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Verification in theory and in the sciences

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Abstract

In this work, we undertake the task of laying out some basic considerations towards straightening out the foundations of an abstract logical system. We venture to explain what theory is as well as what is not theory, to discriminate between the roles of truth in theory and in reality, as well as to open the road towards clarifying the relationship between theory and the real world. Etymological, cultural and conceptual analyses of truth are brought forth in order to reveal problems in modern approaches and to set the stage for more consistent solutions. One such problem addressed here is related to negation *per se*, to its asymmetry towards affirmative statements and to the essential ramifications of this duality with respect to the common perceptual and linguistic aspects of words indicating concepts akin to truth in various languages and to attitudes reflected and perpetuated in them and to their consequent use in attempted informal or formal logic and its understanding. Finally, a case study invoking the causes or “causes” of gravity both clarifies and reinforces the points made in this paper.

Keywords: truth, false, negation, reality, logic, theory, etymology, gravity

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1. Introduction

At first sight, the title of this paper may seem somewhat redundant; one would think that it would suffice to just call it “verification in the sciences”, since theory is commonly considered to be an integral part of the scientific field. Or maybe not?

“Verification in the sciences” could most probably be just another reference to the grandiose – save failed – agenda of the Vienna Circle; of course, no matter how hard one tried, by bringing up the word “verification” into an epistemologically orientated text, a quasi-metaphysical obligation seems to jump forth demanding to pay homage to Logical Positivism, which is the spiritual offspring and, at the same time, the tombstone of the Viennese Circle. That we will do. However, the core of our approach is quite a modern one, since nowadays little attention is paid to the concept of *truth per se*, as well as to its relation to theory and to its critical difference from *reality*; etymological, cultural and conceptual approaches will only assist in making our points more transparent.

Our journey will take us to exploring the very foundation of epistemology, of science (in any form) and even of our own private cosmos – since even in “science” there is not much that we can do other than project our own world (or should we say thought-structures) onto the world outside of us (or whatever is out there which we perceive as that). By exploring various concepts related to truth, we shall explore the place of metaphysical realism, of infinity as well as of zero – this last one both as opposed to infinity (infinite vs. infinitesimal) and as the non-coincident antonyms of Truth i.e., Falsehood, untruth, lie and the like. Finally, the concept of gravity will pull us back into reality.

2. Logical Positivism and logic

What is very much telling in the case of the Vienna Circle and of its spiritual offspring, namely Logical Positivism, is that, rightfully or wrongfully, the names of many legendary personalities were linked to it. Mach, Einstein, Schlick, Carnap and others were identified with at least some aspect of logical positivism / empiricism (Psillos, 2007; Papageorgiou, 2015). The reader may have already discovered that e.g. Einstein

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was a candidate for proselytism, but eventually distanced himself from the cycle's proceedings; however, one cannot help seeing that, one way or another, every major figure in science for the best part of the 20th century was measured against the ideas of the said cycle. Why is that?

There must be a systemic reason for such a deviation. We make ourselves clear: *epistēmē*, as it was conceived in classical Greece, was the result of the effort to seek truth bypassing the *fault of the senses*; it was not meant to utilize the then heavily underestimated senses towards “finding” the truth. The fervour nowadays to put into boosting our senses with billion-dollar equipment would count as nothing less than a monstrosity for Greeks who seemed to have been avoiding anything more complex than a ruler and a compass in order to do mathematics (Cajori, 1893). What has gone wrong? The nucleus of that question is intensified by the very fact that, despite the fall of logical empiricism back in the 50's and the end of its *dogma of verification*, nobody seems to have really abandoned it. Logical empiricism has just been transformed into “*statistical*” *empiricism*, where something is not of course verified if we observe it, but it becomes verified should we observe it frequently – say billions of times, say in CERN experiments!

No matter what we call it, i.e. positivism or empiricism, it is categorized as “logical”. But what does that mean other than being related to the modern understanding of logic, i.e. symbolic logic, i.e. the mathematical field initially formulated (in terms of symbolism) by Frege and Russell and Whitehead (Stoll, 1963)? On the other hand, empiricism, as connected to the ideas of Francis Bacon, John Locke and David Hume, states that sensory experience is the only valid way of knowing something – therefore, the only way of abstaining from value judgements, hence becoming *positive*. Can that then be anything more than applied mathematics? In the classical mathematical point of view, though, applied mathematics is the methodology of extending pure theory towards forming systematic organizing and descriptive tools for observation, in essence with a license to be borrowed as a tool by the sciences. But not only that (as it is considered to be a beneficial deed to apply mathematics); logic, even in its most basic and intuitive version, bans us from identifying causes with effects (unless some one-to-one / “iff” correspondence is shown).

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All in all, then, we and everybody else along with us ought to realize that the theoretical applicable outlook of mathematics and the empiricist theorist course of the sciences run in opposite senses: mathematics flow from theory to application, whereas the sciences start from observation and try to end up in theoretical schemes. How can A be identical to B, if A is sailing East to West while B is drifting West to East?

That understood and moving along, to the extent that nature and the world exists and functions in its own ways by its own means and rules, there are certain norms to causality: if phenomenon B is “typically” preceded by phenomenon A in this particular temporal sequence (B after A) to an identifiable and significant degree of material association and correlation of occurrence, then we can venture to say or suppose that the occurrence of A is a (material) cause for B, and that the manifestation of A creates or reveals (this distinction staying controversial) a partial mechanism and/or an expectation for the occurrence of B; that plus the feeling that if A were absent or altered, B proper would be expected to happen differently or not happen at all.

And, while this nebulous and contingent situation applies to our subjective noting or appraisal of something being *a* cause for or towards something, the situation is indeed somewhat better for the statement that something is *the* cause for something else. The meaning is something that something does not / will not / may not / cannot happen without.

No empirical observation could become the foundation of a causal system – let alone a theoretical causal system – unless, of course, we are talking about the cause or source of an outburst and flow of information, but that really should be a totally different thing, not confused with the ontology of entity or fact. But then again, it is a well-founded and easily demonstrated dogma in epistemology that no phenomenon – a near synonym for *effect* only too often – includes causes. They (causes) are always set by us as relevant to our theoretical system, our assumptions, our level of analysis etc. To demonstrate that a bit further, let us imagine a scenario of a car-crash on a rainy day. What is the cause of the hit bumper of the front car? Any one of the following may be said to be *the* cause, but can also just as easily be refuted (cf. Koutoukios, 2008):

1. Momentum/inertia.
2. Driver’s attention.

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3. Driver's girlfriend who said she's breaking up with him.
4. Rain.
5. Slippery road.
6. Bad asphalt quality.
7. Bumper's material strength.
8. Karma.

On one hand, a verdict about something being *a* cause here, as in a contributing factor to causality, is a different story, which is not what we are looking for here, unless of course it is. All that notwithstanding, however, a logical positivist would exclaim that we got it all wrong; no matter what the scenario is, we can always have a specific theory that it alone (*bracketed* in a sense) may be verified by observation alone. Indeed, the fall of logical empiricism did not come from its failure to accommodate such simple phenomena (Quine, 1951); however, it is exactly where we disagree: a theory cannot be refuted or validated by reality – let alone by means of observation.

What is so appealing about observation in the sciences then? Where does it come from and what are its consequences? In order to give answers to these questions one must examine closer basic truths about truth. We shall see that these attitudes are a direct result of a misconception about truth, that truth and theory “exist” at a different level from reality and that not all truths are created equal (truth, *veritas*, *alētheia* etc.).

3. The truth about truth

The authors of this paper expect nothing less of a new scientific revolution (or at least a humbler paradigm shift) when sciences start using truth, truthfully. So, let's get on with it!

Mathematical and logical truths are about the design of building arguments, structures and systems, making sense of their pattern or layout, combination, arrangement, order, all that towards reaching conclusions, in the affirmative or in the negative, regardless of their semantic content. That may be a material of reality in the sciences, but quite outside mathematics and logic. Besides, in all languages, *truth* or Latin *veritas* or Greek *alētheia* also has a second associated meaning, which is the antonym of a lie,

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as in the expression telling the truth; this is not the same as *reality* or Latin *realitas* or Greek *prāgmatikotēs*, i.e. rapport to the imprints of things as they actually do exist and function in the world. It is really a question, worth contemplating, why two concepts that are so dissimilar become confused and identified in the minds of so many people.

The true issues in mathematics are things like definitional aptness, elegance, decidability, consistency, completeness, clarity vs. ambiguity, systemic coordination, theoretical productivity. None of these totally abstract features touch upon things like reality, concrete features regarding the material world, nature, physics or metaphysics.

Truth, as it appears in logic and mathematics, is abstract and regards scheme of train of thought; it has no bearing to meaning or reference to the world. Telling something like “it is”, logical concepts as if... then..., therefore, contradiction, equal, set, subset, and/or, for all, one, five, plus, equals, unit, longer, ratio, infinity etc. are *not* material of materialism or naturalism, metaphysical or otherwise.

For the rest, one is totally welcome to check the sciences. But, there, logic and mathematics serve as abstract borrowed modeling devices towards applications and descriptions. They do not “exist” or “reside” somewhere; so, they lie outside the administrative realm of materialism and naturalism and anything of the sort.

There have already been efforts to “track the truth” related to the observation of reality (Nozick, 1981). Tracking the truth may increase its chances at success when someone tracks its signifier. The etymological variations of “truth” in various languages – i.e. languages that have played some role in the sciences – is quite telling about the perception surrounding it from corresponding cultures. From the following examination it will be made clear that the elementary difference between truth and reality is just the tip of the iceberg; what lies hidden underneath the surface is the really hot stuff.

Inter-translatability has been widely discussed among philosophers and it has been argued that it would be wrong to assume that meaning cannot be transferred between different languages by means of their signifiers – even at extreme cases (cf. Davidson, 1984). This is a conclusion which we shall not be attacking by any means; however, it is just as justified to take it for granted that the meaning of different words generally referring to the same notion ought to be identified. On the contrary, much as it is

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possible to explain their differences in the languages where they originate (such as English in our own present discussion right now), the words themselves may suddenly exhibit themselves as carrying strikingly different meanings – such as the words *epistēmē* and science, as we have shown elsewhere.

In the beginning there was *alētheia* – in Greek. Etymologically, it means “not to miss something / anything (significant or obvious)”. Latin *veritas* (cf. the common verb *to verify*) derives from *verus*, “true”, and that has indeed the same root as, say, German *Wahrheit*; that comes from Middle High German *wār*, *wāre*, from Old High German *wār*, *wāri*; both of them, then, come from PIE root **were-os* (trusted, trustworthy), conceivably ultimately related to proto-root **wār* meaning to rise up; it may be revealing, though, that all the different Scandinavian Germanic languages use a variety of different words from different roots for adjectives suggesting this meaning; and that reveals that the necessity in these languages for a concept in this direction is very recent. English *truth*, one among them, together with abstract noun and verb *trust*, comes from another Germanic abstract noun **treuwitho*, from Proto-Germanic *treuwaz* “having or characterized by good faith”, related to German *treu*, from PIE **drew-o-*; further on, this is a suffixed form of the PIE root **deru-*, “be firm, solid, steadfast”, related to Latin adjective *durus* = hard. The Slavic counterparts are inherited from Old East Slavic *правда* (*pravīda*), from Proto-Slavic **pravьda*, derived from Proto-Slavic **pravь* (compare *правый* / *právyj*) plus a standard structural suffix. Contrary to the Germanic branch, all Slavic languages, exhibiting features of a dialectal continuum, share this common root, which possibly has its ultimate origin in the same root as Greek and Latin adverb / prepositions *πρό* / *prae* = forward / before, suggesting once more seeing clearly that which lies in front of us.

Now, one may put forth the objection that etymology just follows the history of the signifier and that the technical meaning may be completely different – isn’t Ebola (the name of the horrific disease) etymologically quite irrelevant to the disease – to any disease? Ebola, also commonly known by its indigenous name Legbala, is the headstream of the Mongala River, a tributary of Congo River in the north of the Democratic Republic of the Congo. So, why bother tracking the various etymological origin of “truths”?

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The making of the word truth is no accident and has been deliberately done in a certain way according to what each culture ventures to express through it. There are many characteristic examples, such as *Schuld*, the German word for *debt*; yet in German *Schuld* also means *blame* and *guilt*. However, its cognate in English means an obligation regarding something that is due to be done; that is not so different from Greek, where *χρέος* means *debt* and *duty* and *service*, with an etymology derived from *χρή* (necessity) yet linked to verb *χρήομαι* = *to use*, noun *χρήσις* = usage and adjective *χρήσιμος* = *useful*. How can anyone miss the cultural significance of such usages as a historical witness of how ideas function and evolve and even change within the creation, evolution, continuity and transition and sometimes conversions in cultures? Truth and all related or “related” concepts are indeed full of cultural connotations which can be accessed by means of their etymological tracing and anatomy, since it is exactly this kind of “reverse engineering” that tells us how these notions are conceived in the first place and treated subsequently – and consequently. And it can be quite presumptuous to assume that “translating” the term from one language can be an all-preserving and non-corrupting tautology.

4. The logic of logic

When it comes to theoretical mathematics, there is a very widespread fallacy lurking here.

The more abstract something is, the less concrete factual information it contains, known in semantics as “*significand*” (> Latin passive participle present = *signified*): the specimen “my dog”, an actual being, contains a greatly more mass of precise significand than the category “mammal” with its common features, which is an abstractive classification and grouping. On the other hand, my dog is not only a mammal; she is also *one* (1). What does “one” mean on the level of specific factual information, in general and/or as used in this particular referential case? How much “information” does it contain regarding my dog? Not much, indeed!

When we reach theoretical mathematics, *par excellence* mathematical logic and then methodologically whatever is stemming from it, we have actually exhausted the entire

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course to all-inclusion, generalization and abstraction, and there is zero significant left. Pure mathematics is a mental discipline that means nothing really, in or about the world and, as such, it is a methodological construction consecrated by its sole desired virtues of internal consistency and completeness and, to the degree where it is used in applications, thrives on the sole merits of i. its interpretative power as void design, ii. its theoretical fertility, i.e. its abilities and slacks towards generating many theorems rather than procuring a limited number and exhausting its capacities fast and, surprisingly to non-mathematicians, its *elegance*, an aesthetic choice particular to the trade. *Mutatis mutandis*, it resembles a beautiful crossword puzzle in a magazine, which has no real “existence” as an entity besides what it tells us about itself and what rules it follows which are figurative and unreal and how nice and to-the-point and imaginative it looks and sounds. That is what truth means and has no *a priori* association with realities, facts or perceptions. As a result, it cannot possibly have anything to do with *beliefs, creeds, laws, conventions, theses* or anything that means anything at all. Logic, seeking the truth in this context, is totally concerned with the pattern of putting down and correlating statements via self-contained invented and accepted figurative rules, and with the validity of inference by way of *tautology of outputs to inputs*, not at all with their content, i.e. with what they state.

Therefore, given all this as it is, no one “believes” or “accepts” or “questions” or “rejects” pure mathematics on the basis of scientific or philosophical considerations; and axioms do *not* describe or postulate laws. The essence of turning to and addressing and raising expectations from the axiomatic / theorematic realm is this question / proposal: “what if we treated our statements and data in this fashion, mobilizing these considerations and reaching conclusions as conducted by this structure if it is selected to be exercised as a technique?”, *regardless* of what all this says. An objection to an axiomatic point of view, or course of action, is an objection to a schematic focus, a way of treating demonstration as in “I don’t like your ‘what if?’”; the answer is “be my guest and change my ‘what if?’”, then, with another one of your liking, and see where it gets you”; i.e. switch axiomatic system, put in and take out whatever you think and we shall see what happens a. in its theoretical virtue, b. in its applicability, wherever one had hoped for the new setup to be applied, c. its relevance to the wider horizons of human knowledge and d. to its elegance. That is all. Mathematics is in the

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mind; it is not mundane or empirical; it is neither physics nor any other reality-describing science; it is internal and mental, not external and sensory; it is the intellectual conception and processing, not the empirical intake of stimulus and information.

Given all this, the Platonic point of view regarding mathematics and *alētheia* (the authentic Greek term which as it turns out by virtue of what we have set out above is typically *poorly* and incompletely and culture-specifically translated as *veritas* in Latin and as *truth* in English and as *Wahrheit* in German and as *правда* in Russian) reflects its genuine Greek etymology (literally meaning, in fact, something that cannot be missed): it's all about an ideal way of considering and checking mental images, capitally archetypal ones, and the criteria behind their specifications and groupings. As already stated above, it has *nothing* to do with creeds, attitudes, ideologies, facts, realities, or indeed with explanations; it is a good intellectual void scenario pattern; it is *not* a vision of the world and of its objects and its ways.

A note of caution. Pure theoretical abstract mathematics is not a language or a methodology either. Mathematics produces language and can be used as a methodology by the sciences and arts and crafts, *a posteriori*. Neither of these unfortunate assertions, typically only too often coming from and encountered in the sciences, are acceptable here; they even remind us of modern ethical stances about individuality: I am who I am, not what my observer and user describe me as and what they use me for; I am not determined as being somebody else's instrument, or even as my own agent; these phrases are extraneous, irrelevant and offensive.

For logic, in its elementary essence, truth must ideally be broken down to individual elemental cases; and its definite, absolute, non-relative, non-ambiguous, non-probabilistic, non-proportional, non-cumulative, non-survey, non-statistical substance may only be conceived in its most essential minimalistic form: simply as a valence, as a 1-0 state, as a YES-NO dilemma, which is its key feature and, alas, the source of its major perceived applied or usage-connected weakness. Whenever anything more than that is (nonchalantly? suspiciously?) inserted into logic, suddenly its relationship to reality becomes inevitable – soon we cannot help following the path of “logical empiricism” (strictly literally contradiction in terms, as *logos* means thought and/or

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speech, therefore it does NOT refer to environment or reality) and indulge in trying to find truth in reality. But that is a lie; or isn't it?

This is where an inevitable question arises out of the lips of simple yet demanding users of theory: does T, logical truth, really suggest something *necessarily true*, or something just *possibly* or *conceivably* or *perhaps true*? First and foremost, it depends whether one is talking about a statistical survey of several statements, or strictly about individual core true-false yes-no statements. So where, again, is the Boolean distinction between a *core statement* (isomorphic to an *element* or *member*) and a coherent sequence of inter-related statements, such as an organized theory (isomorphic to a *set*)? Where indeed?

Moving right along, though and pretending that that structural shortage is not there, what is the verdict on the main question? Well, the verdict is that the theory herself will not tell us what it means, because the theory does not *mean* a thing. *We* are the ones deciding which theory to pick in order to organize our concepts and syllogisms, according to what we need and what it says. To that end, we take propositional calculus, look at the theorems, apply a test of giving this and then that meaning, and see and decide whether we are satisfied in our quest of investing our expectation; if we are satisfied, we keep the model for as long as we deem that it suits us; or else we drop it. So, before we postpone this discussion for a more specific occasion, we may try:

- i. T is employed as meaning necessarily true and F as meaning necessarily false;
- ii. T is employed as meaning conditionally true and F as meaning conditionally false;

And then we may put the dilemma to a test, NOT to see what the theory says, but if and how we are going to employ it. Crash test? Lydian stone? This then will be left for a next time. But let us bear in mind that then we shall have to also test applicability and usability for the following two:

- iii. $\neg T$ is employed as meaning necessarily not true and $\neg F$ as meaning necessarily not false;
- iv. $\neg T$ is employed as meaning conditionally not true and $\neg F$ as meaning conditionally not false.

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And, though pairwise uniform is better, one may introduce the test to more investigating semantics regarding negation such as *necessarily not* and *conditionally not* etc., checking whether that is useful or not, which it probably isn't, but it would not hurt to check, would it? For instance, as a *teaser*, what do we make of / how do we apply / what do we do with / how do we proceed with / what do we make of this standard proved theorem $F: F \rightarrow T$? So, now what? necessarily false implies (also) necessarily true? Perhaps false implies (also) perhaps true? Which one, where, why, how come and to what end?

The next crucial question is whether we may be tempted to change the axioms. Well, why not? But we should make totally sure that the new axioms work better with our new explicit criteria which we should be able to identify, understand, rationalize, explain, introduce and give ample convincing reasons for them. And, if we do intend to push a motion towards abandoning propositional / statement calculus in favour of our new formulation, or, which is much more daring, REFORMING propositional / statement calculus in the direction in which we point, that is really-really big. Do we have enough reasons and initiative so as to intend to undertake such a potentially sacrilegious task? Maybe we do; yet, in any case, whether we do or not, we do have every right to do. Or are we being *agents provocateurs* in stating this statement about this endeavour of ours towards “level-0” logic? Are we telling the truth or are we telling lies? Necessary ones or conditional ones?

5. The truth about lies

One ought to wonder about the semantic meaning of truth by also contemplating the nature of its opposite(s) in usage and beyond. To get started, then, what is the antonym of truth? is there just one or are there more?

Indeed, there are the notions of a lie, of a falsehood and maybe even of something wrong or mistaken. Do all of these mean the same as one another? Not at all. Apart from mere semantics, there is even an ethical distinction among them. One may be at fault because they didn't know any better; but to tell a lie is a conscious and, in general, unethical act, as in a deliberate misrepresentation of what the subject knows or trusts

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as true. There are cases such as when a potentially violent drunk friend is asking for his gun; it may be more ethical to lie to him that we cannot find it, rather than giving it to him. The question, therefore, is this: should our concept of truth express the reverse of its diverse opposites? Or just of one of them? And which one would that be and why and when and when not?

It is much more parsimonious in terms of total assumptions needed to just accept that we do accept one – or both – of two cases: either truth with the widest possible range of meanings, or truth with no meaning at all: “truth” with no meaning at all, a valence, a typical correspondence between the “Boolean” number 1 and the lexeme “truth”. That kind of truth is a one-way decision for theory and *epistēmē*, where no significant is permitted to enter. In the sciences, however, the widest possible meaning of truth must be accepted, since meaning itself is the *desideratum* there. If necessary, then, one should re-train one’s understanding of things in order to conceive a theoretical truth free of meaning and therefore devoid of sentimental connections. Axiomatic systems, as we set them, have the intrinsic value “truth”, or “1”. As we argued earlier in this text, the criteria towards their evaluation are fullness, consistency, theoretical productivity and elegance (cf. Dimitrakopoulos, 2007). Anything that can boil down to an identification with them is automatically true; anything else is not true; or is it perhaps false? or not? Or are we telling lies? Or could it be, perhaps, undecidable? Or are we pushing into the “unpushable”? Why would we want to do that? Or can’t we help it? Wait... are we lost already? And does getting lost have any connection to not accepting the truth of the axioms? Or to not understanding it? Understanding what? Understanding how? And what not and how not? Ugh!

It is evident by now that scientific or empirical “truths” are nowhere to be spotted in this vortex. Though on one hand reserving the right to implicate the world by referring to it, on the other hand our “truths” are subject to the misfortune that at the bottom of the page no mixing with theoretical truths is acceptable. But doesn’t science proceed tracing its way along “theory”? Or is it perhaps by way of “theories”? Where has this new freaky dilemma crept out of all of a sudden?

Unfortunately, the Greek abstract noun *θεωρία* is chiefly used as capitally (though not exclusively) meaning a general overall theoretical outlook on –and methodical mental

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overview of— a narrower or wider field of human examination, scrutiny, contemplation and study. As such, this word is generic and has no plural. Expressions like “the foundation of mathematical theory” and “the realm of the theory of law”, or “theory and application”, or “theory and practice”, or “this approach may sound good in theory”, all fall under this shade of meaning and would sound silly in the plural – should someone just attempt to substitute “theories” for “theory” in these expressions. Or, looking at the expression “this is true in theory”, we can attest that it is standard, whereas “this is true in theories” sounds bizarre. In this pure context, it might even sound next to ludicrous to cite an expression like “practical theory”, because it should be expected to be accompanied by the extra adjective-noun pairs “theoretical theory”, “theoretical practice” and... “practical practice”!

Therefore, the main focus of the original Greek word *θεωρία* without plural is not a definitive synonym for its derivative Latin loanword *theoria* coming with plural *theoriae*; and that in spite the fact that a marginal usage like the Latin one has at times been jumping forth even in Greek texts. In literal decorum, the word with a plural means individual and diverse *viewings* or *overviews*, therefore a more expedient proper term in Greek for this parallel line of meaning would be *θεώρησις*. As for organized scientific realistic and/or pragmatic name for the overview of an applied or extant field seems to have been devised in Greek somewhere in the flow of ages, applicable specifically to the art and science of music. There, strictly speaking, next to the general abstract mathematical *θεωρία μουσικῆς* / *theory of music* – no such plural monstrosity of course as ‘*θεωρίαι μουσικῆς*’ / ‘*theories of music*’, as Latin and the Western languages keep drifting in their ocean of ambivalence and of ambiguity –, Greek on its own means has devised and put to use the ingenious term *θεωρητικά μουσικῆς* for bodies of features and rules describing and theorizing practices and behaviours of (various) musical systems, in a manner of saying: “*theoretics*” of music.

As long as this paradigm is not perceived as righteous and does not become more generally accepted in all fields and in all languages, and as long as the plural of theory exists and is not separately called something else like *theoretics*, a fundamental structural misapprehension will always lurk, confusing *epistēmē* with science (Papageorgiou and Lekkas, 2014), truth with truths and those with reality and realities, and all communication will be partially mutually incomprehensible and

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inconsistent and invalid. Whichever way, the language-induced semantic problem lurks and shall keep lurking for as long as the distinction between *epistēmē* (*theōriā*) and *science* (“*theoretics*”) will not be possible in English and in fact in all Western languages – at least while using one single word.

This lack of flexibility is expressed again and again in Latin-derived or Latin-modeled languages in cases such as *epistēmē* vs. *scientia*, evident in the very grammatical and syntactical deep-structural discrepancy between the Western *indicative* (*modus indicativus*) in juxtaposition to the supposed but nowhere near actual discrepancy to Greek *definitive*, *enclisis horistikē* (Papageorgiou and Lekkas, 2014). Though dictionaries indicate the two as equivalent, the truth is that Greek has no indicative and Latin has no definitive, and their misidentification reveals the fundamentally diverging nature of these two dominant classical linguistic vehicles. However, that, in its entirety, would be the subject for another study. Here, we are merely referring to this distinction externally, as an indicator of how this distinction may be relevant to our search for truth vs. reality in theory vs. empiricism and the sciences. Yet, since the sciences ought to have a theoretical prior, we will now focus on an evaluation of the control field that studies truth in its most abstract manifestation, i.e. logic.

It is, unfortunately, true that elementary symbolic logic treats affirmative and negative as sort of symmetric in its theorems. That may be plausible in a special class of cases, where sets may be roughly symmetric or on a pretty much one-to-one correspondence, as in negative and nonnegative numbers, or even and odd (= non-even) integers, or up and non-up (level or down) with respect to a given plane in solid geometry. However in most cases the asymmetry is so pronounced (vertebrate and invertebrate animals, “us” and “the others”) or huge (rational and non-rational real numbers, here and elsewhere, now and not now), that considerations incorporating such experience and requiring such techniques should really lean on some kind of inductive reasoning, whether an ascending (generalizing) or a descending (specializing / individualizing or example-locating) one, notably in contexts invoking the duality of abstract / structural cases (i.e. those dealing in supersets and subsets). A typical negation most often makes a category that is much wider than its corresponding affirmative, especially if that affirmative refers to an element or a singleton (a Boolean distinction woefully absent from elementary logic so far).

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However, there is an inbred problem in the very stratification of logics: elementary deductive formal symbolic logic of level 0 (alias our staple statement or propositional calculus) cannot really import considerations from basic inductive formal symbolic logic of level 1 (alias predicate calculus) without causing a logical *cul-de-sac* impregnated with a necessary definitional and theorematic *prōthysterōn*.

Thus it would be quite important to stay very much to-the-point, in dealing with statements referring to elements, or to singletons, or at most to small well-defined sets of cases —excluding, for the sake of argument and for the present elementary limited context, inductive statements calling for predicate calculus, which had better be examined separately and in a more specialized rigorous fashion to avoid paradoxes. To achieve that, we should probably lay down three elementary patterns of inference, which can all be handled effectively in rather easy and straightforward ways. Of course, we can never be too careful about factually negative (or crypto-negative) concepts passing in language as pseudo-affirmative; those “anti-concepts” or, worse, “non-concepts”, would only be definable in essence only via a negation of a truly definable concept — e.g. odd = non-even = *not* divisible by 2, or darkness = absence of light, i.e. of photons, or prime number, all indirectly definable: not by effectively defined sets, but via complements of such sets. Let us bear in mind that, in all cases listed below, there is an underlying sequencing of the statements breaking any strict symmetry between A and B, *grosso modo* suggesting that A is some cause or reason or given or antecedent or input or starting point, whereas B is some effect or consequence or conclusion or output or terminal point or finishing line.

Primary affirmative deduction, of the form $A \rightarrow B$;

primary negative deduction, of the form $\neg A \rightarrow \neg B$;

primary reduction (*ad absurdum*), of the dual forms $\neg A \rightarrow B$ or $A \rightarrow \neg B$.

These three basic forms above can also be further checked by laying down and examining their antisymmetric reversions, equivalent to them via standard established well-known theorems, formally falling under cases of *modus tollens* (usable under the previously proved understanding that $\neg\neg A \leftrightarrow A$ and $\neg\neg B \leftrightarrow B$):

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$\neg B \rightarrow \neg A$: secondary negative anti-deduction as a checking mechanism towards an effective validation of a reversed affirmative deduction;

$B \rightarrow A$: secondary affirmative anti-deduction as a checking mechanism towards an effective validation of a reversed negative deduction;

$\neg B \rightarrow A$ or $B \rightarrow \neg A$: dual secondary anti-reductions as checking mechanisms towards alternative effective validations of reversed reductions.

So, now, how is negativity as in absence founded logically? Arguing and establishing that something does *not* exist or did *not* happen or is *not* X, as the phrasing of an all-too-common ever-recurring question goes, would probably have to fall under the dual pairs of cases numbered 2 and 3b above. Conceivably, a call involving a capitally negative concept, trying to serve as a definitive approach to this question, would involve a demonstrable identification of i. what consequence B could NOT have happened as a result of precedent A not happening (2), and ii. what would necessarily have followed as a result of A's occurrence that would cause failure of effect B to surface (3b); then we could double-check by reversion, in fact by wondering what *non-sequitur*'s and other paradoxes would or would not have arisen as essential consequences to an identifiable cause and/or mechanism A having either occurred (2) or evanesced / been impossible to occur (3b), in the *unreal* case that B had indeed been recorded as having happened (but of course hasn't).

Case study: what are the main causes of gravitational force?

Gravity is not there in the universe and it is not real. It is not an identifiable entity or process; if someone says they see gravity because it can be identified as an observable *pulsus* or an *impulsus* or a *tractio*, and think that they have solved the problem, well, they haven't; first of all these fancy Latin words signify an activity (not an entity) mobilizing the mechanism of generation and manifestation of "force", yet are not nouns substantive or declarative of force herself, who keeps smiling from without stubbornly unsubstantiated like an elusive Roman goddess, and second this does not happen in all cases, because, in common treacherous magnetism and electro-magnetism *and in gravity* (leaving out nuclear "forces" goddess-forbid), there are no

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real *pulsi* or *impulsi* or *tractiones*; there is only a propensity to be set to motion (i.e. to accelerate), which physicists feel compelled to describe, document and attribute, literally or figuratively, and then set their model unfailingly predicting, by all means imaginable and at all costs incurable, because that is the nature of their discipline. Still, what is there in the universe and what is real and observable and recordable and accountable is acceleration, and thence gravity is a physicists' postulated cause, in a supernatural or at least trans-natural frame of mind. And if that has to be documented using some other mental imagery, a tautology is a tautology. By baptizing acceleration an effect and imagining a cause, one has indeed highlighted force. But, in magnetism, the magnet is indeed there in the universe and real. By seeking an analogue of cause in asserting a "similarity of effect" as of observed behaviour (whatever that means in reality since in theory it is nonsensical either way), one establishes a "totemic" quasi-magnet "thing", describes it by invoking mathematical formulas (which, by the way, are mathematics, *not* physics, therefore do not essentially mean a thing), looks for it and does not or cannot find it. Thus, gravity is an apocalyptic deity manifested so and so and clad in a costume of a field, where force is in the field and force is the field, therefore force is in itself, as though both box and content, an ambit of fancy equations, mathematically speaking, immaterial and abstract "causes" towards material and concrete effects: a semantic paradox. And, if someone believes that this description laid out here is unfair, we would like to *see* the causes invoked as entities or as processes or both. And if the counterargument is offered by someone saying "here they are", yet pointing their finger at the effect and saying that this is it because it is terminal evidence of the cause that they are invoking, this will just not do. When the ancient Greeks were asking why earthquakes occur and the priests were answering "Titan Enceladus", showing volcanic vapours as "proof" of the Titan's breath, that was circularly self-asserting mythology.

In the case of gravity, then, what is real and observable directly is acceleration; gravity, on the contrary, is supposed to be a "cause" of acceleration. This is what exists in nature and is real and is apt to beget a magnitude in objects and processes and behaviours *directly* observed; it is not a horizon of theological or spirit-world postulated causes and models, suspected or potentially deemed to be detectable indirectly through effects. A cause may be a model, a belief or a figment of the

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imagination. None of these are acceptable as mathematics. One may indeed argue that the cause is an equation, another one may argue that the “real cause” of gravity is the wisdom of the biblical God or Zeus or Shakti. Textbook gravity is no more authoritative than these. It might be much better, then, to stick to the description of phenomena, stick to mere behaviour-describing analyses and spare everybody the attempts to detect *would-be* causes; *hypotheses non fingo*, in other words. In order to have a record of acceleration, there is no need of anything, except a measure and a description and a timer. Protons are stuck together and that is enough said. Maybe physicists would be better off without mechanistic and theist powers.

In mathematics, which is the foundation of all science (methodologically at least), in lack of a physical object or process, to have *a* cause or, worse, *the* cause as reflecting or “causing” an effect has a requirement, already hinted at previously: to rigorously theoretically show, by logical equivalence, that the cause invoked is *the only cause possible* for the particular effect; that is the only rigorous way of securely correlating cause to effect and going from the latter (effect) to the former (cause). There is a huge complication in proof schemes like this, connected to the underlying inductive (i.e. predicate) negativity of the statement as productively inferentially connected to the examples cited, which, on top of that, are already argued for by using the same pattern as the one they are trying to uphold; thus the approach blackmails the output towards reflecting the input, and that is logically foul. Where is the effect of *confirmation bias* in all this and where is it not? And what does Logical Positivism have to say here? And what about scientific empirical realism?

This brings us all too conveniently to summing up the discussion of force. A “force” is not an entity. Taking the first example (there are others), in Newtonian terms, logically starting at the top, if we have an object of mass m , which we observe accelerating at acceleration a , we define a magnitude called force, F , regardless of what it might be or of what be “causing” it (springs, externally applied actions of pull, impulse or traction, distant influence, geometry etc.), which, in equaling the metric and/or [scalar times vector] product (ma), is just only a measure of propensity to accelerate, given a mass. And all that regardless of intrinsic *pulsus* or *impulsus* or *tractio*, which are material agents of the would-be “force”; and, worse, also regardless of magnetism or electromagnetism or the strong and weak sub-atomic “forces” which

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alas aren't, but they are a field operating as a field operating in a field, i.e. in itself. What that means is left to the eye of the beholder. And nothing has even been said about angular acceleration, which, unlike linear acceleration, has nothing like angular force generating it; rejection of the "non-existent" (i.e. that which physics can claim to be able to do its job without, i.e. simply usage-wise redundant), or a-symmetrical breach in the uniformity and harmony of conceptualization and argumentation? And, when some (not all) mathematicians start uttering this skepticism, they are often indignantly told to shut their mouths, because they do not understand the first thing about physics, and to go get a BS in physics and then ask again. Ask whom about what? Is this addressed to the leading experts in the field, who, when asked for explanations, unequivocally end up with one of the three following alternative answers: "The truth is that we don't really know or we don't really understand or we can't really tell". About the rest, OK, they are pretty confident. And their argument is sheets upon sheets of mathematics.

The magnetic force of the magnet is nothing "real"; it is a feeling or idea one gets upon seeing objects accelerating towards the magnet. The field is something we have yet to see. Then one may wonder if there are causes responsible for that acceleration and for the differentiation from other masses that don't accelerate to it. There may be an essential quest about the nature of that propensity there, but that is beside the measure of the propensity itself. Some things look like they are subject to an analogue of attraction or pull on a surface of water, which may be "due" to a vortex; the vortex itself *is* a phenomenon though.

According to physics, inertial motion is a phenomenon connected to anything from no force to one zillion forces "canceling out". No acceleration, no force, things are simple. The strong force is "attractive" or "repulsive" according to the accelerations we measure, then it becomes a graph reflecting observation, then it "must be *a* cause" in the sense of conflicting behaviours, then the graph must become nature, then *a* cause must be sought for it, then three particles are invented that no one has ever seen or will ever see, then these particles are objects etc. etc. This is a classic case of subjectivist projection and a forcing of make-believe idea on phenomenon.

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What if another model works better, say a vortex-type one? What if there are three gravities instead of one? Why? Because, say, somebody said so and because they have managed to show that it works... as well... better... In *epistēmē*, it is totally indifferent if somebody said so and we think that the “it works” argument is disgraceful, and the rest is a scenario of biased self-affirming self-trapping assumptions, interpretations and applications that convince whomever they convince; pretty much like a specialized custom-tailored mythology.

What if someone, tomorrow, came up with a new set of equations for gravities, and then a new equation for wave-matter? Don't galaxies look pretty much like dirty suds sucked up by the dark hole of a sink as they spin? If gravity is contingent on the reciprocal of the square of distance, why do galaxies have two (2) spiral arms coiled around and separated by two (2) spirally coiled voids? Why are the spiral arms *not* three (3), four (4), five (5) or six (6)? What “gravity” is it that keeps them apart and prevents them from merging into rings? What if the observed voids are better for a galaxy than the observed “arms”? Why are voids in cosmic rings equidistant? Where, and how, do phase spaces come in?

What if, tomorrow, someone were to document or offer a wonderful simple explanation that the *simple harmonic oscillation* is a type of motion that is not overall (externally) accelerating but is naturally inherently *inertial*, and that no “(extra) force” is required to intermediately come and keep coming into the picture towards accounting for its functions? What if it were then to be established that, consequently, the building blocks of matter and energy do not operate via some invoked force – which is an external cause, or via some field, which is a self-external and self-internal intrinsic / environmental cause-and-effect-and-*vice-versa* external / internal cause within itself without itself –, but if it turned out that all can be re-explained via inertial simple harmonic oscillations, basic algebraic geometrically affine periodicity, all ultimately subject to Fourier's theorem? As if all this is not in the equations already, and as if Albert Einstein did not make a point of telling us that the crash test of understanding a theory is telling it simply; and as if someone not reciting the material in the way that the mainstream scientific establishment wants it “does not understand it and must study contemporary science to get it”? If so, then, what about the statement

lurking at the other end of this labyrinth, the clichés of the kind “the truth of the matter is that we do not understand”? Is this not a truth? If it is not, then what is it?

6. Conclusions

It could not hurt to bear all this in mind, especially as we are dealing with the higher and more exalted fields of human experience and thought in laying out, appraising and judging the living juices of civilization. People ask all kinds of questions, in diverse ways, and give all kinds of answers. What does the human mind have to go by? Given the fundamental dichotomy of speech and thought between affirmative and negative, endowed with a fundamental lack of symmetry between them, if there is no way to reach a conclusion in this lurking eulogy of parallel monologues and layout of coexistent clashing sentences and verdicts, where is the classical logical feeling that if two people disagree at least one of them is wrong? Where are the axioms of elementary logic? Where is the main reason and motive for us to be engaging in *epistēmē* and science? Don't we go through all this trouble motivated in order to reach conclusions? Or do we accept the trouble for a reason other than in order to reach them? or in order not to reach them? Why do we even bother, then? What are we? Some kind of Sisyphean masochists?

Because, at the bottom of the page(s), and at the end of the day(s), if affirmative and negative are not symmetric (which of course they are not),

- i. we may be answering whatever we are answering about intuitive and nonintuitive logics, given that perhaps a lot of people don't really desire a logic that is strictly intuitive and common-sensical; but, sanely speaking, who wants a “logic” that is totally definitively and shall remain forever *non-intuitive* and *non-sensical*? who, for whom, when and for what?
- ii. we may be answering whatever we are answering about applied and applicable mathematics and epistemonomic principle and scientific theory, given that perhaps a lot of people are not dying for an abstract mathematical theory that is strictly referential and applicable; but, sanely speaking, what kind of “sicko” wants a mathematical realm that is totally ultimately and forever definitively

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inapplicable to anything conceivable and shall remain forever non-intuitive and non-sensical and irrelevant to anything whatsoever? who, for whom, when and for what?

The authors of this paper have no answer to give to these last questions. Maybe someone else has. Maybe a worthy intellectual descendant of Aristophanes or of Molière...

PS

And then there came quanta, and then quanta interfered and meddled in gravity, and then there was quantum gravity. And then came the next day of creation.

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