MARIANO ARTIGAS AND THE PHILOSOPHICAL BRIDGE BETWEEN SCIENCE AND RELIGION

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In a brief assessment of the last four decades, the outlook as regards the dialogue between science and faith shows very encouraging consolidation and progress. Nevertheless, at the same time, some difficulties have arisen, triggering an in-depth review of the contents and proceedings that are at stake in that dialogue.

One of the authors committed to this analysis, perhaps the most prominent one among Spanish-speaking authors, is Mariano Artigas. His death at the end of 2006, in the middle of his career, implies, for his followers, the obligation of recognizing his work. Perhaps, the best way to do so is by spreading his thinking, and also, by continuing and deepening his main lines of thought.

In order to achieve this, I would like to schematically present Artigas' contribution to the understanding of the problems inherent in the science-faith dialogue. I will specifically refer to his insistence on stressing the mediating function of philosophical wisdom as the suitable environment for unfolding a fruitful exchange between disciplines.

Problems of the Dialogue between Science and Faith

I will start by the difficulties that hinder the dialogue between the different kinds of knowledge. Artigas points mainly to three of them. The first one is *specialization*, a phenomenon of increasing deepening into the details of the knowledge of nature. This specialization has had the negative effect of a growing fragmentation of knowledge into incommunicable compartments. Artigas reminds us that specialization was shaped already in the 19th Century with the comparison between the "two cultures", the scientific and the

humanistic ones.[1] Attempts to solve this isolation through the proposal of a "third culture"[2]or of certain limited forms of interdisciplinarity[3]are not enough.

Secondly, he alludes to the different cases of *reductionism*, that is to say the explanation of a certain field of reality by means of causes referred to another field. In this way, the attempted integration of the different kinds of knowledge has become the pure and simple assimilation of some into others. Typical examples of the last centuries are the mechanistic reductionism of physics, and the evolutionist reductionism of biology.[4] Those reductionisms must not be confused with those that belong within a same field of knowledge, where some theories are usually reduced to others of greater scope.[5]

Finally, there is the difficulty of presenting scientific theories in an unsuitable philosophical context, which implies, almost always, the frustration of any possible dialogue. Examples proposed by Artigas are very similar to the previous case. These philosophical contexts are some sort of menial correlate of scientific theories and are subjected to them without taking into account a strictly philosophical approach.[6]

In Mariano Artigas' diagnosis, all these problems originate in the absence of mediating wisdom that allows building the bridges that link science to faith. This mediation by nature concerns philosophy, whenever "every feature or part of science can be the subject of a philosophical, religious or theological consideration". But, at the same time, "in the case of religion and theology we will always need some form of philosophical mediation; we can construct it, take it from an already existing philosophy, or work with a not too explicit philosophy: but a certain dose of philosophy will always be needed to translate scientific elements into humanistic terms".[7]

Thus, some options open up. The first one, which would be to build an *ad hoc* philosophical doctrine, has disastrous antecedents and goes directly against the universality and autonomy of the philosophical discourse. Such epistemological engineering would imply an extrapolation of raw scientific and religious propositions, i.e., without an

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[1]*Filosofía de la ciencia* Pamplona, EUNSA, 1999, p. 53.
[2]*Ibid.* I have referred to the topic in the following paper: "La Tercera Cultura: apuntes críticos y proyecciones educativas", available online: www.enduc.org.ar
[3]*Filosofía de la ciencia* pp. 140-141.
[4]*Op. cit.* p. 41.
[5]*Op. cit.* p. 139.
[6]*Op. cit.* p. 232.
[7]*The Mind of the Universe* Radnor, Templeton Foundation Press, 2001, p. 13.

interpretative context capable of relating them. In my opinion, Kantian criticism, neopositivism and Bergson's vitalism can serve as examples in this regard.

The second option, which would be to let an implicit philosophy flow, goes against the nature itself of epistemological reflection. Precisely, the point is to shed light on and examine critically the presuppositions that maintain the scientific discourse and its aspirations of agreement with the content of faith. Nevertheless, the conclusion to which Artigas comes, especially inspired by Stanley Jaki's work,[8] is that the historical practice of scientific work has already chosen a philosophical tradition based on metaphysical and gnoseological realism.

So, the alternative of an already existing philosophy flows into the stream of Greek metaphysics, accepted and perfected by the Christian authors of the Middle Ages. In spite of the proliferation of schools and theories since the Modern Age and the debate among them, that tradition has not been interrupted until today. Artigas has taken great care to stress its merits for the task of mediation that must be undertaken in the dialogue between science and faith.

Philosophy as Regulatory Wisdom

In his *Introducción a la filosofía*, Professor Artigas sets out the characteristics of this knowledge with the clarity of an almost scholastic style. Next, I will state those characteristics that, most appropriately, promote a genuine integration of disciplines. First of all, Artigas emphasizes the *scientific* nature of philosophy in an analogous sense. In effect, beyond the semantic restriction that predominates nowadays, science comprises any knowledge that accounts for something by providing its causes. It arrives at these conclusions through demonstrative reasoning from certain principles.[9]In that sense, there is a clear affinity between philosophical and scientific knowledge that eases the understanding between them.

[8] Cf. Especially "Historia de la ciencia y Teología Natural: reflexiones en torno a la obra de Stanley Jaki" in *Scripta Theologica* 13, 1981, n.1 pp. 185-204.
[9]*Introducción a la filosofía* (4º ed.) Pamplona, EUNSA, 1995p. 31.

However, in my opinion, the most important feature has to do with the sapiential nature of philosophy. If science expresses more dignity than common knowledge, at the same time, wisdom stands out over the rest of the sciences. Indeed it looks into the first causes of all things, and has the absolute first principles of the intellect as backup. Thus, wisdom may be defined as "the certain knowledge of the deepest causes of everything"[10]. Its highest natural expression is metaphysics, which "studies the being in all its universality, and looks at the general modes of the being and its ultimate causes"[11]. It is important to notice that a fundamental part of this metaphysical knowledge is natural theology. This discipline "studies scientifically what we can know about God in light of natural reason and, by leading us to the knowledge of the nature, the attributes and the action of God, it provides the ultimate reference that gives sense to all human life and has, therefore, a clearly sapiential nature".[12] The specific method of natural theology lies in reaching a certain rational representation of God, very limited indeed, but which relies on the study of nature as God's work. So it becomes closely connected to particular sciences and supernatural theology. As regards supernatural wisdom, in a rational frame, it corresponds to supernatural theology. The object of this science is "God and all the reality and each of its parts in light of what we know about God; therefore, it deals with the ultimate sense of human life and of all the creation: this is why it is the sapiential science par excellence."[13]

Having said that, where does the importance of this sapiential condition of philosophy lie? The answer has already been given by Aristotle, who first introduced this consideration clearly: to order is inherent to the wise man. And, that function is understood in two senses: wisdom *puts in* order, and it *gives* orders, both of which correspond to the functions of *judging* and *directing*, respectively, the work of the sciences.

This is how Artigas synthesises it: "Philosophy *judges* and *directs* the rest of the sciences because it is its responsibility to judge the first principles of all human knowledge and the value of scientific methods. So it is its job to determine the specific object of each science and to classify sciences in a hierarchy according to the nature of each one of

[10]*Op. cit.* p. 25.
[11]*Filosofía de la ciencia* p. 133.
[12]*Ibid.*
[13]*Ibid.* Cf. *Introducción a la filosofía* pp. 104-109.

them."[14] Metaphysics, by contemplating reality and knowledge from their highest causes, is capable of establishing the field and responsibility of each particular science. At the same time, it orders each one of them

1) to use its own methods properly,
2) not to interfere in the conceptual fields of other sciences, and
3) to subject to the principles on which it depends in order to undertake its specific work.

It is like a conductor that allocates the instruments and their scores in their own places on stage, and then, from the podium, conducts the performance of the symphony.[15]

Of course, it is part of the sapiential work of philosophy to recognise and protect the legitimate autonomy of particular sciences without pretending to absorb them or searching for a direct deductive connection between their statements and philosophy itself.[16] It can be admitted that, in the times of Aristotle and during a considerable part of the Middle Ages, the distinction between philosophy and particular sciences took place merely in very restricted fields,[17] or in the "historical" or purely descriptive sciences. Nevertheless, supporters of this realistic metaphysical tradition were able to establish, eventually, standards of integration that demand special conditions. On the one hand, a general view of the world, which is proposed by this philosophical line of thought. And, on the other hand, the findings of particular sciences in their state of autonomy.[18]

A third significant feature of the philosophical conception accepted by Artigas is its strict correspondence with the content of faith. As it has already been stated, the realistic metaphysical tradition to which I refer had a decisive prop in the medieval period thanks to the influence of the Christian world view. In the same way that metaphysical wisdom is capable of considering the fair autonomy of particular sciences, supernatural wisdom derived from faith also teaches us to appreciate the resources of reason as a way of reaching the truth. This is why medieval thinkers embraced the legacy of pagan philosophy, pointing

[14]*Introducción a la filosofía* p. 38.
[15]*Filosofía de la ciencia* p. 134.
[16]*Introducción a la filosofía* p. 38.
[17]Vgr. astronomy, optics or mechanics (which depended strongly on the use of mathematics).
[18]One of the most notable and renowned representatives of this tradition was, without a doubt, Jacques Maritain, who has left an extensive production of studies that show a deep compatibility between realistic metaphysical thought and scientific theories. In several occasions, this author is quoted by Artigas on topics that are presented in this paper.

out its mistakes from the ruling of faith, but entrusting reason itself with the purification of this philosophy *qua philosophy*. Therefore, Christian faith has remained, in fact, deeply linked to the traditional metaphysical line of thought in such a way that the dialogue between philosophy and theology cannot be but enriching and fluid under these terms.[19]

Boundary Questions

In Artigas' opinion, the exchange between science and religion and, therefore, the need for bridges, appears in the context of what is generally known as *boundary questions*. This expression refers to all those topics or problems traditionally studied by one science but which, at the same time, involve contents inherent to another one.[20] Naturally, when referring to boundaries, it is accepted that each discipline has well defined limits, whether in terms of formal objects or in terms of methodology. These contrasts, according to Artigas, can be described as a *methodological gap*. He remind us that the specific study of natural sciences "is centred on the search of spatiotemporal patterns" and "is limited to those aspects of reality that can be studied using experimental control".[21] Agazzi's "realistic objectualism" is applied here. This epistemologist sustain that "each science makes some kind of "cut" in reality: it defines a certain perspective that constitutes its specific field" . So "the same thing can become the object of different disciplines, depending on the adopted point of view".[22]As the author himself recognises it, "realistic objectualism" has to do with a renovated version of the scholastic doctrine of formal

[19]*Introducción a la filosofía* pp. 101-102; *Filosofía de la ciencia* pp. 143-144. It is necessary to mention Artigas' statement, according to which philosophy does not oppose common knowledge or the general view of the world that arises spontaneously in the intelligence of any human being as a result of his vital experience. On the contrary, the specific work of scientific philosophy will be to purify and deepen this knowledge as a way of continuing it. Having said that, it is from this world view of the common man that the message of the supernatural Revelation is formulated. The Word of the Lord questions man, who already has a certain representation of the sense of things. And, this is why it is notable that philosophy and faith meet precisely at the time of giving answers to these universal questions of the human being. Cf. *Introducción a la filosofía* pp. 16-18.

[20] These issues are broadly present in the scientific literature of the last decades. The culture of our time seems particulary willing to deal with those issues. The most resounding examples are the origin of the universe, the origin of man, bioethics and the mind-brain question.

[21]*The Mind of the Universe* p. 8.

[22]*Filosofía de la ciencia* p. 123.

objects.[23] That issue was developed by medieval writers when discussing the order of the sciences, and subsequently refined with the appearance of the new epistemological type of science.

It is in light of this objectualism that philosophy can establish connections that allow "bridging the gap between science and religion".[24] In order to achieve this, we must first take into account that "most of what are usually considered boundary questions may be better labelled as «subjective connections» and «particular overlaps»". Secondly, there is a type of boundary question of great relevance, which has to do with the general presuppositions of science.[25] In my opinion, the application of the philosophical analysis for an appropriate interpretation of the so-called "boundary questions" is a crucial point in Artigas' view because it reduces considerably their traumatic aspect.

To begin with, the so-called "subjective connections" are repercussions derived from certain issues of science such as the origin of the universe or the anthropic principle, which echo in the subjectivity of each researcher because of their heavy load of transcendental sense. It is very common for a scientist to connect the Big Bang theory with the philosophical and religious questions about the divine creation of the world. But, if we look closely, "this kind of problem can be bracketed or left aside in scientific work".[26] In conclusion, they are issues that justify, just as it has recently been insisted on, the recovery of subjectivity as the field where the awareness of the world, of the own oneself and of the sense of the relation between one another coexist. But, in this aspect, philosophy vindicates the objectifying capacity of the intelligence, which allows discovering what things are *in themselves* before getting involved with them. It is important from the epistemological point of view to understand that "if we need metascientific reasons to formulate or solve a concrete problem, this would indicate that the problem cannot be strictly considered as a scientific one."[27]

The question of partial overlapping arises when the same problem concerns both science and philosophy or religion at the same time. If the doctrine of objects is properly

[23] *Filosofía de la ciencia* p. 131.

[24] *The Mind of the Universe* p. 7.
[25] *Op. cit.* p. 13.
[26] *Op. cit.* p. 17.
[27] *Op. cit.* p. 18.

understood, the answer would be that said overlapping has sense only in relation to material objects, but not formal objects. Hesitations that once existed as regards the delimitation of disciplinarian fields created conflicts of high impact such as that of heliocentrism or the origin of species. And there is a tendency to introduce scientific premises in the argument of certain topics of natural theology such as that of the existence of God or that of the divine action. But, in both cases, it is possible to channel the debate thanks to a sapiential regulation. Additionally, scientific data cannot be incorporated into philosophical or theological arguments without an appropriate assimilation to the type of objectivity that is typical of these different kinds of knowledge. Consequently, the weight of that data is minimized considerably. Briefly, discovering the consonance between scientific theories and the outlook of the world from the metaphysical or religious perspective is always welcome. But, perhaps, it is not about waiting for scientific findings to provide contents that are significant to what philosophers and theologians have firmly established since before Copernic.[28]

Presuppositions and Implications of Science

Now I will expound the most original and prolific point, unless in my opinion, of Artigas' reflections on the interactive connection between disciplines. The core of this author's proposal is the following: there is an intellectual tradition that maintains the necessity of a hierarchical organization of knowledge, in which science must submit to the regulation of the principles established by philosophical and theological wisdom. Even though Artigas himself agrees with this requirement, he realises that many consider it as an invasive imposition or an ideological or confessional option that has nothing to do with the requirements of pure scientific work. But, if there is something that no man of science will be able to question, it is the *fact* that science exists, and, furthermore, that it is *progressive* knowledge. Well then, the existence and progress of science require certain objective conditions without which they would not be possible. These conditions are what Artigas calls *presuppositions* of science, whose nature and meaning concern philosophy. And, at

[28]*Op. cit.* pp.18-20.

the same time, those *presuppositions* that, as such, must be considered previous to the scientific work are, in turn, affected by the implications of scientific progress. In effect, the contributions of science contain *implications* that result in the *retro justification, extension* and *adjustment* of the same presuppositions. Consequently, science is open to the beneficial influence of philosophy when referring to certain presuppositions on which it depends logically, and philosophy is open to the beneficial influence of science that, through its progress, allows enriching the content and scope of those presuppositions.[29]

What the General Presuppositions of Science Are

Given the importance of the subject, it is urgent to establish the clearest definition possible of what has to be understood as "presupposition". Above all, it can be characterized logically as any knowledge required as a necessary preceding condition for the justification of another one. Given a proposition P, there will be another proposition Q which is required as a necessary preceding condition and presupposition of P as long as "If P then Q".[30] What must be first emphasised is, then, that "the existence of the presuppositions of science is required as a necessary preceding condition if science is to exist at all."[31]

Having said that, those presuppositions can be understood as "beliefs" that a scientist accepts, or as "statements" that would serve as a base to the formulation of different scientific theories. Beliefs are a fact, which the great historian Stanley Jaki has

[29]Even though the topic is dealt with in many places, I recommend and follow especially the explanation of chapter 2 of *The Mind of the Universe*, pp. 27-60, and "Articulating science and theology: presuppositions and implications of science" in *Sixth European Conference on Science and Theology* (ESSSAT VI), Cracow (Poland), March 26-31, 1996.

[30] Cf. *The Mind of the Universe* pp. 27-28. "I use the term "presupposition" following its common use as it is explained by contemporary English dictionaries when we are told what "to presuppose" and "presupposition" mean. "To presuppose" is explained by saying that "if one state of affairs presupposes another, the first state of affairs cannot be true unless the second is also true." And a "presupposition" is described as "something that you assume to be true, especially something which you must assume is true in order to continue with what you are saying or thinking." ("Presuppose" and "Presupposition", in: John Sinclair, editor in chief, Collins Cobuild English Language Dictionary, London and Glasgow: Collins, 1987, p. 1136) (2). These explanations closely correspond to my use of those terms, and they are clear enough to avoid any misunderstanding." "Creativity: Natural, Human and Divine" in *Jacques Maritain Center – Thomistic Institute* 1998 (www2.nd.edu/Departments/Maritain/ti98/artigas.htm), appendix 1.

[31]*Ibid.* p. 29.

seen to study and explain. There is a kind of "metaphysical faith" (K. Popper's exact words), of unstoppable conviction, often explicit, in certain contextual statements without which the scientific work would lose any support. But, as the same word "belief" or "faith" suggests it, there is, here, a load of subjectivity that makes those attitudes suspicious. In fact, it is confirmed in many cases that scientific work can be developed even if those presuppositions are ignored or denied expressively. Therefore, even if those beliefs have some influence on the results of the scientists, they "will be regarded as something accidental and therefore irrelevant unless we may show that some particular beliefs must be shared by all scientists as a part of their job."[32]

Artigas could be expected to take presuppositions as statements, but he finds it dangerous for the autonomy of sciences. Historically, the emancipation of scientific knowledge has been identified as the suppression of any connection to propositions strange to it. There has been an attempt to take the methodological gap to its highest expression, thus falling into an abysmal separation where science has to manage without presuppositions or take charge of them. One thing is to consider the methodological self-sufficiency of science, which is no more than the definition of its autonomy, and another thing is to disrupt the view of reality in order for science not to have to give explanations out of its scope.[33]

Artigas' point of view is somewhat more subtle. When he refers to presuppositions, he does not want to identify them with the traditional *metaphysical principles*, which, by the way, he does not reject, and which he prefers to designate as *foundations*,[34] or with the principles of formal logic. It is a fact that presuppositions are consistent with those principles, but they are not *inferred* from them. Conversely, they resemble because of their regulative character, "for they provide a clue to understanding science itself and to reflect on its meaning. In some way, they participate in the regulative character of metaphysics".[35]

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[32]*Ibid.* p. 29.
[33]*Mi visión de la interdisciplinariedad* n. 3. On reductionism cf. *Filosofía de la ciencia* pp. 137-140. On naturalism cf. *The Mind of the Universe* pp. 30-33.
[34]"On the one hand, rather vague convictions attributed to common sense have to be distinguished from, on the other hand, philosophical principles that are certain and constitute a presupposition necessary in scientific activity. The observation, the experience, the realistic sense of knowledge, the causality in its rigorous sense play an essential role in experimental science, and it has no sense to deny its value as if scientific progress would force us to do so, since that progress would be impossible if those presuppositions were not valid." *Filosofía de la ciencia* p. 164.
[35]*The Mind of the Universe* pp. 51.

Similarly, general theories, which are still part of the same science, or particular principles that apply only in some theory or specific branch of science, must be excluded.[36]

Artigas believes that the presuppositions of science are "situations" or "states of affairs", that is, certain characteristics of reality that are implicit in the practice of science. By understanding them in that way, their objective nature is out of discussion: "natural order, human cognitive ability, and science as a goal-directed enterprise are «states of affairs» that exist in nature, in the human being and society, respectively."[37] They are very concrete features, though of universal scope, whose denial would contradict directly everything that science may pretend to maintain. Let us analyse them a little more in detail:[38]

LEVEL	PRESUPPOSITION	CONTENT
objectives	ethical	values of science (truth, social utility)
methods	epistemological	gnoseological realism
constructions	ontological	natural order

The *ontological* presuppositions are summarised in the concept of *natural order*. It is a very deep metaphysical concept of difficult characterization, since it indicates a feature of supreme generality, up to the point that many consider it a *quasi-transcendental*. When we talk about order, we must think about a whole of related parts. In the case of nature, and as presupposition of the scientific activity, that order may be described as the presence of spatial and temporal standards, that is, of coherent and stable structures and dynamisms: "two types of order play a unique role in empirical science, namely *patterning* and *organization* […] Patterns refer to fixed ways of being and behaving, and progress in science always depends on the possibility of achieving some kind of empirical control, and therefore on the existence of repeatable patterns". At the same time, "organization includes

[36] *Ibid.* pp. 30-31.
[37] *Ibid.* p. 30.
[38] *The Mind of the Universe* pp. 49-50.

the idea of parts that are related because they play a role within a whole, and this could be taken as a sign of rationally and, therefore, of the existence of a plan".[39]

Epistemological presuppositions refer, basically, to the ability of the human intelligence to know that natural order and express it in an understandable way. Concretely, it has to do with taking sides for the realism of knowledge, that is, its ability to reach the truth, considered as adequacy (imperfect and partial at least) to what is real.[40] Besides, it presupposes the natural harmony between the intellect and the sensitive faculties, overcoming the dualistic trauma of modern philosophy: "In actual scientific practice, the empirical and theoretical aspects are intertwined in such a way that both empiricism and rationalism fail to explain how science works. Also, pragmatism fails to account for the results that we obtain. All this suggests that further examination of the scientific method may provide important insights about human knowledge and also about the philosophical problems related to it."[41]

Finally, *ethical* presuppositions are linked to the presence of *values* in the scientific activity. This causes resistance when the objectivity of science is contrasted with the (presumed) subjectivity of the value. And, it also seems a threat to the autonomy of science, as if its justification were beyond knowledge itself and were conditional on some practical purpose.

Artigas has deepened this aspect with great lucidity, showing, above all, that values are unavoidable presuppositions of science. Indeed, whenever there is a venture that requires so much effort (years of study, infrastructure, funding of programmes), there must be something worthy of it, that is, precisely, a *value*. And, it is convenient to repeat that, by reasoning in terms of presuppositions, the objectivity of the conditional moves to its condition. Therefore, it would be contradictory to establish a moment based on subjectivity,

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[39] *Ibid.* pp. 64-65.

[40] "construction and control, such as they are used in empirical science, presuppose a realist perspective. Theoretical constructs refer to real situations and are used to explain them, and methods of empirical control serve to prove the explanatory claims of theories. An anti-realist perspective would fail to account for the real achievements of scientific method and even for its fallibilist aspects. The realism presupposed by the scientific method is only a basic one that does not involve many specific philosophical consequences. It is centred around the possibility of obtaining a true knowledge about reality." *Three levels of interaction…* n. 1. Just as it was explained at the beginning, science does not deny common knowledge either, but it accepts it precisely because of its realistic nature: "the analysis of the method of science shows that this method basically corresponds to the realist character of ordinary knowledge." *Ibid.*

[41] *Ibid.*

or to be clearer, on subjectivity as opposed to objective order, as presupposition of an activity based on the search for objective knowledge.

When specifying the content of this type of presuppositions, Artigas emphasises, above all, the truth: "the search for the truth is an ethical value, and certainly very central."[42] The strength of this value depends on its connection to ontological (there is truth that awaits to be known) and epistemological (we have the ability to do so) presuppositions. This is why Artigas maintains that "the search for the truth implies unselfishness and impartiality as regards subjective interests; besides, it corresponds to one of the most important aspirations of the human being. In this sense, I would not have the slightest doubt in saying that experimental science possesses an ethical nature."[43]

Presuppositions as Bridges between Science and Religion

After this quick enumeration, the problem of the methodological gap arises again: in order for certain presuppositions to have an influence on a kind of knowledge, they should be part of it. But then, that knowledge would be presupposition of itself, which is absurd. ¿How can we overcome this paradox? The presuppositions that we have analysed are of a triple nature depending on the approach. They are *scientific* since they are necessary conditions for science, which are, so to speak, attached to it, or *come along* with it. In that sense, "they constitute a part of the entire building of empirical science as its foundation".[44]

However, by quoting the scholar R. Trigg, Artigas mentions that "those preconditions are not a part of the subject matter of the science".[45] If they were to be introduced as explicit data into the scientific discourse, they would no longer be considered as presuppositions, and we would have to think about which the presuppositions of that data are. Thus, when examining their content, there is no doubt that they are "situations" or "states of affairs" that fall into the object of philosophy: "they are «no scientific» only in the precise sense that their study requires a philosophical perspective that is different from

[42]*The Mind of the Universe* p. 262.
[43]*Ibid.* p. 280.
[44]*Ibid.* p. 40.
[45]*Ibid.* p. 42.

the particular points of view used in empirical science".[46] It is immediately seen that the statement of the natural order, of the realism, and of the values exceeds the framework of science and appears as backbone of a philosophical conception.

Finally, such presuppositions also have a *theological* nature in two senses: "first, because historically they were partly derived from theological ideas, and because their study may eventually have a theological import".[47] These words take us back to the question of the reason-faith relation and to the historical and conceptual value that is possible to assign to the experience of Christian philosophy. This is the reason why Artigas shows enthusiasm for the historical studies of P. Duhem and S. Jaki, who have emphasised the virtualities of the Christian world view as an encouragement for science.[48] And the theological scope to which he refers is immediately connected to the subject matter of the dialogue between science and theology.

Here, we are already in a position to understand and value better the importance that Artigas assigns to presuppositions as *bridges* for interdisciplinary dialogue. The suspicion caused by the metaphor is understandable if the autonomy of those who let those bridges stand on their own ground is threatened. But the proposed approach solves —we would almost say skilfully— these difficulties. Scientists need, especially in order to talk with religion, the supply of philosophical contents that can only reach them through bridges. And philosophers need, at the same time, to be confident that their bridges are firmly based on the scientific bastion, so as to be able to cross them without fear: "it is precisely because they are double-sided that they can serve as a bridge between science and philosophy and theology. They belong to science but the not add specifically scientific contents to it in such a way that they do not clash with the autonomy of science. Rigorous philosophical or theological reflection may serve as a real bridge uniting the natural world of facts with the personal world of meaning."[49]

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[46] *Ibid.* p. 40.
[47] *Ibid.* p. 51.
[48] Cf. "Historia de la ciencia y Teología Natural: reflexiones en torno a la obra de Stanley Jaki" in *Scripta Theologica* 13, 1981, n. 1 pp. 185-204 and *Filosofía de la ciencia* pp. 32-34.
[49] *The Mind of the Universe* p. 44.

Implications of the Scientific Progress

This subject presents, in my point of view, two important advantages. On the one hand, it introduces a circulation model into the dynamics of the different kinds of knowledge, which corresponds —strictly speaking— to the *vital* nature of knowledge. In the perspectives related to rationalism or to any expression of "epistemological monism", a linear development pattern is followed. This pattern has more to do with inertia and the mechanical nature of mobility in the inorganic world. But, knowledge is life, and it implies an exchange, a modulation between transcendence and immanence. The organic nature of knowledge must be reflected not only in the relation of the intellect with the senses and with free will, but also in the one that must exist between the different disciplines that stem from the work of reason. So, in this way, the fact of postulating a reciprocal causality pattern among science, philosophy and theology benefits, greatly, the representation of knowledge as an expression of life.

The other advantage is that an unbalanced integration of knowledge can be avoided. Many people think that, in a hierarchical frame, philosophy and theology would have much more to give than to receive from science. With the excuse of its supremacy, science is left as mere beneficiary, under a kind of protection that questions and conditions its maturity and autonomy notably. The problem is that scientists have recognised the contribution of science to philosophy and theology, which is correct, but they have inferred from that that there is no such hierarchy, which is not correct.

Artigas talks, indistinctively, about *feedback* or about the *implications* of the scientific knowledge of the presuppositions in which it is supported. The basic idea is that, thanks to the support of these presuppositions, science is capable of reaching genuine knowledge of the reality according to its own formalities. Besides, it can progress indefinitely in that knowledge. And, what has to be notice here is that, when science progresses, its presuppositions must be reconsidered in light of new findings that sponsor: "new findings contribute to reshaping our previous ideas about nature and human knowledge and provide new means to achieve practical goals and pose new problems. […]

[But] this perspective does not come from the study of the presuppositions of science alone; it requires considering the feedback from scientific progress to these presuppositions."[50]

This feedback of the scientific progress over presuppositions takes places in three ways: *retrojustification*, *enlargement* and *refinement*:

> "«Retrojustification» means that scientific progress reveals the validity of its three preconditions, as they are necessary conditions of the kind of results actually achieved. To say that the presuppositions are «enlarged» means that the progress of science provides a more complete and detailed knowledge of them, so that completely new perspectives may be opened. And to say that the presuppositions are eventually «refined» means that scientific progress sometimes leads us to change older ideas that do not fit with new advances."[51]

Retrojustification resembles a kind of *quia* test, or verification, of those presuppositions. It can be recognised even within the organization of philosophical knowledge, where the specific areas confirm, through their own investigation, the validity of the metaphysical and logical principles. Enlargement is an effect typical of the connatural expansion to scientific investigation. Its influence can be compared with the one that causes a trip around many far-off countries, after which, one has a more mixed and complete view of the people, the cultures, the landscapes, etc. Science takes us on a trip around territories to which only it can gain access.This is why Artigas states that "*when there is more science, there is more order*; any scientific progress means better knowledge of the organization of nature."[52] Refinement or adjustment of the presuppositions deserves an especial reflection that I leave for the end.

Conclusion

Mariano Artigas' work, revised through a dominant topic like the integration of knowledge, is perceived in a delicate balance between tradition and avant-garde. More precisely, between realistic and Christian identity and openness to the multiform variety of epistemological approaches. By having studied science, philosophy and theology in depth,

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[50] *Ibid.* p. 34.
[51] *Ibid.* p. 56.
[52] *Supuestos e implicaciones del progreso científico* p. 211.

Artigas is able to give a synthesis where the criterion of sapiential order and the dynamism of a vital exchange among disciplines stand out.

In my opinion, the most interesting benefit of Artigas' interpretation is his development of the presuppositions of the scientific progress. He considers them as a resource to go beyond the traditional moulds of subalternation and the negative regulation of the inferior kinds of knowledge by the superior ones. Artigas finds a fertile path by showing that science is what it is, and progresses so rapidly, because it implies three basic mainstays: natural order, the metaphysical scope of human reason, and a moral dimension that recognises scientific activity as fulfilment of the person. Clearly, these presuppositions do not belong to science but to philosophy and theology, and they invite science to open up so as to recognise them. In another sense, philosophy and theology discover that the scientific advances that they have silently made possible are reverted to those presuppositions in order to perfect them retroactively. In that way, science and wisdom influence one another in a virtuous circle with no place for suspicions or abandonments.

Some weak points have been noticed, especially when there is an attempt to give a precise measure to the dependency of presuppositions, to their strict content and to the way in which they are affected by the statements of science. But these are tiny flaws in a set that prevails because of its clarity, its consistency and its doctrinal rectitude. Let us hope that Father Mariano Artigas' work will become a consultation site in libraries and curricula, especially in the scope of Catholic universities where he taught, and where his teaching would be a great contribution.