Articulating science and theology: presuppositions and implications of science

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Communication presented in the *Sixth European Conference on Science and Theology* (ESSSAT VI), Cracovia (Poland), March 26-31, 1996
Unpublished text.

Science and theology are two different realms separated by a methodological gap. Nevertheless, they can be connected by some bridges (Barbour 1990). I will refer here to one of them, namely the general presuppositions and implications of science (Artigas 1992).

General presuppositions are necessary conditions of the whole scientific enterprise. There are, at least, four of them. The first is the existence of a natural world with a consistency which is independent of our will. The second is the orderly character of this world. The third is the contingency of the natural order. And the fourth is the human ability to know this natural contingent order. The entire scientific enterprise would be impossible without these presuppositions, which cannot be proved within science itself.

On the other hand, the progress of science exercises some kind of feedback on those presuppositions: it retrojustifies, enlarges and refines them. Actually, the more the sciences progress, the more we can be sure that we are grasping in some way a natural order which is independent of us.

What contemporary science shows is that nature is not only ordered, but organized. The concept of order is relative, as it always depends on some particular framework; organization is a particular kind of order: it supposses a multiplicity of elements which cooperate in forming a single system.

Our world consists of different levels of organization, from the subatomic particles to the stars and the living beings. It is not necessary to accept an extreme kind of holism in order to recognize that there are many holistic dimensions in nature: the analytical perspective is extremely effective because it allows us to know the specific details, but now it has become evident that, within science itself, this should be combined with a synthetical perspective in which the wholes, and not only the parts, are relevant.

Natural order includes patterns, systems, holism. But it also includes information. Genetic information is perhaps the most striking example of this kind of materialized rationality, as it represents a set of instructions stored in material structures. But every law can be considered as a pattern of information. Laws do not exist by themselves: they represent in an abstract way the behaviour and the possibilities inherent to matter. And, what is more striking, every natural system seems to possess, in some way, an entire set of information about all possible natural processes. For instance, using metaphorical language, any electron knows how it should behave in any particular

circumstance, in combination with a potentially infinite set of arrangements with other material entities.

We live in a very specific world which is characterized by synergy. Nature is already organized at its most elementary levels. For instance, the behaviour of fermions according to the principle of exclusion shows that every single atom is organized following specific patterns. Generally speaking, the ability to build up patterns is one main characteristic of the natural world. Speaking about the microphysic world, Paul Davies has written: «It is one of the universal miracles of nature that huge assemblages of particles, subject only to the blind forces of nature, are nevertheless capable of organising themselves into patterns of cooperative activity» (P. Davies 1989, 4).

Besides, natural behaviour is also very subtle. Indeed, information is stored, coded and decoded, displayed through the activity of messengers which transmit their messages. Although we already know many features of this kind of activities, we are only at the beginnings, but it is enough to be astonished about the subtleties of nature. What is amazing is not only the activity of living beings, but also the physical and chemical basis that makes possible the existence of these beings and of their activity.

If we combine all this with the image of a universe which has evolved from much simpler states to its present state, it is easy to recognize that we are the witnesses of some kind of paradigm shift in science. The ancient organistic paradigm was substituted by mechanicism during the scientific revolution of the seventeenth century, but mechanicism began to colapse long ago and now a new picture is emerging which is centered, precisely, around emergence and self-organization.

The relevance of this shift is perhaps much bigger than what is usually thought. Paul Davies and John Gribbin describe it in this way: «The movement towards a 'post-mechanistic' paradigm, a paradigm suitable for 21st-century science, is taking place across a broad front: in cosmology, in the chemistry of self-organizing systems, in the new physics of chaos, in quantum mechanics and particle physics, in the information sciences and (more reluctantly) at the interface of biology with physics. In all these areas scientists have found it fruitful, or even essential, to regard the portion of the Universe they are studying in entirely new terms, terms that bear little relation to the old ideas of materialism and the cosmic machine. This monumental paradigm shift is bringing with it a new perspective on human beings and their role in the great drama of nature (...) We have no doubt that the revolution which we are immensely privileged and fortunate to be witnessing at first hand will for ever alter humankind's view of the universe» (P. Davies-J. Gribbin 1991, 2-3).

Scientific progress also enlarges our views about the human ability of knowing. Science would be impossible were it not because we have some characteristics which should be considered as another kind of necessary conditions of the entire scientific enterprise, such as the descriptive and argumentative functions of our language, which include creativity and hermeneutics. Natural science is a kind of dialogue with nature, and this is possible because we have designed a language which allows us to pose questions and to interpret the answers. This way, scientific progress is one of the better proofs we have today in order to study the singularity of human beings when compared with the rest of natural beings.

Natural order, and its manifestation as a specific kind of multi-level organization, is an ontological presupposition of science. Our ability of knowing this order is an epistemological presupposition. We can also speak of an anthropological presupposition, if we consider empirical science as a goal-directed enterprise directed to obtain a knowledge of nature which may be submitted to empirical control. This is an essential part of science, because science is, above all, a human enterprise and its products can be aptly valued only when they are considered in the context of this specific human activity. Today, scientists are aware of the existence of these presuppositions (Hodgson 1979).

If we reflect about science, putting it on the background of these presuppositions, we can immediately realize that scientism is nonsense. Of course, empirical science has its own autonomy and its products cannot be judged by using standards other than the scientific ones. But the existence of presuppositions which are a necessary condition for the scientific enterprise and the feedback of scientific progress on these presuppositions clearly show that empirical science should be considered as a human activity integrated within a broader context. In other words: empirical science is rooted on some ontological, epistemological and anthropological presuppositions which are a necessary condition for the very existence of science but, nevertheless, they cannot be studied by using specific scientific methods.

The study of these presuppositions is, therefore, a task which corresponds to the philosophical and theological perspectives. From the historical point of view, some greek and christian ideas furnished the framework necessary for the development of modern empirical science. Putting aside some particular points which are not really so important, the alledged conflicts between science on the one side, and philosophy and theology on the other, belong almost entirely to the nineteenth century, and were the outcome of such bad philosophies as hegelianism (at least, in his natural philosophy part), materialism and positivism. Now, the conditions are most favourable for an integration which, respecting the autonomy of the three realms (science, philosophy and theology), relates them in a kind of a new humanism which is not only desirable, but also a real need of our age.

I think that it is easy to agree with this general perspective about science and nature. What is more difficult is to determine exactly its philosophical and theological import. Using this basis to argue from science to divinity requires a long journey. Indeed, it is difficult to prove that some specific ideas about the divine may be seen as necessary conditions of scientific reasoning or as implications of particular achievements. And, even if we could conclude that there are some general metaphysical ideas related to science, this could be connected with different views about their ultimate foundations.

Nevertheless, if our reflections can serve to build a real bridge between the sciences on the one hand, and the philosophical and theological reflection on the other, this would already be extremely important. And I think that this is the case. As I have referred here especially to the ontological presuppositions and implications of science (and therefore to the new paradigm about natural order and self-organization), I will conclude with a hint about the philosophical and theological import of this new paradigm. Paradoxically, I will use a text which is already seven centuries old.

This text belongs to the commentary of Thomas Aquinas to the Physics of Aristotle, when the topic considered is the existence of finality in nature. After an examination of the aristotelian arguments in favour of teleology, Aquinas ends his lecture with a kind of solemn definition of nature, which runs this way: «Nature is nothing but the reason of some art, namely the divine one, interior to the things, by which those things move towards a concrete end: as if the man who builds a ship could give to the pieces of wood that they could move by themselves to produce the form of the ship» (Aquinas 1954, book 2, chapter 8: lectio 14, n. 268).

This kind of definition shows that the idea of self-organization is very old. Indeed, it is easy to conceive it on the basis of the development and activity of living beings. What is new is the detailed knowledge of it in the physical and chemical levels, and also in molecular and developmental biology. We know now many accurate details that furnish a very interesting background for the old idea.

Also, what can be disputed about that idea is the explicit reference to natural teleology. Nevertheless, we can certainly say that, in some way, teleology should be considered today as a fact, as far as we find in nature many systems whose organization is very stable and whose constituents behave in a functional way. We can even say that the whole system of nature, as we know it, is the condition of possibility of our own existence and, therefore, that if we consider it under the light of the human existence and values, everything makes sense.

We find in nature some characteristics, such as consistency, rationality, harmony, intelligibility, effectiveness, beauty, which are rooted in ordinary experience but are also underlined by the new developments of science. This is generally recognized now, although it is interpreted in different ways (Davies 1992; Gilkey 1993). What is most mysterious is the specific way followed by natural creativity, from the simplest elements until the living beings and, above all, human beings.

To look at nature as a pre-condition for our existence and, therefore, for the existence of human values, should not be considered as any kind of antropomorphism or antropocentrism, but as the plain truth: it is, indeed, a fact. We can proceed further and think about the meaning of this fact, but the progress of science does not preclude a metaphysical or theological interpretation of it. In this context, it is important to realize that we face today a new scientific paradigm, a new way of thinking about science and nature.

The systematic birth of modern physics was accompanied, in the seventeenth century, by a mechanistic philosophy which was thought to be the right interpretation of nature. In that context, until the end of the nineteenth century, concepts like substance, form and finality were forbidden in science as well as in natural philosophy. This situation was partly due to the fact that physics, and specifically mechanics, was considered as the paradigmatic branch of any scientific explanation. However, further developments within physics, and also in chemistry and biology, have restored living beings to their central place in nature. Mechanicism conceived them as machines; now, on the contrary, physical systems are partly studied through qualitative approaches which include patterns, information, propensities, powers, and other related concepts.

I do not mean to say that empirical science has ceased to be quantitative in any real sense. Only, it has become apparent that nature as well as science have both quantitative and qualitative dimensions, and it has become fashionable again to work on natural philosophy, i. e., to study those dimensions of nature which are presupposed by the scientific enterprise and are, in their turn, affected by the progress of science.

In the field of natural philosophy, we meet the ideas of patterns in space and time, systems, natural order and organization, information, and teleology, which play an important role as bridges between the sciences and the metaphysical perspective (including both metaphysics and theology).

As I see it, the articulation between science and theology is not some kind of mixture or combination of both: it is impossible to add factors which are not homogeneous. The articulation should rather be achieved at the philosophical level, namely through a reflection on the presuppositions and implications both of science and theology. In this level we can find a real dialogue. My reflections here have been centered around science, but they could also be extended to the presuppositions and implications of theology: a part of them can be conceptualized philosophically, so that there is a real common rational ground which can be the subject of dialogue and mutual complementarity (Barbour 1990). And could also be complemented by a reflection centered on ordinary life, ethics and faith, rather than on science and theology.

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