

Religion and Science as Inclinations towards the Search for Global Meaning

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Abstract

The human intellect has a natural inclination to know reality as a whole, as part of its quest for global meaning. The search for global meaning has elicited responses from three areas of human thought, namely, myth, philosophy, and religion. In addition, today scientific knowledge claims to be a quest for global meaning and tries to offer its own view of the whole of physical reality and of its historical development. The question is then raised whether such a claim is legitimate. In itself, the scientific method is incapable of giving an exhaustive account of the whole of reality; nor does it grant entry to an all-encompassing meaning, due to the problems of the ontological and logical incompleteness necessarily associated with its formal, empirical language. However, any seeking after global meaning that seems to emerge in the scientific worldview should be understood as the subject's desire to know the whole, since the spiritual intellect of each scientist is naturally open to the universality and totality of being. Once the scientific enterprise is acknowledged as a human and personal activity, and its philosophical dimension better esteemed, the quest for global meaning set forth by the philosophical reflections of scientists can legitimately be understood as part of the natural human desire to know the whole, to know truth, and then as part of the human natural desire to know God.

Key words: Aquinas; Human intellect; Humanistic dimension of Science; Search for a global meaning; Ultimate questions.

In one of the pages he devotes to the theology of creation in his work *Summa Contra Gentiles*, Thomas Aquinas (1224-1274) affirms that “the natural appetite of the intellect (*appetitus naturalis intellectus*) is to know the genera and species and powers of all things, and the whole order of the universe.”¹ The human natural inclination to know the whole of reality is certainly related to the spiritual, intellectual nature of our minds, which have the capacity to participate in the universality of being. We are not satisfied in knowing only some

parts of reality, no matter how deep the knowledge we have about them: We seek after the whole. Behind this aspiration there is the feeling, or rather the conviction, that the truth lies in the whole and that the search for truth is nothing but a search for global meaning. While in a cosmological context, we wish to know the whole of physical reality and the ultimate causes of its being and becoming, on the anthropological level, the search for ultimate truth seeks after the cause of our personal self and the meaning of our own lives. The concepts of the whole, of truth, and of global meaning are deeply interwoven.

Philosophy and Religion on the Search for a Global Meaning

From a philosophical point of view, two main perspectives seem to dominate various approaches to the whole. The first one is the metaphysics of being, which maintains that the universality of the whole is the universality of being and that the intelligibility of reality strongly depends on the intelligibility of being, giving little relevance to time or history. The second one is the idealistic perspective of historicism, according to which the truth is likewise the whole, but here the whole is the global development of history; the fullness of meaning and the final intelligibility of reality will be clear only at the end of time. In fact, both perspectives are present in our search for the truth and both of them have implicitly nurtured human thought throughout the centuries.

Philosophy, however, is not the only area of human thought that seeks after global meaning. Two other areas express and interpret the desire for global meaning, namely, myth and religion. Myth aims to offer a complete account of how all things came to be, of why they are the way they are, of how their relationships originated in the beginning, and of what cosmic laws all things must obey in order to fulfill the prescriptions of fate. The answers provided by myth are both cosmological and anthropological, as both contexts are involved in any search for meaning. Precisely because myth conveys a narrative that seeks to explain the whole and embrace all of the parts, it makes use of images and intricate allegories: All gaps in knowledge must be filled, and a complete account of the origin and meaning of things — including nature, humans, and the gods — must be provided.² Religion, too, has its own account of the origin and meaning of the world; however, somewhat differently from myth, religion's main concern is not to offer a complete description of the genesis of things but to focus on the behavioral praxis that stems from the belief in those foundational relationships that link humans to nature, and humans and nature to god (or the gods). Here, the quest for

global meaning encounters the belief that all the feelings and needs of human life are entrusted to the care of a god or gods and that the whole of reality is subject to his (or their) power.

For its own part, the Judaeo-Christian Revelation also conveys a message that intends to satisfy the human search for global meaning. Although the fundamental religious experiences of this tradition take place within a strong existential context (that involving a history of liberation and salvation) the Unique God who reveals himself as the Lord of history and Savior of his people is also the God who created the heaven and the earth; he is the God of everyone and everything. His power is extended as far as the extension of being and his Word gave origin to all that exists.³ He is the primary and the final Cause of the world, the ultimate source of its truth and intelligibility, the very reason for why things are, and are the way they are. The appearance of life on earth and the individual life of every human being are not a chance product but receive their meaning from God's creative and loving will.

The universal meaning set forth by the Judaeo-Christian Revelation became engaged in a living, historical dialogue with the analogous claims of universality set forth by philosophy, religion, and also by myth.⁴ The Trinitarian image of God did not change the basic content of the dialogue, since the consubstantiality and the identity of nature among the three divine Persons enabled the Son and the Spirit to be subjects of the same universal attributes associated with the Unity of God. Moreover, theological reflection on the intelligibility and the ultimate meaning of the cosmos benefitted from the development of a theology of the Logos, while in the Eastern Christian area that same reflection gave rise to a theology of Sophia.

The historical stages that marked the encounter between the global answers provided by the Christian Revelation and the ultimate questions at the core of philosophy and religion, as well as the theoretical apparatus that allowed such a fruitful synthesis, are too well known to give an account of them here. In a certain sense, it is a synthesis still in progress, but one whose milestones were established by the Fathers of the Church and later developed in a more theoretical fashion by medieval authors, Aquinas among them. The only thing I would emphasize here is that the human desire for global meaning, as it was expressed by philosophy and religion, and also partly by myth, was insightfully incorporated into the Christian proclamation of the true God; the search for ultimate answers was interpreted as part of the human search for truth, a truth that the Christian Logos was declared capable of

revealing in all of its fullness. The search for global meaning, then, is nothing but a quest for the Absolute; the human desire to know the Cause of all things is nothing other than our desire to know the Truth, and the desire to know the Truth is nothing other than the desire to know God. Here is a passage from the *Contra Gentiles* that seems to express in some way what we mean: “The end and good of the intellect are the true; consequently, the first truth is the ultimate end. So, the ultimate end of the whole man, and of all his operations and desires, is to know the first truth, which is God. Besides, there is naturally present in all men the desire to know the causes of whatever things are observed. Hence, because of wondering about things that were seen but whose causes were hidden, men first began to think philosophically; when they found the cause, they were satisfied. But the search did not stop until it reached the first cause, for then do we think that we know perfectly, when we know the first cause. Therefore, man naturally desires, as his ultimate end, to know the first cause. But the first cause of all things is God. Therefore, the ultimate end of man is to know God. [...] Therefore, for human happiness which is the ultimate end it is not enough to have merely any kind of intelligible knowledge; there must be divine knowledge, as an ultimate end, to terminate the natural desire. So the ultimate end of man is the knowledge of God.”⁵ In other words, the natural desire to know the whole, the natural desire to know the truth, and the natural desire to know God are dimensions of a unique, fundamental human inclination.

A further observation is worth mentioning here. Although we search for global meaning, we do not have an experience of the whole. Even our intellectual openness towards the universality of being is not capable of grasping the wholeness of being. We are not the source of meaning, but rather we encounter it. The totality of the world and of history, and the totality of our own lives, is beyond our intellects. We must *entrust ourselves to a source of meaning*. We must be prepared to receive the answer as a gift. For this reason, any acceptance of global meaning implies a kind of faith; any discourse on the whole of reality implies belief in the intelligibility of reality — that is, the belief that reality makes sense — any existential decision implies a self-commitment to a truth.

Is science’s claim to reach a global meaning legitimate?

The title of this present talk, “Religion and Science as Inclinations towards the Search for Global Meaning,” involves scientific thought as well. If we examine many popular science best sellers and ask people about the image of science they contain, we soon realize that

scientific thought shares the same inclination towards a global explanation, one that is capable of embracing the whole of reality; in other words, it seems to be the same as that which characterizes philosophy or religion. Science today is a major source of comprehensive worldviews aimed at presenting the whole of reality within a strong, unified, space-time framework, from the origin of our physical universe far into the past and ahead to the cosmic scenarios matter and life will experience in a distant future.⁶ Physics, chemistry, and biology no longer work in separate fields but are concerned with a unique scientific domain in which the origin and evolution of the cosmos and life are investigated at large. Macrophysics and microphysics are today linked within the framework of strong unified theories, which explore the emergence of the four fundamental forces and reveal the highly symmetric structure of matter and radiation. Cosmic evolution and biologic evolution are no longer two histories but one and the same history, namely, ours: It is a history that tells us all the stages that led from the primeval phases of the universe to the appearance of *Homo sapiens* on earth.

Unsurprisingly, the desire of scientists to offer a truly global and all-encompassing view is manifested by the fact that the name “God” appears today in the titles of many popular science books; it has a specific entry in books indexes, and is called into debate when the question of “Origins” (i.e., of the universe, life, and man) is raised. It is less important to discuss now whether God’s existence is legitimated or denied in such a debate: The issue at stake is that currently it would seem science has the capacity to reach this level of questioning, which by its nature is more general and universal in character. The problem that needs to be answered then is the following: Does the desire to reach a global answer and search for global meaning fall within the realm of scientific activity? Is it legitimate for researchers to place the quest for totality, the totality of the physical and biological history of reality, on their scientific agendas?

The answer we instinctively give this question is *no*. It is common to affirm that scientific knowledge, as such, cannot set itself forth as a science of the whole. On the empirical level, seeking to offer an exhaustive explanation of reality is often supposed to lead to forms of neo-mythological, and ultimately ideological, thought, that more or less implicitly clothe scientific data and organize it according to a totalizing worldview. Such worldviews, theologians say, have their roots in some form of neo-positivistic thought, whose revival is always possible in the realm of the natural sciences. The philosopher’s task, and especially the theologian’s, then, should be first to shed light on the influence of a mythical, ideological, or neo-positivistic thought on scientific language, and second to lead scientific knowledge back

within its own boundaries. Aquinas himself seemed to share this view as he affirmed that the search for the ultimate foundation of all things is a task for metaphysics, not for natural philosophy.⁷

This *prima facie* answer is certainly reasonable. The scientific empirical method, as such, does not have the capacity to reach any totality it might strive for; totality remains a philosophical, not an empirical, issue. The scientific method is susceptible to a serious problem of incompleteness on both the ontological and logical levels. As first shown by Henri Poincaré in physics, and then by Kurt Gödel in logic, when trying to build a full predictable mathematical representation of phenomena or a complete system of axioms, scientific formalisms cope with problems of complexity and undecidability. The scientific method cannot build itself on a self-referential basis. It needs to start with some ontological foundation, it must assume the basic metaphysical nature of material entities, the rules of logic and the knowledge of commonsense. In scientific empirical analysis, final and formal causes, able to point to more foundational questions, are usually left aside; scientist's work seems confined to efficient causality, which rules transformations and interactions.

However, answering that scientific activity is no way adequate to search for a global meaning, seems to me unsatisfactory. Any philosophical approach to contemporary science that confines itself to warning the scientific method about its own intrinsic limitations and censuring the scientific search for totality as a neo-positivistic or ideological contamination seems to underestimate two relevant facts. First, the acting subject in "doing" science is not the scientific method but rather the scientist; as a human being, the scientist's mind is an intellectual spirit open to totality, but now able to exploit the experience of his senses, which relies upon the extraordinarily deep knowledge provided by scientific instruments. Second, the high degree of coherence, and the all-encompassing character, of our contemporary scientific view both have an objective basis; for the most part they do not depend on superimposed idealistic or extra-scientific paradigms. Probably for the first time, science today is on its way to understanding our universe as a single object of intelligibility, one having a strong objective unity, whose historical and global development can actually be comprehended within a single intellectual glance. We now have the ability to study the very first moments of the entire physical universe and reflect upon the reasons that determined the arrow of time. We know the elementary components of matter and the basic interactions that rule all physical and chemical phenomena, interpreting their mutual relationships within a

unitary framework. It has been discovered that all living beings share a common language for their genetic code, and that they all originate from a Last Universal Common Ancestor. The roots of the biological phylum that gave rise to the species *Homo sapiens* from the gradual evolution of chordates, mammals, and primates are sufficiently known, including the timing of the main stages in which the arboreal catharrine primates led to the coming of *Homo sapiens*. We know the essentials of man's long progress from an erect posture and bipedal locomotion to the rise of language and up to the appearance of his social behavior. The coherent and highly organized reconstruction of cosmic and biological development provided by science cannot be underestimated: We are no longer in the realm of popular imagination, but rather in that of a shared, evidence-based knowledge.

The scientific enquiry into ultimate questions as part of the subject's personal quest for truth

The deepest reason to consider the quest for global meaning as something intrinsic to scientific activity is that scientific knowledge is a human and personal knowledge.⁸ It participates in the human sphere of passions, motivations, and desires, which drive all human seeking after the truth. Without such an emotional and spiritual dimension, scientific research would no longer be possible. Although based on empirical experience, scientific knowledge is not merely *sense* knowledge but is *intellectual* knowledge. As such, it is joined to the universality of being, it shares in the natural desire to know the whole and to search for meaning, as prerogatives of any intellectual spirit. If we investigate the phenomenology of the scientific enterprise starting with the words of researchers themselves, and read the philosophical reflections of many scientists upon their innermost motivations, then the personal and humanistic dimension of scientific research emerges in a clear fashion,⁹ free from any materialistic and reductionist prejudice (a prejudice that is certainly not applicable to the majority of scientists, though the mass media largely portrays it this way).

It is true that the ontological and logical incompleteness intrinsic to the scientific method prevents empirical analysis from assessing any conclusions about the ultimate causes of the whole of reality. It is, however, precisely this same incompleteness that allows researchers to perceive, today much more than in the past, the need for a very foundation of their knowledge.¹⁰ It is an awareness experienced *within scientific analysis and language*, as authors like Ludwig Wittgenstein, Kurt Gödel, Alfred Tarski, and Alan Turing showed

decades ago, and current researchers such as Paul Davies, John Barrow, George Ellis, and Francis Collins have discussed at large.¹¹ Though scientific research makes use of efficient causes only, in their *philosophical reflections* scientists realize that formal and final causes — that is, the cause for the specific quality of each material entity and the cause that understands the behavior of a system as a whole— are also meaningful. It is precisely thanks to these causes that the scientific picture of the world acquires coherence, intelligibility, and unity.¹² The import of formal and final causes holds even when popular science emphasizes the role played by chance, indetermination, and unpredictability in the total picture of the physical and biological universe. It must be kept in mind that chance and unpredictability are more linked to our gnoseological limits in describing the causal chain involved in some empirical phenomenon than to an intrinsic indetermination of nature. Moreover, these empirical phenomenon operate on a level of intelligibility less profound and less ground-based than those that correspond to other properties of the physical and biological universe, such as the various principles of unification, the universality of the laws of nature, the presence of symmetry and intrinsic order in the structure of matter, and the cosmic import of an objective fine-tuning between physical and chemical laws and those conditions that make life possible.

It is clear enough that the scientific method remains incapable of answering what we call the “ultimate questions,” but we cannot ignore the fact that today the ultimate questions resound in scientific labs; they arise not only because of the new deeper and more coherent worldview of the physical and biological universe, but also, and in a some way primarily, because scientific activity is performed by a human subject. Just like in other intellectual activities, in science, too, we look for a global understanding, we tend towards a unified view, and we remain unsatisfied with partial and provisional explications.

We will now turn back to the question we asked in the beginning: Are the desire to search for global meaning and the attempt to give a global answer a legitimate aspiration of science?

The unity of truth and its consequences for the dialogue between science and theology

We answer the above question by saying that the quest for global meaning does not belong to the method of the natural science, but it belongs to the human person, to the subject of the scientific enterprise, a subject who desires to know a reality that present-day science presents in an ever greater and coherent unity. Insofar as science is a human, personal

endeavor, its philosophical dimensions are highly worthy of being recognized and esteemed. The source of any science lies in sensible knowledge, but science is not confined to the empirical level. The subject of scientific knowledge is the human intellect, which is constitutively open to the universality of being.¹³ In this respect, the quest for global meaning set forth by the philosophical reflections of scientists can be legitimately understood as part of the human natural desire to know the truth and so as part of the human natural desire to know God. In other words, paraphrasing Aquinas, there is a deep continuity among the natural desire to know the whole order of the universe (*appetitus naturalis intellectus cognoscendi totum ordinem universi*), the natural desire to know the truth (*desiderium naturale cognoscendi veritatis*), and the natural desire to see God (*desiderium naturale videndi Deum*).

The openness to the totality of being, proper to the human intellect, whether experienced in reflecting upon being as being, or upon the global phenomenology of nature, is always, at least implicitly, an openness to acknowledging God and his perfections.¹⁴ We have mentioned above that all openness towards global meaning implies a subject's intellectual commitment, and then a form of faith, because the whole is far beyond any experience and insight. Does this reasoning also hold in the case of science? I think so. A scientist is asked to commit himself to reality, its order and intelligibility, and believe that there is a truth that deserves to be investigated, even if this requires perseverance and hard work. It is the faith and humbleness of one who accepts that reality, including physical reality, is something found and not posited by the subject, something received as given, not created by one's mind. To be open to the search for global meaning, and to consider this search worthwhile, is nothing but implicitly acknowledging oneself as a creature; it is the faith that a Creator exists and that he represents the ultimate source of meaning.

Recognizing the legitimacy of scientists to search for answers to ultimate questions brings about a number of consequences that philosophers and theologians, in my opinion, must consider. An effort must be made to better address scientists' quests for the Absolute and to purify the image of the Logos they could envisage when reflecting philosophically upon nature. Refusing such an engagement (maintaining, for instance, that scientists' quests in this regard are always naïve or philosophically poor, always colored by pantheism or deism, and ultimately inadequate for either denying or affirming anything about the Absolute) is an intellectual position that may avoid difficulties, but on a deeper level remains largely unsatisfactory. Philosophers and theologians must lead their dialogue with scientists starting

with the epistemological realm (a key area in which it is useful to examine and explain misunderstandings and make methodological clarifications) up to the anthropological realm (which is more apt to address questions that involve the search for truth and the search for meaning). While today the epistemological approach — biblical exegesis, hermeneutics, and theories of knowledge — exhibits lively debate, the anthropological one is much less developed; however, it is precisely in the anthropological domain that the ultimate questions and the quest for meaning acquire all their relevance, the relevance they have for a personal subject who searches for the truth.

If scientific, personal knowledge has access to the ultimate questions, and is capable of looking at the whole space-time evolution of the universe within a single, global view, then the scientist can also inquire about the notion of the Logos, understood not only as a source of rationality and order, but also as a Word that the universe embodies, conveys, and reveals. In considering the ontological and logical incompleteness of the scientific method, and the openness of formal, syntactic scientific language to a semantic meta-language responsible for meanings and values, a scientist realizes that there is room for a notion of the Logos; in light of this, even the notion of God cannot be dismissed by the world of science as nonsensical or meaningless. Many reflections of scientists, starting from the wonder and awe experienced in their own work, are clear on this point. The route that begins with scientific knowledge is open to philosophy of nature, philosophy of nature is open to metaphysics, and metaphysics is ultimately open to theology. This is a long but exciting route that not only philosophers, but also scientists, can travel.

Finally, if scientific, personal knowledge is open to the quest for truth and participates in the search for the Cause of being, then the activity of scientists also has a religious dimension. Actually, the ultimate questions are both philosophical and religious, because they are not confined to an impersonal knowledge of reality but involve the level of life and meaning. It is no wonder, then, that even scientific research flows at times in reverence toward the Mystery, towards worshipping the Absolute. There is no lack of scientists who bear witness to these kinds of feelings.¹⁵

The task that theologians have before them is certainly new and demanding, but the heritage of Christian thought provides a good amount of inspiration. When pondering how to speak of God to the Greco-Roman world, Augustine suggested referring to the notion of God

as used or envisaged by the natural philosophers, namely physicists, whose proper intellectual context was the *cosmos*; instead, the notion of god used in the context of Emperor's authority or the gods of polytheism celebrated by poets, which contexts were the *polis* and the *theater*, respectively, were refused.¹⁶ In a similar fashion, Aquinas encouraged the knowledge of creatures provided by natural philosophy because a better knowledge of creatures brings about a better knowledge of God.¹⁷ As is well known, he greatly emphasized the unity of truth, which could be understood both in terms of listening to physical reality through the instruments of natural philosophy (i.e., science) and by listening to God's revelation in history.¹⁸

The Judaeo-Christian Revelation has always been familiar with discourse on God starting from the cosmos. There are several reasons for this: the strong relationship between the word of the Covenant and the word of Creation, the relevance that reflection upon nature and its laws has in the Sapiential books, and the cosmic attributes associated with God since the first baptismal Creeds. Revelation had no fear — and this was crucial for its dialogue with science — in presenting the Logos made flesh as the center of the cosmos and of history, that same cosmos and that same history that are also under the eyes of those who study physical reality. In a similar way, we once again face the great challenge of showing that the God of Abraham, Isaac, and Jacob is *also* the God of philosophers and scientists.¹⁹ This is an extremely sensitive and touchy thesis, but it is also extremely fascinating. We are not dealing with the identity of an image, but we are dealing with the identity of a Subject.²⁰ This is the very reason why the search for a Foundation and the desire for global meaning experienced by scientists — whether they are more or less aware of it — should also interest theologians. And theologians should accept the challenge of announcing to the scientific world that the Logos came out of silence and revealed himself in Jesus Christ.

¹ Thomas Aquinas, *Summa Contra Gentiles*, book III, ch. 59, Eng. tr. by Vernon J. Bourke, (Notre Dame - London: University of Notre Dame Press, 1975), Vol. 3, 195. “Est autem appetitus naturalis intellectus ut cognoscat omnium rerum genera et species et virtutes, et totum ordinem universi: quod demonstrat humanum studium circa singula praedictorum.”

² On the nature of myth and its relationship with the language of philosophy, cfr. Paul Ricoeur, “Mythe. L’interprétation philosophique,” *Encyclopaedia Universalis* (Paris: Encyclopaedia Universalis France, 1985), vol. 12, 883-890; Kees W. Bolle, “Myth: An Overview,” *The Encyclopedia of Religion*, ed. M. Eliade (New York: Macmillan, 1987), vol. 10, 261-273; Paul Ricoeur, “Myth: Myth and History,” *Ibid.*, 273-282. On the interaction between the language of myth and that of science, cfr. Ian G. Barbour, *Myths, Models, and Paradigms. A Comparative Study in Science & Religion* (New York: Harper & Row, 1974); Mary Hesse, “Physics, Philosophy and Myth,” *Physics, Philosophy and Theology. A Common Quest for Understanding*, ed. Robert J. Russell, William R. Stoeger, George V. Coyne (Vatican City State: LEV and University of Notre Dame Press, 1988), 185-202.

³ Cf. Gen 1:1; Sir 42:17-21; Is 43:11-13; Jn 1:3; Act 4:12; Col 2:3.

⁴ Cf. Giuseppe Tanzella-Nitti, “Il cristianesimo fra universalità della ragione e universalità della religione,” *La verità della religione. La specificità cristiana in contesto*, ed. Giuseppe Tanzella-Nitti, Giulio Maspero (Siena: Cantagalli, 2007), 173-202.

⁵ Thomas Aquinas, *Summa Contra Gentiles*, book III, ch. 25, Eng. tr. by Vernon J. Bourke, Vol. 3, 101-102. “Finis autem et bonum intellectus est verum: et per consequens ultimus finis primum verum. Est igitur ultimus finis totius hominis, et omnium operationum et desideriorum eius, cognoscere primum verum, quod est Deus. Naturaliter inest omnibus hominibus desiderium cognoscendi causas eorum quae videntur: unde propter admirationem eorum quae videbantur, quorum causae latebant, homines primo philosophari coeperunt, inveniunt autem causam quiescebant. Nec sistit inquisitio quousque perveniat ad primam causam: et tunc perfecte nos scire arbitramur quando primam causam cognoscimus. Desiderat igitur homo naturaliter cognoscere primam causam quasi ultimum finem. Prima autem omnium causa Deus est. Est igitur ultimus finis hominis cognoscere Deum. [...] Non sufficit igitur ad felicitatem humanam, quae est ultimus finis, qualiscumque intelligibilis cognitio, nisi divina cognitio adsit, quae terminat naturale desiderium sicut ultimus finis. Est igitur ultimus finis hominis ipsa Dei cognitio.” (Thomas Aquinas, *Contra Gentiles*, III, ch. 25).

⁶ I attempt to offer a short account of this new intellectual climate in the “Introduction” to a book of mine, Giuseppe Tanzella-Nitti, *Faith, Reason and the Natural Sciences. The Challenge of the Natural Sciences in the Work of Theologians* (Aurora, CO: The Davies Group, 2009), vii, xiii. A valuable reflection on how science seems to speak of God today, and how theologians should rightly address this question, is given by John Buckley, “Religion and Science: Paul Davies and John Paul II,” *Theological Studies*, 51 (1990): 310-324.

⁷ Cf. Thomas Aquinas, *Summa Contra Gentiles*, book II, ch. 37: “It is the business not of the philosopher of nature to consider that origination [the origin of all things out of nothing], but of the metaphysician, who considers universal beings and things existing apart from motion. – Propter quod nec ad naturalem philosophum pertinet huiusmodi rerum originem considerare: sed ad philosophum primum, qui considerat ens commune et ea quae sunt separata a motu.” (Eng. tr. by James F. Anderson [Notre Dame - London: University of Notre Dame Press, 1975], Vol. 2, 110).

⁸ On the personal dimensions of scientific knowledge, cf. Michael Polanyi, *Personal Knowledge. Towards a Post-Critical Philosophy* (1958) (London: Routledge, 1998); Idem, *The Tacit Dimension* (Garden City, NY: Doubleday 1967); Charles Taylor, “Overcoming Epistemology,” *Philosophical Arguments* (Cambridge - London: Harvard University Press, 1995); Idem, *Philosophy and the Human Sciences* (Cambridge: Cambridge University Press, 1985). An early examination of the role of

intentions and aims in the work of researchers was made by Maurice BLONDEL, *L'Action* (1893), esp. chapters III and IV, Eng. tr. *Action. Essay on a Critique of Life and a Science of Practice* (Notre Dame: University of Notre Dame Press, 1984).

⁹ Cf. Marco Bersanelli, Mario Gargantini, *From Galileo to Gell-Mann. Wonder that Inspired the Greatest Scientists of All Time in Their Own Words* (West Conshohocken, PA: Templeton Press, 2009); Elaine H. Ecklund, *Science vs. Religion: What Scientists Really Think?* (Oxford: Oxford University Press, 2010); Nancy K. Frankenberry, *The Faith of Scientists in Their Own Words* (Princeton, NJ: Princeton University Press, 2008); Henry Margenau, Roy Varghese (eds.), *Cosmos, Bios, Theos. Scientists Reflect on Science, God, and the Origin of the Universe, Life and Homo Sapiens* (La Salle, IL: Open Court, 1992). On Science and Religion on ultimate questions, see also Robert J. Russell, *Cosmology. From Alpha to Omega. The Creative Mutual Interaction of Theology and Science* (Minneapolis, MN: Fortress Press, 2008).

¹⁰ See, in this respect, the works carried out by Alberto Strumia and his research group: Alberto Strumia, *The Sciences and the Fullness of Rationality* (Aurora, CO: The Davies Group, 2010); Idem, *I fondamenti logici e ontologici della scienza. Analogia e causalità* (Siena: Cantagalli, 2006); Idem, *Il problema dei fondamenti. Da Aristotele a Tommaso d'Aquino all'ontologia formale* (Siena: Cantagalli, 2007); Idem, *Il problema dei fondamenti. Un'avventurosa navigazione dagli insiemi agli enti passando per Gödel e Tommaso d'Aquino* (Siena: Cantagalli, 2009). The basic philosophical perspective is already present in Kurt Gödel, *The Modern Development of the Foundations of Mathematics in the Light of Philosophy* (1961), in *Gödel's Collected Works*, vol. III (Oxford: Oxford University Press, 1981).

¹¹ Useful readings, among others, are those provided by John D. Barrow, *Theories of everything. The quest for ultimate explanation* (Oxford: Clarendon Press, 1990); Paul C.W. Davies, *The Mind of God. Science and the Search for Ultimate Meaning* (London: Simon & Schuster, 1992); John D. Barrow, *Impossibility. The Limits of Science and the Science of Limits* (Oxford - New York: Oxford University Press, 1998); Francis S. Collins, *The language of God. A scientist presents evidence for belief* (London: Free Press, 2006); George F. Ellis, "Issues in the Philosophy of Cosmology," ed. Jeremy Butterfield and John Earman (eds.), *Handbook of the Philosophy of Science. Philosophy of Physics* (Amsterdam: Elsevier, 2007), 1183-1285.

¹² On the role of formal and final causes in natural philosophy, and the relationship between formal causes and the laws of nature, see Giuseppe Tanzella-Nitti, "The Aristotelian-Thomistic Concept of Nature and the Contemporary Debate on the Meaning of Natural Laws," *Acta Philosophica*, 6 (1997): 237-264. Cf. also James A. Weisheipl, "The Concept of Nature", in *Nature and Motion in the Middle Age*, edited by W.E. Carroll (Washington: The Catholic University of America Press, 1985), 1-23; Richard J. Connell, *Matter and Becoming* (Chicago: The Priory Press, 1966), 152-157.

¹³ It could be useful, in this respect, to consider a passage from a speech of John Paul II to the Plenary Assembly of the Secretariat for Non-Believers: "To try to understand the totality of reality is a legitimate ambition which honours man and which the believer shares. So there is no opposition [between faith and science] at this level, but rather at the level of mentalities. When these are dominated by a scientific conception, according to which the sphere of truth is identified with what can be known and verified experimentally. This positivistic mentality deeply marks modern culture, which is derived from the philosophy of the Enlightenment. It is the latter, not science itself, that opposes faith, and does it on the ideological plane. On the contrary, passionate pursuit of the 'hows' calls for an answer to the 'whys'." (JOHN PAUL II, *Discourse to participants in the Plenary Assembly of the Secretariat for Non-Believers*, Rome, April 2, 1981, original in French. The English translation published in *Osservatore Romano*, Weekly Edition, 21 April 1981, 8, has been slightly modified here to make it more consistent with the original).

¹⁴ Cf. Thomas Aquinas, *Summa Contra Gentiles*, book II, ch. 15 "As we proved above [ch. 7, n. 3], God is the Maker of things inasmuch as He is in act. But by virtue of his actuality and perfection God embraces all the perfections of all things, as was shown in Book I [ch. 28, nn. 7-8]; and He is virtually

all things. – Deus secundum hoc factivus est rerum quod actu est, ut supra ostensum est. Ipse autem sua actualitate et perfectione omnes rerum perfectiones comprehendit, ut in primo probatum est: et sic est virtualiter omnia. Est igitur ipse omnium factivus.” (Eng. tr. by James F. Anderson, Vol. 2, 48).

¹⁵ On the feeling of reverence before reality, as a philosophical, intellectual position, cfr. William Desmond, “On the Betrayals of Reverence,” *The Irish Theological Quarterly*, 65 (2000): 211-230. On the philosophical and religious dimensions of wonder, as experienced by those who are engaged in the natural sciences, cf. Enrico Cantore, *Scientific Man. The Humanistic Significance of Science* (New York: ISH Press, 1977), esp. ch. 3: “Wonder and Awe: The Scientific Experience of Ultimates,” 95-132. Cf. also Olaf PEDERSEN, “Christian Belief and the Fascination of Science,” ed. Robert J. Russell, William R. Stoeger, George V. Coyne, *Physics, Philosophy and Theology*, 125-140.

¹⁶ Cf. Augustine of Hippo, *De civitate Dei*, VI, chps. 1-9. Commentary is offered by Joseph Ratzinger, *The Truth of Christianity*, lecture given at the Conference “2000 Years After What?,” University of Sorbonne, Paris, November 27, 1999; eng. text in *30 Days*, (January 2000): 33-44.

¹⁷ Cf. Thomas Aquinas, *Summa Contra Gentiles*, II, chps. 2-3.

¹⁸ In tune with the thought of Aquinas, John Paul II’s encyclical *Fides et ratio* reaffirms such a unity by these words: “The unity of truth is a fundamental premise of human reasoning, as the principle of non-contradiction makes clear. Revelation renders this unity certain, showing that the God of creation is also the God of salvation history. It is the one and the same God who establishes and guarantees the intelligibility and reasonableness of the natural order of things upon which scientists confidently depend, and who reveals himself as the Father of our Lord Jesus Christ.” (*Fides et ratio*, September 14, 1998, n. 34).

¹⁹ Cf. Joseph Ratzinger, *Der Gott des Glaubens und der Gott der Philosophen. Ein Beitrag zum Problem der theologia naturalis* (1959), ed. Heino Sonnemans (Leutesdorf: Johannes Verlag, 2005).

²⁰ Cf. Giuseppe Tanzella-Nitti, “The Book of Nature and the God of Scientists according to the Encyclical ‘Fides et ratio’,” *The Human Search for Truth: Philosophy, Science, Faith. The Outlook for the Third Millennium* (Philadelphia: St. Joseph's University Press, 2001), 82-90.