

25-03-2008

ACADEMIE INTERNATIONALE DE PHILOSOPHIE DES SCIENCES Entretiens

2007 - Cerisy, 4 - 8 Octobre

<< Le Temps dans les différent approaches scientifiques >>

MASSIMO PAURI

**Time, Physics, and Freedom:
at the Roots of Contemporary Nihilism.**

[PAURI-CERISY-DEFIN.doc]

Physics Department – Theoretical Section

University of Parma

Sezione I:N.F.N. di Milano Bicocca

Gruppo Collegato di Parma

43100 Parma - Italy

October 2007

<< Neither the subtlest philosophy nor common human reason can jeopardize freedom by means of sophisms. Reason must therefore assume that no real contradiction exists between freedom and the natural necessity of human actions; because reason cannot do without the concept of nature no more than without the concept of freedom.>>

I.Kant: *Groundwork of the Metaphysics of Morals*, 1785.

1. Introduction

As far as I know, the term *nihilism* appears in philosophical literature in the second half of the XIX century. The notion of *nihilism* entails a general negative attitude towards all of the traditional values, including the notions of Truth, Being, and Logos; so much more compared to the old historical criticism of the notion of *truth*, prevalently focused on its *logical aspects*.

Two strands can be recognized in the modern *nihilism*: one belonging to the German tradition, from Nietzsche to Heidegger, and one to the French tradition, exemplified, for instance, by “La décadence” of Bourget and subsequently by Deleuze. I believe, furthermore, that we should ascribe to *nihilism* the deflationary minimalism which lies at the ontological roots of – so to speak – the “anti-idealist ineffability” of certain analytic philosophy. Anyway, nowadays in western civilization we have an every-day experience of a widespread sociocultural manifestation of *nihilism* and its *effects*, which includes a deep loss of effectiveness of the sense of truth, meaning, freedom, responsibility, sense of personal and national identity, and which is impressively evident in the common life manifestations of the man of the street: *a world of inauthenticity*.

According to certain critics, Enlightenment carries most of the responsibility for such influential cultural effects, in particular because of the ideas of *causality* and *determinism* stemming from its prevailing philosophy (remember Laplace and Lamettrie). I must say, however, that I see the whole of modern philosophical thinking, at least up to Kant included, as a great *reaction* to the Galilean foundations of physics. Accordingly, in this paper - without being detrimental at all to the achievements of scientific knowledge - I will argue that: i) a robust contribution to contemporary cultural *nihilism* comes as a long-term effect of certain *totalitarian* self-interpretations of these foundations, one of which is already present in the radically mechanistic view of Descartes; and (ii) a contemporary contribution derives from certain prevailing (although often only implicit) philosophical interpretations of the astonishing achievements of physics, including elementary particle theory, relativity theory, certain simplistic interpretations of the remarkable results of neurosciences and, last but not least, the parallel flourishing of the so-called “philosophy of mind” and the “computational” revolution.

Weinberg, for example, has expounded a very clear position about a harsh reductionistic view leading the above mentioned *totalitarian* interpretations to a climax. He calls this position about the theoretical structure of physics “Grand-Reductionism”, meant however as a *general conception of Nature*. Since this position – as Weinberg himself admits - is also strictly connected to a *deterministic view* of the world, I will unify them, for the sake of argument, into a single *View of Nature* which I call “Deterministic Grand Reductionism” (DGR). I believe that, when properly scrutinized, Weinberg’s view turns out to be a strong, but irrational *metaphysical* thesis, according to which the *facts of the past, in conjunction with the laws of nature, entail every truth* about the *present* and *the future*. In this paper I will take Weinberg’s stance as an exemplary source of *nihilistic* thinking. More generally, I will focus on three main issues: namely a crucial logical junction that I would like to call the *freedom of meaning*, the issue of *determinism and free will*, and the *philosophy of time* in conjunction with *the mind-body problem*. I am aware that in this way I am considering a notion of *nihilism* which is different from, and more general than, the one introduced by Nietzsche. However, this more general and disruptive brand of *nihilism* is precisely a specific outcome of certain contemporary self-representation of physics.

The main thesis I will propose is that the *nihilism* arising from such issues is due to a common *aporetic logical source* having to do with a basic misunderstanding concerning the nature and the range of the *physical description of the world*, as shaped by the Galilean foundation. Accordingly, I will start by examining the sophisticated philosophical and methodological process lying at the basis of the Galilean enterprise and some consequent *structural limitations* inherent to the foundations of physics which, when ignored or too confidently underestimated, become just the basic source of contemporary scientific *nihilism*. Overlooking the *structural limitations* of the physical enterprise is especially relevant to the debate about the alleged *determinism* (or *indeterminism*, as well) of the *world*, and the so-called *causal closure* of physics, both of which bear upon the *mind-body problem* and the so-called *compatibilist* thesis about Free Will.

I will analyze in particular the aporetic nature of some consequences of DGR that bear upon the issue of the *freedom of meaning*. In a sense, the *aporia* characterizing this case is exemplary and summarizes the aporetic elements surfacing in all of the issues discussed in this paper. They are all deeply interconnected and play analogous roles as sources of nihilistic influences. Briefly, if we are not able to *freely believe* and *freely think* in a *meaningful way*, we are not even able to *freely will* and *freely act* in the world, and viceversa. The conceptions of *time* also bear upon the same problems. In particular, as is evident from

history of philosophy – Kant’s thought especially – the issue of freedom and free will is strictly related to the way in which *subjectivity* is thought to stay *in* time. Thus, my analysis will be jointly directed to the analytic view expounded in the so-called A and B-theories of time. I will then discuss the consequences of the implicit assumption that the metaphysics of time is dictated by the role played by *physical time* within the theoretical structure of physics, in particular by a *literal* interpretation and *reification* of the spatio-temporal models of the relativity theory. A further instantiation of the same logical junction concerning *meaning* and *freedom of choice* is provided by the current reductionist and ideological interpretation of *strict Darwinism*. This is where I wish to be absolutely clear from the very start. My position has nothing to do with the so-called “creationism”, “intelligent design”, “vitalism” and the like, nor am I willing to put into question the central Darwinist thesis of the common origin of species. Rather I intend to face the philosophical difficulties arising from the conjunction of, on the one hand, the recognition of the *reality* of *subjectivity*, which reveals itself in living organisms by various degrees, and, on the other, the extrapolation of the strictly Darwinian theoretical model to the cosmological level. A final section is thus briefly devoted to expound my critique of the aporetic features and nihilistic elements surfacing in standard evolutionary thinking, in parallel with DGR.

In this paper I will argue throughout according to a principle of metaphysic *parsimony*, so I will not propose any *positive* metaphysics, if not for the brief analysis given in Section 9. The overall logical structure of my arguments is that of a “reduction ad absurdum”, by which I intend to individuate a perspective with the capacity of avoiding deeply antinomic conclusions. Therefore, I tend to a clarification of the subject which, in a sense, be an incontrovertible conclusion to the extent in which it is implicitly upheld even by those who tend to deny it. Indeed, is this logical circuit not the great discovery of the *inner necessity* of Reason revealed by the Greeks ?

Given the conceptual range of the subject matter and the limited space of this paper, my analysis will necessarily be rather sketchy and simplified. I am well aware that only a few of my readers may be convinced. To most of the readers, my discourse may appear as really provocative. I am saying “appear” deliberately, however, because I am deeply convinced of my view.

2. A philosophical premiss: the *ontological- phenomenological aporia*¹

¹ This concept is an extension of what Abner Shimony called “phenomenological principle”. See Shimony (1993).

I call *ontological-phenomenological aporia* the logical structure of a philosophical argument in which: 1) a basic distinction is deliberately maintained between *reality* and *appearance*; 2) *ontology* does not account consistently for the corresponding *phenomenology*, in particular, for the *distinction* between *reality* and *appearances* “qua” *appearances*.

This is the logical tool I am going to exploit for my *reduction ad absurdum* type argumentation. In this paper will present some instantiations of this *aporia*.

3. The structural limitations of the *physical description of the world*

3.1 – A florilegium of quotations – I

3.1.1 - The foundations: Galileo Galilei (*Third Letter to Markus Welser*, 1633)

<< O noi vogliamo specolando tentar di penetrar l'essenza vera ed intrinseca delle sustanze naturali; o noi vogliamo *contentarci* di venire in notizia *d'alcune loro affezioni*. Il tentar l'essenza l'ho per impresa non meno disperata e per fatica non men vana nelle prossime sustanze elementari che nelle remotissime e celesti >>

3.1.2 - The foundations: Galileo Galilei (*Il Saggiatore*, 1623)

<< La filosofia è scritta in questo grandissimo libro, che continuamente ci sta aperto innanzi agli occhi (io dico l'Universo), ma non si può intendere se prima non s'impara a intender la lingua, e conoscer i caratteri ne' quali è scritto. Egli è scritto in *lingua matematica*, e i caratteri son triangoli, cerchi, ed altre figure geometriche, senza i quali mezzi è impossibile a intenderne umanamente parola; senza questi è un aggirarsi vanamente per un oscuro labirinto >>

3.1.3 - The foundations: Ernst Cassirer (*Das Erkenntnisproblem in der Philosophie und Wissenschaft der neuren Zeit. Ester Band*, 1906)

<< Modern thinking about nature is characterized by a lengthy process of ontological transformation which leads from the classic paradigm of *substance* to that of *function* >>

3.2 - The fundamental *blockade*

Galilei's intuitions quoted above have been implemented, through a radical philosophical transformation taking place during the Renaissance, by means of a literal *blockade* of the process of *essential* individuation of entities. “Accidental” and “essential” properties are no longer taken into account for the understanding of *temporal change* and *transformations* of individual entities. This *blockade* has methodological consequences that match the passage from the notion of *object of experience* (say “this table”) to *idealized abstract classes of entities* that allow for *mathematization* (say “electrons”, but also “Newton's apple” as concrete instantiation of the class of weighty abstract material objects). The transformation of the world

of experienced objects into a world of abstract mathematizable entities entails the simultaneous and implicit *ablation of the experiencing subject* from the field of entities that physics is entitled to understand.

This takes place through a set of founding approximations and exclusions. A first *founding approximation* is the constitution of *physical time* (see later) which (according to Whitehead) bifurcates Nature. A second *founding approximation* is the separation of the world into *three parts*: (i) the *object* to be defined as a *physical system*; (ii) the observing and theorizing *subject*, who often assumes the ambiguous role of “observer” or even “measuring apparatus”; (iii) the *remnant of the world*. The variability of this last part, initially taken as irrelevant to the immediate scope of defining the physical system, determines the *irreducibly contingent* component of the physical description in the form of *initial* or *boundary* conditions. This partition allows the determination of the forms of possible *temporal variations* of the physical system in connection to *different choices* of the relations to the *remnant of the world*, as *physical laws*².

The basic passage, however, is the *abstraction of the particularities* of the object to be interpreted as physical system, as well as of its *relations* to the remnant of the world, by means of a *systematic pre-selection*. This sustains the *blockade of essential properties* that constitutes the physical object as an *abstract equivalence class* of perceptual things. In this way, the *blockade* leads to a peculiar new individuation, or better, *specification*, of entities that constitutes a new *reduced* and *abstract ontology*. The important point is that, *within the limits of the internal methodological approximations* of the physical description, *this specification* can be considered *exhaustive* or “complete”. This allows maintaining – in the new sense – terms like *the ontology of a theory* (say, of “material points” [Euler], of “classical fields”, of “elementary particles”, “antimatter”, “identical particles”, “relativistic quantum fields”, and so on). Once the reduced ontology is established, *any physical action* is described in spacetime as an exchange of 4-momentum among the interacting parts of a whole³.

It is just in force of the *exhaustiveness* or *completeness* of the *reduced ontology* (which allows, first of all, the mathematical specification of the concept of “initial conditions”) that one can speak unambiguously of *determinism* or *indeterminism* of a *theory*, while I maintain that

² Admittedly, *stricto sensu*, this picture schematizes the framework of classical physics only. Typical Galilean conditions like the indefinite *temporal repeatability* of the relevant relations with the remnant of the world, and like the *irrelevance of the spatial relations* between a suitable region including the physical system and the remnant of the world (*spatio-temporal omogeneity*), are no longer simply satisfied in the case of general relativity. The situation of astronomy and astrophysics is still recoverable due to the multiplicity of similar physical systems under scrutiny, while the basic conditions are not met in the case of cosmology. Indeed, I believe that “the Universe as a whole cannot be considered as a scientific object in any sense that such words have had in the historical development of physics”, see Pauri (1991) and a related comment in Torretti (2000).

one is not allowed to attribute *determinism* (or *indeterminism* either) to the *world simpliciter*. *Aside from* the idealized *reduction*, there is in fact no *natural minimality* in the *concrete multiplicity* of the real world upon which to base the dynamical description mathematically (see the following quotation of Nagel and the reference to “*des êtres qui la composent*” in the quotation of Laplace). Therefore *absence of determinism* (in the world) *is not equivalent to indeterminism* in the ordinary sense of chance. Not only does the primary ontological reduction leave out of the picture the experiencing subject with their *qualia*, but more generally, a whole background of *happenings* of the world which could not be mathematized in principle. Furthermore, it does not take into account the fact that we have *limited access* to great part of the world, nor the fact that we cannot say how much of reality lies beyond the reach of the present and future domain of objectivity, or any other form of human understanding. In other words, *beyond* the typical idealizations of the *physical description of the world* there is an “*open world*”. The so called *causal closure* of physics is only a *restriction* to the *reduced, idealized* ontology of a broader *general causality* of the world which must thereby be admitted. The *causal closure* of physics is only valid under the condition that the *theorizing subject* (the *agent subject*) does not intervene in the *dynamic play* of the game *once the initial conditions are settled*. Correspondingly, *physical time*, related to *physical causality*, is just a *reduction* of what I call *real time* of the world, which is related to the *general causality* of the world. In the *open world* a *free agent* can initiate an *emergent causal chain* (emergent with respect to the *reduced physical causality*), that subsequently *exploits* the quasi *macrodeterminism* allowed by the physical description under specified conditions.⁴ *General causality* and *finality* are two aspects of the same fact. The *bi-unity* of causality and finality is, as I will argue later, the very essence of the *future-past relation* and of the agents’ freedom. On the one hand, *physical laws* are *entirely silent* about the “initial conditions” and, therefore also about the present state of the world. On the other hand, the laws are astonishingly (and “unreasonably”⁵) effective in describing a great set of empirical data and forecasting the temporal evolution of physical systems. This, however, happens under exceptional circumstances, precisely when all the *relevant conditions* of the present state are known in terms of the *reduced ontology*. Finally, this knowledge is possible due to a bundle of *actual*

³ This description is of course inadequate for quantum phenomena and requires important adaptations. See Pauri (2000),(2007).

⁴ I have already discussed elsewhere the notions of *real time* and *general causality of the world*. See Pauri (1997a,b),(1998),(1999),(2001). These papers also contain my stance about the mind-body issue and the genetic evolutionary problem that arises from the view that some kind of freedom with respect to strict physical causality be a companion of the subjectivity which is present in various degrees in all living organisms (see also Section 9 of this paper). Free actions of living organisms, giving rise to emergent causal chains, introduce and *reveal* a new *temporal structure* of the world, *real time*, which is *reduced* within the physical description.

features of Nature which, while guaranteeing its overall *stability*, allow for a *fine-tuned selection* of the *relations* between the physical system and the *remnant of the world*, discarding great part of such relations. As stressed by Wigner⁶, this condition is exemplarily and maximally met *artificially* in the construction of *machines* where all *determinant* conditions are known. The phenomenic appearances have been separated at the beginning from an alleged self-contained “physical world” and transferred within the “minds” of the theorizing subject. The very concept of an objective “physical reality” precisely depends upon this fundamental exclusion of subjective appearances from the “external world” and their attribution to the “mind”. Thus, scientific progress holds in itself the warranty of its *essential incompleteness*, that is, its inability *to explain everything*. Overlooking this crucial point is tantamount to implicitly assuming a question begging stance about an alleged physicalistic “resolution” and “explanation” of the *mind-body problem*. It is then no wonder that the causal closure of physics is typically invoked for denying *causal powers to mental properties*. Applying reductionism to the *field of objectivity* is easily understandable since it exploits the simple geometric concept of the relation between the *parts* and the *whole*⁷. A corresponding direct reduction of subjectivity to “the physical” cannot be *really* carried through in the form of what we intend to be an “explanation” in science because it would fail anyway to possess the character of a relation between a *given level of objective description* and *another*. Therefore, DGR and the so-called “eliminative materialists” base their fundamental philosophical stances on a rather irrational attitude.

I believe that a progressive concealment of the *foundational limitations* of the physical enterprise has taken place since Galilei’s intuitions. This concealment has been favoured by: i) some initial *totalitarian interpretations* of physics’ methodology; ii) the astonishing, though “unreasonable”, *empirical success* of the mathematization of Nature; iii) the *patchwork* character of the working habits of modern scientists. This concealment has generated the - mainly unconscious - tendency to endorse the philosophical untutored program of a *reconstruction* of the “world” in terms of the deterministically organized *reduced ontology* of mathematical physics, as well as the arrogant pretension to reach a *complete description of reality*.⁸ This is exactly the program of DGR and this – I claim - is the main source of all the *aporetic manifestations* that I shall discuss presently. By

⁵ According to a well-known essay of Eugene Paul Wigner. See Wigner (1960).

⁶ See Wigner 1960.

⁷ With the important exception of quantum phenomena. See Pauri (2007).

⁸ Although, as Richard Feynman remarked, “When you follow any of our physics too far, you find that you always get into some kind of trouble”.

identifying the two different types of causality, DGR excludes any gap in the physical description, confining the mind-body issue within the rigid alternative options of *determinism* and *indeterminism* and making it philosophically intractable if not by mere words. In conclusion: beyond the description provided by the *reduced ontology* there is certainly something else out there, independent of our representations. Yet, it is an “open world” and there is no “physical world” *simpliciter*. We can only talk of a *physical description of the world*. It should also be clear, by now, that I am at the same time against both the *compatibilist* and the so-called *incompatibilist*⁹ theses about Free Will.

3.3 – A florilegium of quotations - II

3.3.1 - E. Schrödinger (about the *reduced* ontology)

<< Science is founded on a fundamental “objectification”, precisely on the “simplification” of the problem of nature obtained through the preliminary exclusion of the knowing subject from what has to be understood ... yet the deepest philosophical problems are just those concerning the subject which has been excluded from the scientific view of the world >>

[E. Schrödinger: *What is Life*, 1947]

3.3.2 – D.Bohm (about the cosmological connection of consciousness)

<< To meet the challenge before us, our notions of cosmology and of the general nature of reality must have room in them to permit a consistent account of consciousness. Vice versa, our notions of consciousness must have room in them to understand what it means for its content to be “reality as a whole” >>

[David Bohm: *Wholeness and the Implicate Order*, AIR Paperbacks, London, 1980.

3.3.3 – P.S.Laplace: (about the unwarranted *exhaustive minimality* of the component beings (*des êtres qui la composent*) required by the alleged deterministic view of the “world”)

< Une Intelligence qui, pour un moment donné, connaîtrait, toutes les forces dont la nature est animée, et la situation respective des *êtres qui la composent*, si d'ailleurs elle était assez vaste pour soumettre ces données à l'analyse, embrasserait dans la même formule les mouvements des plus grands corps de l'univers et ceux du plus léger atome; rien ne serait incertain pur elle, et l'avenir, comme le passé, serait présent à ses yeux >>.

Pierre Simon de Laplace: *Théorie analytique des probabilités*, 1812].

[3.3.4 - T. Nagel: (about the unwarranted attribution of determinism to the “world”)

⁹ The view maintaining that Free Will requires *indeterminism*. The latter, however, besides being a property of theories and not of the world, has no *capacity* for justifying a *meaningful finality* of the agent's choice, anyway.

<< The ideas of *determinism, probability and reduction*¹⁰... can be significantly discussed only if they are directed to the *theories or formulations of a science*, and not to its *subject matter* >>
[Thomas Nagel: *Principles of the Theory of Probability*, 1939].

4. – The aporetic structure of “Deterministic Grand Reductionism”

4.1 - Weinberg’s “Grand Reductionism”

<< We should distinguish between reductionism as a *program for scientific research* and what I call “Grand Reductionism”, which is a *view of nature* ... Phenomena like *mind and life do emerge*. The rules they obey are not independent truths, but follow from scientific principles at a deeper level; apart from initial conditions and historical accidents that by definition cannot be explained (such as the size and the orbit of the earth for meteorology), the *nervous systems of George and his friends have evolved* to what they are *entirely* because of the *principles of macroscopic physics and chemistry*, which in turn are what they are *entirely* because of *principles of standard model of elementary particles*..... *Determinism* is logically distinct from *grand reductionism*, but the two doctrines tend to go together because the *reductionist goal of explanation* is tied in with the *determinist idea of prediction*; we test our explanations by their power to make successful predictions.....[Of course, everything is ultimately quantum-mechanical; the question is whether quantum mechanics will appear directly in the theory of mind, and not just in the deeper-level theories like chemistry on which the theory of the mind will be based..... In quantum mechanics isolated systems are governed by an equation (the Schrödinger equation) whose solutions are strictly speaking fully deterministic, never chaotic. The famous uncertainties in the positions and velocities of particles discovered by Heisenberg do not arise in isolation systems but only when we let such a system interact with a measuring apparatus. >>]¹¹

Neither I do believe that quantum theory is *directly* involved in the issue of subjectivity. Accordingly, and for the sake of argument, I will take the two doctrines as a *single view of nature* renamed as “Deterministic Grand Reductionism” (DGR).

4.2 – Weinberg and his “imaginary friend” George¹²

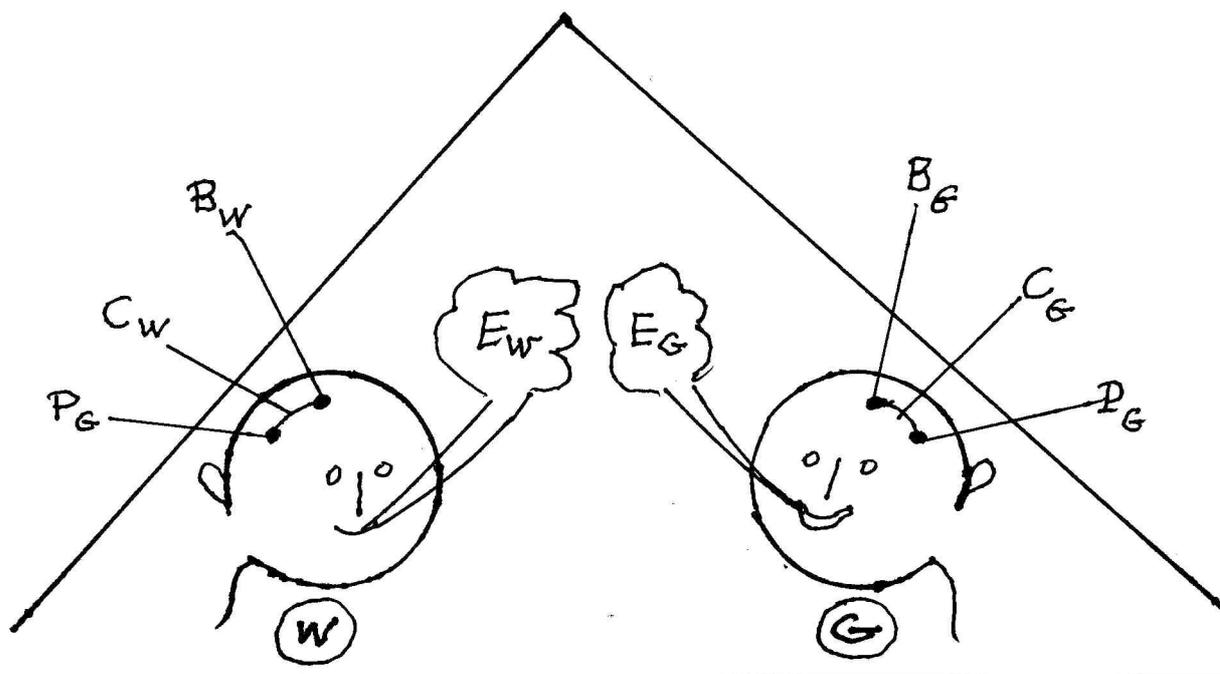
I will use Jaegwon Kim’s terminology (*Mind in a physical world*¹³): *mental properties* are physically realized as “second order properties” causally generated out of “first order” *non-mental* properties.

Fig.1 illustrates a realistic happening involving Steven Weinberg and George:

¹⁰ Of course in the “weak reductionist sense”, see Weinberg later on.

¹¹ See Weinberg (1995).

¹² All of the figures in this and the following Sections are free-hand sketches.



Caption for Fig.1:

B_W = physical state of Weinberg's brain;
 B_G = physical state of George's brain;
 P_W = Weinberg's brain's "second order properties";
 P_G = George's brain's "second order properties";
 C_W = causal specification of P_W ;
 C_G = causal specification of P_G ;
 E_W = Weinberg's uttering: << GRAND REDUCTIONISM IS TRUE ! >>
 E_G = George's uttering: << GRAND REDUCTIONISM IS BULLSHIT >>

→ Weinberg believes that C_W causally determines P_W in such a way that E_W expresses a *real truth*.

→ Weinberg *must also believe* that C_G causally determines P_G in such a way that E_G expresses a *real falsity*.

Note, on the other hand, that George is *not self-contradictory* since he can rely in principle upon a notion of truth bypassing DGR.

Let me go on: In fact, I guess that Weinberg, having heard George's uttering, would add to his first uttering the following specification:

<< *the causal generation of a belief does not, of itself, detract in the least from its truth* >>¹⁴.

However, he is *de facto* also accepting the validity of the specular sentence:

<< *the causal generation of a belief does not, of itself, detract in the least*

¹³ See Kim (1998).

¹⁴ This sentence has been indeed presented to my attention by Adolf Grünbaum in a private discussion taking place in October 1992. At the time I had no occasion to reply with the *specular* sentence that now I am writing here. Grünbaum's point of view is also exposed in his *compatibilist* paper "Free Will and Laws of Human Behavior". See Grünbaum (1972).

from its falseness >>.

Note that, even if the content of George's E_g is *judged false*, it *must* appear to Weinberg as a *meaningful* and *appropriate* response to the *meaning* expressed by E_w . All this means, however, that within the context of DGR, as an (ontological) view of nature, there could be no *rational discrimination* between Weinberg's view and his opponent's view.

Consider, now, the following cosmological evolution¹⁵:

According to DGR, suppose that E_1 and E_2 be two cosmic events, and that $E_1 \equiv E_w$ and $E_2 \equiv E_g$, respectively. We must assume, as already stressed, that E_2 is a *relatively appropriate and meaningful* response to E_1 . E_1 and E_2 are end-results of very long causal chains. Now, let $U(0)$ be the physical state of the Universe at $t = t_0$ in cosmic time, say two billion years ago. *We then meet the following coordination problem*: why should $U(0)$, in conjunction with the *standard model*, as well as predetermining the occurrence of E_1 two billion years later, also predetermine the subsequent occurrence of E_2 , which expresses a meaningful and appropriate response to the meaning expressed by E_1 ? Note that, barring a pre-established harmony, at $t = 0$ there was no possible "forecast" of the causal consequences of $U(0)$ two billion years later, nor was there, there and then, any *cognizance of meaning*!

The crucial point is that – within Weinberg's ontology – no *conceptual room* exists, or can be added – for any sensible notion of *meaning* and *truth* validating Weinberg's or anyone else's utterings. This means that, even if not asserted explicitly, the resulting position is equivalent to that of the *total nihilist*, who denies both *truth* and *falseness*.

In conclusion: as soon as Weinberg *states* – against George - that DGR is *the only ontologically admissible view of nature*, he falls into the *ontological-phenomenological aporia*: his ontology cannot justify the *phenomenology of meaning* he *is using* against his opponent's view.

4.3 – A florilegium of quotations - III

4.3.1 - Epicurus (about the *aporia* of *determinism of the world* vs. *meaning*)

<< A man who *claims* that *all things* come to pass *by necessity* cannot resist the argument of a man *denying* that all things come to pass by necessity, for he must admit that *even this negation happens by necessity* >>

[Epicurus, Athens, ~ 300 B.C.]

¹⁵ Adapted from Watkins: see Watkins (1993).

4.3.2 – Eddington (about the *aporia* of *meaning*)

<< Assume our brain produces sugar when we say that 7 times 8 equals 56, while it produces chalk if we say - wrongly - that 7 times 8 is 65. We cannot say, however, that sugar is more "true" than chalk ... >>

[A.S.Eddington, Oxford, 1938]

5 – Time

5.1. – Premises: framework and language

I use throughout the *events* framework, to be distinguished from the *things* framework. The main current terminology concerning the language of time is here summarized for later use. However, I must issue a caveat from the beginning: the following characterization of time determinations follows from the famous McTaggart's paper "The Unreality of Time" (Mind, 1908), but it has been developed subsequently within the philosophical context of analytic philosophy. I do not share the basic stances of this cultural tradition and I will accordingly distinguish my position from it when the case be. It is important to emphasize, however, that such distinctions are not relevant to my conclusions.

There are *two basic modalities* concerning the determination of events and the general philosophical views on time:

- a) The *A-determinations* (*A-series* of events "E") are characterized by the singular and *monadic* terms: "E is present, is future, is past". The truth values of sentences including A-determinations *depend* on the *temporal perspective* of the utterer ("now it is raining in Cerisy" may be false today and true tomorrow); this modality is called *tensed*. Alternatively, one is used to saying that such sentences contain *token-reflexive* expressions (just like "now" or "here") that enter the temporal *tensed* discourse *essentially*. Note the basic difference of time with respect to space: the use of spatially token-reflexive expressions, just like "here", is *not essential* to the description of things as being in space. That is, we can describe an arrangement of things in space although we do not ourselves have a position in *that* space (even if, of course, we live in space: "externality" of space).
- b) *The B-determinations* (*B-series* of events "E") are characterized by the *bi-adic relational* terms: "E₁ is before, after, simultaneous to another event E₂". This series is – so to speak – "static" ("Newton's death is *forever* before Napoleon's death"). The truth values of sentences including B-determinations are *independent* of the *temporal perspective* of the

utterer (“On October 7, 2007 it is raining in Cerisy” may be true or false, but so it is at any time). This way of presenting temporal determinations is called *tenseless*. In other words, to say that an event occurs *tenselessly* at time *t* is to say that it is true at any time that the event occurs at *t*, so that the *truth value* of any *empirical sentence* about it is not a function of time.

An important remark: from a logical point of view, i.e., with reference to what can be captured and represented in language, including truth values, tensed and tenseless sentences are *identical* (if the former is uttered at the right time). Yet, the *tensed sentence* contains additional information of *existential* nature which is essential, for example, for an *action* to be performed “now”: e.g. “to buy an umbrella” if now it is raining in Cerisy. Moreover, suppose we had a complete narration of a sequence of events: to get complete information the question would remain, “And which of these events is occurring now ?”

5.2. – Premises: ontology

The ontological debate is about the issue of the *ontic closure* or *ontic openness* of the future and/or the past. According to an oversimplified account, the two basic positions are:

1) *B-theorists* or *temporal “realists”*: the *future* (and the *past*) is *ontologically closed* just *because* it is *logically determinate* so that, in this sense, it is *real*. The definition of *ontic closure* of the future is allegedly warranted, within analytic philosophy, by the fact that sentences about contingent future events satisfy the *bivalence principle* and are *time-independently true or false*. Since events are *completely individuated by their attributes*, they (unlike things) *do not change* in either themselves or their relations to other events. Real events, which either take place or not, are tenselessly ordered by *B-series* relations within a *universal set W* of “all the real events of the world”. (*Plato does exist* in the sense that – unlike the *hippogryph* – he occupies a place in *W*). Incidentally, note that *logical determination* has nothing to do, by itself, with *causal determination*, even if the two concepts, as we shall see, often interplay. Finally, I must say that, in spite of a great deal of logical exercises put forward by temporal realists, I am still at a loss in understanding how their ontological conception of time could be compatible with Free Will and Action.

The crucial point, however, is another and by far a deeper one. I simply do not share the view of the analytic philosophers who consider a foregone conclusion that *logical determinateness can be safely equated to ontic determination*. This amounts to an unwarranted inversion of the relation between ontology and logic, i.e., a stance which expects to deduce metaphysics from formal logic, that is, from language. This tenet of

analytic philosophy appears to me as an instantiation of the deflationary minimalism I alluded to in the Introduction. Within the classical view (and mine), *logic reflects ontology* and not the other way round. Thus, it could be safely maintained that nothing can be said about the *ontic* status of the future although sentences about future contingents could satisfy the *bivalence principle* under certain circumstances: future is ontologically richer than what can be represented by logical structures. This point is not dissimilar from the relation between ontology of the world and reduced ontology pertaining to the representation furnished by the physical description, and could produce analogous *aporetic* consequences.

2) *A-theorists*, or temporal “*unrealists*”: The *past* is ontologically *closed* in the sense that past events have happened once and for all, and cannot be altered. Correspondingly, sentences uttered “now” about them satisfy the bivalence principle. On the other hand, the future is *ontologically open* (“and” *logically undeterminate*) so that, in a sense, it is *unreal*. It is usually believed that events change their *status* concerning *futurity*, *presentness*, *pastness*, even though this is a highly improper assertion¹⁶. Sentences about future contingents do not satisfy the *bivalence principle* so that they *can be neither true nor false* (classic example: sentences about the future happenings of the Aristotle’s “battle of Salamina”). Note, however, the further asymmetry between A and B theories concerning ontology of the future. Instead of saying that the future is *unreal*, the A-theorist could simply state that ontology of the future is *undefined*, so that sentences about future contingents *cannot* satisfy the *bivalence principle* under *any* circumstances. The A-series embodies the intuitive view that the value of statements about empirical questions is a function of time in the sense that past and future are separated by a transient *present* in which things and events *attain reality and being*.

In other words, while according to B-theorists all real events have a time-independent place in the set *W*, according to A-theorists *future events do not exist yet*, i.e. they - as *undefined attribute-carrying entities* - are merely *possible*. This means that: i) as seen from *now* – and unlike *past* - *more than one future is possible*, and ii) the very set *W* is *undefined*. Then:

1) *B-theory*: *no real demarcation exists between past and future*, so that *no objective transitory property exists* in the world: *nowness* is therefore *unreal* or *mind-dependent* (or

¹⁶ This is where, in my opinion, the very *event framework* – except of course for its role within the *physical description* – reveals its limits.

even, in its consequences for actions, *illusory*¹⁷).

2) A-theory: *a real threshold exists between actualized and merely possible events.* *Nowness* shows a real *temporal structure* of the world. The “now” possesses a specific objective quality in virtue of the fact that events come into being only in the present, and this quality serves to distinguish the *possible* from the *actual*. Furthermore, reality of the “now” is an ontological *sufficient condition for freedom*, because the “now” is when *free action* makes *possible events become actual* (reality of the “*Becoming*”). A-series determinations provide a necessary representation of temporal reality because real transiency cannot be described by means of a tenseless B-series determination. Many B-theorists will not accept this kind of necessity. On the other hand, many A-theorists will not accept the fact that B-theory can describe *change*, because change comes in only in connection to facts of kind A¹⁸. Although I am, obviously, an A- supporter, I believe that B-theory can indeed describe change, of course in a tenseless way, by saying that the same thing possesses tenselessly different properties *at different times, or equivalently* that the *attributes* of the distinct relevant events referring to that thing in *W* are *different*.

Finally, it should be noted that being *unrealist* about the future does not license anybody to say that they can “change the future”. This is an ambiguous claim because, if future allegedly possessed some kind of actual reality, it would be analytically true that it is impossible to change it from being what it “is” actually going to be. The point is of course that we cannot change an as yet non-existing entity. On the other hand, we can “shape” or “influence” *the immediate future* in our spatial neighborhood. The issue of Free Will is strictly interwoven with time, just because the way of shaping this riddle depends upon the way in which *subjectivity* is thought to be *in* time. As stressed in Section 3.2. nothing forbids a free action of an agent from bringing some happenings into being and initiating a (physically) *emergent causal chain* in an open world. By now, the reason why the issue of the *reality of nowness* is strictly connected with the issue of the *freedom of will* should be fully clear. *Reality of nowness* entails *reality of actualization of potentialities* through *action*. Moreover, the issue of the *reality of nowness* is strictly related to the issue of *meaning* and *truth*. For, if we are not *really free to will and act*, we are not even *really free to believe and think*, in such a way that the *essence* of rational thought would result as the *supreme illusion*.

Free choice and free action are fundamental features of the open world and show

¹⁷ Note that the *illusion* at stake here would be a *universal and constant* illusion.

¹⁸ Michael Dummett for one. See Dummett (1960).

the *essence of time and subjectivity*. I am firmly convinced that if the notion of *potentiality* is not recovered in its generality at the level of philosophical thinking, there is no way of avoiding the main manifestations of the ontological-phenomenological *aporia*. The actualization of potentiality (or “becoming”) realizes a change *of* time, not a change *in* time. Therefore, any attempt to reduce potentiality to a change *in* time leads to aporias. Thus becoming is a very *special type of change*: essentially, *it is the only change in reality*. This cannot be blurred by the fact that the overwhelming majority of actualizations, *once realized*, can be described in terms of *efficient* causes. In particular, any choice can be explained in terms of (non-cogent) motivations. As observed by Richard Gale¹⁹, “What time enables us to say is exactly what cannot be said about time”.

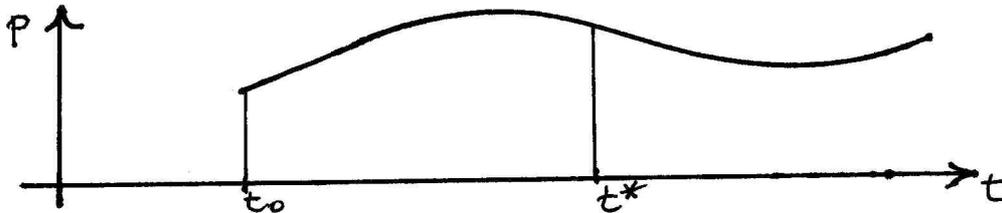
5.3. – Physical time

A fundamental component of the reduced ontology is *physical time*. Its constitution is a sort of *primary idealization* which, *abstracting from phenomenological time*, introduces a fundamental bifurcation of nature (see Whitehead) and is *relational* by constitution. I will not enter here the sophisticated theoretical and philosophical steps required for the foundation of physical time. The relational constitution entails from the beginning that all physical time determinations belong to some B-series. Physical laws are intended to be *valid for any time* and cannot therefore *single out a particular instant* of time as “the now”. Likewise, there can be devised no physical experiment having the capacity of telling whether a particular time shown by the hand of a clock is “the present” or not. Unlike the scientific practice of the experimentalist, there is no “now” in the theoretical structure of physics. Physical time is mathematically represented by an ordered numerical *continuum* à la Cantor in terms of real numbers. In this way physical time is *pointillized*, since real numbers are isolated individuals as natural numbers. As with B-determinations, physical events “E” are characterized by time-independent *bi-adic relations* such as: “E₁ is before, after, simultaneous to another event E₂”. It must be stressed, however, that such determinations are not logically different from the usual ordering relation “smaller than”, “greater than”, “equal to”, of the real line, so they do not possess by themselves the capacity of characterizing such real line as *temporal*. Such line is not *lived through* and is presented to us *wholly*, with all of its distinguishable parts “co-present”. *The pointillized mathematical representation, therefore, must be intentionally supplemented by the phenomenological notion of time, which is not included in it.*

¹⁹ See Gale (1968).

The level of abstraction of the representation of physical time may be properly appreciated in the following examples [see Fig.2,3,4].

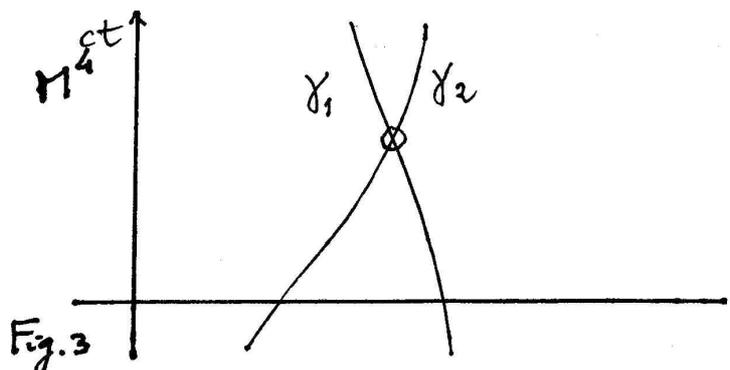
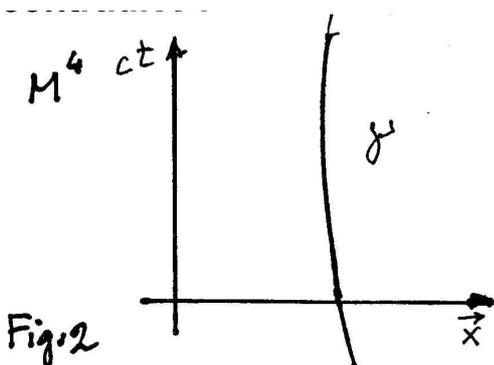
a) Change in a physical property “p” of a given physical entity: (Fig.2)



Here we have an infinite sequence of *isolated attributes*, one for each real number t^* , which *are thought of* as representing the values of a *property* of the *same* physical entity as time goes by. However, *nothing* within the representations tells us anything about the *sameness* of the thing whose *changes* we are describing. The *identity* (i.e., the *substratum* of the changes) of the thing must be *intentionally* maintained *from outside*. We are seeing *in vitro* the effective working of the *blockade* of the *essential/accidental* analysis: the ontological issue is *suspended*, without detriment to the efficacy of the representation.

b) “Genidentity” of world-lines in Minkowski space-time (M^4): (see Figs. 3,4)

“Genidentity” is the notion introduced by Hans Reichenbach (*The Direction of Time*, 1956) with reference to the world-line of a *given* massive particle in M^4 , just as a *memo* for taking into account the fact that such an *identity* has *no room* in the spatio-temporal representation. Note also that it presupposes that a determination of *continuity* is epistemically available to us. Yet, the level of abstraction implicit in the representation of *physical time* appears even more surprising, if we consider the spatio-temporal *intersection* of the world-lines of *two different* massive particles. In this case we have the *same* point-event representing *two different identities*, i.e., even a logical contradiction !



In this connection, it is worth recalling that Einstein, in the so-called *point-coincidence argument*, considered the world–line intersections as the *only physically-objective content* left in space-time by the requirement of general covariance ... We can appreciate here how the Galilean *blockade of essences* can provide a *reduced representation* of the phenomenological experience of real things *which is effective even at the price of tolerating logical contradictions*.

However, in order to avoid misunderstandings, two important *caveats* must be issued here: (i) we cannot restrict the ontological bearing of the physical description of the world to its *theoretical structure*: we must take into account the *coordinative definitions* that link the latter to the *practice* of the experimentalist; ii) as already stressed, the *effectiveness of the mathematical representation* of the *reduced ontology* does not license anybody to operate a *reconstruction of the world* in terms of such ontology being subject to philosophical *aporetic* consequences.

6 - A snare of the reduced ontology: are we inhabitants of Minkowski space-time ?

<< I conclude that *the problem of the reality and the determinateness of future events is now solved*. Moreover, *it is solved by physics and not by philosophy*. We have learned that we live in a four-dimensional, and not a three-dimensional world, and that space and time - or better, space-like separations and time-like separations - are just two aspects of a single four-dimensional continuum with a peculiar metric which sometimes permits distance $(y,x) = 0$, even when $x \neq y$. Indeed, *I do not believe that there are any longer any philosophical problems about time*; there is only the physical problem of determining the exact physical geometry of the four-dimensional continuum that *we inhabit*. >>²⁰

First of all, I maintain that we cannot simply “read off” metaphysical conclusions from the theory of relativity. An even greater mistake, however, is to forget the methodological limitations lying at the basis of any physical description and neglect that unavoidably – though implicitly – metaphysical assumptions have entered the formulation of the theory, in the first place. In the end, one can extract only so much metaphysics from a physical theory as one puts in. And it seems rather difficult to maintain that the (necessarily non-transitive !) notion of “*reality for (somebody)*” *linked to simultaneity* (which Putnam introduces at the beginning of his paper as a fundamental presupposition) is not a metaphysical one. Also, it is difficult to see how a physical theory, such as relativity, which is

²⁰ See Putnam (1967).

concerned with spatio-temporal measurements, could inform us as to the manner in which the mind or consciousness is related to the physical world. All these phenomenological issues are not part of the theory of relativity, but are philosophical interpretations of its metaphysical significance.

Minkowski spacetime²¹ (M^4) is just a *physical instantiation of the set W* of all *actualized* real events considered by B-theorists, with the additional specification that it possesses a fundamental *causal structure* defined by null-cones. Its events are necessarily actualized in terms of *definite physical attributes* individuating them, over and above their geometrical meaning: think, e.g., of the values of electromagnetic field. In this connection, I believe that most working physicists (and the philosopher Putnam) may be unaware of the philosophical subtleties hidden under a standard *literal* interpretation of M^4 as a *reification* of the real space and time which “we inhabit”. First of all, in order to attribute physical properties to events of M^4 , we must think that Maxwell equations have been solved beforehand. Now, solving the equations needs a well-posed Cauchy problem: in this case the allotment of the values of Maxwell fields and their derivatives *over a whole infinitely extended instantaneous 3-space*, say S_3 , at $t=0$. This knowledge is a *synthesis* of information accessible only to *each* one of the *infinite many ideal observers* sitting on each point of S_3 , at $t=0$. *All of such observers* – each of whom can only “see”, with little practical utility, their own past light cone - are therefore *mutually causally disconnected* according to the very *causal structure* of M^4 . This means that gathering the necessary information in order to attribute the physical properties to events is *factually impossible* in M^4 . This operation would require an *external super-observer* who cannot *inhabit* Minkowski space-time. Therefore *no living observer* can be forced within the Minkowski space-time (or any general-relativistic space-time model) to collect in a *factually possible* (specifically *causal*) way the infinite amount of information needed. Furthermore, since all events are *causally actualized* wholly, no living observer can be forced in M^4 who can *act* to selectively generate a situation in their environment so that this situation, as a cause, will, according to their *physical causal knowledge*, later give rise with great probability to the effect which is desirable to them. Finally, there can be no living observer with the freedom to check the very empirical truth of the physical theory itself. Any *alleged reification* of M^4 leads to a notion of the *world which includes everything*, in particular the *object* of an *action* and the *agent* of the same action. This world, however, is a *non-factual world* that nobody can “observe”, *study or control*. While the world of science is the *object* of *our action*, Putnam’s

imagined world fails to account for the empirical basis that is necessary for its very description while allegedly *containing everything*. It is just another instantiation of the basic *aporia*.

We can only look at M^4 as a *mathematical model* for the operational practice of the experimentalist concerning spatio-temporal measures. For example, let us consider the motion of a relativistic object. Of course, given the B-series nature of the temporal description, there is *no motion* at all in M^4 even if there is *change*. The ordinary sense of the term refers to the observation that there is some object "moving". Since this "moving" always takes place in "the present" of the experimentalist, as all other phenomena "taking place", one could be easily misled to believe that the *physical essence* of the concept of motion could be captured by the *experience* of an object as "moving", more or less on the same footing in which it is often asserted that there is a "moving now". Naturally, there are moments of the motion history of the object that are *now* "past" and characterized as moments of a "remembered present". However, if the motion is no longer taking place "now", we can only describe the former motion as a purely B-series sequence of positions of the object at different times (of a clock), a description which expresses exactly the only *objective physical meaning* of "motion". Accordingly, since there is *no temporal transiency* in Minkowski space-time, only *tenseless* senses of the words "becoming", "now" and even "motion" are admitted in the relativistic idiom of physics. On the other hand, the ordinary sense of "motion" is perfectly legitimate in the *practice of physics* and, therefore, *in the idiom of the experimentalist*. This entails that *locally* and for a *limited span of time*, the experimentalist can project – so to speak - their practical view of the motion into Minkowski space-time as a mental aid for their intuition of the physical process. The experimentalist can consider, e.g., a world-line of a point-mass endowed with a clock and, as time goes by, mark on the world-line certain times indicated by their own synchronized physical clock in the laboratory, as a running chart. As long as the motion takes place, this can be a useful way of reasoning. It should be clear, however, that as soon as the limited allotted time has expired, the intuitive spatio-temporal representation of the motion given by the experimentalist is concluded and *nothing remains* in the Minkowski picture which is different by a section of a standard infinite world-line with a B-series finite sequence of marked events.

Then what can we say about the status of *nowness* in relation to the mathematical model of M_4 ? Certainly, in Minkowski space-time there is no absolute fact of the matter as

²¹ A similar discussion could be made concerning general relativity. See Lusanna & Pauri (2007b).

to which an event is *present*. Even more, *present* for different observers. Yet there is no absolute fact of the matter about presentness of events in Newtonian absolute time either, as there is no fact of the matter about *presentness* in a physical theory whatsoever. It is also certain, however, that acceptance of relativity cannot force one into the acceptance or rejection of any of the traditional metaphysical views about the reality of past and future. In addition, one should not forget, within the foundations of the theory, the distinction between *genuinely factual elements* and the merely conventional choices which go into the relativistic spacetime picture. One who wishes to stick by a tensed view of time, and is willing to pay the price, is certainly able to do so, all the while accepting the scientific reasonableness of Minkowski spacetime as an operational model²² for spacetime physics.

The reality of *nowness* is a metaphysical issue²³. Therefore, at the most we can only try to see whether there is a possible *compatibility* of such reality with *some elements* of a (possibly global) spatio-temporal description. As a first example, if one - an external real super-observer - is willing to “force”, whatever the price, a *living agent* along a time-like world-line of M^4 , they would have – as it were - to “update” the structure of Minkowski spacetime at the origin²⁴ of every *emergent causal chain* generated by a free action. This “updating” would take place in the “now” – i.e., in the *real time* - of the external super-observer, but such time convention would not be registered in the updated M^4 . In correspondence to each updating, M^4 would only be tenselessly different from its previous copy. Going further along this line of reasoning, we could *correlate* the “now” of the living agent - assumed in this case as following the world-line of a “fundamental observer” - to *cosmic time* of the standard models of relativistic cosmology. This correlated “global now” would resemble the *cosmic unison* of Whitehead. The identical twins of the standard paradox would share a common “now” at the beginning and the end of the journey, while the *same span* of cosmic time – defined by the initial and the final events - would be measured differently by the “proper clock” of each of the twins, and the same would be for their “specious present” time, even if each of them continued to experience their “now” at any point of their world-line.

²² Remember, for example, that Poincaré always considered Minkowski spacetime as a mathematical model and not “un modèle véritablement physique”.

²³ I must say that I cannot share Shimony’s claim that *nowness* as such can be embarked within Minkowski spacetime: see Shimony (1993).

²⁴ To be defined as “acausal” with respect to physical causality.

7 – Time: on DGR thesis of the subjectivity of *nowness* and *becoming*

From now on I will consider the consequences of DGR on *physical time* representation specifically. First of all it is obvious that DGR makes a *reification* of M^4 as a mathematical model of the spacetime we inhabit (I still consider special relativity only, for the sake of simplicity).

According to the *tensed view* of time, *A-determinations*, reflecting the basic *phenomenological structure* of our experience of time, have the capacity of *singling out a unique instant* (or a more complex phenomenal structure) of experienced time, as *the real "now"*. The issue at stake here is that DGR claims (in analogy with any B -Theory) that there is *no real transiency* in the world, and *A-determinations* are purely *mind-dependent* or *subjective* (or, in this case, even *illusory* because of the connection between *reality of nowness* and *free will* or *action*: "we – *illusorily* - feel to be free").

It can be easily seen that, *once a commitment is enforced* concerning the *ontological status* of experience, awareness, and subjectivity in general, the *attribution* of *mind-dependence* becomes either a *truism* or *aporetic*. In fact, consider two extreme positions:

a) *Subjectivity holds an ontological role* which is neither included nor derivable from the physical description of the world (as DGR contends. Details are irrelevant here). Then, *A-determinations* possess a *real uneliminable status* in nature so that they are *as subjective as they should be*. As already stressed, the crucial philosophical point is the conception of time as *actualization of real potentialities*.

b) *Only physical entities are ontologically fundamental* and subjectivity is included or derivable from the *reduced ontology* of DGR (details would be welcome here !). Then, *only a tenseless view of the world is real*, including subjective or "mental" events. However, when *physicalistic ontology* is conjoined with an implicit reification of M^4 and the thesis that *A-determinations* are *mind-dependent*, DGR must claim that *nowness* is *mind-dependent* (or even *illusory*) at least as purely sensory *qualia*. Besides, it is clear that the B-theory account of *nowness*, *action* and *Free Will* can be maintained only under the condition that an explicit ontological commitment about the mind-body problem is suspended or is questionbeggingly relegated to a future "explanation".

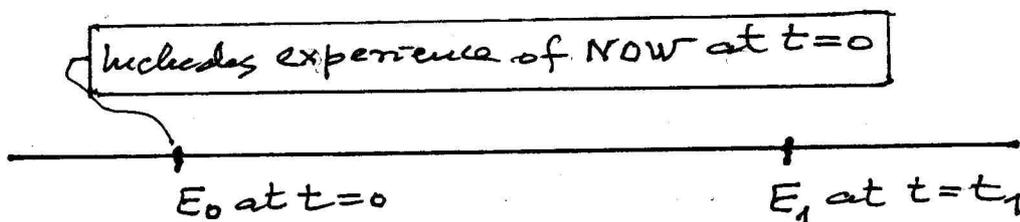
7.1 – Time: on the aporetic structure of DGR thesis of the subjectivity of *nowness* – I

AN ARGUMENT BY TENSELESS TEMPORAL REPRESENTATION ²⁵ [see Fig.5]

Consider the temporal career of a human brain B. DGR describes this history *tenselessly* as a sequence of mental events as characterized on the basis of their neural-physico-chemical properties. According to DGR, the full specification of such properties specifies everything *completely*. In particular all the *attributes*, or *properties*, of the mental events are likewise fully specified in such a way that the *attributes* of any event E are *intrinsic* to it, *fixed* and *tenselessly independent* of time.

Consider now an event E_0 at time $t = 0$. We must assume that the *experience of nowness* of B at $t = 0$ is one of the *properties* of E_0 and, as such, part of the *complete specification* of E_0 that will persist all the time. This entails, however, that at any subsequent time $t_1 > 0$ the intrinsic attributes of E_0 will still characterize E_0 as *taking place “now”* (even as “illusion”). Note that we are not allowed to believe that the *attributes* of, say, E_1 at t_1 will generate the experience of *nowness* at t_1 together with the *remembered nowness* at $t = 0$. This would entail that at least part of the physical specifications attributed to E_0 at $t = 0$ be time-dependent, so that E_0 itself would be an *undefined event*.

Fig.5 shows the effect of an alleged tenseless view of the “now”:



⇒ E_0 is “NOW” FOREVER !

In conclusion, according to DGR, A-determinations would fail to fulfil their *actual* and *tensed* task of *singling out* a particular instant as the *unique “now”*, even as *appearance or illusion*. Therefore, DGR is unable to justify time *phenomenology* and falls under the ontological-phenomenological *aporia*.

²⁵ Adapted from Shimony: see Shimony 1993.

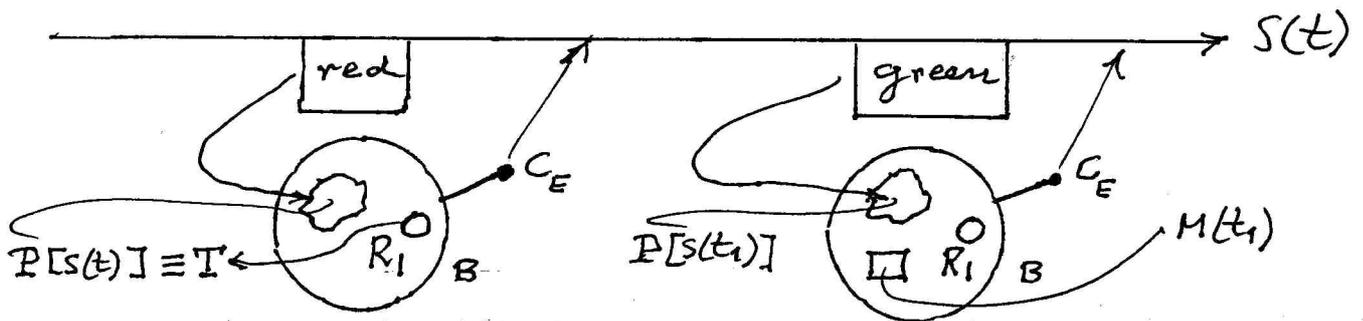
7.2 – Time: on the aporetic structure of DGR thesis of the subjectivity of *nowness* - II

AN ARGUMENT BY A CAUSAL TOY-MODEL [see Fig.6]

DGR supporters claim that the experience of *nowness* should be *tenselessly* explained on the same grounds on which sensory *qualia* are explained by the *causal theory of perception*. Nobody, however, has advanced such kind of explanation up to now. The reason is simply that, even assuming that a *truly explicit* causal theory of perception be offered to us (which it is not), this program is unsound in principle due to the fact that, unlike *secondary qualities*, the experience of *nowness* - and the corresponding *A-determinations* that represent it - are *not sensory data*. We do not *perceive nowness* through one or more of our senses. Therefore, a causal theory of the “*perception*” of *nowness* cannot even leave the grounds, since it should *begin with perceived*, i.e., *sensible properties*. Of course it is up to DGR/B-theory supporters to offer their explanation of *nowness*. A typical attempt to defend the reductionist B-theory interpretation of the experience of *nowness* as mind-dependent or even “*illusory*”, is to identify *experience of the unique “now”* with *immediate awareness*. This thesis is evidently question begging since, of course, that experience is part of the awareness; yet it remains to be “*explained*” what exactly *awareness* (or “*consciousness*”) is. This fundamental ontological issue cannot be resolved by a battle of words.

Here, anyway, I propose a simple *causal toy-model*, *not directly based on sensible perceptions*, which should indicate the nature of the difficulties lying beyond the imagined DGR/ B-theory program.

Fig.6 shows a stretch of the temporal career of a perceiving brain B.



C_E is a clock *external* to the human brain's owner B; $S(t)$ are *sensible properties* in the B's environment at time t ; $P[S(t)]$ is B's *perception* of $S(t)$ at time t of C_E ; $M(t_1)$ is the *memory* at time t_1 of the perception $P[S(t)]$ (which is different from $P[S(t)]$!). Finally, R_1 is an *internal recorder* of the brain B which has the function of attributing an internal *temporal index* T to the perception $P[S(t)]$. Note that the index T by itself – as pure recording of the perception - is a *monadic attribute*: it does not belong to the B-series of C_E and cannot be measured by it.

Adopting a B-series way of thinking, the model consists in describing the *experience of nowness* of B, at time t of C_E, as the *synchronicity* of P[S(t)] (at time t) *and the index* T, as registered by R_i (not a secondary quality!).

Now, the *monadic nature* of T entails that the *internal recorder* be a *tensed mechanism*. Since we want to explain the whole phenomenon *tenselessly*, T of R_i must be *recordable* with the same modalities valid for C_E, a fact that would require a *second recorder* R' initiating an *infinite regress*.

It is obvious, therefore, that either a *tensed* element is introduced at some level, or an *infinite regress* follows; in other words, the imagined DGR/B-series *toy-model* fails to reproduce temporal *phenomenology*: we fall again into the ontological-phenomenological *aporia*.

8. - Natural Evolution

8.1 – A florilegium of quotations - IV

8.1.1 – T.Nagel (about the cosmological implications of the mind-body issue)

<< We won't have an adequate general conception of the world until we can explain how, when a lot of physical elements are put together in the right way, they form not just a functioning biological organism but a *conscious being*. If consciousness itself could be identified with some kind of physical state, the way would be open for a unified physical theory of mind and body, and therefore perhaps for a unified physical theory of the universe. But the reasons against a purely physical theory of consciousness are strong enough to make it seem likely that a physical theory of the whole of reality is impossible>>

[Thomas Nagel: *What Does It All Mean ?*, OUP, 1987]

8.1.2 – T. Nagel (about the *appearance* or (universal) *illusion* vs. *reality* distinction)

<< In physicalism there is *no conceptual room* for an *appearance/reality distinction* >>

[Thomas Nagel: "The View from Nowhere", OUP, 1986]

8.1.3 – W.Pauli (about the eradication of *finality* from Nature)

<< Dieses Modell der Evolution ist ein Versuch, entsprechend den Ideen der zweiten Hälfte des XIX Jahrhunderts, an der völligen Elimination aller Finalität theoretisch festzuhalten. Diese muss dann in irgend einer Weise durch Einführung des "Zufalls" ersetzt werden >>

[Wolfgang Pauli, *Dialectica* 1954]

8.2 - On the aporetic character of the conjunction of DGR and the strictly Darwinian theoretical model of Natural Evolution

I will be sketchy. As already stressed in the Introduction, I am not referring here to such ideological counter-moves like the so-called “creationism”, “intelligent design” and the like. Nor am I willing to put into question the methodological Darwinian analyses and techniques that are necessary to the every-day laboratory work of the biologists and paleologists within their piecemeal work (which I define LD). Neither do I intend to doubt the central Darwinist thesis of the common origin of species. My aim is mainly to focus on the philosophical difficulties arising from the conjunction of, on the one hand, the recognition of the *reality of subjectivity* - which shows itself in living organisms by various degrees – and, on the other, the extrapolation of the strict Darwinian *theoretical model* from laboratory practice to cosmological level, in conjunction with DGR (which I define EDM).

26

(i) The Darwinian *theoretical model* is based on a fundamental connection between the essentially *random* character of *mutations* and the process of *natural selection* due to *adaptation* to the *environment*. Although, according to LD, single mutations are *probabilistic* observable events (note that they only *resemble* pure quantum processes: there are no “quantum events” in spacetime !), the underlying philosophical backdrop of EDM is the same as the DGR view of Nature (“chance and necessity”²⁷). Let me add that the “chance” referred to in EDM is a sort of metaphysical, negatively defined, entity, well distinct from the “chance” embedded in formal probabilistic theories fitting scientific descriptions.

Let us consider the issue of *chance* closely. If this notion must be understood scientifically – i.e., beyond its common sense or vague metaphysical meaning – one should have to define first of all a *space of probability* for the evolutionary context, and then compare the evolutionary *temporal scale*, which follows from the model *theoretically*, with the corresponding *empirically observed temporal scale*. Thus, within EDM, it should be *concretely* shown that, corresponding to the theoretical possibility of a given evolutionary stage, the *empirical duration* necessary for its manifestation is actually verified. I do not believe that a satisfactory account of this foundational theoretical necessity of the model has been given so far. One should not forget, in particular, that while LD exploits statistical methods concerning *frequent* and *reproducible* events, the EDM interpretation requires *in addition* the consideration of *infrequent* and possibly *unique* events. All this means, however, that the extrapolation implicit in EDM is first of all very weak empirically.

²⁶ These considerations parallel those made for relativity theory in Section 6. The fact that the biologists must take into account the phenomenology of probabilistic mutations and adaptive selection at the laboratory scale does not entail that the LD model of evolution could inform them as to the manner in which subjectivity emerged in natural evolution, a fact that has to do with the philosophical interpretation of the possible metaphysical significance of the cosmological extrapolation of LD.

²⁷ Bernard d’Espagnat has ironically remarked that quantum theory seems to play no role for this philosophical chance ! See “Une lacune d’importance”, d’Espagnat 1977.

(ii) As Pauli²⁸ has remarked, the strict Darwinian model of natural evolution (EDM) is a theoretical attempt to a complete eradication of *finality* from Nature. We, however, experience ourselves as acting according to *finality* and *free choice*, so where is this finality coming from ? Clearly we face here the same *aporetic junction* that pervades DGR throughout. Our experience should be explained in terms of the underlying ontology. Alternatively, one can defend the *appearance thesis* according to which *we deceive ourselves: we erroneously feel* to act according to *final causes*. In this case, however, it is the very role of *appearance* that should be explained in terms of the underlying ontology. Yet, this is the philosophical crux we have already met for the issue of time, since DGR (like physics itself !) has no room for the *reality/appearance* distinction. The conclusion is the same: if we are continuously deceiving ourselves concerning *finality* and *free choice*, why are we not continuously deceiving ourselves concerning *believing* and *thinking*? In conclusion EDM is another *typical* source of *nihilism*.

(iii) Consciousness. This is an ambiguous term that is often misinterpreted for *self-awareness*. I would rather use the term *subjectivity*, which is common, by various degrees, to all *living beings* and points essentially to *sentience (qualia)*. EDM claims it can explain the emergence of consciousness (*sentience*) in the *phenotype* by means of *adaptation* and *survival of the fittest*. Yet, the fundamental point is that *adaptation* can explain the survival of *something given, or at least something whose possibility is already taken for granted*²⁹. Subjectivity must be *possible* before its value in terms of survival can be tested, and this is equivalent to having *solved* the mind-body issue. The *impossibility* of this solution within DGR has been argued in Section 3.2. Above all, what is highly unconvincing (and a little grotesque) is the general scenario of the DGR+EDM view: that of a *completely senseless Whole* that, by *pure chance, necessity* and *adaptation*, gives rise to a *hyper-complex* medium sized *object* (the human brain) which *secretes an intellectual* highly convincing, *counterfactual* supporting, *insight of this senseless Whole*, including an *astonishing and successful* physico-mathematical representation of “quantum” phenomena which – by definition – lay outside all the macroscopic adaptive experiences of human evolution !

(iv) The cosmological genetic problem. Summarizing, it is clear that the structure of the Galilean *physical description* of the world poses *anyway* a *cosmological genetic problem*. It is very difficult to imagine a clear-cut demarcation line between *life* and *absence of life*. Then, how can an *evolutionary* process be explained as leading to *life, subjectivity* and

²⁸ See Pauli (1954).

²⁹ Note that this question can be raised even for functions other than consciousness, yet this specific case is emphatically critical for the

real time starting from what we *describe* as inanimate "matter" ?

At this point, I believe I ought to indicate at least what I believe to be a *direction of solution* of the cosmological genetic issue and to advance a positive metaphysical proposal. My suggestion is that the *physical description* of the world is not able to capture the whole endowment of potentialities of "matter" either.

In its essence, the issue is simple: we cannot deny the reality of *subjectivity*. The existence of a causally closed *physical world* would imply that either subjectivity is one of the properties of this world, or that it is *something else*. As I have already argued, the first alternative leads to deep antinomies. Then, if we refuse to accept a transcendent solution of Kantian type, which forbids any ontology of subjectivity, and we also refuse to introduce a world of *different entities*, which raises the awkward and intractable issue of the *relations* between the *two worlds*, we must reject the concept of a *physical world* as a *self-contained whole*, as if we could put ourselves "from the point of view of matter". Although, in 8.1.1 above, Nagel clearly realizes the connection between mind-body issue and cosmology, in my opinion he misses the crucial point. For – as already stressed in Section 3.2 - in order to avoid aporetic conclusions about subjectivity, we have precisely to give up the idea of a *physical world* as a *causally closed self-contained whole*. For the *reduced physical ontology* only allows us to speak of a *physical description* of the (*open*) world.

Then, however, it is the *philosophical* concept of "matter" that is in need of reformulation, and this points to a *direction* of solution of the mind-body problem that is more akin to a neo-Aristotelian view. Note that my stance is not a Whiteheadian thesis according to which physics should be reformed. My claim is that the *structural limitations* of the Galilean methodical foundations inherently forbid an *exhaustive* description of the world, from "matter", to living organism *qua* living organisms, let alone of superior conscious and self-conscious organisms. Physics deals with very sophisticated constructions like "physical objects" and "systems", not with "matter".

9. A conclusion ?

DGR necessarily implies a *reductionist notion of truth*, which is nothing else than a merely "pragmatic" notion of truth. This, however, is a *basic source of nihilism*.

I literally cannot live with a "pragmatic" notion of truth. I do not possess the truth, of course, but I deeply feel that my existential ground would collapse at every instant of time

if I had to give up the *horizon* of real truth and the *inner necessity* of the *circuit of reason* as discovered by the Greeks. Thus, when I used the notion of *truth* in this paper I was not referring to any particular choice among its various well-known different *logical definitions*. I was simply exploiting the common immediate notion of truth which everyone implicitly uses every time they want to defend a thesis whatsoever. Otherwise any human communication about knowledge would be impossible.

Certainly, accepting the strength and the *validity* of the *Greek circuit* is only an *option*, rather than a *mechanical necessity* imposed upon us. On the other hand, were it a *necessity*, the whole articulated edifice of rational thinking would *ipso facto* be annihilated.

In the end, therefore, the conflict shows its real content: in that it arises from a *very deep existential diversity* between the opponents in the debate. Yet the “pragmatic” notion of truth remains a *basic source of nihilism*. That we all live in, today.

Acknowledgements

I am warmly indebted to my dear friends Professors Mario Casartelli and Tony Scotti for very useful and stimulating discussions.

References

- Bohm, D.: (1980) *Wholeness and the Implicate Order*, AIR Paperbacks, London.
- d’Espagnat, B.: (1977) “Une lacune d’importance”, Review of Monod’s “Chance and Necessity”, *Nouvelles Littéraires*, May Issue.
- Dummett, M.: (1960), “A Defense of McTaggart’s Proof of the Unreality of Time”, *The Philosophical Review*, **69**, n.4, pp.497-504.
- Gale, R.: (1968) *The Language of Time*, Routledge & Kegan Paul, London.
- Grünbaum, A.: (1972), “Free Will and Laws of Human Behaviour”, in H. Feigl, W. Sellars, and K. Lehrer, eds. *New Readings in Philosophical Analysis*, New York: Appleton-Century-Crofts, pp. 605-627.
- Kim, J.: (1998), *Mind in a Physical World - An Essay on the Mind-Body Problem and Mental Causation*, The MIT Press, Cambridge, Mass.
- Lusanna, L. and Pauri, M.: (2007), “Dynamical Emergence of Instantaneous 3-Spaces in a Class of Models of General Relativity”, in *Relativity and Dimensionality of the World*, V. Petkov ed., Springer Verlag, October 2007; gr-qc/0611045.
- Pauli, W.: (1954) “Naturwissenschaftliche und Erkenntnistheoretische Aspekte der Ideen vom Unbewussten”, *Dialectica*, **8**, pp.283-301.

- Pauri, M.: (1997a) "Time: The Physical Worldview and Becoming", in *Perspectives on Time*, J.Faye, U.Scheffler, and M.Urchs eds., *Boston Studies in the Philosophy of Science*, n.189, Kluwer Academic Publishers, Dordrecht, pp. 267–297.
- Pauri, M.: (1997b) "La Descrizione Fisica del Mondo e la Questione del Divenire Temporale", *Essay* in the book *Filosofia della Fisica*, G.Boniolo ed., Bruno Mondadori, Milano, pp. 245-333.
- Pauri, M.: (1998) "Do Living Organisms Possess Peculiar Temporal Properties ? ", Talk given at the 1996 Session of the *Académie Internationale de Philosophie des Sciences* (Vigo, Spain, May 1996), now in the book *International Conference on Philosophy of Science: Philosophy of Biology*, José Tojo Suarez ed., Universidade de Vigo Press, pp.163-189.
- Pauri, M.: (1999) "I Rivelatori del Tempo", *Nuova Civiltà delle Macchine: Il Profilo del Tempo*, Anno XVII, N.I(65), pp. 38-54.
- Pauri, M. (2000): "Leibniz, Kant and the *quantum*. In E.Agazzi and M.Pauri (eds.), *The Reality of the Unobservable*, Boston Studies in the Philosophy of Science, n.215, Kluwer Academic Publishers, Dordrecht, pp.270-272.
- Pauri, M.: (2001) "Perennial Cosmology", Invited Presentation at the Workshop SSQ-II: Physics and Cosmology, UNESCO, Paris, January 9-12.
- Pauri, M.: (2007), "Il Quanto, il Tutto e le Parti: Crisi dell'Atomismo e Spaziotemporalità – I", *Epistemologia*, XXX, pp.3-40.
- Putnam, H: (1967) "Time and Physical Geometry", *The Journal of Philosophy*, **64**(8), pp.240-247; reprinted in *Mathematics, Matter and Method - Philosophical Papers*, vol.1, Cambridge University Press, Cambridge 1979.
- Shimony, A.: (1993), "The Transient Now", in *Search for a Naturalistic World View, vol.II, Natural Science and Metaphysics*, University Press, Cambridge, pp. 271 – 287.
- Torretti, R.: (2000), "Spacetime Models for the World", *Studies in History and Philosophy of Modern Physics*, vol.31, pp. 171-186.
- Watkins, J.: (1993), "Adolf Grünbaum and the Compatibilist Thesis", in J.Earman, A.Janis, G.Massey and N.Rescher, eds. *Philosophical Problems of the Internal and External Worlds – Essays on the Philosophy of Adolf Grünbaum*, University of Pittsburgh Press, Pittsburgh, PA, pp. 573-588.
- Weinberg, S.: (1995), http://www.idt.mdh.se/kurser/ct3340/ht02/Reductionism_Redux.pdf.
- Wigner, E.P.: (1960), "The Unreasonable Effectiveness of Mathematics in Natural

Sciences", *Commun.Pure Appl. Math.*, **13**, pp. 1-14.