

# Whitehead and Science: From Philosophy of Nature to Speculative Cosmology\*

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## 화이트헤드와 자연과학: 자연철학에서 사변적 우주론으로

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What is nature? This seems a very simple question. But the answer is not as obvious as it would seem.

When we speak about nature, it may be about our environment as we can experience it, the trees along a river, with flowers and birds. It is then what we should respect, not pollute and destroy.

But it may also be destructive tsunami or storms or cyclones, and the old human answer is then prayer, because we face something much more

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powerful than ourselves, something we must learn how to protect ourselves against.

And it may also be hidden menace, like a sudden epidemic disease – you can think about this brand of aviary flue virus that is maybe now brewing in Asia into a human flue virus, and here we deal with a connection between the time scales associated with our lives and the time scales associated with biological evolution, with the production and selection of mutants viruses.

And finally you may ask physicists, thinking that they should know since the name of their science, physics, is derived from the Greek word FUSIS, which meant nature as power to grow and develop - think to seeds or embryos.

Some physicists will probably tell you that the distinctions I have just presented may well be quite interesting for us, because of our subjective interests – we love rivers, and not tsunamis, we appreciate cats or dogs as products of biological evolution, but not lethal germs. However, the physicist will claim, from the objective point of view, which is from the point of view of physics, there exists no such distinctions. The many different examples I presented of what we may associate with what we call “nature”, rivers, trees, tsunamis, germs, may all be characterized in very general terms, as the result of physical interactions between physical entities. The physicist may add that since all those examples require molecules and interplay between molecules, they belong to a particular place where the temperature is neither too hot like the Sun nor too cold, like the frozen Pluto, for instance.

Now if you deal with some physicists, like Ilya Prigogine with whom I worked and learned to love physics, they will be very happy and proud that physics may now state something a bit more interesting.

For Prigogine, it was a matter of great happiness that physics was now able to state that a cyclone is an active self-organized structure, and that such structures are probably also required for something like living beings to be possible at all. Such structures, physics may now state, do not need only average conditions, like temperature. They need a world in flux, for instance the flux of heat and light coming from the Sun, and they need also strong coupling between different types of processes.

In other words, for physicists like Prigogine what matters in physics is not so much universal interactions that are always the case, it is the progressive discovery of new relevant questions, enlightening the diversity of nature, and the need to learn how to approach this diversity.

However a majority among physicists would be more satisfied emphasizing the power of universal definitions, and arguing that this so-called diversity may be surprising for us, but we must accept it all derives from physical interactions. In other words the fundamental laws describing those interactions are the objective truth of what we call nature.

This first short introduction was meant to tell you about what did matter for Whitehead, the way he addressed the question of the philosophy of nature, which is nature's bifurcation between an "objective nature" and a "subjective one". This bifurcation has indeed found its illustration in the difference between the first examples I presented you and the physicist's universal interaction. Those first examples are perplexing because of their diversity, but we would may agree that this diversity is that of nature, that we discover them in nature, and that in each case it is useful to learn about them in order to learn about nature.

But physicists usually do not claim to add something to what is already diverse. It claims an opposition between one objective definition and everything else which would be subjective, linked with human values and perceptions. The physicist's definition only would be objective, independent of those values and perceptions. Here nature bifurcates.

And physicists are not the only ones who have nature bifurcating. If we turn now towards contemporary biologists, we will face the same situation.

It may be that many of you have heard about sociobiology or evolutionary psychology. This time, the point is to have human beings objectively understood from a biological evolutionary point of view. And again, we deal with an opposition.

What we feel as important for its own stake, be it love, the sense of justice, or the feeling for beauty, will be explained as the result of evolutionary processes where the important point is, for instance, to succeed in identifying and attracting a fit mate, and to succeed in providing children with as many advantages as you can, in order for them to transmit

in a successful way the genes that made you able to do all that.

This would be the objective tale, the one which makes us part of nature. Whatever we feel and respect is then but a subjective feeling that must be explained in those objective terms.

Now, it could obviously be asked to those biologists if the value they themselves give to objectivity, to the scientific explanation of why we feel and cherish, is itself to be explained in the same subjective terms. It could be asked if the high feat of having explained away human values has not its own so-called evolutionary objective value in advancing an academic career, and thus being able to provide a comfortable life for one's own children.

This would be what in philosophy we call a retorsion: you retaliate by using the very same argument as your opponents, but you use it about those who implicitly mean to be excluded from the consequences of the argument they use about others. The result provided by the retorsion is absurdity: if the argument is correct, then we have no reason to pay attention to the one who provides it, and thus no reason to take this argument seriously.

It is the same structure as the famous Cretan Epimenides claiming that all Cretans are liars. If we take seriously Epimenides, then he is a liar, but then we don't have to take him seriously, but then maybe even if he is a Cretan he may tell the truth, but then we have to take him seriously...

Now, it is not by chance that I have used the word "opponent". To use retorsion is to refuse speaking with somebody, trying to understand her position, it is something like a declaration of war. And using it against scientists is a very violent move indeed, because they do not wish to harm us, they believe that learning how to disentangle the objective from the subjective is the best service they can provide to human societies.

I will take as an example of this goodwill what sociobiologist Edward O. Wilson calls "consilience", meaning the possibility of some harmonious unity of knowledge.

Wilson holds that "nature is organised by simple universal laws of physics to which all other laws and principles can eventually be reduced", but he derives from natural selection that human beings have a genetically rooted need for "sacred narratives". Men need a sense of a larger purpose,

he writes, in one form or another. Thus there may be “consilience” since the importance of values appears to be objectively, that is genetically, grounded. We would need meaning just as much as we need oxygen. Nobody would claim that our need for oxygen is subjective only.

Wilson’s consilience means his hope that science may well have the value of a sacred narrative, uniting mankind and giving human life its sense of worth and importance. However the bifurcation is lurking, ready to explode. Wilson will certainly not recognize that the simple universal laws of physics together with the story of genes and biological selection are just one sacred tale among others. He rather hopes that, since we are sacred narratives producers, we will be able to turn the objective scientific story into a source of spiritual inspiration and be satisfied by it. The advance of science will then be giving us a sense of a larger purpose, even if this advance establishes that nature is to be explained by laws that are devoid of purpose, or that the more we understand the Universe, as physicist Stephen Weinberg said, the more it appears pointless. The advance of science is itself bifurcating into its objective content and the subjective meaning it could acquire for us, as genetically inveterate sacred narratives producers.

If Whitehead, whose philosophy was created some eighty years ago, is still a philosopher for our time, it is because he squarely faced the issue most philosophers evade. For Whitehead, the bifurcation of nature into a causal, or objective nature, as it is explained in scientific terms, and an apparent nature, the nature as we perceive and feel it, is not something we can accept because it leads to absurdity.

As a result of such bifurcation, Whitehead comments, we should conclude that nature gets “*credit which should in truth be reserved for ourselves: the rose for its scent; the nightingale for his song; and the sun for its radiance. The poets are entirely mistaken. They should address their lyrics to themselves, and turn them into odes of self-congratulation on the excellency of human mind. Nature is a dull affair; soundless, scentless, colourless; merely the hurrying of material, endlessly, meaninglessly.*” (SMW, 54)

Now for Whitehead this is something absurd. And all the more so because we are led to inconsistency as soon as we wonder about the sciences which impose the conclusion that Nature is a “dull affair”, that is as mate-

rial obeying pointless laws of nature.

Indeed we cannot describe the scientific work which led to this conclusion without describing the scientists as looking for explanations, that is as endowed with an activity gifted with meaning and aim.

We thus have two dominating modes of description, one for a reality which would be submitted to causal mechanisms, and the other for ourselves as self-determined beings, and the two are needed in order to understand science. *“This radical inconstancy at the basis of modern thought accounts for much that is half-hearted and wavering in our civilization. It would be going too far to say that it distracts thought. It enfeebles it by reason of the inconsistency lurking in the background.”* (SMW, 76)

Now, I would never deny that dealing with some parts of nature as devoid of value and feeling may be quite useful in certain circumstances.

For instance, I can punch this table in order to better convince you. I am the one who decided to hit the table, and I am also the one who felt the shock while the table remains indifferent. However, generalizing this indifference of the table to the whole of nature leads to being unable to take into account the very simple fact that not everything in nature is indifferent.

And this non-indifference does not begin with mankind. In the following example, proposed by Whitehead, an angry man is featured, but it could also be an angry bull or an angry cat. *“An angry man, except when emotion has swamped other feelings, does not usually shake his fist at the universe in general. He makes a selection and knocks his neighbour down. Whereas a piece of rock impartially attracts the universe according to the law of gravitation. The impartiality of physical science is the reason for its failure as the sole interpreter of animal behaviour. It is true that the rock falls on one special patch of the earth. This happens because the universe in that neighbourhood is exemplifying one particular solution of a differential equation. The fist of the man is directed by emotion seeking a novel feature in the universe, namely the collapse of his opponent.”* (MT, 28-29)

The price modern thought paid for opposing the rock's impartial fall and the angry man's partial fist was not, for Whitehead, a matter of intellectual or philosophical inconsistency only. In the last chapter of *Science and the Modern World*, Whitehead writes that modern time has given to

aesthetical values the most superficial attention. We may well love art, but we do not hesitate to deface beauty in nature.

*“A striking example of this state of mind in the middle of the nineteenth century is to be seen in London where the marvellous beauty of the Estuary of the Thames, as it curves through the city, is wantonly defaced by the Charing Cross railways bridge, constructed apart from any reference to aesthetic values”.* (SMW, 196)

This, for Whitehead, was directly correlated with the modern weakness he diagnosed and linked to the inconsistency lurking in our way of thinking. Indeed why not to deface the beautiful estuary of the Thames if poets are entirely mistaken, if they should address their lyrics to themselves and turn them into odes of self-congratulation about the excellency of the human mind? There is nothing special with the estuary of the Thames only the subjective values we attribute to it.

But this may even go further, as human sciences progress, since this advance of knowledge leads to deride human values as well, because society is only the hurrying of egoist interests, endlessly, meaninglessly, blindly making up human history. Indeed the cut between what is objective and what is subjective is not a stable one. What is stable is the cut itself, between objective values, the ones that define scientific work, and subjective ones, the ones which scientists feel free to interpret or explain away at will.

A rather simple solution to the problem would be retaliation. We could then tell Wilson, for instance, that he himself exemplifies his own thesis, giving a sacred meaning to what he calls objectivity. This is a path Whitehead will never follow. He is very clear about that that in *Process and Reality*: “Science is either an important statement of systematic theory correlating observations of a common world, or is the daydream of a solitary intelligence with a taste for the daydream of publication. But it is not philosophy to vacillate from one point of view to the other.” (PR, 329) Whitehead’s philosophy will not vacillate, he will always accept the importance of science’s results, when they are relevant. Mathematical physics’ differential equations may not be relevant for the angry man’s fist, but they are for the falling stones.

It is also possible to diagnose the partiality of the scientific under-

standing of the world, claiming that it leaves outside the true nature with her beauty, values and self-determining properties. Putting into question human understanding may be associated with Henri Bergson, for instance. For Bergson, our intellect, which is at work in science, is unable to grasp becoming. Intellect is bound to interpret what we perceive, and this interpretation is always a reduction of what becomes in terms of static categories. To put it shortly, intellect spatializes time. Time, for Bergson, is creation, is invention. Physics' interpretation is then the most dramatic exhibition of the way intellectual interpretation tames down creation and abstracts away becoming, submitting change to spatial interactions and to deterministic laws.

Henri Bergson thought is a deep and important one, and I have simplified it in order to produce a contrast with Whitehead. Whitehead knew Bergson's diagnose and he agreed with Bergson about what he himself called the "**fallacy of misplaced concreteness**". Matter, as defined by physics, which is as bits of material that can be defined as situated somewhere in space, independently of everything else, and whose motion depends upon the interaction with other bits of material, is an abstraction. It was a very successful one for physics, but the mistake, or the fallacy, was to give to this abstraction a misplaced concreteness, that is to accept that this abstraction is able to define reality, what concretely exists. This leads right to the bifurcation of nature.

However Whitehead did not follow Bergson about the impossibility for human intellect to grasp becoming, and about the idea that only intuition could give us a faithful access, devoid of interpretation, to what is concrete, that is to becoming.

For Whitehead, we cannot think without abstractions. So he did not accept Bergson's intuition as concrete, as getting some kind of immediate access, devoid of interpretation, to the concrete truth of things. Whitehead once wrote that "*If we desire a record of uninterpreted experience, we must ask a stone to record its autobiography.*" (PR, 15)

Thus, for Whitehead the problem is not abstract thought, it is our mode of abstraction, our mode of interpretation, having some aspects of the experience matter while others are neglected.

For Whitehead, abstract propositions, be they propositions related to



a perception or philosophical propositions or scientific propositions, are not abstracted from something more concrete, more “truthful”. They are first and foremost interesting, they elicit interest, and, more precisely, a variation of interest. In *Modes of Thought*, Whitehead wrote that the basic expression of this value is – “*Have a care, here is something that matters! Yes – that is the best phrase – the primary glimmering of consciousness reveals, something that matters.*” (MT, 116) Abstract propositions are asking for, and prompting us to, a “leap of imagination”; they act as a lure for feeling, for feeling “something that matters”.

Thus, Whitehead did not think that we were prisoners of a particular kind of abstraction, for instance bound to reduce time to a static, spatialized, ghost. This is why he spoke about “fallacy” of misplaced concreteness, or else of a mistake; The mistake was a deep one, indeed, with many important and unfortunate consequences. But it was a mistake, nevertheless, not the truth of human knowledge.

As a consequence, the duty of the philosopher was not to criticize abstract thought as such, but to try and take care of our modes of abstraction. More precisely, in front of the bifurcation of nature, the philosopher’s duty was to construct new, more relevant modes of abstraction. And this duty was a pressing one since what had been successful for physics, and acceptable for chemistry had turned into a failure when living beings are concerned.

Whitehead accepted Darwin’s doctrine of evolution. But this doctrine, for him, spelled out the irrelevance of matter as physics conceives it. “*Evolution, on the materialistic theory, is reduced to the role of being another word for the description of the changes of the external relations between portions of matter. There is nothing to evolve, because one set of external relations is as good as any other set of external relations. There can merely be change, purposeless and unprogressive. But the whole point of the modern doctrine is the evolution of the complex organisms from antecedent states of less complex organisms. The doctrine thus cries aloud for a conception of organism as fundamental for nature.*” (SMW, 107)

Whitehead would have seen sociobiology and evolutionary psychology, which agree to make selection the only responsible for the difference between a stone and a human as the direct consequence of this cry being

muted.

I will come back to the content of Whitehead's concept of the organism, the importance of which was such, for Whitehead, that he still talked of his own philosophy in *Process and Reality* as the "philosophy of organism", even while, as we will see later, it was no longer a primary term.. The main point now is to emphasize that it was not an intuition. Organism is also an abstraction, that is an interpretation, but Whitehead hoped it would be a more relevant one.

This position of Whitehead with regards to abstractions – do not criticize them, construct better, more relevant ones - is what I call Whitehead's constructivism.

It is important to differentiate this constructivism from any form of deconstructivism. Usually, if I tell somebody "yes, but this is your construction, your interpretation of the situation", the person I address will understand that I am criticizing him or her, or at least downplaying his or her position. Somehow he or she missed the situation by imposing upon it his or her view. So, I am deconstructing his or her position by showing that it was only a construction.

A constructivist thinker, as I use the word - but some would speak about constructionism - never will say "it is **only** a construction". If I am interested in somebody's position, I will ask : what does this position make important ?; which aspects does it have mattering ?; how do they matter ?; how does it justify the neglect of what does not matter ?; what are the consequences of such justifications ?

This is not criticizing but evaluating. And I can evaluate somebody's construction not because I would have a direct access to what the construction is about, but because I am concerned. It may be that aspects which are neglected away are important for me, or that the kind of justification that is used has consequences I cannot accept.

Proposing the organism as a candidate abstraction to understand the order of nature without having it bifurcate, as Whitehead did in *Science and the Modern World*, published in 1925, is the answer to the claim that to neglect away value, as a subjective feeling only, leads to absurdity. Partiality is in nature. Value must, one way or another, belong to nature.

Whitehead proposes that whatever we deal with in sciences, be it phys-

ics, chemistry or biology, and even psychology, are organisms. What is an organism? I will characterize it using two main features. The primary feature of an organism is that it endures. The second feature, to which I will turn later is that it affects its environment and is affected by its environment.

Let us take the first feature, enduring, that is maintaining its own existence during some period of time. What is to be understood is that enduring here does not just mean having a duration. What endures does succeed in enduring. Enduring is not an attribute, as it is for a mass, it is an achievement, as we know it is for a living being. Being alive is not an easy matter. In very general, abstract terms, an organism is the achievement of a togetherness, what Whitehead will describe as a grasping and holding together in a definite pattern, of aspects of other beings.

In physics, theories do not speak about the stability of atoms and molecules as achievements. We know they may be unstable, but we will say that if a molecule is destroyed along a chemical reaction, while different molecules are produced, it is because of interactions, it is not because the first molecules failed to endure. As for atomic nuclei, we know that they can disintegrate without this event being explained by interactions, but we are used to this fact, and anyway, Whitehead's concept of the organism does not provide an explanation.

Thus physicists and chemists could say that the concept of an organism is of no use for them, and it is normal, since we are in the domain where modern scientific abstractions have been relevant. However, even here Whitehead's concept changes something very important. Indeed it means that it is because something endures, succeeds in keeping its identity, that we can explain its behaviour.

Thus, when physicists explain the behaviour of an atom or of a molecule, as a function of interactions, they may do so only because what they characterize does endure.

In other words, even when physical abstractions are successful, the reason for their success is not that the organism would obey physical laws. The laws hold only as long as the organisms endure. Thus the power of the laws of physics is restricted. They do not define a reality, they are relevant because of the endurance of what they describe.

But it is in biology that the concept of the organism dramatically enlightens the high feat we refer to when we speak about stability. For instance, when we describe a living being in terms of biological functions which explain that it succeeds in staying alive.

Since Whitehead, there has been a lot of progress in the description of living beings at the molecular level, and molecular biologists have assigned to particular molecules logical, functional, roles such as activation or inhibition, roles that seem to explain biological functioning. But the more they learned about what happens inside a cell, or among cells, penetrating the details of molecular processes, the more some of them came to experience perplexity and wonder. Indeed what was discovered is that the functional role attributed to a particular molecule is not an attribute at all. For a molecule to play its assigned role, other molecules are required to play other roles and their number is ever growing. In other to have that molecule activating that process, we need let us say three so-called “co-factors” but they themselves in order to play their co-factor role, again need other molecules, and so on...

In other words, the possibility to assign a particular, limited role to a molecule and explain a biological function through this role emerges from a bewildering molecular entanglement. Some biologists now even propose to reverse the usual course of reasoning. What would come first would be the emergence of some pattern of functioning able to maintain itself in a changing environment. Robustness would be the first achievement. It would be required first, before this pattern of functioning may acquire a specific biological functional value.

This is exactly the kind of guiding abstraction Whiteheadian organism was meant to inspire. As Whitehead wrote, “*There is no such thing as mere value. Value is the outcome of limitation. The definite finite entity is the selected mode which is the shaping of the attainment. The mere fusion of all that there is would be the nonentity of indefiniteness. The salvation of reality is its obstinate, irreducible, matter-of-fact entities which are limited to be no other than themselves.*” (SMW, 94)

The primary feature is thus not general interactions, leading to some kind of “fusion” of all that there is, but an entity holding together in **this** way, a very partial, definite way. This gives its meaning to value: the or-

ganism is not holding together impartially, or in general, but in **this** selected mode. Thus value is limitation, it refers to the way the organism defines itself, being no other than itself, obstinately maintaining its own way of holding together, as long as it is able to endure.

We may think to people we call obstinate or even stubborn. Whatever we tell them, they understand and interpret their own way, and sometimes you may feel that if ever you did succeed in convincing them to change their mind, to truly hear what you are telling them, they would disintegrate. This is why you are often patient and usually avoid to try having them change their mind. This is how obstinate people affect their environment.

This leads to the second aspect of an organism as a primary natural entity, which is its capacity for affecting its environment. *“That which endures is limited, obstructive, intolerant, infecting its environment with its own aspects. But it is not self-sufficient. The aspects of all things enter into its very nature. It is only itself as drawing together into its own limitation the larger whole in which it finds itself. Conversely it is only itself by lending its aspects to this same environment in which it finds itself.”* (SMW, 94)

Again, to tell about a molecule or an electron as infecting its environment with its own aspects would appear as a simple play of words, a curiously complicated way to describe interactions. But it is relevant for living enduring entities, be them cells, organs or organisms in the usual sense, since they are not themselves independently of a complex environment they partly shape, upon which they depend but which can also put them at risk.

However it is when we turn to enduring human institutions or organizations that one of the consequences of Whitehead’s concept of the organism becomes particularly thought-provoking. The Whiteheadian organism is a grasping of both what we call its parts and its environment. There is no clear-cut difference between parts and environments as in both cases the grasping draws into its own limitation what it grasps, but also infects it with its own aspects. And in both cases endurance depends on what Whitehead called the patience of what is infected with regard to the way it is infected. The obstinate person depends on the patience he or she demands from you.

Let us take a hospital for example. Everybody knows that as soon as you enter a hospital, it is better that you forget the kind of civilized manners you are used to, when outside. It is hard to say if you are now part of the hospital or still part of its environment because even if you are just coming to visit a hospitalized friend, you are prepared to see something you would not accept outside: for instance, doctors or nurses entering a room whenever they like. And if you are a patient, you will accept them discussing about you, in front of you but not with you.

The complex enduring pattern we call a hospital selects those aspects of both its environment and its parts that are relevant for its functioning and infects, that is lends its own aspects to, what it draws together in its own limitation. But it also depends upon the patience of what it infects.

If ever those who are quite rightly called the patients did become impatient, collectively refused to be infected by the hospital pattern and demanded to be treated in a civilized manner, what we call a hospital would not endure, be it for the better but maybe also for the worse.

I have tried to show that Whitehead's concept of the organism has many interesting consequences, one of them being that we have not to wonder why some social institutions do crumble down. They did seem to have the power to explain their own functioning, just as, in a hospital, people would tell you, "it could not be otherwise, because..." But their explanation holds just as long as the environment they depend upon is patient. Their own specific value - to be holding in this way and no other - may disappear, together with all the good reasons that justified it, if their environment becomes impatient.

And this may be for the better or for the worse. For Whitehead, endurance is a value for the organism, not a transcendent value, and so is impatience, that is for a part or for an environment not to fulfil the role an organism requires it to play in order for this organism to be itself.

The question now is: Is this meaning assigned to values sufficient to overcome the bifurcation of nature ? As we will now see, it was not.

I come now to the reason why Alfred North Whitehead may be named the most surprising among 20<sup>th</sup> century philosophers, the one who, in a very few years, after writing *Science and the Modern World*, took the most

dramatic speculative turn. Indeed the book he published in 1929, *Process and Reality*, is no longer about modern thought, the dominating abstractions of which should be revised, and it is no longer about nature either; Whitehead subtitled it “An Essay in Cosmology”.

We should hear two things with this idea of Cosmology. The first is that now everything that may be told to exist will be concerned. And the second is that a Cosmos is not just a Universe, some kind of a matter-of-fact ensemble of everything that exists. It is, as it was with the Greeks, something with an inherent value.

As I already emphasized, for Whitehead we cannot think without abstractions but we must take care about our modes of abstraction. We need different modes of abstraction to exhibit what matters when the order of nature is concerned, as it was the case in *Science and the Modern World*, and when the Cosmos is concerned. This also makes the difference between speculative philosophy and sciences. Speculative philosophy addresses what exists as part of a Cosmic adventure, while sciences address the order of nature.

Both the concepts relevant for the order of nature and for the Cosmos are thus equally abstractions. And it is the very mark of a constructivist thinker to feel free to revise, transform, and redefine her concepts because those concepts are related to a way of having a particular question matter. If another question comes to matter, the concepts have to change.

What is the difference that matters for Whitehead between the Cosmos and the order of nature? The difference is that the order of nature is a problem for the thinkers, scientists and philosophers, while the Cosmos must include the thinker. Thinking itself must become part of the Cosmic adventure.

Now, what would happen if the organisms, as I have characterized them, were transplanted in the Cosmos?

I have presented the example of obstinate, stubborn people. More generally, we may say that the concept of an organism is quite relevant when what we call habit is concerned, be it habit of perception, what I select and see, what escapes me, habits of behaviour or habits of thought. All habits are selective, and some obstinacy is important since it is the very meaning of habits that they are able to endure in a changing environment.

Furthermore the disarray you experience when you feel your environment is displaying impatience against your habits, not yielding to them, is a beautiful illustration of the risk, which is part of any Whiteheadian organism's way of being.

Thus organisms could be relevant for psychology or socio-psychology as they deal with human habits, as parts of the order of nature. The reaction of the angry man belongs to nature. And they would be useful there, because we often have the habit of judging habits as a weaknesses, as something from which we should free ourselves in order to be free. The concepts of organism help us to see habits as achievements. In a way laws of nature rely on robust habits, and so do our living bodies and our most complex behaviours. For Whitehead, as well as for William James and the whole Anglo-American tradition, starting from Hume, habits are not something to criticize. They are achievements indeed.

It seems clear, reading *Science and the Modern World*, that Whitehead had first thought that his concept of the organism was meant to be generally relevant for psychology as the science not only of habits but of human experience in general. And it may well be that it is at that point that he did experience what a famous dictum of Leibniz describes: "I thought I was safely in the harbour and I was rejected in full sea".

Indeed, if organisms were the key, Whitehead would never be able to describe in a coherent way the possibility of his own enterprise, trying to take into account what we habitually abstract away, struggling with abstractions so dominating that they have become "habits of thought". The very challenge he associates with philosophy – "*Philosophy destroys its usefulness when it indulges in brilliant feats of explaining away*" (PR, 17) – means that habits, and thus organisms, cannot be the last word.

It is a constructivist demand that Whitehead's conviction that a modification of our dominant concepts is possible and important be given meaning in cosmic terms. The Whiteheadian Cosmos will thus have to include the thinker learning to care for abstractions, not being their prisoner. However, this demand is not sufficient because it is too general. As any construction, Whitehead's cosmos is not the whole truth but a conceptual device to have aspects of our experience mattering. A device must have its own functioning rules, constraining the thinker not to in-



dulge in a goodwill thought, to take an active care of his own modes of abstraction. The master word in *Process and Reality* will be “coherence”. The Cosmos must be such that Whitehead’s adventure of thought may belong to this Cosmos he himself describes, and more precisely that the possibility and importance of such an adventure may be coherently affirmed. This means that the Cosmos must provide for what such an adventure **requires**, that it gives its meaning and importance to what Whitehead tries to achieve: a “relevant novelty”.

Whitehead’s speculative concepts are abstractions that make the possibility of relevant novelty matter. The difference between a Cosmos and a universe of organisms may be spelled out through the possibility that a contradiction, for instance either my habit, or yours, or the angry man’s fist, may happens to be turned into a contrast, with both habits not losing their claims, but those claims being articulated in a new non contradictory manner. Such an event does not belong to the order of nature, it is a cosmic event, and it is not restricted to mankind, even if mankind exhibits its importance – the idea of a Cosmos is produced in a human history.

However what is required from the Cosmos, in which relevant novelties happen and may matter, implies another more general requirement. When we succeed in turning a contradiction into a contrast, instead of doing like the angry man I described, who strikes down his opponent in order for his own habits to prevail, it is because we are sometimes able to refrain being angry and entertain the possibility that maybe there is an other way out, that maybe we could be able to discover how to coexist without contradicting each other. We are able to feel the importance of **unrealized possibilities**.

This ability was precisely how Whitehead conceived the difference between animals and humans. In *Modes of Thought*, published in 1938, he wrote: “*In animals we can see emotional feeling, dominantly derived from bodily functions, and yet tinged with purposes, hopes and expression derived from conceptual functioning. In mankind, the dominant dependence of bodily functioning is still there. And yet the life of a human being receives its worth, its importance from the way unrealized ideals shape its purposes and tinge its actions.*” (MT, 27) For Whitehead what is missing with the idea of habit,

is not something like rationality or freedom. What we call rationality or freedom both require the entertaining of unrealized possibilities, the importance of which may even sometimes dominate the consideration of what is.

Whitehead never tires of emphasizing that human experience is not dominated by rationality or survival values. *“Instead of fixing attention on the bodily digestion of vegetable food, it catches the gleam of the sunlight as it falls on the foliage. It nurtures poetry. Men are the children of the universe, with foolish enterprises and irrational hopes.”* (MT, 30)

As I have told you at the beginning of this talk, the sociobiologist Edward O. Wilson also admitted the importance of “sacred narratives” for human beings. However he remained stuck to one particular narrative, the one which describes nature as organised by simple universal laws of physics to which all other laws and principles can eventually be reduced. The need for sacred narrative was then explained by some selective value. For Whitehead the point was not to recognize the empirical importance of hope or the sense of possibility when humans are concerned, but to create concepts that give an irreducible meaning to the feeling for what may be possible, concepts that make it impossible to reduce this feeling to mere uncertainty plus human illusions, however vital be those illusions.

In contrast with many Eastern wisdoms, Whitehead never proposed to consider Men’s foolish enterprises and irrational hopes as the mark of a power of the illusion, from which we would have to escape. He did not wish his Cosmos to tell a truth beyond our illusions, rather he accepted that the adventure of rationality, or his own adventure as a philosopher, were examples of adventures of hope, exhibiting the dominant role a feeling for what, maybe, could be possible, play in human life.

Now, it may well belong to mankind to exhibit the importance of possibility, but it does not mean at all that mankind is the creator of possibility. This would be to accept that our sense of possibility - without which there would be no science, no philosophy, no mathematics, no exploration of the unknown, no foolish enterprises - is just a human subjective feeling in a world of stubborn entities.

Philosophy for Whitehead has not for its duty to produce solutions. Cosmology, affirming relevant novelty, does not object to the human ad-

venture turning into a disaster. For Whitehead what matters is that we do not think and feel this adventure either in terms of a promise that everything will eventually turn well, or in terms of fate, of sin, of human guilt. Novelty and possibility are for the better or for the worse.

Let us now turn to Whitehead's construction. Since cosmology needs the irreducibility of possibility, it needs metaphysics, that is metaphysical concepts that will affirm that everything that exists must be conceived not first as enduring, but as becoming, as the actualization of a potentiality, as making a difference between what could have been, but will not, and what will be. This will be the role of the metaphysical *res verae*, what exists in metaphysical terms, to affirm the ultimate generality of **creativity**. Whatever exists is a creature of creativity, is something irreducibly **new**.

Those *res verae* are what Whitehead called "actual entities", and the whole conceptual or categoreal scheme presented in *Process and Reality* is centred around the challenge of having any actual entity conceived as *causa sui*, transforming potentiality into its own actuality, as it decides for itself how it will fulfil its own process of becoming itself.

It is important to emphasize again that actual entities are metaphysical abstractions: their role is not to give access to a truth which scientific abstractions would miss, but to transform our relation with the specialized modes of abstractions prevalent in current life, in sciences and in philosophy. They are meant to produce coherence, an appetite for relevance, and a distrust for the power of explaining away, which is the glory of most scientific abstractions. Their failure would be that they could be used in order to confirm certain types of specialized abstraction against the others.

For instance, the Whiteheadian metaphysical term "decision" may well invoke our experience of choosing something while something else would have been possible, or of affirming the importance of possibility in front of what is. But it is not to be confused with freedom as freedom has sometimes been philosophically defined: by the power to decide against good reasons. The very reason of this definition was to assure a sharp, radical opposition with causality as it is associated with the laws of nature. Actual entities turn this opposition into a contrast. They will not oppose "to be free" and "to be explained by something else". Their self-pro-

duction is *causa sui*, but not against causation. The metaphysical point is “how” will a cause cause? This “how” is the question forgotten by both causal explanation and the claim to decide without a cause. They both presuppose that a cause has the power to determine its effect.

“*How an actual entity becomes constitutes what an actual entity is*” (PR, 23). With this simple statement, Whitehead overcomes a double simplification he makes matter as hidden in both the claim that something is explained by something else, and the claim that this something may be the free, ultimate source and reason for its own decision. Both claims take for granted that it belongs to a cause to define by itself **how** it will cause while the whole point of Whitehead’s concept of actualization is the determination of this very “how”. The becoming of the actual entity is the process of determining how what causes it will matter in its decision. Its experiential analogue is not what we would call a free decision – the fist striking the table, “I” decide - but envisagement, hesitation and concern.

Once hesitation is over, it becomes possible to define how the situation came to matter, how the decision was derived from the situation, but before this decision, we do not lack any knowledge, we do know what should be taken into account. What we do not know is “how”.

My talk is about Whitehead and nature, not about Whitehead’s metaphysics. This is why I will just emphasize the importance of this question : how ? How will an actual entity be a cause for another, will be taken into account in the process of concrescence through which this other actual entity becomes itself? The answer to this question belongs to the very process of concrescence, but Whitehead added that it needs the ingression of what he called an **eternal object**.

It is here we need to remember Whitehead was a mathematician. If you wonder about strange mathematical entities like complex number for instance, do not try to imagine them, try to understand why mathematicians need them. We cannot imagine or represent what is an eternal object, but we can understand why Whitehead needed them as a metaphysician. His aim was to deprive any cause of the power to define how it will cause, and more generally to protect any becoming against its reduction to a function of something else. But he also had to deprive

the actual entity in concrescence of the sovereign power to determinate how it will be affected by others. The determination is a decision – that way, not another way – but there is no deciding subject, because the decision is producing the subject.

Eternal objects were needed in order for the “how” to be irreducible, in order for the determination, any determination, to require something which belongs neither to the “causes” nor to the entity deciding for itself. Eternal objects are not responsible either because they do not decide about their own ingression. They are **required by creativity**, which is the ultimate, that which all metaphysical concepts must affirm, each in its own way, but that none can explain. That determination needs the ingression of eternal objects is required for every determination of what is undeterminate to be the production of something **new**.

In the same way, it is not because of religious reasons that Whitehead introduced a God in his philosophy, but because he needed it in order for his metaphysics to communicate with a cosmology. He needed God because without a God, his metaphysical categories were able to describe an actual entity including in its own becoming an eternal object already realized in an other actual entity, but not that new unrealized eternal object would ingress and produce relevant novelty, turning a contradiction into a contrast. *“Apart from the intervention of God, there could be nothing new in the world, and no order in the world. The course of creation would be a dead level of ineffectiveness, with all balance and intensity progressively excluded by the cross-currents of incompatibility.”* (PR, 247)

It is important to emphasize that Whitehead’s God is a metaphysical concept. It is a concept which is relevant only when we deal with actual entities. God is not to be the source of social order, be it one which is exemplified by physical laws or by moral habits. God’s functioning has to do with actual entities alone, or, more precisely, with the envisagement of each new entity as an opportunity for a slightly original becoming.

It is written in the Bible that “there is nothing new under the Sun”, which could mean, in Whiteheadian terms, that the habits of the Sun have such a stability that nothing on Earth can disturb it. This is the reverse with God. For God, everything, every actual entity is new. God is completely devoid of habits.

This is important when we come to the very radical challenge of Whitehead's metaphysics. Actual entities do not endure: when they have produced their own determination, when they have become themselves, they exist no longer as self-producing or becoming. Their mode of existence then is that of those "causes", which will enter into the process of becoming-themselves of new actual entities. The formula for creativity is: *the many become one and are increased by one.* (PR, 21)

As a consequence, no continuity can be described as self-producing, *causa sui*, and this includes ourselves as persons endowed with continuous memory, identity, intentions, hopes or reasons, our prayers to God, or our feeling that we do not need God. Instead, they are all adventures that require what metaphysics provides, that production of existence means production of what is new.

Thus we cannot metaphysically speak about a God listening to a prayer, only about a God participating in the intense adventure that is a prayer. God has no power to rule, to explain or even to know what will happen. God is needed as envisagement of each new actual entity as what maybe could escape the impasse of already settled modes of determination, and maybe produce relevant novelty. This is why Whitehead wrote the "*function of God is analogous to the remorseless working of things in Greek and in Buddhist thought. The initial aim is the best for that impasse. But if the best be bad, then the ruthlessness of God can be personified as Ate, the goddess of mischief.*" (PR, 244)

I turn now to what took the place of the organisms as what endures, that is whatever can be characterized in terms of a continuity, however short. As I emphasized, what endures is now a society and a society is no longer what is real in the final, metaphysical sense. What is real in this sense are actual entities. But I must immediately repeat that this emphatically does not mean that there would be something illusory about societies. Whitehead was a mathematician, and when a mathematician produce a new definition, here substituting societies for organisms as a key to the order of nature, it is not to destroy the previous one, but to be able to answer new questions.

So the right question is: what can we understand now, in terms of societies, that had no meaning in terms of organisms?

What was endurance, when organisms were concerned, is now “social continuation”. That societies are not *res verae* means that a society is not in itself a cause, it has no power to impose its own continuation. The power on which depends the continuation of a society belongs to the decision of actual entities only. Each entity appears in a social environment and what it has to decide, as it becomes itself, is how it will conform to this social environment and continue it, or diverge from it.

Continuity thus means conformation, reiterating the mode of self-determination of others that have already decided for the continuation of some defining characteristic, producing again the relevance of some particular interrelated “how” that contributes to a social role. Any role, any function, any explanation, now depends on actual entities ratifying some social trend.

We may think about a familiar situation when we have to give an interpretation about a situation after many others in a group have already given a convergent same one. Yes we are free, but it is hard to disagree because of the already settled social environment of our evaluation. There is no need to invoke the power of the group, the possibility that a divergent interpretation will result in adverse consequences: it is the situation itself as we perceive it which has been progressively shaped in such a way that the prevalent interpretation appears as the normal, obvious one. We perceive it the way it matters for others, and it may be said in a positive way that we have learned how it did matter, or, in a negative way, that we have conformed.

Metaphysics, for Whitehead, is neutral about this point. What it is concerned with is that, when we describe an actual entity, agreement and disagreement, continuation or betrayal of social continuity be put on the same plane, none needing a supplementary explanation, both being equally decisions, none being forced choices.

Whiteheadian organisms were meant to unify the multiplicity of our sciences. Whiteheadian societies are meant to elucidate their divergences. And the most important divergence, for Whitehead, concerns living and non living societies. Biology is again at the centre, but no longer as an example of self-sustaining enduring order in nature. The contrast is that while the success of physics designates the social dominance of conformity

with past decisions, biology deals with beings able to adapt, which means able to innovate, to produce original answers to changing conditions.

Whitehead wrote that “*Life lurks in the interstices of each living cell and in the interstices of the brain.*” (PR, 105-106) In other words life as such is not a defining characteristic of living societies. A living society, as any other societies, “*binds any one of its occasions to the line of its ancestry.*”(PR, 104) What is particular with living societies is the possibility for some diverging actual occasions, as they escape the shackle of reiteration from the past, not to be averaged away, dismissed with no consequences.

Living societies are structured in such a way that novelty may matter, may induce an enduring social modification. Novelty is thus canalized into originality, but canalization also means that novelty has found some stable, if restricted, expression.

Whitehead thus proposes to see living societies as agencies the very specificity of which is not order as such, but their ability to harbour and canalize novelty into a new order. And now, the connection with psychology is easy. Habits are no longer threatening. We may say that laws of nature, as discovered by physics, are habits indeed, but the distinction that matters, the one because of which actual entities had to be speculatively invented, concerns the difference between so-called physical habits and living ones. Physical habits can only endure or disintegrate, living body habits are open to originality, they may “adopt” novelty, being transformed and not destroyed by them.

What we may call mental habits, habits proper to those very sophisticated entangled societies that came to existence with human beings, even signify a reversal of importance. The mental habits of a mathematician can be compared to a social order **at the service of its own interstices**.

Originality, in this case, can no longer be interpreted as adaptation, emphasizing continuity through modification. Originality now means adventure, irrational hopes and foolish enterprises. Adventures that may mean disaster, hopes that may be disappointed, and enterprises that may destroy their environment, but that all proclaim that the continuity of conformity has become a matter of speculation and concern, requiring the intense contrast between what is and what may be.

For Whitehead the human and social science by excellence was educa-



tion, the aim of which should be to provide habits of sensitiveness against dead abstractions, to provide habits that may be compared with a *culture medium for interstices*. Whitehead's metaphysics is abstract, indeed, as we cannot perceive an actual entity, but metaphysical abstractions are not meant to induce some kind of an abstract position, forgetting about nature and life. They are meant to induce vivid feelings that our usual abstractions lead us to judge as subjective only. When a teacher feels that what she is doing is important, that it is not only a transmission of useful knowledge, Whitehead metaphysics tell us that she indeed participates to what may be called a cosmic adventure, because the manner the children will experience new possibilities, feelings and ideas, or stubbornly keep to their abstractions, to their judgement about what matters and what does not, is indeed a cosmic stake.

Whitehead embarked the philosophical adventure because he felt modern thought needed new abstractions. The abstraction he produced is meant to activate resistance against the power of generalization, the power to eliminate away what does not fit our explanations, whatever explanation, be it by physics, psychology or religion. What his abstractions are meant to promote instead, he has described at the end of *Modes of Thought*.

*"Philosophy begins in wonder. And, at the end, when philosophic thought has done its best, the wonder remains."* (MT, 168)

I would add, and this is the reason why I love Whitehead, that the wonder that remains after he did his best is combined with a sense of adventure, and protected against any temptation to bow down in front of powerful, reductive explanations.

### Abbreviations and References

- MT** Alfred N. Whitehead, *Modes of Thought* (New York: Free Press, 1968).
- PR** Alfred N. Whitehead, *Process and Reality: An Essay in Cosmology*, corrected edition by D. R. Griffin and D. W. Sherburne (New York: Free Press, 1979).
- SMW** Alfred N. Whitehead, *Science and the Modern World* (New York: Free Press, 1967).