

CRITICAL NATURALISM

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ABSTRACT: In this paper I map the conceptual framework of naturalism, its ontological implications and its current projection in the field of neurophilosophy. I show how critical naturalism formally differs from radical ontological naturalisms, both global and sectoral, in order to become a critical instance. Its theoretical implications lead to a definition of natural causality from the emergentist perspective and to metaphysical scenarios ranging from ontological pluralism to noumenal monism.

KEY WORDS: Naturalism; Reductionism; Materialism; Emergentism; Neurophilosophy.

Naturalismo crítico

RESUMEN: En este artículo llevo a cabo una cartografía conceptual del naturalismo, de sus presupuestos ontológicos y su proyección actual en el ámbito neurofilosófico. Muestro cómo el naturalismo crítico diverge de los naturalismos ontológicos radicales, tanto globales como sectoriales, en orden a convertirse en instancia crítica. Sus implicaciones teóricas conllevan una definición de causalidad natural en clave emergentista y escenarios metafísicos que van desde el pluralismo ontológico hasta el monismo nouménico.

PALABRAS CLAVE: Naturalismo; reduccionismo; materialismo; emergentismo; neurofilosofía.

But in thy gratitude towards man forget not gratitude towards
holy Nature!¹

— LUDWIG FEUERBACH (1841: 334)

Whenever real, corporeal *man*, man with his feet firmly on the solid ground, man exhaling and inhaling all the forces of nature, *posits* his real, objective *essential powers* as alien objects by his externalisation, it is not the *act of positing* which is the subject in this process [...] He only creates or posits objects, because he is posited by objects —because at bottom he is nature.²

— KARL MARX (1844: 577)

Naturalism is casting a haunting shadow over contemporary thought. There are two reasons for this: first, its conceptual profile, which is difficult to grasp

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¹ *The Essence of Christianity*, translated by Marian Evans from the second German edition, London: Kegan Paul, Trench, Trübner, & Co, Oct 31, 2014

² *Economic and Philosophic Manuscripts of 1844*, translated by Martin Milligan from the the German text, revised by Dirk J. Struik, contained in Marx/Engels, *Gesamtausgabe*, Abt. 1, Bd. 3 <https://www.marxists.org/archive/marx/works/download/pdf/Economic-Philosophic-Manuscripts-1844.pdf> (last retrieved 1 December, 2018).

and often confusing, means it is associated with other classic and modern trends, from which it is barely discernible; and second, this ambiguity gives rise to its connection with reductionist positions, making it a target for authors who identify in it assumptions which are incompatible with the metaphysical, anthropological or ethical frameworks that aspire to understand the reality in its global structure and to guarantee a transformative praxis, committed to the rights of human freedom. Naturalism's inheritance of such typical problems of post-Kantian thought has turned it into a battlefield.

I have expressed my criticisms of the materialistic aspects of naturalism elsewhere. Many of these objections coincide with those brilliantly put forward by several of the contributors to the present monograph. In the following pages I will propose a naturalistic way of thinking—a style and also a methodology—that I consider not only compatible with such criticism but necessary if it is to enable an understanding of reality appropriate for our times.

My roadmap is as follows. First, I explain the reasons that lead me to distinguish different forms of naturalism. I then describe the features of what I have called «critical naturalism». In the next section, I address its metaphysical implications, paying particular attention to the underlying causal structure. I then examine possible objections in this regard, and attempt to answer a basic question: what is critical naturalism? This question calls for a justification: why do I think it is appropriate to distinguish it from other forms of naturalism? In this paper I do not broach the generic philosophical framework of critical naturalism, which will be the subject of a future monograph, *Cartography of the split subject*.

1. «NATURALISM» IS SAID IN MANY WAYS

The difficulty in demarcating naturalism is common to any philosophical trend. However, in this case it is accentuated for at least two reasons: first, because of the extraordinary breadth of the semantic field to which it refers, namely, that of Nature; and second, because of its historical and conceptual connections with trends of thought, ranging from ancient and Renaissance materialism to mechanicism and modern and eliminativist materialism.

To prevent the concept from collapsing and becoming intractable, I consider it necessary to distinguish three forms of naturalism. The first I call «global radical ontological naturalism» (gRON) (Teruel, 2018a). This trend, the agenda of which is to reduce the explanation of superior intellectual operations—which the modern tradition has identified in reflective self-consciousness and autonomous moral thinking—to their material bases, considered in a biological-evolutionary manner. The introduction of the evolutionary paradigm and the notion of adaptive advantage distinguish it from classical materialism and connect it with a vast nineteenth-century model that revolves around natural history and its psychic and cultural projection. Proposing that such a

reductive operation must be able to be carried out exhaustively, without any metaphysical rest, gives gRON its radical character and its global aspiration³.

Elsewhere I have written on what I consider to be the errors of this trend. I was particularly interested in its radical modulation in eliminativist materialism (Teruel, 2008b). Among the criticisms of this position, here I highlight four that refer, respectively, to a negligence, a forgetfulness, an exaggeration and a subterfuge. gRON negligently confuses the scope of psychic experiences with the framework of physical facts and aims to dissolve *manu militari* the first in the second. This brings with it the strategic oblivion of the psychic spheres, from the phenomenology of internal meaning to mathematics, whose features, such as intelligibility, universality and unconditionality, go beyond the scope of the external, contingent and finite. Both errors contribute to an exaggerated estimation of its explanatory and predictive capacity. Along the way, eliminativist materialism sneaks in the presumption that it will one day have the reductive tools to justify the whole project; it thus adopts the subterfuge that Karl Popper called «promising materialism» (Popper / Eccles, 1977: 96). All of the above means that gRON incurs in an illicit intertheoretical ontological reductionism (Teruel, 2013a: 193-194).

There is also a restricted version of gRON, which I call «sectoral radical ontological naturalism» (sRON). The global claims of the former have given rise to multiple sectoral projections. One of them is especially relevant to the subject of this monograph, namely its extension to the practical field and the consequent attempt to display morality in a naturalistic key. Within the framework of this naturalisation of ethics, it has been proposed, on the one hand, to explain the specifically human aspects of the moral world through the natural history of its pre-human conditions; and on the other hand, to dissolve the pretensions of unconditionality and universality characteristic of diverse ethical conceptions —and, according to these, of ethics in itself— in phylo- and ontogenetically rooted psychic tendencies. Along this path, the allusion to non-invasive brain observation techniques has become common currency to empirically support assertions about the siting of certain moral predispositions in one or another of the brain's functional areas. Examples of these strategies can be found in the theories of Jonathan Haidt and Joshua Greene, lucidly examined by Pedro Jesús Pérez Zafrilla in this volume.

Regarding the explanation of human morals that accentuates the natural history of their pre-human conditions, elsewhere I have exposed how, in my opinion, this approach uses arguments that can be reduced to absurdity (Teruel, 2012). I have underlined the phenomenologically reductionist, biologically-evolutionarily counterproductive, metaphysically contradictory and humanly regressive nature of ethical naturalisation. In effect, by their means the ethical

³ Jesús Conill provides a rigorous characterisation of naturalism in the introduction to his paper «Can the human person be naturalised?», which opens this volume. On the difficulties in defining naturalism, cf. the works of FERRATER MORA (2009: 2509; 1965: 33); cf. also ARANA (2015: 19-40).

principles are dissolved in mere deliberation relative to adaptive effectiveness, so that ethics becomes the ethological illustration of natural history. sRON deprives ethics of even the normative force that it has as a refined product of evolutionary performance. In this way, it deactivates the ethical pretensions that could guide the naturalising practice. Any attempt at transformative praxis must therefore be evaluated and restricted by the weight and heritage of phylogenesis. Several sRONs have emphasised how their position does not represent any form of social Darwinism; they have done so without providing arguments to connect the theoretical and the practical spheres, thus falling into a striking conceptual schizophrenia (Churchland, 2009: 101; Dawkins, 2008: 44' 03" - 45").

Epistemic Naturalism (EN) constitutes a materially similar but formally different version of naturalism. Here, too, the theoretical agenda revolves around the possibility of explaining superior intellectual operations in light of their physical-chemical structure and dynamics, as well as in the frame of natural history in a biological-evolutionary key. However, EN lacks the pretension of reductive radicality and ontological globality. In other words, it does not have a materialist ontology in the background. In contrast to the *primum ontologicum* of evolutionary matter, EN identifies the existence of different levels of intelligibility with specific and mutually irreducible characteristics. Faced with the *primum causalitatis* of physical influence, it recognises the reciprocal influence—the material on the psychic, the psychic on the subjective, the subjective on the psychic, the psychic on the material—and the holistic configuration of reality. EN is a methodology to work by, not an intertheoretical ontological reductionism.

The boundaries between EN and evolutionary epistemology are vague but real. There are authors who embrace evolutionary epistemology as an epistemological corollary of gRON (this is the case of Paul and Patricia Smith Churchland, Richard Dawkins or Daniel Dennett, to give some well-known examples). Other authors use EN as part of a *forma mentis* that does not imply a commitment to materialism (the case of Konrad Lorenz, Julián Pacho or Antonio Diéguez Lucena). To avoid this ambiguity I prefer to speak of «critical naturalism» (CN).

2. WHAT IS «CRITICAL NATURALISM»?

Critical naturalism is a meta-theoretical position that emphasises the need to pursue the natural causal series as a regulative idea in the holistic study of reality, and to do so as a critical instance in order to achieve a proper phenomenology of the correlation between subjectivity and objectivity. I begin by examining its relationships with other forms of naturalism.

2.1. gRON, sRON and CN

The above arguments allow us to distinguish CN from gRON and sRON. All of them share the methodological formality of their material approach: reality

has to be explained by taking into account the tools provided by the natural sciences, as they have been shaped through the convergence of disciplines such as physics, chemistry, physiology, evolutionary biology and the neurosciences. Since the superior intellectual operations of the human being are located at the edges of this approach, these operations become the front whose positions—traditionally reticent to intrusions from such strategies—are to be overcome.

At the same time, CN differs from gRON and sRON in its meta-theoretical formality: it is not designed to serve a particular ontology, nor does it intend to create a new one (which does not mean that it does not have metaphysical implications; I will refer later to this). It is, therefore, a critical instance that emphasises the need to introduce the perspective of natural sciences into the study of the subjective. This emphasis is the result of a successful history: the study of subjectivity is the frontier that has been pending enquiry by the natural sciences on their triumphal course since the seventeenth century.

2.2. *CN and natural causality*

From the methodological point of view, CN implies a commitment to natural causality. What we understand here by «natural causality» is the productive link between entities or networks of entities in which the phenomenological characteristics of the natural world—contiguity, temporality, quantity, quality, relationship, etc.—are intervening, together or separately, in a decisively dynamic way. These characteristics constitute the ontological framework of the natural laws described by the scientific disciplines: the law of universal gravitation; the law of inertia; the law of conservation of energy; the law of the relationship between potential difference, intensity and resistance in the transmission of an electrical impulse; the law of the relationship between intensity of the stimulus and sensory perception, and so on⁴.

CN accentuates the need to pursue the explanation of the subjective dimension of reality through natural causality. The knowledge of the subjectivity that we have gained in this way has allowed us to approach it in its relationship with the brain, a relationship that has multiple facets according to the dynamics alluded to above. The psyche has revealed itself to be incorporated in a radially organised electro-chemical system, in which the generation and transmission of action potentials takes place within the framework of Newton's law of gravitation and his first law of motion, according to Helmholtz's law, Ohm's law, Weber-Fechner's law and so on. This interaction brings with it very

⁴ Addressing the structure of natural causality exceeds the scope of this paper. The only characterisation I provide is a definition of work that should be completed in at least two ways: analysing the notion of «productive nexus» and mapping the «phenomenological characteristics of the natural». The first refers to the plurivocity of the notion of «nexus»; the second, to the extraordinary reach of the expression «the natural». On the difficulties in characterising natural causality, see the work of Juan Arana *Los sótanos del Universo* and specially its third chapter «Rise and decline of causes», (ARANA, 2012: 61-101).

specific psychic dynamics —of, for instance, motor modification, excitation, inhibition— that constitute the neurophysiological correlate of intellectual activity.

Natural causality —with all that it implies— constitutes, in the world of life as we know it, a condition of possibility for subjective experience⁵. It does this with constant non-solipsist implications. By this, I mean that it could be thought that once the structures made possible by these conditions have been generated, the subjective experience is built only from its own dynamics. However, there are multiple phenomena of physical causality that modify the subjective experience in an evident and observable way; these include phenomena related to the modification of psychic states through food, drink and drugs, or through suggestion, as in the context of mass public events, pornography, collective panic, all of which have been familiar since ancient times.

2.3. *Why do we need CN?*

CN is necessary in the framework of a holistic metaphysics. In other words, it serves the purpose of constituting a theory of the real that is respectful of its different ontological levels. One might think that in this case emphasis is placed on one of these levels —that linked to natural causality— and that therefore it does not contribute to these global goals. However, my opinion is that CN is the correlate of a self-respecting metaphysics of subjectivity. I try to explain this in what follows.

The demarcation of the specifically subjective is achieved dialectically: in the thorough confrontation with that which is different from the self. Subjectivity recognises itself in its positioning of itself as such against the background of objective reality. Since subjectivity implies self-reflection and autonomy in the frame of the living body, it can only find itself in the dialectic with the objective, the conditioned, the external. In this sense, subjectivity is a story of conscious self-configuration in dialogue with what is different from itself.

Similarly, the cultural construction of subjectivity —as an attempt to understand the human being, rooted in personal experiences but also in the interaction between education, socially-shaped ways of thinking, scientific-technical advances and cultural trends— requires a thorough examination in which CN plays a non-exclusive but prominent role. Our epoch, dazzled by the theoretical and technical achievements of successive scientific, industrial and now digital revolutions, does not accept modulations of the subjectivity that do not submit to this examination. This is not a mere sociological consideration, but an epistemological-cultural level that has to be taken into account: in order

⁵ This statement implies bringing back the ontology of the cause that goes beyond the transcendental point of view. In this sense, my Kantian affiliation prefers Adickes to Vaihinger: *Amicus Plato sed magis amica veritas*. I consider that Kant's own theoretical philosophy includes basic pieces whose adequate combination depends on ontological assumptions about the way we grasp the things in themselves.

to update the tools for understanding subjectivity, it is necessary to temper them in the forging of CN. These tools will enable us to draw an up-to-date map of the different areas at play, whether physical, chemical, electrical, psychic, subjective, or cultural, in their mutual interrelationships.

CN is, thus, a critical correlate of a metaphysics that advocates the rights of subjectivity. It contributes to a map of the being in general and of the human being in particular which aspires to be appropriate for our times. CN delegitimises RON with its own resources, showing how the scope of the naturalistic reduction is intra-theoretical, not inter-theoretical. I return to this point later in the paper.

3. METAPHYSICAL IMPLICATIONS OF CN

CN does not imply a commitment to an ontology of materialist or idealistic bias. However, it brings with it metaphysical implications, among which I refer to two: one related to emergentism, and the second concerning natural causality. I also add a consideration on CN in the moral perspective.

3.1. *CN and emergentism*

Since it implies an exhaustive prosecution of natural causality, CN contributes to delimiting the specific rights of subjectivity. In other words: subjectivity is cut off as such on the horizon of a natural causality pursued to the end. If this is not done, the subjective features appear blurred in their specificity and can be accused of being *Deus ex machina*: they would aspire to a spiritual specificity of the psychic that, in fact, could be explained by appealing to natural causes.

The development of scientific-natural research around the psychic has persuaded us of the extent to which the subjective is rooted in its neurophysiological bases. It has favoured the shift from a rational psychology, unable to render an account of the psychic in general and of the pathological in particular, to an experimental psychology that integrates both in its field of study. This transition concerns the illustrated image of the psyche, largely presided over by the clear light of consciousness and alien to its unconscious aspects (not, for example, in Schiller), and its modulation by the psychoanalytic or neurophilosophical perspective. We now know the extent to which the psyche and its dysfunctions involve a neurophysiological system that is a network of electrochemical patterns in delicate dynamic balance. For example, obsessive-compulsive disorders concern the electrical stimulation of deep areas of the brain (Teruel, 2013b).

All this sheds light on the specificity of the subjective. Now, that these patterns generate a reflexively self-conscious psyche, receptive to the unconditionality characteristic of theoretical constructs —like mathematical axioms— and to practical ones —like ethical imperatives— entails a quality leap not implicit in the

foundations of the system. We are dealing here with emergent properties (Broad, 1923: 25). The strategy of CN allows pursuit of the limits of natural causality and, in this way, exhibits what it cannot explain. In other words, a coherent CN allows subjectivity to emerge in its own specificity. For this to happen, of course CN must not abandon its methodological character nor inadvertently accommodate materialist ontological assumptions (which would make it a RON).

3.2. *CN and natural-systemic causality*

The link between CN and emergentism qualifies natural causality. This must be compatible with the emergence of subjectivity and with the biunivocal causal interaction between the material-physiological, the psychic-soulish and the subjective-cultural. It is a complex ontological problem. In my opinion, its resolution implies the transition from a causality understood in an ontic key to a causality in a systemic key.

The causality understood in the ontic key revolves around the set of potentialities of the individual entity. The acorn is able to grow into a specimen of its oak species, just as the human embryo can develop into a mature individual of the species *homo sapiens*. The emergence of the qualitatively new constitutes a *factum*: the adult oak presents capacities absent from its previous phases, just as the mature human being generates virtualities which are unseen in his or her embryonic or foetal stage.

Observing this dynamism from a systemic key implies going back to the field of matter. The material world provides the stage for multiple emergent properties. This would not be feasible if their conditions of possibility were not formally lodged in their previous phases. This leads us to systemic conditions. In other words, the elements of the material have unfolded in directions enabled by virtualities linked to their reciprocal influence. The material would have to be understood as a complex of essential affinities that allow the emergence of systems gravid with potentialities. This idea of essential affinities finds its oldest precedent in Anaxagoras' theory of homogeneous parts (ὁμοιομερῆ), its transcendental correlate in the third Kantian analogy of experience in the *Critique of pure reason*, its dialectical parallelism in the elective affinities that Hegel points to in the first book of his *Logic* and its organic indications in phenomena such as brain plasticity or the varied ontogenetic deployment of stem cells depending on their tissue context.

Speaking of systemic causality does not imply dispelling the essential novelty represented by the emergence of properties: this would remain the enigmatic key of the Universe. It does imply, however, a redefinition of the notion of matter—and of Nature itself—that surpasses the modern mechanistic framework and is compatible with relativistic and quantum physics. In other words, CN makes the notion of emergence necessary and is cut off from a conception of natural causality in which the very concept of Nature is affected.

In this framework, neither a materialist nor a spiritualist monism is feasible as a theoretical assumption; an ontological pluralism would be acceptable. On

the basis of the emergence of the subjective dimensions from Nature —since the subjective and hermeneutical experience is first in the order of knowledge, but not in that of its material conditions of possibility— I have proposed what I consider the only possible monism: the «noumenal monism» (Teruel, 2009a). This recognises the intrinsic duality of human experience, which is constituted from the dialectic between the external and internal sense, the point of view of the third person and of the first person, the fact and the experience (Teruel, 2007; 2008: 275-286). Such a constitutive duality does not in itself require a dualistic ontology. In fact, Nature constitutes the *humus* for the emergence of the aforementioned dualities. The noumenal monism can be related to the dynamical monism of Lain Entralgo, in which «dynamism is a form of causality, its primary form» (19952: 108).

3.3. *CN and moral experience from the neurophilosophical perspective*

CN allows us to investigate the structure of morals without sliding towards an ethical naturalisation. On the one hand, it emphasises the need to reveal the presuppositions of moral life that are associated with natural causality in its different variants: electro-chemical, neurophysiological, biological-evolutionary, and psychic-collective. On the other hand, insofar as it recognises the qualitative emergence of the new, it conjures the materialistic reduction and allows the exhibition of the specific elements of moral experience.

In this sense, «double-sided» experiences are particularly significant. Among them, the irruption of moral dysfunction in the tension between adherence to the good and weakness of the will plays a prominent role, namely: the phenomenon of *akrasia* (Teruel, 2016), the problem of moral evil (2015) and its reflection in the tradition linked to concupiscence and original sin (2017; 2014). These are facets that can be illuminated by appealing to natural causality in a neurophysiological and biological-evolutionary key. At the same time, delimiting this aspect of the problem reveals what cannot be addressed from there: the self-determination for the good beyond phylogenetic predispositions, its usefulness or its evolutionary effectiveness.

The use of non-invasive brain observation tools is of special relevance here. CN incorporates, as a methodological principle, the need to adjust its conclusions to the scope defined by its methodology. This methodological clause will avoid incurring in paralogsms in which the moral experience as a whole is qualified on the basis of results that only concern its neurophysiological bases.

4. OBJECTIONS AND APORIAS

At this point, several critical questions may be posed. I highlight what I consider to be three appropriate criticisms, which I enunciate as questions.

4.1. *Is CN an undercover intertheoretic reductionism?*

CN is not an undercover intertheoretic reductionism, but it can become one. This can be avoided by not abandoning its character of critical instance. Its function is to discern what connects with natural causality, revealing what goes beyond its explanatory possibilities. In this sense, it is essential to (i) acknowledge the appearance of emergent properties; (ii) understand them in the light of a non-reductionist ontology; (iii) maintain the methodological clause referred to in (3.3); and (iv) avoid promising materialism. Disregarding requirement (ii) has given rise to formally emerging theories that have slipped into a materialist ontology; this is the case of Engels in the transition from the first law of the dialectic of Nature to its global interpretation. Ignoring (iii) or (iv) is the reason why contemporary philosophical dissemination often exposes paralogisms that lead to materialistic positions which are only seemingly systematic, as in the case of the most recent and comprehensive work of Daniel Dennett (2017).

4.2. *Why CN and not critical subjectivism?*

CN is compatible with a critical subjectivism. The function of the latter is to examine the phenomenology of experience in order to reveal the series of self-determinations —intellectual, volitional, moral— that give rise to its configuration as such (see Javier Gracia's paper in this volume). In a certain sense, one might consider that the classical German philosophy —the variants of idealism, from Fichte to Hegel— offers a foreshortening of such a methodology; it is not surprising that several episodes of that deployment —such as in the early stages of Schelling's thinking— led to a task of demarcation and a valuing of the organic bases of experience. Since the cultural shaping of our time has placed naturalism in one of its vectors, it is now even more necessary to develop a CN that, without denying what is right in the naturalist approach, serves to cultivate a critical awareness in this field. Through this, a relevant piece of a global phenomenology would be shaped.

4.3. *Is CN a system?*

CN is not a system but a critical instance. Its metaphysical implications indeed refer to a possible ontological system; however, this system could not be built from CN, since it has no pretensions to completeness. Similarly, a critical subjectivism could not constitute a system without falling back into ontological reductionism. The only possible system should contemplate the results of a critically modulated global phenomenology. Key pieces of that ontology would be, in my view, (i) the recognition of the intrinsic duality of human experience; (ii) the emergentism of properties; and (iii) noumenal monism. Thanks to (ii) and (iii), (i) would lose its antinomic character in order

to become a natural-scientific aporia, and open itself to a holistic meta-theory⁶. Such a meta-theory constitutes a challenge of our time and a question that has been pending since Hegel strove to overcome the modern dualisms.

Coda

I have tried to map the conceptual framework of naturalism, its ontological implications and its current projection, in light of the distinction between three modulations of the concept. Among them I have highlighted one, critical naturalism, that does not harbour reductionist presuppositions with materialistic bias. I have shown how it formally differs from radical ontological naturalisms, global as well as sectoral, to become a critical instance. I find it not only legitimate but also necessary in order to demarcate the conceptual sphere of subjectivity in its irreducible specificity. Its theoretical implications lead to a definition of natural causality from an emergentist point of view and to metaphysical scenarios ranging from ontological pluralism to noumenal monism.

Nature must be given what is its own. The vicissitudes of post-Kantian philosophy can be considered an attempt to do justice. The ontological *pondus* has swung from the side of human subjectivity to that of natural objectivity. Our present is the scene of a naturalising trend that has led to the risk of materialistic one-sidedness. At the same time, social developments have given rise to a culture of practical self-determination —political, social, sexual and existential— or at least of the aspiration to it, which collides head-on with the deterministic implications of materialistic reductionism. This latent tension between materialism and humanism is one of the great issues of our time.

Giving Nature its own is nothing but an act of gratitude. It is ourselves who, with our feet firmly on solid ground, breathe in and exhale its gifts; and we do so in an intersubjective context, open to the existence of others and blessed by it. Is it not just the aspiration to reconcile —also in theory— what is already united in practice?

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⁶ Such meta-theory has been advocated from models close to RON. This bias turns these attempts into only apparent conciliations. This does not diminish such efforts, but it points out one of its weak points. One example is the «theory of unified knowledge» around neuroscience proposed by Francisco Mora (MORA, 20082: 201-223, 2007, cf. critical review in TERUEL, 2009).

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