

WHITEHEAD'S CONCEPT OF SPECULATIVE PHILOSOPHY

A METATEORETICAL PERSPECTIVE

Bogdan RUSU

bogdan_p_rusu@yahoo.com

ABSTRACT. Whitehead's most important work has the complete title *Process and Reality. An Essay in Cosmology*. One would expect that the concept of "cosmology" be defined somewhere, as it seems to characterise the subject-matter of Whitehead's book. However, such a definition is not to be found. Instead, PR opens with a dense treatment of the "speculative philosophy", so that we are led to believe that speculative philosophy is what PR is about. But another word that occurs quite often in PR is "metaphysics", together with its adjectival form, so that it looks like PR is actually a metaphysical treatise, and that "speculative philosophy" is a special kind of metaphysics. However, this later term is not clearly defined either, although Whitehead is more generous with it than he is with "cosmology". What we need is a clear understanding of the three terms' meanings and of the relations between them. I will begin by considering what Whitehead has to say about metaphysics, and later proceed to the other two concepts.

Whitehead's Concept of Metaphysics

The closest thing to a definition of metaphysics that we find in PR is that "metaphysics is nothing but the description of the generalities which apply to all the details of practice" (PR, 13). Metaphysics is thus connected to some "generalities" which must have a universal application in practice, where "practice" can be taken to mean "experience". Thus, metaphysics has to do with the generalities which

apply to all bits of experience. The connexion between this kind of generalities and metaphysics is stressed out by Whitehead's use of the phrase "metaphysical generality" (PR, 96, 222, 308). Such a generality applies, as we saw, to all bits of experience or, as Whitehead puts it elsewhere, "to all actual entities" (PR, 90). There are also contexts in which the metaphysical generalities are called "metaphysical necessities" (PR, 228). All generality that can be called "metaphysical" seems thus to enjoy both universality and necessity. It follows that metaphysics should be concerned with those generalities which are both universal and necessary.

What is necessary can not be contingent. Metaphysics stays away from whatever principle, characteristic, concept etc. that is universal but contingent. We have today, by means of the semantic of possible worlds, a much better understanding of these modal concepts that was available in Whitehead's time. As we all know, the possible worlds semantic interprets necessity as existence or truth in all the possible worlds, while it interprets contingency as non-necessary truth or existence in the actual world. Whitehead did not dispose of these interpretations. But he gets close to this understanding of contingency and necessity, expressed not in terms of possible worlds, but of "cosmic epochs". Several contexts (PR, 96, 222, 288 etc.) show that the philosopher associated the metaphysical necessity with what is common to all cosmic epochs. Conversely, what belongs only to the present cosmic epoch is contingent, not necessary, and thus not within the domain of metaphysics.

From the previous considerations it follows that the metaphysics has to do in Whitehead's view with the generalities applicable to all bits of experience in all cosmic epochs (that means universal and necessary). I will go further and say that metaphysics is concerned with the *system* of these generalities, and not with only a subset of them, or with all of them taken in isolation. Finally, it is worth mentioning that Whitehead refers to these universal and necessary "generalities" as "first principles" (PR, 4 sq.).

Whitehead's use of the term "metaphysics" is as though its meaning was generally known. This is probably why he doesn't feel the need to insist on the concept, to consider it explicitly. It looks like he was addressing a public that did not need any explication or clarification of this term. This suggests that, in order to have a better understanding of Whitehead's concept of metaphysics, we should have a look at how the concept was being used at the time being.

Before Whitehead's PR, Britain had seen a whole plethora of philosophers mostly inspired by Kant, Hegel or Lotze, beginning with Green and continuing with such figures as Bradley, Ward, Bosanquet, Taylor, McTaggart, Pringle-Pattison, Joachim and others. During Whitehead's time in Cambridge he witnessed also the development of a realist reaction, with the main figures Cook Wilson, Alexander, Russell and Moore. This realist trend had a strong American counterpart, the pragmatists as James or Dewey, the group of the New Realists, the critical realists as Roy Wood Sellars. In that period of time metaphysics had recovered its place of glory, after its collapse as a consequence of Hume's and Kant's attacks. Doing metaphysics was considered, after the demise of Mill's empiricism, the highest philosophical occupation and metaphysicians were highly respected. Three creators of philosophical system marked the epoch, and it is to them that we should look in order to grasp what was back then the current use of "metaphysics". I am referring to Bradley, Alexander and McTaggart.

I will begin with a brief regard at Bradley's definition. In his *Appearance and Reality* he writes the following:

"We may agree, perhaps, to understand by metaphysics an attempt to know reality as against mere appearance, or the study of first principles or ultimate truths, or again the effort to comprehend the universe, not simply piecemeal or by fragments, but somehow as a whole." (AR, 1)

This definition asks for interpretation, since it could mean at least two different things. If we note by A "the knowledge of reality as against appearance", by B "the study of first principles" and by C "the comprehension of the universe as a whole", then the definition can be interpreted by each of the following expressions:

- 1) $A \vee B \vee C$;
- 2) $A \leftrightarrow B \leftrightarrow C$.

The two expressions have different truth conditions, so they say different things. According to the first interpretation, doing only one of A, B, and C is enough for one to be called a metaphysician. He could try only to understand the universe as a whole, and not care to separate the reality from appearance. According to the second way of interpreting the definition, it says that doing one thing means automatically doing the other two, that you can not have one without the others. It says that knowing the thinking the reality as against appearance means thinking

the universe as a whole, which means studying the first principles. Bradley's own example leads me to believe that the second interpretation of the definition is the correct one. However, the accent falls on investigating the first principles, as it can be seen from the following statement of Bradley: "this volume is meant to be a critical discussion of first principles" (AR, xi). Bradley expresses also the requirement that the first principles form a system, when he says that the English mind is fully capable of producing (as he will try) "a rational system of first principles" (AR, xii). Now, if I read him correctly, Bradley says that metaphysics deal with the framing of a rational system of first principles or ultimate truths. It must be said that this is an ideal; metaphysics tends toward such a goal.

I will move on now to Alexander. In order to define metaphysics, he begins by laying down a set of questions which fall within the metaphysical domain. Thus, as we look around us we see that there are many things, which have characteristics on the basis of which they can be grouped together. We find that there are material bodies; that some things are living; that some things have minds. What do they all have in common? Is there a fundamental nature which they all share? After all, we see that there are some all pervasive characteristics of the universe, like causality, individuality etc. These topics form the subject-matter of metaphysics, as Alexander says:

"Metaphysics is thus an attempt to study these very comprehensive topics, to describe the ultimate nature of existence, if it has any, and these pervasive characters of things, or categories." (STD, I, 2)

The categories, or categorial features of the existence, are characteristics that belong to all bit of reality, universal. Later in STD Alexander calls them *a priori*. In experience, says he, we distinguish variable and "pervasive" characteristics. What is not variable is called by Alexander non-empirical or *a priori* or categorial. Thus, when he says that metaphysics is "the experiential or empirical study of the non-empirical or *a priori* and of such questions as arise out of the relation of the empirical to the *a priori*" (STD, I, 4), Alexander comes pretty close to saying that metaphysics is the empirical study of the universal and invariant features of the reality.

To close up this tour, I come to McTaggart, who put his definition of metaphysics in a very concise form: "The systematic study of the ultimate nature of Reality" (PS, 183). The statement of the

purpose that he set up to reach in his *The Nature of Existence* gives a more detailed version:

“In this work I propose to consider what can be determined as to the characteristics which belong to all that exists, or, again, which belong to Existence as a whole.” (NE, 3)

It is clear that McTaggart meant to study the fundamental nature of reality in terms of universal, pervasive characteristics of existence. That he considered these characteristics necessary in nature, it can hardly be doubted. Being a Hegelian (or so considered), McTaggart thought that these universal characteristics of what is real have to be *a priori* deduced from the nature of the pure thought alone, and that that warranted their necessity. He even spoke of using “transcendental arguments” in the process. To sum up, there is safe to say that McTaggart saw metaphysics as concerned with the *a priori* necessary characteristics of the existence.

There is no need to go any deeper into all this. One can easily see that the three definitions of metaphysics, belonging to three philosophers whose final outlooks are so much different from one another, bear a clear resemblance. In all the cases metaphysics is about universal, invariant features of the reality, which configure together the “ultimate nature” of reality. In an easy to grasp sense, it is about the system of first principles of what is real. The goal of the systematic character is emphasized clearly by all the three philosophers that we checked out.

It seems to me that Whitehead did have a concept of metaphysics not too different from those of his predecessors. He did understand metaphysics in a sense already established, commonly accepted: as the tentative to arrive at the necessary, universal, principles of reality.

Whitehead's Concept of Cosmology

In order to understand what Whitehead means by “cosmology”, let's take a look at how he actually uses the word. Thus, some contexts (PR, 96, 103, 238, 308) suggest that cosmology has to do with features of the world which lack metaphysical generality, that is which belong only to the present cosmic epoch. They are therefore contingent and can not be the object of metaphysical investigation. Diverse characteristics of the physical space-time, for example, fall within the domain of cosmology, for it is not necessary that it constitute a plenum, or that it be

measurable. Indeed, it seems that everything pertaining only to the physical world – which defines our present cosmic epoch – constitute the subject-matter of cosmology.¹

But then, this is also true about the natural science and about the natural philosophy: they both try to comprehend the physical world, *i.e.*, the nature. It should be noted that in Whitehead's view there was no qualitative difference between natural sciences and natural philosophy. He said that “the philosophy of science differs from any of the special natural sciences by the fact that it is natural science at the stage before it is convenient to split it up into its various branches” (R, 5). Natural philosophy, called also “pan-physics” (*ibid.*), is just general science. So, we are entitled to simplify our problem, by only asking what difference is there between cosmology and natural philosophy, if both of them deal with the nature, *i.e.* with the physical world.

The philosophy of nature must determine the most general notions or conceptions which apply to things perceived (CN, 28; R, 4); or, which is the same thing, “to formulate the most general characteristics of things observed” (R, *ibid.*). We can get a better idea of the kind of generalities pursued by the philosophy of nature² from the following statement of its task:

“The primary task of a philosophy of natural science is to elucidate the concept of nature, considered as one complex fact for knowledge, to exhibit the fundamental entities and the fundamental relations between entities in terms of which all laws of nature have to be stated, and to secure that the entities and relations thus established are adequate for the expression of all the relations between entities which occur in nature” (CN, 46)

To clarify the concept of nature is exactly to determine the fundamental kinds of natural entities, the fundamental relations that hold between them, and to make sure that any relation observed between any observed entities can be construed in terms of the previously determined fundamental entities and relations.

¹ The same opinion can be found in Nobo 1986: “Metaphysics is strictly concerned with the necessary features of any and all cosmic epochs. Science and philosophical cosmology, on the other hand, must also concern themselves with the pervasive, but contingent, features of our cosmic epoch” (243–244).

² Whitehead makes no difference between natural philosophy, philosophy of nature and philosophy of natural science.

Whitehead warns us about the undesirable character of “metaphysical interpretations” in the philosophy of nature (CN, 48). But, while he does so, he admits the need of a metaphysics that goes beyond the limits of nature. He says that the object of such a “metaphysical science” would be to “exhibit in its utmost completeness our concept of reality” (CN, 32). The emphasis must lay here on the phrase “concept of reality”: while the task of natural philosophy is to exhibit our *concept of nature*, the task of metaphysics is to exhibit our *concept of reality*. How exactly this concept of reality looks like, we will see later.

By clarifying Whitehead's concept of natural philosophy, we have still not made progress in our understanding of “cosmology”. Previously, when we discussed Whitehead's concept of metaphysics, I made reference to the commonly accepted meaning of the word. This suggested clearly, I think, that Whitehead's concept of metaphysics drew on a common understanding of the term. Could we find help now in the same manner, *i.e.* by looking at how the word “cosmology” was used by British philosophers at the beginning of the 20th century? If in the case of “metaphysics” we dispose of plenty of definitions (I selected only the more influential three), in the case of “cosmology” this is not at all the case. In fact, the only (philosophical) definition that I know of comes from McTaggart. With his usual clarity, McTaggart writes:

By Cosmology I mean the application, to subject-matter empirically known, of *a priori* conclusions derived from the investigation of the nature of pure thought. [...] it is clearly to be distinguished from the empirical conclusions of science and every-day life. These also, it is true, involve an *a priori* element, since no knowledge is possible without the categories, but they do not depend on an explicit affirmation of *a priori* truths.[...] In Cosmology, however, the conclusions reached are deduced from propositions relating to pure thought. Without these propositions there can be no Cosmology, and a disagreement about pure thought must result in disagreements about Cosmology” (HC, 6)

By investigation of the nature of pure thought McTaggart understands in this book the dialectic. So “cosmology” means in the context the application of Hegelian dialectic to experience. In NE, after having said that he will try to determine the ultimate characteristics of what exists (which means to frame a metaphysics), he says that he will

also deal with how the results of his endeavour apply “to various parts of the existent which are known to us empirically” (NE, 3). That means that in his work McTaggart proposes to build a metaphysics, as well as a cosmology based on that metaphysics. Cosmology, unlike natural science, is connected to *a priori* truths, being nothing more than the application of these truths or principles to experience. To put it differently, cosmology is the application of metaphysical principles to experience. To do cosmology, one has first to find the system of necessary universal characteristics of the reality, or of first principles, and second to apply them to experience.

This seems to me to be root of Whitehead’s concept of cosmology. Natural philosophy, as pan-physics, is, according to Whitehead, empirical knowledge. That which is known by pan-physics is the nature, and what is arrived at is the concept of nature. The task of the “metaphysical science” is to exhibit “our concept of reality”. Hence, cosmology is the application of our concept of reality (as determined by metaphysics) to our concept of nature (as determined by the philosopher of science). In connection to this I should mention that the meaning of “cosmology” can not be derived from physics, because cosmology is only a branch of physical science. The philosophy of science must be able to determine the most general principles to whom the principles of physical cosmology are to be subordinated. Certainly, Whitehead did not mean in PR to particularise the results of his natural philosophy but, *au contraire*, to generalise them. Thus, we must consider that he conceived of cosmology pretty much in the same way McTaggart did. Further evidence for that claim will come from the analysis of Whitehead’s concept of speculative philosophy.

The Concept of Speculative Philosophy

With the notion of speculative philosophy we reach a firmer ground, as Whitehead treats it a lot more explicitly in PR than he does with “metaphysics” or “cosmology”. Its famous definition runs as follows:

“Speculative Philosophy is the endeavour to frame a coherent, logical, necessary system of general ideas in terms of which every element of our experience can be interpreted” (PR, 3)

In order to explicate the meaning of this definition, I will begin by analysing the phrase “coherent, logical, necessary system of general ideas”.

The notion of coherence, as used by Whitehead, means that “the fundamental ideas, in terms of which the scheme is developed, presuppose each other so that in isolation they are meaningless” (*ibid.*). This kind of semantic holism requires that the ideas composing the scheme should not be capable of abstraction from one another. One such idea must be intelligible only within the context of the whole scheme. However, the ideas of the scheme must not be inter-definable; there should be no possibility of conceptual reduction of these ideas. Rather, they must imply one another on the ground of their reference to a reality which expresses solidarity and relatedness. There is no entity which exists in total disconnectedness, bearing no relation whatsoever to the rest of the universe. Hence, what the human mind can grasp of that entity must not be semantically independent from what human mind can grasp of the rest of the universe.

The fact that the scheme must be “logical” wants to say that it has to integrate the results of mathematical logic. Indeed, Whitehead determines the meaning of the term by reference to “logical consistency, or lack of contradiction, definitions of constructs in logical terms, exemplification of general logical notions in specific instances, principles of inference” (*ibid.*). It has been speculated that this requirement shows that Whitehead’s philosophical scheme is actually an axiomatic system (Mays 1959, McHenry 1986). On a *prima facie* reading, the lines quoted do not imply that. They just say that the scheme has to be expressible in the symbolic language of mathematical logic. For the time being, there is no need to go deeper into the polemic started by Mays’s interpretation of the philosophical scheme as an axiomatic system. The fact that the importance of the “logical perfection” of the scheme is illustrated “by the role of mathematics in the restricted field of natural science” (PR, 6) suggests that the scheme resembles a mathematical theory. Mathematics and speculative philosophy have in common at least three things: that their notions are obtained by means only of generalisations conducted under the drive of free imagination, that they presuppose each other and that, on the ground of their logical perfection, they must one day find an application. This is a daring thing to say; Whitehead seems to suggest that any imaginative construction that obeys to the rules of coherence and logical perfection has an objective denotation, which will be discovered sooner or later. This idea seems to be connected with

Whitehead's belief in the existence of a rational essence of the universe, but here it is not the place to insist upon that.

Whitehead says that "the philosophic scheme must be 'necessary', in the sense of bearing in itself its own warrant of universality throughout all experience" (PR, 4). I believe that in this context we should read "possible experience" instead of mere "experience". Experience is related to observation, hence to the present cosmic epoch. Thus, the universality throughout all experience is a characteristic of the laws of science. In order for the scheme to be philosophical, its universality must transcend what is observed, that is, nature as characterising the present cosmic epoch. A philosophical scheme acquires its universality from the fact that it is applicable to other cosmic epochs as well. It is universal, because necessary. However, we recognise its necessity by its universality. We could express the facts in the following way. There are two kinds of universals: contingent and necessary. Science (and natural philosophy as general science) is in the business of formulating contingent universals, while speculative philosophy looks for necessary universals. Or since the philosophical scheme is universal, and since it is distinct from the system of natural science's principles, it follows that it has to be necessary, hence applicable to all cosmic epochs.

A philosophical scheme or "system of general ideas" serves to the interpretation of our experience. By "interpretation" it is understood that

"everything of which we are conscious, as enjoyed, perceived, willed, or thought, shall have the character of a particular instance of the general scheme. Thus the philosophical scheme should be ... in respect to its interpretation, applicable and adequate. Here 'applicable' means that some items of experience are thus interpretable, and 'adequate' means that there are no items incapable of such interpretation". (PR, 3)

One should be careful when reading this, because the first tendency is to think that every "item of experience" must be an instance of one or another notion composing the scheme. But Whitehead says something different: that every item of experience must instantiate the whole scheme, and not just a part of it. Let's look at this conversely. I take Whitehead to be saying that no item of experience should be interpretable only by a part of the scheme, however vast. That would mean "the arbitrary disconnection of first principles" (PR, 6), *i.e.*

incoherence of the scheme. So, if the scheme is to be coherent, logical and necessary, it should be involved in its totality in the interpretation of each and every item of experience. But, on another level, this means that the whole of experience is somehow involved in every of its parts. And this is what Whitehead calls the “solidarity” of the universe.

Now “interpretation” is a kind of relation holding between the scheme and the experience. Not divagating too far from Whitehead’s language, we could say that every item of experience must be an interpretation of the scheme. Thus, the requirements of “applicability” and “adequacy” impose that the class of the scheme’s interpretations should not be empty and, furthermore, that every one of our experiences should belong to the class of the scheme’s interpretations. Anyway, the requirements of the “applicability” and “adequacy” of the scheme are clear enough not to necessitate any in depth analysis: the scheme must apply to experience and to the whole experience. How can we make sure that it does, we will see later. What is not clear is the nature of the relation between the scheme and its interpretations. What do we mean by saying that an item of experience is an interpretation of the scheme?

First, we should notice that an item of experience is “a particular instance of the general scheme”. The terminology is apparently that of the logic, since Whitehead spoke before of the “exemplification of general logical notions in specific instances” (PR, 3) in order to suggest the meaning of the term “logical”. Following these hints, it is no wonder that the notion of “interpretation” has generally received a logical reading. Wolfe Mays is one commentator who expresses this tendency by saying that

“Whitehead ... would seem to be using the notion of interpretation ... in the way it is used in symbolic logic – where an abstract system is spoken of as being given an interpretation by definite value” (Mays 1959, 32)

Yet, I do not think that such a reading is correct. In logic, the rule of instantiation is used in order to obtain sentences from sentences. In Whitehead’s case, although the scheme is made “of general ideas”, the “instances” are experiences, *i.e.* things “of which we are conscious, as enjoyed, perceived, willed, or thought”, not ideas. The relation between the scheme and its “instances” has a rather different nature.

Whitehead lists in PR a series of “habits of thought” repudiated by the philosophy of organism. Among these, there is one of particular

relevance to our argument: “the trust in language as an adequate expression of propositions” (PR, xiii). This mistrust in language must be connected to the sixth category of existence, which is that of propositions. This is how these entities are characterised: “Propositions, *or* Matters of Fact in Potential Determination, *or* Impure Potentials for the Specific Determination of Matters of Fact, *or* Theories” (PR, 22). Thus, the lack of theoretical differentiation between propositions and theories imply that the philosophy of organism rejects implicitly the habit of thinking that theories can be adequately expressed by language. A theory, being a proposition, is a non-linguistic entity composed by a set of actual entities and a complex eternal object. There is no limit as to the complexity of the eternal object involved in a theory; it can easily have the complexity of a coherent fragment of mathematics. To identify a theory is thus to describe a structure containing a set of objects and a complex characteristic common to all the objects of the set. Whitehead is thus the exponent of a non-linguistic view of theories. Clearly, to him a theory is not a set of sentences. Since there are many *loci* in PR where Whitehead uses “theory” as an alternative for “philosophical scheme”, it is safe to assume that he did not consider the scheme to be a complex sentence.

But this is not all. The categorial scheme or theory that he intends to build should not be considered as true, but quite the contrary: “if we consider any scheme of philosophic categories as one complex assertion, and apply to it the logician’s alternative, true or false, the answer must be that the scheme is false” (PR, 8). In another fragment Whitehead says, speaking of the adequacy of the scheme to experience, that the “texture of observed experience” illustrates the scheme. The texture (better said: structure) of experience illustrates the scheme, but the scheme is not true of experience. In FR, Whitehead formulates a series of criteria for the acceptability of a belief’s content:

- “(i) Conformity to intuitive experience:
- (ii) Clarity of the propositional content:
- (iii) Internal Logical consistency:
- (iv) External Logical consistency:
- (v) Status of a *Logical* scheme with,
 - (a) widespread conformity to experience,
 - (b) no discordance with experience,
 - (c) coherence among its categorial notions,
 - (d) methodological consequences”

Again, the epistemological vocabulary does not include “truth”; Whitehead demands that a belief should respect only the criterion of the “conformity” (with no counter-examples) to experience. Elsewhere he expresses his conviction that “the logician’s rigid distinction, ‘true or false’, is largely irrelevant for the pursuit of knowledge” (PR, 11). Whitehead does not demand to his philosophical scheme truth, but only conformity to the observed experience. The relation of the scheme to experience can be captured by van Fraassen’s concept of “empirical adequacy”. Take the Euclidian geometry: while false, it “saves the phenomena”, it corresponds to observed physical world; that is, Euclidian geometry is empirically adequate.

These considerations suggest that the “items of experience” can be understood as models of a theory, or parts of models. Usually we are inclined to say that a theory is a model of some phenomena. But there is no impediment to saying that the phenomena are models of a theory. A model in this sense is the representation of an ontic system of which the theory is about. Thus, we will not speak any more of the scheme’s class of interpretations, but of its class of models. That the scheme must be interpretable means that it should have models and that every element of our experience should belong to the class of the scheme’s models.

We are now in a position to understand better what the speculative philosophy is about. It is about two things: constructing a theory (“scheme of general ideas”) and showing that what is observed falls within the scheme’s class of models. The “general ideas” have to be necessary; that means that the first stage in the development of a speculative philosophy is the construction of a metaphysical theory, since this necessity is what characterises metaphysics. And to interpret the scheme is to apply this metaphysics to what is observed; or, as we have previously seen, this is nothing but the object of cosmology. That which is observed is called “nature”, or physical world. Thus, the main goal of PR is to construct a metaphysical theory empirically adequate to the physical world, i.e. whose models are isomorphic with the observed facts.

The Methodological Specificity of the Speculative Philosophy

Metaphysics is the tentative to formulate the first principles in a coherent and logical manner. The system of these principles constitute a metaphysical system (PR, 8), or, as I shall say, a metaphysical theory. But the metaphysical first principles are not easy to grasp, since they are

pervasive and permanent. And our cognition is based on difference recognition. We know things by the method of the difference. That is, their intermittent presence is what makes them noticeable, on a relatively changeless background. The metaphysical principles are always in this background, and there is no more fundamental background against which they could become noticeable. Thus, we need a special method in order to grasp them. This is “the true method of discovery” (PR, 5), of which Whitehead says the following:

“The true method of discovery is like the flight of an aeroplane. It starts from the ground of particular observation; it makes a flight in the thin air of imaginative generalisation; and it lands again for renewed observation rendered acute by rational interpretation” (PR, 5).

The phrase “particular observation” refers not to the observation of particular facts, but to particular domains of knowledge. The discovery of the first principles must start from the already general principles formulated by the particular sciences, for example from the general notions and principles of physics. Thus, the speculative philosophy is continuous with the sciences, and with the natural philosophy, which is the most general natural science.

The second phase of the method is the “imaginative generalisation”. This phase is characterised in terms of the “play of the free imagination”, “play with inconsistency” in order to supply the differences that, by missing, make direct apprehension of the first principles impossible (PR, 5). Whitehead makes it clear that the result is a construction, with no definite link to experience. Even though the generalisation departs from the soil of scientific observation, the metaphysical principles are not simply logical generalisations of the scientific principles. The imaginative construction is a counterfactual enrichment of the observed factors, controlled only by the requirements of coherence, logical perfection, and applicability³.

The third phase of the method is the “pragmatic test” of the generalisation. It has to be verified in another field of knowledge, where it should facilitate observation of new general principles. When confronted to the facts in diverse scientific domains, the scheme must not contradict them. Only complete agreement, or general agreement with disagreement in detail, is acceptable. A complete disagreement with

³ We remember that to be applicable means for a theory to have a non empty class of models.

the facts must lead to the “fundamental reorganisation of the theory, either by way of limiting it to some special province, or by way of entire abandonment of its main categories of thought” (PR, 9). We may remark at this point that the imaginative construction must not contradict the facts, and also not to project incoherence into the domain of observed facts. For example, the “scientific materialism”, when applied to facts, ultimately conducts to the bifurcation of nature, which is a form of incoherence.

The metaphysical theory is thus an imaginative construction whose purpose is to allow the discovery of new general principles when applied to a field of knowledge. If this field of knowledge is the nature, then the system of the new general principles, impossible to formulate in lack of the metaphysical theory, is what Whitehead calls a cosmology.

The method of speculative philosophy has been compared to the method of the working hypothesis from science, and it is true that it bears a lot of resemblance to it. But there are a few things to be added, in order that Whitehead's method to be correctly understood. The first thing to be emphasized is Whitehead's form of conventionalism, hence, of antirealism.

The early article MC is a good place to start in order to grasp some essential features of Whitehead's way of thinking. The purpose of this memoir is

“to initiate the mathematical investigation of various possible ways of conceiving the nature of the material world. I so far as its results are worked out in precise mathematical detail, the memoir is concerned with the possible relations to space of the ultimate entities which (in ordinary language) constitute the ‘stuff’ in space” (MC, 465)

Whitehead wished to unify the theory of space with that of time and with that of movement, in other words he was aiming to build a cinematic, and he wanted that this cinematic to be able to support Maxwell's electromagnetism, the most advanced physical theory at that time.

The definition of a “concept of the material world” is as follows:

“The *Material World* is conceived as a set of relations and of entities which occur as forming the ‘fields’ of these relations ... The *Fundamental Relations* of the material world are those relations in it, which are not defined in terms of other entities, but are merely particularised by hypotheses that they satisfy certain propositions ...

The hypotheses, as to the propositions which the fundamental relations satisfy, are called the *Axioms* of that concept of the material world ... Each complete set of axioms, together with the appropriate definitions and the resulting propositions, will be called a *Concept of the Material World*" (MC, 466).

When we look closer at the definition of the material world, we see that we are talking about a mathematical structure, comprising sets of objects and relations holding on these sets. Whitehead will use structures containing maximum 3 sets, one being the set of instants of time. He will distinguish also between an essential relation and other "extraneous" relations. All the entities which are not time instants are called "objective reals". Thus, a material world is a structure $\langle O, T; R, E \rangle$, where O is a set of sets, T is the set of instants, R is the essential relation and $E_1 \dots E_i$ are extraneous relations. This kind of relational structure is what we call a model. So, a material world is to be conceived as a kind of model which can unify several advanced physical theories.

One essential characteristic of Whitehead's way of thinking present in MC is the ontological non commitment. Whitehead wishes to build a model of scientific theories without prejudging on the nature of the ultimate components of the world. Whitehead excludes the "ontic decision" from the scope of his enterprise. This aspect is of particular importance, and Whitehead emphasizes it every time his language could give us the impression that he is doing ontology:

"The complete class of those entities, which are members of the fields of fundamental relations, is called the class of *Ultimate Existents*. This technical name is adopted without prejudice to any philosophic solution of the question of the true relation to existence of the material world as thus conceived ... Also, we have no concern with the philosophic problem of the relation of any, or all, of these concepts [of the material world] to existence." (MC, 467).

What clearly results from these lines is the lack of importance of the model's "truth" (this is the sense of the phrase "true relation to existence"). Whitehead will refer next to Poincaré's conception of the possibility of interchanging Euclidian and non Euclidian geometry, tacitly assuming the conventionalist position of the French mathematician. Whitehead's relational theory of space, which he never abandoned, is a good argument for his conventionalism, because it

implies that metrical relations are not factual. Poincaré considered that the manifolds underlying Euclidian and Lobatchevskian geometry are homeomorphic, so that a physical theory could be re written to explain the same facts with both geometries. This subjacent conventionalism of Whitehead's program will be implicitly developed in his subsequent works, where the central place will be occupied by the idea that natural science (including geometry) should explain perception without falsifying it. Thus, the ideal of the scientific research is not to produce true theories, but only empirically adequate theories (that is, whose models correspond to observation). It is Duhem's idea of "saving the phenomena", which was largely accepted at the time by the philosophers of science.

Poincaré began exposing his conventionalism since the 1890's, when he affirmed "the axioms of geometry are ... neither synthetic *a priori* judgments, nor experimental facts. They are conventions" (Poincaré 1891, 773). The axioms of geometry are underdetermined by experience; they are not implied by facts of experience, although their choice from the multitude of possible complete and non contradictory sets of axioms is guided by experience. Not only geometrical axioms are conventions, but so are also the hypotheses of physics. Discussing Fresnel's hypothesis of the wave nature of light, Poincaré says the following:

"It is of little importance whether ether really exists; ... the essential for us is that everything happen as if it existed and that this hypothesis is commodious for the explication of phenomena" (Poincaré 1888, I, 1)

As it has been noticed (Brenner 2003, 49), Poincaré emphasizes the utility of Fresnel's hypothesis, warning against the temptation of according to it any ontological value. The fact that Fresnel's conclusions remain valid when looked at from the standpoint of Maxwell's electromagnetic theory of light implies that the success of the theory does not depend on this hypothesis.

Whitehead's conventionalism is not a passenger feature of his thought, but a persistent one, observable at all phases of his career. A most relevant proof of this commitment to conventionalism is the discussion concerning the laws of nature from AI. Whitehead distinguishes four types of conception concerning the character of these laws, the most recent one being that of the "conventional

interpretation". It is to this later doctrine that he adheres. The description of this doctrine bears a remarkable resemblance to the description of the philosophical method from PR:

"We elaborate a system of ideas, in detachment from any direct, detailed observation of matter of fact ... They do not bear the aspect of patient induction from the facts. They are dominated by speculation and dialectics. Also Mathematics has developed, especially in recent years, by a speculative interest in types of order, without any determination of particular entities illustrative of those types. But Nature has subsequently been interpreted in terms of such mathematical laws. The conclusion seems to be, that Nature is patient of interpretation in terms of Laws which happen to interest us ... There is thus a certain amount of convention as to the emergence into human consciousness of sorts of Laws of Nature ... But such 'convention' should not be twisted to mean that any facts of nature can be interpreted as illustrating any laws that we like to assign." (AI, 136, 138)

Whitehead thus says that the laws of nature acknowledged at a certain time in the history of mankind do not derive from experience, but from the independent development of abstract sciences, which find sooner or later an application⁴. Mathematical theories, developed independent of direct experience, are capable of yielding laws of nature when applied to experience. Of course, the conditions that make application possible are not always available. The conventional character of the laws of nature is connected thus to what we call today the empirical subdetermination of theories. There are, without doubt, facts, and these are in no way conventions; but their interpretation in terms of laws of nature is conventional, as this interpretation is always dependent on some abstract theories developed only under the requirements of coherence and logic. The laws of nature are, then, in no way inductive generalisations, nor *a priori* truths.

Another thing to be noticed is Hilbert's influence on Whitehead. Although directly he did not have a major impact, Hilbert's works in the foundations of geometry did influence Whitehead via Veblen's memoir on the same subject, which had a strong influence on Whitehead's similar works (see Grattan-Guinness 2002). One of the things that Hilbert introduced in the foundations of geometry was the "method of ideal elements".

⁴ Compare to PR, 6.

This method consists in the extension of the domain of “real” elements of geometry with some “ideal” elements, in order to simplify the axiomatic foundation of plane geometry. This works not only for geometry, but for other branches of mathematics also; the theory of imaginary numbers is an example of application of this method. In geometry, however, Hilbert used this method when introducing the ideas of ideal point and ideal plane. In Euclidean geometry, the incidence of lines and planes was subjected to two axioms, specifying that any two points determine one straight line, and that any two points determine a unique line with which they are incident. From here it follows that two distinct straight lines either have one point in common, either no point in common. And, of course, Euclid’s postulate says that one point exterior to a straight line can only be incident with a single parallel straight line. Now, we can consider that two parallel straight lines do have a point in common, if prolonged infinitely, but not a regular point. This point is called a “point at infinity”. In each plane, we consider a single straight line which contains all the ideal points. Infinite points and lines are ideal elements, but they are not to be distinguished in any way of “real” points and lines. The plane, thus enriched with is called a “projective plane”. With these new notions of points and lines, we can formulate different axioms for the incidence of points with straight lines. We say now that (1) two distinct points determine one and only one straight line, and that (2) two distinct straight lines determine one and only one point. If, in these axioms, we interchange “point” and “straight line”, we observe that they rest unchanged, and that the theorems proved from these axioms also rest unchanged and valid. This is called the principle of duality in the projective plane. From here, several important results can be proved, such as Desargue’s theorem in the plane. The method of ideal elements is used by Veblen in his memoir, and is visible in MC also. One theory developed here is the theory of intersection points, of “interpoints”, strongly connected to the duality principle which I mentioned before. Whitehead conceived not only of lines as classes of intersection of points, but also of points as classes of intersection of lines and planes.

Later, in his *Axioms of Projective Geometry*, Hilbert and some of his followers are quoted several times, and the method of ideal elements is also present. In the first chapter of the tract, Whitehead says:

“A Geometry will be called ‘Projective’ if two coplanar lines necessarily intersect. Thus Euclidean Geometry is not projective, but becomes so when the various entities called points at infinity on the various lines have been defined, and added to the other points on the lines” (PG, 5–6).

A fundamental feature of Hilbert’s method was the requirement that the extension of the geometry’s domain of entities should be conservative and non creative. Thus, every time that this method is applied, we need a theorem of consistency, which should prove the eliminability of the ideal enrichment. For Whitehead, the only consistency proof could come from an existence theorem. He adheres to an intuitionist position, and what he says on the subject is particularly relevant:

“Some mathematicians solve the difficult problem of existence theorems by assuming ... that, if a set of axioms are consistent, there exists a set of entities satisfying them. Then consistency can only be guaranteed by a direct appeal to intuition, and by the fact that no contradiction has hitherto been deduced from the axioms. Such a procedure in the deduction of existence theorems seems to be founded on a rash reliance on a particular philosophical doctrine respecting the creative activity of the mind⁵. But apart from its logical justification, the procedure is in practice always wise; since simple axioms which appear to be consistent probably are consistent, and as far as we know existence theorems can be found for consistent axioms. Accordingly it is not well to be hampered in the initial development of a new subject by the lack of the existence theorem and of the attendant proof of consistency” (PG, 3–4)

One feature of Whitehead’s philosophical method, namely applicability, receives now a more complete interpretation. As we saw, the “philosophical scheme” is an imaginative (counterfactual) enrichment of the observed experience, susceptible to be interpreted as an addition of ideal elements to the domain of things observed. The fact that the philosophical generalisation must proceed from “particular observation”, i.e. from observation in a particular field of knowledge, dispenses us of seeking a proof of consistency for the “general ideas” which compose the philosophical scheme.

I have referred a lot to mathematics and sometimes to science when discussing Whitehead’s philosophical method, for I do believe

⁵ This is Poincaré’s point of view.

that, in philosophy also, he worked as he was trained to do, that is as a mathematician and a scientist. But doesn't Whitehead say that "philosophy has been misled by the example of mathematics"? This affirmation by no means contradicts my interpretation. When saying that, Whitehead criticises the *a priori* deductive method in philosophy, like that of Spinoza or, closer to him, of McTaggart. The philosophical principles are not required to display any initial clarity or intuitive evidence. They will be gradually refined, getting closer and closer to such high standards of clarity, but never quite reaching them. It is in this context that Whitehead considers metaphysical categories to be "tentative formulations of the ultimate generalities", and not "dogmatic statements of the obvious" (PR, 8). But, once the scheme has been gradually refined, it is used "to argue from it boldly and with rigid logic" (*ibid.*, 9), as it is in fact argued in mathematics from a set of axioms.

Whitehead is not against the conception of philosophical principles as axioms: he is against a certain conception of axiom, as applied to philosophical principles. In his discussion of the nature of axioms from PG, he does not impose clarity and certainty to axioms. He affirms only that "the really essential logical requisites respecting the foundations of a mathematical subject are that the axioms should be consistent and that their existence theorem be proved" (PG, 4). In the spirit of modern developments in the foundations of mathematics, he imposed only formal constraints to a set of axioms, and he accepted their conventional nature. Certainly, it is easier to frame a set of geometrical axioms than a scheme of philosophical principles; a lot of work needs to be done before one can state such a scheme. But, in principle, philosophical principles resemble mathematical axioms and scientific hypotheses.

The "true method of discovery" consists thus in the construction of a scheme of ideal elements, starting from entities observed in a particular field of knowledge. The generalisation is by no means induction; rather, it is obtained by ideal projection of the structure of observed things, guided by the abstract theories available at that time. Imagination is what mediates between abstract theory and concrete observation⁶. The next step is the formulation of principles, or hypotheses, describing the functioning of these elements. And the last

⁶ We can notice here a Kantian influence.

step is confrontation to experience and evaluation of the scheme's general success (PR, 5). We can see now that Whitehead does not build a first-order ontology, and that he is not interested in finding the true entities existing in the universe. This ontic decision⁷ is left to sciences and common experience. Whitehead's aim is to obtain an ideal enrichment of the universe which should allow the successful unification of all domains of experience, while "saving the phenomena".

The Structure of Theories

The close resemblances between Whitehead's method of speculative philosophy and the method of sciences have been acknowledged for quite some time. Consequently, there have been attempts at understanding the philosophical theory of PR by projecting on it the structure of scientific theories⁸. But, in my opinion, these attempts are vitiated by a misunderstanding of the nature of scientific theories. When trying to interpret Whitehead from such a point of view, philosophers made use of the model of scientific theory rendered available by the philosophy of science of their epoch. Most of all, the Anglo-Saxon interpreters of Whitehead used the conception of scientific theories as interpreted axiomatic systems. This is what used to be called "the received view" of scientific theories as linguistic entities. As I have indicated earlier, Whitehead did not share this linguistic perspective on theories, which he considered complete entities. This alone should make one suspicious when trying to interpret Whitehead through the prism of the "received view". But, indifferent of Whitehead's own view of theories, the received view is not applicable because it could not be involved in foundational research and it simply failed to account for the complex nature of mature physical theories. And, of course, that renders this model of scientific theories obsolete. Indeed, it has been abandoned for a long time. But, while new models emerged in the philosophy of science, no attempt of applying them to Whitehead's speculative philosophy are known to me.

If the value of a theory is to be interpreted in terms of its general success in practice, than the model of scientific theory to be followed is that of the metatheoretical structuralist school in the philosophy of science (Sneed, Stegmüller, Moulines, Balzer, Pârnu etc.). It is not the

⁷ I borrow the term from Professor Pârnu's *The Architecture of Existence* (1990; 2002).

⁸ See, for example, Mays 1959 and McHenry 1987.

case that I defend here this conception or my use of it; indirectly, this will be proved by the same pragmatic criterion, namely its success in the theoretical reconstruction of Whitehead's theory from PR. What I will do in the following lines, is give an outline of the structuralist analysis of scientific theories, which will serve me as a logical framework for reconstructing Whitehead's own philosophical theory.

The structuralist view of theories belongs to the family of visions which depart from the standard view of a theory as linguistic entity empirically interpreted. The structuralists and their predecessors consider that to axiomatize a theory is to define directly the class of its models, with little concern for the particular language in which this is done. Thus, the accent falls on the mathematical notion of "model", which has to be distinguished from the connotations that this notion still has in semantics. A model should be understood as a mathematical structure which satisfies certain axioms, and which is a model of a theory simply in virtue of its belonging to the defined class of the theory's models. The models are understood as species of structures, in the sense introduced by Bourbaki. They are structural entities, composed by sets of objects and a system of relations, which satisfy certain conditions, defined on these objects. Thus, a model can be represented by an ordered tuple of the form $\langle D_1, \dots, D_i; R_1, \dots, R_j \rangle$. Viewed in this way, a model is not an intermediary tool for interpreting a theory, but a constituent of the theory itself. Thus, to identify a theory is to specify its models.

The conditions that I spoke of earlier are of two kinds. First, there are conditions which only specify the kind of concepts we are intending to use, called frame-conditions. They describe the mathematical microstructure of the theory. A structure that satisfies only these conditions will be called a potential model of the theory, since it describes only the type of entities to which the theory could apply. For example, in order to axiomatize Euclidean geometry, the concepts involved are those of some entities called "points", of the relation "between" and of the relation of "congruence". A definition of a potential model of geometry is the following⁹:

$X \in \mathbf{Mp}(\text{Geo})$ dacă $\exists R, \text{in}, \equiv$, astfel încât

1. $x = \langle R; \text{in}, \equiv \rangle$

⁹ Cf. Balzer 1997.

2. $R \neq \emptyset$
3. $\text{in} \subseteq \mathbf{R}^3$
4. $\equiv \subseteq \mathbf{R}^4$

But we notice that nothing is said as to the specific properties of the relations involved. By specifying these properties, we obtain an actual model of Euclidean geometry. In order to do that we have to introduce a set of axioms, or substantial laws, that say something about the world. Any known set of classical axioms for the Euclidean geometry will do. Noting this set of axioms with A , and adding it to the previous definition, we obtain an actual model of the Euclidean geometry, that is, a definition of the Euclidean space. In the absence of A , any triadic, respectively dyadic relation can satisfy the first four conditions. Thus, the structure X as given in the first definition, refers to an undetermined entity, it can describe virtually an undetermined number of types of real systems. Only by introducing the content axioms the domain of application of the structure is specified:

$x \in \mathbf{M}(\text{Geo})$ iff $\exists R, \text{in}, \equiv$ such as

1. $x = \langle R; \text{in}, \equiv \rangle$
2. $x \in \mathbf{Mp}(\text{Geo})$
3. A

Another simple example is that of the classical collision mechanics. The systems described by this theory comport objects which move with different speeds, entering in collision with one another and having certain masses. Thus, the conceptual elements that we need are the class of material particles, the moments of time (“before” and “after” the collision), as well as two functions, one associating a mass to each particle, the other associating to each particle a certain speed at an instant t . The structures defined only in these terms constitute the potential models of the theory. In order to obtain actual models, the fundamental law needs to be added; and this is the law of momentum conservation. Thus, a potential model of the classical collision mechanics (CCM) can be defined as follows:

$x \in \mathbf{Mp}(\text{MCC})$ iff $\exists P, T, \mathbf{R}, v, m$ such as

1. $x = \langle P, T, R; v, m \rangle$
2. $P \neq \emptyset, P$ finit
3. $T = \{t_1, t_2\}$
4. $v: P \times T \rightarrow \mathbf{R}^3$

$$5. m: P \rightarrow \mathbf{R} \text{ \textit{ \textless} } (\forall p \in P) m(p) > 0,$$

Consequently, an actual model receives the following definition:

$x \in \mathbf{M}(\text{MCC})$ iff $\exists P, T, \mathbf{R}, v, m$ such as

$$1. x = \langle P, T, \mathbf{R}, v, m \rangle$$

$$2. x \in \mathbf{Mp}(\text{MCC})$$

$$3. \sum_{p \in P} m(p)v(p, t_1) = \sum_{p \in P} m(p)v(p, t_2) \text{ }^{10}$$

The concepts appearing in the potential models of a theory T, whose meaning is dependent on the theory as a whole, are called “T-theoretical”, while the rest are “non T-theoretical”. Thus, the potential models of a theory T are the structures that satisfy only the conditions for the terms T-theoretical.

Now, if we “erase” all the theoretical terms of a theory, by a function $r: \mathbf{Mp}(T) \rightarrow \mathbf{Mpp}(T)$, we are left with a structure that contains only non T-theoretical terms, or only T-observational terms. Such a structure, definable only in terms of T-observable functions, is called a “partial potential model” of the theory T. Sometimes it is possible that, by adding the T-theoretical functions to a partial potential model of T, a model of T is obtained. Thus, we can informally say that a structure belong to a theory’s class of actual models iff there is a “theoretical enrichment” of this structure which belongs to the class of the theory’s potential models. Formally, a definition of a theory’s class of partial potential models is the following:

$\mathbf{Mpp}(T)$ is the class of *partial potential models* given by $\mathbf{Mp}(T)$ and $\mathbf{M}(T)$ (or simply the class of T’s partial potential models) iff for every $x \in \mathbf{Mpp}(T)$ there exists $D_1, \dots, D_k, A_1, \dots, A_j, n_1, \dots, n_p, t_1, \dots, t_q$ such as

$$x = \langle D_1, \dots, D_k; A_1, \dots, A_j; n_1, \dots, n_p \rangle$$

$$\langle D_1, \dots, D_k; A_1, \dots, A_j; n_1, \dots, n_j; t_1, \dots, t_q \rangle \in \mathbf{Mp}(T)$$

exactly t_1, \dots, t_q are T-theoretical

In order to grasp the whole complexity of mature empirical theories, the three classes of models previously described are not sufficient. In general, the models of theories do not appear in isolation, but they are correlated by some second-order conditions. It is rarely the case that a theory has a single, global application (the general theory of

¹⁰ Cf. Sneed, Moulines, Balzer 1987, 27.

relativity is one example). The general case is that the models appear together in nature; they intersect and influence one another. For example, in CCM there is the requirement that a particle appearing in two systems has the same mass, that the particle's mass depend only on itself. The two systems are thus correlated by this constraint.

Another feature of contemporary science is that the models of different theories are mutually correlated by a sort of inter-theoretical relations called "links". Links serve, among other things, to the transfer of data from an older theory to a newer one. They contribute thus to the determination of the new theory's T-non-theoretical terms. For two theories T and T', the abstract notion of a link can be understood as a relation on $\mathbf{Mp}(T) \times \mathbf{Mp}(T')$. By specifying exactly which elements in the two classes of potential models are inter-theoretically connected, a concrete link is obtained.

The five components exposed before suffice now to define the "core" of an empirical theory:

$$K = \langle Mp, M, Mpp, C, L \rangle.$$

A "theory-element", the simplest form of empirical theory, is now definable as a theory-core plus a class of intended applications, I. When presenting a theory, a scientist offers a description, in informal terms, of the chunks of reality his theory is supposed to apply to. For example, when presenting classical mechanics, a physician does not offer only a mathematical apparatus, but also some paradigmatic examples of mechanical systems, like the system earth – moon. As the authors of the structuralist *summa* remark, sometimes the theory's formalism is left on its own to decide which its applications are. This idea is in complete agreement to Whitehead's observations concerning the advance of sciences. Thus, the formal identity of a theory-element is completely given by the double $\langle K, I \rangle$. It must be said at this point that the scientific theories are usually too complex to be presented as theory-elements. Rather, they are networks of theory-elements. The members of the network have the same theoretical functions, or conceptual frame, and they are all specialisations of the same fundamental law.

Back to Speculative Philosophy, Metaphysics and Cosmology

The view of theories sketched in the previous section can now throw a new light on the nature of Whitehead's philosophical enterprise

from PR. The terms “speculative philosophy”, “metaphysics” and “cosmology” can receive a precise interpretation, and the connexion between Whitehead’s earlier and later philosophy can be also precisely determined.

I have shown that the speculative philosophy has two components. The first (in logical order) is the construction of a metaphysical theory, and the second is the application of this metaphysical theory to what “natural knowledge” delivers. The natural knowledge has as superior forms the natural sciences; and the most general natural science is natural philosophy, or the philosophy of nature, or panphysics. Finally, we have seen that the product of the natural philosophy is our concept of nature. It follows that the precise meaning of “cosmology” is *application of a metaphysical theory to the concept of nature, or interpretation of our concept of nature by means of a metaphysical theory.*

By “metaphysical theory” we understood a sort of mathematical (or mathematizable) scheme of concepts, which applies to all cosmic epochs. We have also seen that the scheme must be an imaginative construction, obtained by way of enriching the “observed experience” with some ideal elements, whose behaviour must be regulated by some principles. And we have seen that this construction must not be interpreted as true of something, but it must be proven empirically adequate. To use a phrase of Whitehead’s, this construction represents our concept of reality. It follows from here that to do cosmology is to apply somehow a concept of reality to a concept of nature. And thus, to do speculative philosophy is to frame a concept of reality and to interpret with it our concept of nature. Lastly, we have seen that this notion of “interpreting” can be understood in terms of models. If we note by r the concept of reality and by n the concept of nature, then to interpret n with r is to prove some model-theoretical relation between n and r .

When speaking of “concepts”, we should not let ourselves forget that they really are structures. Whitehead’s use of the term leaves little doubt. We have seen earlier what a “concept of material world” was. The “concept of nature” is also a structure; as I have shown somewhere else (Rusu 2004), it is a concept of material world whose class of ultimate existents contains only natural entities, given in perception, *i.e.* events (with a special subcategory, durations). The relations that range over

these entities are that of “covering” and that of “cogredience”. The essential is that a concept of nature is a kind of relational structure, just like a concept of material world. We can assume that the concept of reality is also a similar sort of structure.

From the metatheoretical perspective here adopted, it is important to notice that a concept of reality is a concept which does not know what it is talking about. It describes cosmic epochs, but no cosmic epoch in particular. This only means that it makes sense to ask whether a cosmic epoch could fall under a concept of reality or not. And this means, in turn, that a metaphysical theory should be identified only with a class of potential models. A metaphysical theory is nothing more than a frame-theory, a structure which satisfies only some frame-conditions (or theoretical laws). It is a blind structure. What it needs in order to “see”, to have objectivity, is an infusion of “intuition” (to keep within this Kantian analogy). It needs some fundamental laws, or content axioms, or non-theoretical laws. Providing the fundamental laws, this is precisely the business of cosmology.

I must say it right away: it is very unlikely that showing our concept of nature to be a model of some concept of reality could be done in a direct manner. Actually, Whitehead does not do it. Various mediations are needed; diverse “doctrines” interpose between the results of natural philosophy and the abstract metaphysical theory. Finally, it is to be expected that the concept of nature should be a model of a substructure of the PR-theory whose class of potential models is defined by the concept of reality. And I must mention also that the construction of the class of potential models parallels the construction of the diverse mediating doctrines, and thus parallels the metaphysical interpretation of the concept of nature. It is only in the fifth part of PR that the final cosmological touch is added, *i.e.* the substantial laws of the PR-theory are completely formulated.