d]. It proves in the context of Yakov Sinai's famous chaos-theoretic deterministic statistical mechanics [Sinai, 1970], that the Zwicky conjecture (of light fast particles being braked by heavy slow attractive ones) reflects a universal principle of nature. In the first step, the repulsive Sinai billiard was smoothed, which fact (apart from introducing small KAM islands) extends Sinai's deterministic theory to the far-from-equilibrium domain of statistical thermodynamics as a deterministic explanation. In the second step, the repulsive smooth potentials were sign-inverted, thereby yielding cryodynamics. Thus, the existence of a physical science mirroring thermodynamics has been proved deterministically. Further pure-mathematics work is called for. It will allow cosmology to "congeal" again. The new science of cryodynamics is not just

a “secret key to the universe,” however (to use the title of a popular book), it also is of a maximal applied interest down here on earth. Firstly, it can help explain – and improve – the well-known experimental procedure of “collinear electron cooling” of fast atomic nuclei in nuclear accelerators [Prasuhn et al., 1994] (Heinz Clement, personal communication 2013). Secondly, it predictably can stabilize fusion reactors [Rossler et al., 2013] as mentioned. Thirdly, the annoying feature of cryodynamics to show up only in high-precision numerical simulations [Sonnleitner, 2010] is a mathematical challenge. It enables a renaissance of numerical cyclotron dynamics (pioneered by Igor Gumowski [1963]), of galactic dynamics [Binney, Tremaine, 2008] and of cosmological dynamics [Boylan-Kolchin et al., 2009]. Poincaré’s celestial-mechanical chaos theory [Letellier, 2013] is back at the forefront.

Concentrating all forces on finding a flaw in the belated proof of “tired light” offered by cryodynamics, no doubt represents the most promising way to fend-off the emergent new coherent picture of the cosmos. The new picture can be hoped not to appear like a “bad dream” to the astrophysics community. Twenty-four commonly accepted postulates in cosmology that accrued over 8 decades were recently shown to be untenable each for an independent reason [Rossler, 2012c]. Taken together with the above-presented twelve points of deviation from an 84-years-long consensus, they will all need to be taken up by the looked-forward-to “restorative counter-attack.” The main aim will be to refute cryodynamics itself. It was due to the lenient response shown to the preprint of the Rossler-Fröhlich-Kleiner paper of 2003 by the late Ilya Prigogine that cryodynamics could take shape.

Neglect of a new fundamental science carries its own risks. A prestigious experiment designed to produce “miniature black holes” on earth was continued even though the hoped-for black holes had already been shown to possess radically new properties which among other things render them invisible to the available detectors. A more cautious experimental strategy could have been steered [Rossler, 2008c]. The beautiful Higgs boson that was eventually found in the said experiment [CMS collaboration, 2012] therefore carries an undetermined price tag in light of the never updated LHC safety report of 2008 [LHC safety report, 2008], cryodynamics could have helped.

To conclude, a new physical theory entails a revolution not “just” in cosmology. A 150 years old dogma in physics (uniqueness of the entropic time’s arrow) got challenged and – if the evidence is not misleading – overthrown. An empirical litmus test offered 6 years ago (to check for minor slow variations in the MBR [Rossler et al., 2007]) still waits to be implemented: a re-evaluation of the PLANCK may prove sufficient. The

chocolate side of cryodynamics lies in the promise of unlimited free energy [Rossler et al., 2013], made to an energy-thirsty planet that currently ranks gasoline higher than bread [Lagi, Bertrand, Bar-Yam, 2011]. A smart country betting on Lithium may be also ready to bet on cryodynamics. I herewith offer the nascent new cosmology to the young physicists of the planet.

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