OriginalResearchArticle

Theunsustainableresistancetoadisruptivephysics:Cosmologyandthermodynamicsinnewperspective Unsustainable resistance to disruptive physics and a new look at cosmology and thermodynamics

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Abstract

This article combines two theories that attempt to describe the ultimate nature of the universe.
The first is concerned with the physical continuity of the four-dimensional cosmic woof's expansion.The second describes the continuum's expansion energy using a Lagrangian approach to the intrinsic thermodynamical expansion process.In terms of their unconventional proposals, both theories are disruptive and embrace the hope of a new impulse in theoretical physics.The following major issues are addressed in the paper: ~~This article performs a synthesis of two theories that seek to describe the ultimate nature of theuniverse.The first deals with the physical continuity of the expansion of the four-dimensionalcosmicwoof.Theseconddescribestheexpansionenergyofthecontinuumwiththeaidofa Lagrangianapproachtotheintrinsicthermodynamicalexpansionprocess.Boththeoriesare disruptive and embrace the hope of a new impulse to theoretical physics in terms of theirunconventional proposals.Thepaperdiscussesthefollowing mainissues:~~
1.Continuityinphysics;2.Space-time;
3.Entropy;4.ThermalexpansionoftheuniverseatPlanckscales.

Theexplanatorycontentis organizedlikethis:
1 Introduction–
familiarizationofthereaderwiththephilosophyoftheproposedtheoriesandpresentationofthegeneralpurposes;
2 Howtheexpansionofthespace-timecontinuumworks—thetheoryof
ever-expandingspace-time(thecontinuousphysicexpansionofthecosmos),i.e.,~~expanding~~regardlessofthespace-

Keywords:Cosmology;Thermodynamics;Space-time;Scale;Energy;Entropy
2010MathematicsSubjectClassification:53C25;83C05;57N16

1 Introduction

Science,byitsverynature,mustbedisruptivewhenevernecessary,proposingunusualanswersto hitherto unsuspected problems, or to questions left open either for convenience or for lack ofknowledgeyettobeobtained.

The stagnation of physics, at least in the last five decades, is an unquestionable fact, accompanying the decline of Western thought in general. With respect to observational cosmology, of which a great example is the recent work of Migkas [8], there is certainly some progress due to the broad technological resources, if only to raise more doubts than enlightenment. However, the most advanced research in astrophysical cosmology and gravitation has hardly moved theoretical physics [(1; 4; 7; 10], even considering the confirmation of gravitational waves, a long-predicted phenomenon. Also, some authors, such as Bejan, Norton, and myself with my colleagues, brought theoretical approaches to thermodynamics that are more coherent with the world view we have today [(2; 9; 13; 15; 16], but the discipline continues to be taught in books and classes as if we were in the days of Carnot and Clapeyron. Recent works have questioned the quality and relevance of the global search for the advancement of our civilization [(3; 5; 6; 14; 15; 17)], because the massive amount of articles produced has added very little to knowledge. In addition, the confusion between scientific advancement and technological revamping is notorious in our time.~~Thestagnationofphysics,atleastinthelastfivedecades,isanunquestionablefact,accompanyingthedeclineofWesternthoughtingeneral.Withrespecttoobservationalcosmology,ofwhichagreatexampleistherecentworkofMigkas[(8)],thereiscertainlysomeprogressduetothebroadtechnologicalresources,ifonlytorisemoredoubtsthanenlightenment.However,themostadvancedresearchinastrophysicalcosmologyandgravitationhashardlymovedtheoreticalphysics[(1;4;7;10)],evenconsideringtheconfirmationofgravitationalwaves,alongpredictedphenomenon.Also,someauthorssuchasBejan,Norton,andmyselfwithmycolleaguesbroughttheoretical approaches to thermodynamics which are more coherent with the world view we have today [(2;9;13;15;16)], but the discipline continues to be taught in books and classes as if we were inthedaysofCarnotandClapeyron.Recentworkshavequestionedthequalityandrelevanceoftheresearch currently carried out around the world for the progress of our civilization [(3;5;6;14;15;17)],sincetheenormousamountofarticlesproducedhasaddedverylittletoknowledge.Inaddition,theconfusionbetweenscientificadvancementandtechnologicalrevampingisnotoriousinourtime.~~

Collaborative work, which is essential for research, has lost its luster in the face of an increasing number of corporate teams formed for marketing purposes~~Collaborativework,essentialforresearch,haslosttheshineoftheproductivecintellectualsuminfaceofthegrowingnumberofcorporateteamswithmarketingpurposes.~~Theseteamsarecommitteessubject to political whims, popular fads in topics, and the desire by committee members for prestige,paychecks, perks, and public adoration.They are mostly government-funded, with universities andbusinessesmakingonlyaminorcontributionmonetarily.

Wearebasicallylivinginaworldoftechnological"collages"– whosetruesciencebehindthem~~it~~datesback to the first half of the 20th century — aimed at mere uncritical consumption, creating a passingillusion of progress and joy. As my colleague Richard Cathcart observed, "we are flabbergasted atthe blatant (unhideable) cupidity and lack of discernment of too many of our younger students andcollaborators".So,Ibelievethisbriefdescriptionofthediscordantscenerypresenttodayinscientificactivitywill askto inspireothers to rejoinscience withits real fundamentalprinciples andpurposes.

1.1 Fundamentals

Mydisruptiveworksaremainlyaboutcosmologyandthermodynamics,two~~both~~disciplinesthatconvergetobuildamoreessentialandlessfragmentedmodeloftheuniverse.Wheneverythingstartedin~~at~~2016as a large program of research, with the publication of a relativistic model describing the continuousspace-time expandingand constricting of the~~/constricting cosmic~~ woof as constituting the fourth interaction [(11)], the ideawastoestablishakindofsub-Planckianmentalconstruct—asitwerea"quantum"ofspace-time , and geodesics are one-dimensional replications of that quantum with arbitrary scale changes. In other words, there are no actual chunks of space-time, just a scale-shifting continuum. This conception allowed the elucidation of the exact meaning of what continuity is in physics. Since then, the theory has evolved considerably in conceptual and semantic details, with a strong appeal to

thermodynamics and an unusual application of classical field theory.—, from which the geodesics would be defined as one-dimensional replications of that quantum byarbitrary changes of scale.In other words, there are no actual chunks of space-time, just a scale-shiftingcontinuum.Thisconceptionallowedtheelucidationofanexactmeaningofwhatcontinuityisin physics. Since then, the theory has evolved considerably in conceptual and semantic details witha strongappealtothermodynamics andunusualapplicationof classicalfieldtheory.

The above program intends to demonstrate

1) that a complete unification of known interactions may be impossible due to the consideration of a space-time continuum that exhibits gravity, whose nature differs completely from the other interactions and appears as the backbone of everything that exists, contradicting the corpuscular framework of all other known forces;

2) that time, along with its eternal companion "entropy," has a greater physical reality than previously thought; andWhat the above program intends to show is

3) that energy and time are coupled in such a way that true space-time energy is defined

1) that perhaps a complete unification of knowninteractionsisnotfeasibleduetotheconsiderationofaspace-timecontinuumthatevincesgravity — whose nature differs completely from that of the other interactions —, and appears as the back-ground of everything that exists, something that goes into flagrant contradiction with the corpuscularframework of all other known forces, 2) that time, with its eternal partner called "entropy",actuallyhas a greater physical reality than was commonly supposed until recently, and 3) that energy andtimearecoupledinsuchawayastodefineatruespace-timeenergetic.

1.2 Generalpurposesofthisarticle

This article presents the current state of the mentioned program as of~~from~~ 2016, bringing the most recentimprovements to the theory.It would be very difficult to reproduce here all the details and findingsdocumentedoversixyearsofintensivework,sothatIwilldwellprimarilyonthenoveltiesofthetheory atthe moment, directingthe reader to therelevant open access literaturewheneverrequired.

It is important to highlight the contributions of all the colleagues who appear as co-authors in mypublications.They havealwaysshown adisruptive andinnovativespirit.

2 Howtheexpansionofthespace-timecontinuumworks

Theuseofsingularityfunctionsintherepresentativedifferentialstructureofthetheoryallowstheintroductiono fverysmallintervalsofspace-timeexpansion,however, which are~~however,~~finite,sothat,byarbitrarychangeofscale,itcanbededuced,giventhecontinuouscharacterofthe expansion,howageodesicbehavesinanexpandinguniverse.Inmypreviousworks,thoseintervalsweresom etimesdescribedas"quanta"ofspace-time,butnowadaysIprefertoreferto*scalons*,mentalconstructsthatdonotrepresentconstitutiveelements,butrat heranyimaginarypiecesofspace-time,chosenatrandomonlytorealizethatwhateverthephysical"look"—- thescalewewanttoadopt—- ,wewillalwaysbeseeingthesamething,thesamecontinuousexpandingprocess,regardlessoftheorderofm agnitude.

At first, the quadratic arc element of a geodesic as a function of the intervals above describedwasgivenby

$$ds^2 = g_{\mu\nu} d\cdot x_\mu - \varepsilon_\mu \cdot {}^1 d\cdot x_\nu - \varepsilon_\nu \cdot {}^1, \tag{2.1}$$

where $\varepsilon_\mu$and $\varepsilon_\nu$are any fixed points that establish markers from which the expansion of space-timein a sub-Planckian region is evaluated. For simplicity, we can omit the unit exponents and place theindicestothebottomrightofthekets,sothat

$$ds^2 = g_{\mu\nu} d\cdot x - \varepsilon\cdot \; d_\mu \cdot x - \varepsilon \cdot \; {}_\nu \tag{2.2}$$

As the sub-Planckian intervalshave arbitrarily small but finite sizes, I insist on repeating that they are not constitutive elements in the strict sense, since any space-time interval is expanding, and within these there are expanding intervals, and so on, as in an infinite mirror effect [(17)]. This is what features the physical continuity of the expansion process, so that it becomes necessary to improve the symbology to understand that the very small intervals in brackets are taken on an arbitrary scale.~~As the sub-Planckian intervals – the s*calons* – have arbitrarily small but finite sizes, I insist onrepeating they are not constitutive elements in the strict sense, since any space-time interval is ex-panding, and within these there are expanding intervals, and so on, as in an infinite mirror effect[(17)].This is what features the physical continuity of the expansion process, so that it becomesnecessarytoimprovethesymbologytounderstandthattheverysmallintervalsinbracketsaretaken on an arbitrary scale~~. So, I introduced the symbol (whatever the scale considered), and the firstandsecondformsofthegeodesicequationarerewrittenas

$$\frac{\partial g_{\mu\nu}}{\partial\cdot \forall|x-\varepsilon\cdot_k} \frac{d\cdot \forall|x-\varepsilon\cdot_\mu}{ds} \frac{d\cdot \forall|x-\varepsilon\cdot_\nu}{ds} - 2 d_{\mu k} \frac{d\cdot \forall|x-\varepsilon\cdot_\mu}{ds} = 0, \tag{2.3}$$

and

$$\frac{d^2\cdot \forall|x-\varepsilon\cdot_\xi}{d\tau^2} + \Gamma^\xi_{\mu\nu} \frac{d\cdot \forall|x-\varepsilon\cdot_\mu}{d\tau} \frac{d\cdot \forall|x-\varepsilon\cdot_\nu}{d\tau} = 0, \tag{2.4}$$

withtheaffineconnectiongivenby

$$\Gamma^\xi_{\varepsilon\cdot_\mu\nu} = \frac{\partial\cdot \forall|x-}{\partial\chi^\eta} \frac{\partial^2\chi^\eta}{\partial\cdot \forall|x-\varepsilon\cdot_\mu \partial\cdot \forall|x-\varepsilon\cdot_\nu}. \tag{2.5}$$

An extensive semantic discussion of this new symbology can be found in reference [(17)]. The com-pleteoriginalformalismisfoundinreference[(11)],havingbeenwidelydiscussedwithreviewersandcolleag uesatthetimeofitsacceptanceforpublication.Also,thesameformalismwasappliedinLyrageometry[(12)].

Furthermore, by assuming the static gravitational field in space at a given moment, one can only investigate the temporal aspect of space-time, reducing the affine connection to~~Further,onecanexploreonlythetemporalaspectofspace-timebyassumingthestaticgravitational-fieldinspaceatagivenmoment,sothattheaffineconectionreduces to~~

$$\Gamma^{\xi}_{00} = \frac{1}{2} g^{\xi\lambda}(\partial g_{0\lambda 0} + \partial g_{0 0\lambda}). \tag{2.6}$$

Some additional cosmological and formal considerations led to establishing the expression of the invariant measure of the rate at which the arc element evolves, now in its new form, as the correlation function.~~Some additional cosmological and formal considerations led to establishing the expression of theinvariantmeasureoftherateinwhichthearcelementevolves,nowinthenewform,asthecorrelationfunction~~

$$\cdot 0|g_{\mu\nu} d\cdot\forall|x-\varepsilon\cdot_{\mu} d\cdot\forall|x-\varepsilon\cdot_{\nu}|0\cdot = -d\cdot\forall|t-\varepsilon\cdot_{0} + \overset{2}{R}\cdot_{\forall|t-\varepsilon\cdot_{0}} \overset{2}{d}\cdot\forall|\ x-\ \varepsilon\cdot d\cdot\forall|\ x-\ \varepsilon\cdot. \tag{2.7}$$

Thus, by understanding the dynamics of the continuous expansion of space-time at any scale, it is possible to start the study of thermodynamics associated with the energy of expansion through the Lagrangian and Hamiltonian formalisms applied to heat. Furthermore, working with interval differentials imparts a physical character of creative fluxion that ordinary differentials do not.It is the region demarcated by the bracket that is "fluxionant" per se, not dependent on something coming from outside; there is not merely a transfer from elsewhere.~~Thus, understanding the dynamics of the continuous expansion of space-time at any scale, it ispossible to start the study of thermodynamics associated with the energy of expansion through theLagrangianandHamiltonianformalismsappliedtoheat.Inaddition,workingwithintervaldifferentialsbringsaphysicalcharacterofcreativefluxionthatonecannotpresumefromordinarydifferentials.Itistheregion demarcatedbythebracketthatis"fluxionant"perse,notdependentonsomethingcomingfromoutside;theroisnotmerelyatransferfromelsewhere.~~

3 Understandingentropy

The main point of disruption in thermodynamics is the banishment of the fanciful idea of reversibility. In fact, entropy never decreases; it can only slow down in its advance. Misconceptions that often occur in traditional literature, strongly supported by the industrialist's comprehension of thermodynamics prevalent in the 19th century, are due to a lack of discernment to realize that irreversibility creates, in certain particular circumstances, curious situations of organization associated with states of equilibrium that are just boundaries of irreversible sequences [(9)]. In a nutshell, natural phenomena are irreversible, reflecting the arrow of time.As systems evolve from the past to the future, entropy expresses irreversibility.Anthropic phenomena can only be simulated, by means of technical devices, by a partial reversal of entropic processes, which, in the last analysis, is nothing more than a forced deceleration of the entropy advance.~~The main point of disruption in thermodynamics is the banishment of the fanciful idea of reversibility.In fact, entropy never decreases; it can only slow down in its advance.Misconceptions that oftenoccur in traditional literature, strongly supported by the industrialist comprehension of thermodyna-mics prevalent in the 19th century, are due to the lack of discernment to realize that irreversibilitycreates, in certain particular circumstances, curious situations of organization associated with statesof equilibrium that are just boundaries of irreversible sequences [(9)]. In short, natural phenomenaare irreversible, a fact that reflects the arrow of time, being reflected by the latter.Entropy expres-ses irreversibility as systems ever evolve from the past to the future. Anthropic phenomena can onlysimulate, by means of technical devices, a partial reversal of entropic processes, which, in the lastanalysis, isnothingmorethanaforceddecelerationoftheentropyadvance.~~

In general, what matters is the rate of change of the entropy, and, as the entropy has the samedirectionas thetimearrow,itisusefultoestablishaLagrangefunctionalas

$$L = \delta Q_{int}\dot{\mathbf{f}}(H) + \mathbf{f}(H)\frac{\delta Q_{ext}}{\tau_{ref}}, \tag{3.1}$$

whereτ_{ref}isthecharacteristictransitiontimeintervalofthesystem,called"referencetime",and f(H)isageneralizedcoordinategivenbytheHeavisidefunctionofthetimeinterval

$$\mathbf{f}(H)=(\tau-\tau_0)H(\tau-\tau_0),\dot{\mathbf{f}}(H)=H(\tau-\tau_0),$$

whichcanbetranslatedintoMacaulay*ket*sas

$$(\tau-\tau_0)H(\tau-\tau_0)=\cdot\tau-\tau_0\cdot^1\rightarrow\cdot\forall|\tau-\tau_0\cdot^1,$$

with

$$H(\tau-\tau)=\frac{d}{d\tau}\cdot\tau-\tau\cdot^1=\cdot\tau-\tau\cdot^0\rightarrow\cdot\forall|\tau-\tau\cdot^0.$$

The Macaulay functions are used here to start a polynomial thermal loading at some time interval in the entropic evolution of the system. The connection with the theory presented in the previous section is already apparent at this point, since the same sub-Planckian time intervals can be considered here from the point of view of the energy they ~~The Macaulay functions are used here to start a polynomial thermal loading at some time interval intheentropicevolutionofthesystem.Theconnectionwiththetheorypresentedintheprevioussectionisalreadyperceivedatthispoint,sincethesamesub-Planckiantimeintervalscanbeconsideredherefromthepointofviewoftheenergythey"encapsulate".~~

3.1 Entropyandevolution

Now,letustaketheEuler-Lagrangedifferentialequationforanon-dissipativesituation,

$$\frac{d}{d\tau}\left(\frac{\partial L}{\partial \dot{f}(H)}\right) - \frac{\partial L}{\partial f(H)} = 0. \tag{3.2}$$

Thisimpliesthat

$$\frac{d}{d\tau}(\delta Q_{int}) - \frac{\delta Q_{ext}}{\tau_{ref}} = 0 \therefore \tag{3.3}$$

$$\boxed{\delta Q_{int} = \frac{\delta Q_{ext}}{\tau_{ref}}}. \tag{3.4}$$

Forregistrationandfurtherstudies,thecorrespondingHamiltonianexpressionisgivenby

$$H = -\cdot \forall|\tau - \tau_0 \cdot \frac{\delta Q_{ext}}{\tau_{ref}}, \tag{3.5}$$

asexpected,couplingthefluxionintimewiththeenergy.Inaddition,wecaninterpret$\dot{Q}_{int}$asthe heattransferinteractionfortheinteriorsideofaborderattemperature$T$[2],sothattheentropyloadedinthevariation ofthephasepathoftheinteractionisgivenby

$$\frac{\delta \dot{Q}_{int}}{T} = \frac{\delta Q_{ext}}{T\tau_{ref}}. \tag{3.6}$$

In this way, it is easy to interpret entropy as the very measure of the evolution of the system, beingassociatedwiththevariationintherateofdiffusionoftheexpansionthermalenergy.Notethatenergyco uplestofluxionintime,butentropydoesnot.

4 Thesynthesisitself

The fundamental idea~~thought~~ is to associate the arbitrary geodesic arc element with the intrinsic thermalenergy related to the expansion of space-time. Clearly, as can be deduced from the formalism pre-sented in the previous section, entropy appears as the system's evolution equation itself. Note thatreasoningintermsofanarbitraryscalemakesitpossibletounderstandthephysicalcontinuityoftheexpa nsionprocess.

Consideringatime-likeLagrangefunction,wecanwrite

$$L = \alpha g_{00}\frac{d\cdot \forall|\tau - \varepsilon\cdot_0}{ds}\frac{d\cdot \forall|\tau - \varepsilon\cdot_0}{ds}, \tag{4.1}$$

which,ingeometrizedunits,leadsto

$$L_2 = \sqrt{L_1} = \alpha g_{00}\frac{d\cdot \forall|\tau - \varepsilon\cdot_0}{ds}\frac{d\cdot \forall|\tau - \varepsilon\cdot_0}{ds}ds = \tilde{\alpha}\int \delta Q_{int}\cdot \forall|\tau - \tau_0{}_0 + \cdot \forall|\tau - \tau\cdot_0\frac{\delta Q_{ext}}{\tau_{ref}}Gc^{-4}. \tag{4.2}$$

[2]Inhisapproachtoentropicinteractions,Bejan[(2)]underlinesthateachheattransferinteraction$\dot{Q}_i$whichcro ssesaborderofatemperaturesystem$T_i$carrieswithittheentropyinteraction$\dot{Q}_i/T_i$;$\dot{Q}_i$and$\dot{Q}_i/T_i$areconsidere dpositivewhentheyenterthesystem.Itconstructsaninteractionvector $\dot{Q}_i$withcomponentsofenergyinteractionandentropyinteraction,namely($\dot{Q}_i$,$\dot{Q}_i/T_i$).

Theconstants$\alpha$and$\tilde{\alpha}$arearbitrary.Thus,basedonthecorrelationfunction(2.7),wecanreasonably assumethattheinvariantmeasureoftheenergyrateofspacetimeexpansioningeometrizedunitsattheinterval$\cdot\forall|\tau-\tau_0\cdot^1$isexpressedas

$$\cdot 0|\alpha g_{\mu\nu}\frac{dx_\mu dx_\nu}{dsds}ds|0\cdot = \cdot 0|\tilde{\alpha}\ \delta Q_{int}\ \cdot\tau-\tau\cdot + \cdot\tau-\tau\cdot_0{}_0{}_0\ {}_1\frac{\delta Q_{ext}}{\tau_{ref}}\ ,\ Gc_{-4}|0\cdot = \\ = \frac{-d\cdot\forall|t-\varepsilon\cdot_0{}^2\neq R.\cdot_{\forall|t-\varepsilon\cdot_0}{}^2 d\cdot\forall|\ x-\ \varepsilon\cdot d\cdot\forall|\ x-\ \varepsilon\cdot}{ds}. \tag{4.3}$$

Thecompletecosmologicalfoundationofthecorrelationfunction(2.7)canbefoundinreference[(11)].

5 Conclusions

Themainfindingsofthisworkareasfollows:

a The representation of an arbitrarily small time interval, *scalon*, however, was defined as finite and in continuous expansion, being valid for it in the differential analytical operations as they are carried out under the Macaulay

~~**a** The representation of an arbitrarily small time interval *scalon* , however, finite and in continuous expansion, was defined, being valid for it the differential analytical operations as they arecarriedoutundertheMacaulaybrackets.~~

b Through the Lagrangian formalism, a more refined expression for entropy was reached, includingthevariationintherateofthermalenergydiffusedbythesystem.

c The synthesis between the geometric and thermodynamic approaches to the space-time continuum in expansion was technically established by means of a correlation.

~~**c** The synthesis between the geometric and thermodynamic approaches of the space-time continuum in expansion was technically establishedby means of a correlationfunction.~~

~~**d**~~ **As we access the world of externalities, it has been demonstrated that there is a continuous physical representation of the universe beyond the apparent diversity**~~It has been shown that there is a continuous physical representation of the universe beyond theapparentdiversityasweaccesstheworldofexternalthings.~~

The implications of current theory push us further away from the ideal of unification in the most literal sense of the word in current physics.Even so, if we abandon the strictosensu, everything is unified at the most fundamental level of space-time.Of course, this choice in no way invalidates the successful models that we have and their many useful applications for humanity. But, it goes beyond the limits imposed by common understanding to consistently describe the essence of gravity as a consequence of the fluxionating nature of the *scalons*, which are everywhere, and allow everything we know to be created.~~The implications of present theory take us further away from the ideal of unification in the mostorthodoxsenseofthewordforcurrentphysics.Still,ifwegiveupthestrictosensu,everythingisunifiedfromthefundamentalwoofofspace-time.Ofcourse,thischoiceinnowayinvalidatesthe successful models that we have and their many useful applications for humanity.But, it goesbeyondthelimitsimposedbycommonunderstandingtoconsistentlydescribetheessenceofgravityas a consequence of the fluxionating nature of the *scalons*, which not only is everywhere, but allowseverythingweknowtobecreated.~~

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