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## SCIENCE AND THE SEARCH FOR ULTIMATE MEANING IN THE THOUGHT OF JOHN PAUL II

### *A Brief History: The Church and Science*

From the very beginning of the papacy of John Paul II one can discern a new view on the relationship of science and faith. One aspect of this relationship is the part that science plays in the search for “ultimate meaning”, a phrase found many times in the encyclical *Fides et Ratio*. This essay will attempt to explore that claim, but in order to judge what is new and in what the newness consists, it will be necessary to review what is old. I have done this elsewhere<sup>1</sup> and so will only summarize it here. A detailed history up to the present time of the development of the thinking within the Church concerning the relationship between science and faith would be extremely helpful to the advancement of that very relationship, but such is beyond the scope of this essay. Instead it will be helpful to summarize three periods which together set the background for judging what is new in the new view from Rome: (1) the rise of modern atheism in the 17<sup>th</sup> and 18<sup>th</sup> centuries; (2) anticlericalism in Europe in the 19<sup>th</sup> century; (3) the awakening within the Church to modern science in the 20<sup>th</sup> century.

Although the Galileo case, as it is called, provides the classical example of confrontation between science and faith it is really in the misappropriation of modern science in the 17<sup>th</sup> and 18<sup>th</sup> centuries to mistakenly establish the foundations for religious belief that we find the roots of a much more deep-seated confrontation. From these roots, in fact, sprung the divorce between science and faith and, thus, atheism. As to the influence of 19<sup>th</sup> century anticlericalism on the development of the relationship between science and faith, a good example is seen in the founding of the Vatican Observatory in 1891 by Pope

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<sup>1</sup> G. V. Coyne, “The Church in Dialogue with Science: The Wojtyla Years”, *The New Catholic Encyclopedia* (The Catholic University of America Press, Gale Group: Washington, DC), in press.

Leo XIII. His words show very clearly the prevailing mistrust of many scientists for the Church and his rather hostile response:

So that they might display their disdain and hatred for the mystical Spouse of Christ, who is the true light, those borne of darkness are accustomed to calumniate her to unlearned people and they call her the friend of obscurantism, [...] but we have in the first place put before ourselves the plan [in founding the Vatican Observatory] [...] that everyone might see that the Church and its Pastors are not opposed to true and solid science, whether human or divine, but that they embrace it, encourage it, and promote it with the fullest possible dedication<sup>2</sup>.

The awakening of the Church to modern science during the 20<sup>th</sup> century is best seen in the personage of Pope Pius XII who had an excellent gentleman's knowledge of astronomy and, as Pope, he frequently discussed astronomical research with the staff of the Vatican Observatory. However, he was not immune from a certain apologetic tendency and sought to identify the beginning state of the Big Bang cosmologies, a state of very high density, pressure and temperature, which, at any rate, at his time was purely a theory, with God's act of creation. He had stated, for instance, that:

Thus, with that concreteness which is characteristic of physical proofs, modern science has confirmed the contingency of the Universe and also the well-founded deduction to the epoch when the world came forth from the hands of the Creator<sup>3</sup>.

Georges Lemaître, a respected cosmologist, President of the Pontifical Academy of Sciences and a Catholic priest, had considerable difficulty with this view of the Pope. Lemaître insisted that the Primeval Atom, of which he was the author, and Big Bang hypotheses should be judged solely as physical theories and that theological considerations should be kept completely separate<sup>4</sup>.

From what has been said of these three historical periods we can conclude the following. First, as an inheritance from the origins of

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<sup>2</sup> Leo XIII, *Ut Mysticam* (1891), [in:] S. Maffeo, S. J., *In the Service of Nine Popes. One Hundred Years of the Vatican Observatory* (Vatican City State: Vatican Observatory Publications, 1991); trans. by G.V. Coyne, S.J. from the original Italian: *Cento Anni della Specola Vaticana, Nove Papi, Una Missione* (Vatican City State: Vatican Observatory Publications, 1991) p. 207, 210.

<sup>3</sup> *Acta Apostolicae Sedis*, vol. 44:1952, p. 41–42.

<sup>4</sup> G. Lemaître, "The Primeval Atom Hypothesis and the Problem of Clusters of Galaxies", [in] *La Structure et L'Evolution de l'Univers*. XI Conseil de Physique Solay, Bruxelles 1958, p. 7.

modern atheism in the 17<sup>th</sup> and 18<sup>th</sup> centuries, there had been within the Church a tendency to associate scientific research with atheism. Secondly, a type of “siege” or hostile mentality characterized the thinking of the Church at the time of the foundation of the Vatican Observatory. Thirdly, when enlightened to the magnificent progress in scientific research in the 20<sup>th</sup> century, the Church wished too hastily to appropriate the results of science to its own ends. In the papacy of John Paul II we see a view of the science-faith relationship which contrasts in a significant way with each of these antecedent views.

### *The New View of Science and Faith*

The views of John Paul II on the relationship of science and faith and on the search for ultimate meaning can be found in many of his messages to university communities and to scientists. Two of these are of key importance: the message written on the occasion of the tricentennial of Newton’s *Principia Mathematica* and published as an introduction to the proceedings of the meeting sponsored by the Vatican Observatory to commemorate that same tricentennial<sup>5</sup> and the encyclical *Fides et Ratio*<sup>6</sup>.

The newness in what John Paul II has said about the relationship between science and religion consists in his having taken a position compellingly different than the one he had inherited. This statement is justified principally in the message on the occasion of the tricentennial of Newton’s *Principia Mathematica*. John Paul II clearly states that science cannot be used in a simplistic way as a rational basis for religious belief, nor can it be judged to be by its nature atheistic, opposed to belief in God:

[...] Christianity possesses the source of its justification within itself and does not expect science to constitute its primary apologetic. Science must bear witness to its own worth. While each can and should support the other as distinct dimensions of a common human culture, neither ought to assume that it forms a necessary premise for the other. The unprecedented opportunity we have today is for a common interactive relationship in which each discipline retains its integrity and yet is radically open to the discoveries and insights of the other<sup>7</sup>

<sup>5</sup> R. J. Russell, W. R. Stoeger, G. V. Coyne, *Physics, Philosophy and Theology. A Common Quest for Understanding*, Città del Vaticano 1995 [Observatory Publications, Second Revised Edition], p. M3–M14.

<sup>6</sup> John Paul II, *Fides et Ratio*, English edition in *Origins*, Washington: Catholic News Service, 22 October 1998, vol. 28, no. 19.

<sup>7</sup> Op. cit., Note 5, p. M9.

He furthermore states:

[...] science develops best when its concepts and conclusions are integrated into the broader human culture and its concerns for ultimate meaning and value

Scientists ... can come to appreciate for themselves that these discoveries cannot be a substitute for knowledge of the truly ultimate. Science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes. Each can draw one another into a wider world, a world in which each can flourish<sup>8</sup>

Furthermore, he expresses uncertainty as to where the dialogue between science and faith will lead. The Pope raises the question: "Can science also benefit from this interchange?" It takes a great deal of openness to ask that question and it does not have a very clear answer. In fact, it is very difficult to see what the benefits to science as such might be. In the Papal message it is intimated that the dialogue will help scientists to appreciate that scientific discoveries cannot be a substitute for knowledge of the truly ultimate. In what way, however, do scientific discoveries participate, together with philosophy and theology, in the quest for that ultimate? This is a serious and open question.

### *Fides et Ratio and the Search for Ultimate Meaning*

In the encyclical *Fides et Ratio* the dialogue continues and a serious attempt is made to lay the foundations for dialogue with the sciences. The principal thrust of John Paul II's encyclical *Fides et Ratio*, which in the twilight of his papacy summarizes his thinking on the relationship of faith and reason, is a plea that we not lose the search for ultimate truth. He writes, for instance:

She [the Church] sees in philosophy the way to come to know fundamental truths about human life. I wish to reflect upon this special activity of human reason. I judge it necessary to do so because at the present time in particular the search for ultimate truth seems often to be neglected<sup>9</sup>.

How are we to define ultimate truth? For my purposes the answer to this question is of utmost importance, since I wish to propose that the natural sciences, together with philosophy and others ways of

<sup>8</sup> Ibid., p. M13; underlining by me.

<sup>9</sup> Op. cit., Note 6, No. 5.

knowing, contribute to this search for ultimate truth. I prefer to construct a definition from the words of the encyclical:

[...] people seek an absolute which might give to all their searching a meaning and an answer – something ultimate which might serve as the ground of all things. In other words, they seek a final explanation, a supreme value, which refers to nothing beyond itself and which puts an end to all questioning<sup>10</sup>.

In this search there are various ways of knowing and among them philosophy has a privileged role:

Men and women have at their disposal an array of resources for generating greater knowledge of truth so that their lives may be ever more human. Among these is philosophy, which is directly concerned with asking the question of life's meaning and sketching an answer to it. Philosophy emerges, then, as one of the noblest of human tasks<sup>11</sup>.

The Pope then contrasts philosophy with other ways of knowing and especially with the natural sciences:

It may help, then, to turn briefly to the different modes of truth. Most of them depend upon immediate evidence or are confirmed by experimentation. This is the mode of truth proper to everyday life and to scientific research. At another level we find philosophical truth, attained by means of the speculative powers of the human intellect<sup>12</sup>.

It is clear that philosophy and the natural sciences must each have their autonomy:

St. Albert the Great and St. Thomas were the first to recognize the autonomy which philosophy and the sciences needed if they were to perform well in their respective fields of research<sup>13</sup>.

Later on the Pope laments the “lack of interest in the study of philosophy” and “the misunderstanding that has arisen especially with regard to the human sciences” and he says:

On a number of occasions the Second Vatican Council stressed the positive value of scientific research for a deeper knowledge of the mystery of the human being. But the invitation addressed to theologians to engage the human sciences and apply them properly in their inquiries should not be interpreted as an im-

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<sup>10</sup> Ibid., No. 27.

<sup>11</sup> Ibid., No. 3.

<sup>12</sup> Ibid., No. 30; underlining by me.

<sup>13</sup> Ibid., No. 45.

PLICIT authorization to marginalize philosophy or to put something else in its place in pastoral formation<sup>14</sup>.

A further contrast between science and philosophy is given when he writes:

Reference to the sciences is often helpful, allowing as it does a more thorough knowledge of the subject under study; but it should not mean the rejection of a typical philosophical and critical thinking which is concerned with the universal<sup>15</sup>.

A rather critical view of science is expressed when the Pope says:

Science would thus be poised to dominate all aspects of human life through technological progress. The undeniable triumphs of scientific research and contemporary technology have helped to propagate a scientistic outlook which now seems boundless, given its inroads into different cultures and the radical changes it has brought<sup>16</sup>.

While its principal focus is not upon the natural sciences, the encyclical makes a serious attempt to lay the foundations for dialogue with the sciences in the search for ultimate meaning. It would be helpful to amplify that dialogue from the viewpoint of the natural sciences. Scientific research, especially in our day, cannot be excluded from the search for ultimate meaning. Today scientists, within their own well determined methodology, are asking such questions as: why is there anything rather than nothing?; is the universe finite or infinite in time and in space?, is the universe fine-tuned to the existence of intelligent life?; did humans come to be through necessary processes, chance processes, or some combination of the two in a universe fecund to allow both processes together to fructify? Such questions as these bring me to a discussion of a new view of modern physics, applicable also to the other sciences, which makes ever more significant its role in the search for ultimate meaning. My attempt will be to indicate that science cannot be characterized as depending exclusively, or even principally, on sense experience, but that, like philosophy, it has an important speculative and universal element to it. Science should, therefore, be seen as a true partner in the search for ultimate meaning.

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<sup>14</sup> Ibid., No. 61.

<sup>15</sup> Ibid., No. 69.

<sup>16</sup> Ibid., No. 88.

*The New Physics and the Search for Ultimate Meaning*

The newness of the new physics cannot really be appreciated without some remarks on the history which brought about the new physics. At the birth of modern science in the 16<sup>th</sup> and 17<sup>th</sup> centuries, there was the persistent idea, as there had been for the Pythagoreans, that physicists were discovering some grand transcendental design incarnate in the universe. In fact, it is claimed that one of the essential factors in the birth of modern science was the Christian theology of creation and of the Incarnation. In the latter case, the concept in St. John's Gospel of the Logos becoming incarnate was particularly appropriate and hailed back in some way to Platonic and Pythagorean concepts of the world of eternal ideas and of the transcendental character of mathematics. Indeed, Newton, Descartes, Kepler and others can be cited as viewing physics and mathematics in this way. Kepler for instance, saw geometry as providing God with a model for creation. He went so far as to see the circle as transcendently perfect, the straight line as the totally created and incarnate and the ellipse as a combination of the two, an incarnation in this world of what would have been the perfect geometry for the motion of the heavenly bodies in an ideal world. Newton was the epitome of this manner of thinking as he called upon the Deity as the only explanation of why the universe, dominated by the law of gravity, did not collapse. And yet the simple equations in which he expressed that law of gravity and the laws of motion redirected for future centuries the role of mathematics in physics. No longer was mathematics simply a description of what was observed; it was a probe of the very nature of what was observed.

This mathematization of physics will continue through the classical revolution in physics of the 18<sup>th</sup> and 19<sup>th</sup> centuries and will become, in a different way as we shall see, an essential ingredient of the new physics of the 20<sup>th</sup> and 21<sup>st</sup> centuries. As usual in scientific revolutions, what was happening only came to full realization after it had happened. A three-layered conception of the universe, only partially inherited from the Platonic-Pythagorean tradition, came to be accepted implicitly, and only slowly did it come to consciousness. There was the layer of the true mathematics, the mathematical structures of which the world is truly made. Then there was the second layer, the mathematics of we humans, structures which were in a Platonic sense only the shadows of the first layer. Finally there were at the third layer the images in concrete reality of the true mathematical structures which we humans attempted to understand with a our

shadow mathematics. (These layers should not be confused with the three degrees of abstraction of the Aristotelian tradition as I will attempt to explain below.) However, there is a subtle development, described well by Michael Heller<sup>17</sup>, in which at the second layer mathematics is not only the language or the interpretative tool of physics (the formal object in scholastic terminology) but it becomes also the “stuff” of the ideal world of physics (material object in scholastic terminology). For the present this “stuff” remained under the control of empirical verification i.e., the third layer, the images in concrete reality, remained the test of how true the human mathematical structures were.

The rise of quantum mechanics and of relativity theory at the beginning of this century soon weakened the connection between the second and third layers described above and, in fact, reemphasized the connection between the second and first layers. The images in concrete reality made very little, if any, sense as a test of mathematical “stuff” of the ideal world of physics. There are no natural images or representations which correspond to the Hilbert spaces, the mathematical “stuff” of quantum theory. And while general relativity has passed all of the experiments yet made to test its empirical predictions there are no adequate images or representations which correspond to motions at relativistic velocities or under very large gravitational forces. In its “purest” form the physics of both the sub-quantum world and the world “beyond-relativity” is strictly mathematical in the tradition of Plato and Pythagoras and has little to do with any sensory component.

I have mentioned parenthetically above that the various layers discussed in the previous paragraphs should not be confused with the Aristotelian three degrees of abstraction. For Aristotle, epistemology strictly reflected ontology; there were three levels of abstraction (and, therefore, three ways of knowing) corresponding to Aristotle’s three levels of being: physics studied the world of the senses, mathematics studied geometrical structures, metaphysics studied the true essence of beings. Aristotle and the philosophical (and later scientific) traditions which followed him would not admit of an interpenetration of his first two levels of abstraction, sense experience and mathematics. This viewpoint differs radically from the schools of Plato and of Archimedes and it is critical to understand those differences in order to appreciate the new physics and the implications it might have for the

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<sup>17</sup> M. Heller, *The New Physics and a New Theology*, University of Notre Dame Press: Notre Dame, IN, 1996.

search for ultimate meaning. Modern science, unconsciously rejecting the tradition of Aristotle, embraced that of Archimedes and, in most recent times, has been continuously more influenced by the tradition of Plato. Let me explain.

Archimedes, although judging by his literary style could be thought to be allied to the school of Plato, initiated a totally new way of viewing the relationship of sense experience to mathematics. Unlike Plato he saw mathematics, not as *a priori*, but as *a posteriori* to sense experience; but unlike Aristotle he saw that beyond rudimentary sense experience there was the ability to make quantitative measurements and that mathematics was the means by which those measurements led to understanding. It is undoubtedly the Archimedean way of viewing the relationship of sense experience and mathematics that has become the touchstone of modern science. The new physics has not abandoned or negated that Archimedean insight but it has added a Platonic element to the understanding of mathematics. I am referring to what I mentioned above about the second layer, our shadow mathematics becoming, in Heller's felicitous expression, the "stuff" of the ideal world of physics and also to the fracture taking place between that layer and the layer of concrete images based on sense experience.

There is another significant element in the new physics. The studies of the dynamics of non-linear systems has given birth to the fields of chaos theory and complexity. This represents, in some sense, a return from quantum physics to the world of macroscopic physics and it is, in another limited sense, a vindication of Aristotle's view that the world of the senses is too rich to be limited to or comprehended by mathematics. There are really two parts of this: deterministic chaos arising from classical mechanics and non-linear systems in thermodynamics. The immense variety of forms, shapes and structures which we find in both the inorganic and organic world challenges any theory that they could have come forth from some deterministic set of laws of physics. And yet, using the mathematical analysis of non-linear systems and the laws of physics, we can come to understand the structural design for changes, but we cannot predict the result because we cannot know what result small perturbations, accumulated in a non-linear way, will produce. Thus while we can analyze mathematically and, in that sense, understand the structure of such dynamical systems, we cannot predict the outcome because of the accumulative effect of non-linear perturbations. In the end the world of the senses has a richness which defies ultimate mathematical analysis. In light of such non-linear systems, let us ask

a leading question, one which certainly has the intimations of ultimacy. Had we been given the initial physical parameters in an expanding universe at some time near the Big Bang (a few Planck times) could we have predicted that life would come to be? Is life the result of so many bifurcations in non-linear thermodynamics that we could not have predicted, even if we knew all the laws of microscopic and macroscopic physics, that it would come to be? This is a question somewhat different than that raised by the anthropic principle, whether taken in the weak or strong sense. The questions there have to do with interpreting and/or explaining the apparent fine tuning of all of the physical constants and conditions required for the emergence of life. I am asking whether, given antecedently all of the physical constants and conditions necessary for life from our *a posteriori* knowledge of it, could we have predicted that it would have come to be? Did life happen to be or, given the conditions for it, did it have to be?

From what we have said about the new physics, there appear to be two strains in modern science which are in tension with one another. On the one hand, there is the mathematization of physics and the diminished connection to sense experience. On the other hand, there is the recognition that the world of sense experience has an innate unpredictability which prevents it from being subject to ultimate mathematical analysis. These characteristics of the new physics may make it a significant ally of philosophy and theology in the search for ultimate meaning.

### *Theology and the New Physics in Dialogue*

The methodology of modern science is evolving and that is why I call it a new physics. The methodology of theology must also be in flux. As an effort at coming to a rational understanding of revealed truth, theology is subject to all of the vagaries of human thought. And revealed truth, granted that it first occurred at a privileged time and to chosen persons, is continuous and incarnate. What is revealed is deeply imbedded in the way we think and the understanding of it is, therefore, evolving. Furthermore, all rational knowledge of God is analogous and it would, therefore, be appropriate that concepts from the new physics be taken as analogies in the search to understand God. The methods of theology have always been very determined by prevailing philosophies and Christian theology in particular has since the Middle Ages been very much attached to the Aristotelian-Thomistic tradition, and especially to the concept of final cause. Thus

such notions as purpose and design have been dominant. Might theology not apply itself to an attempt to understand God, the creator of a universe, where purpose and design are not the only, nor even the dominant factors, but where spontaneity, indeterminacy (even at a macroscopic level) and unpredictability have contributed significantly to the evolution of a universe in which life has come to be? After all, we are products of an evolutionary universe and are still evolving. It would appear to me that our understanding of the universe, using the best methods of modern science, would also contribute to an understanding of ourselves and thus of our relationship to God, the Creator of the universe.

I think we must beware, however, of a serious temptation of the new physics. Within the culture of the new physics God is essentially, if not exclusively, seen as an explanation and not as a person. God is the ideal mathematical structure, the theory of everything. God is Mind. It must remain a firm tenet of the reflecting believer that God is more than that and that God's revelation of himself in time is more than a communication of information. Even if we discover "the mind of God" we will not have necessarily found God. The very nature of our emergence in an evolving universe and our inability to comprehend this even with the new physics may be an indication that in the universe God may be communicating much more than information to us.

There will, of course, always be a tension between science and theology because of the transcendental (beyond reason) character of the latter, but considering the somewhat Platonic quest in the new physics for the "mind of God", for ultimate meaning, that very tension could be the source of a quite creative dialogue. It need not be excluded that such dialogue could take place even on the level of ultimate meaning.

### *Summary*

Against the background of previous centuries the thought of John Paul II on the relationship of science and faith can be characterized as new. Science is seen by the Church as a partner in dialogue. Although the encyclical, *Fides et Ratio*, is only indirectly concerned with the natural sciences, it welcomes further dialogue on the partnership of the sciences with philosophy and theology in the search for ultimate meaning, the true focus of the encyclical. From the historical roots of modern science one can come to an appreciation of a new physics which contains highly speculative and universal elements. An

understanding of these elements is necessary for evaluating the role of the natural sciences in the search for ultimate meaning. Furthermore, the intrinsic unpredictability in the evolutionary history of the universe as investigated by the sciences appears to open up questions which are concerned with an understanding of ourselves in the universe and ultimately of our relationship to God, the Creator. In *Fides et Ratio* John Paul II states that the “ultimate truth about human life” is a “gift” and that “every truth attained is but a step toward the fulness of truth”<sup>18</sup>. He, furthermore, reiterates in the encyclical what he had stated in an address in Kraków to celebrate the 600<sup>th</sup> anniversary of the Jagiellonian University:

Scientists are well aware that the search for truth, even when it concerns a finite reality of the world or of man, is never ending, but always points beyond to something higher than the immediate object of study, to the questions which give access to mystery<sup>19</sup>.

## NAUKA I POSZUKIWANIE OSTATECZNEGO SENSU WEDŁUG JANA PAWŁA II

### Streszczenie

W porównaniu do przeszłości myśl Jana Pawła II jawi się jako nowa. Nauka jest postrzegana jako partner dialogu. Chociaż encyklika *Fides et ratio* tylko pośrednio zajmuje się naukami przyrodniczymi, to jednak akceptuje dalszy dialog na temat współpracy nauki z filozofią i teologią w poszukiwaniu ostatecznego sensu, na którym koncentruje się encyklika. Od historycznych korzeni nowożytnej nauki można przejść do nowej fizyki, która zawiera wysoce spekulatywne i uniwersalne elementy. Zrozumienie tych elementów jest konieczne, aby ocenić rolę nauk przyrodniczych w poszukiwaniu ostatecznego sensu. Ponadto istotna nieprzewidywalność w ewolucyjnej historii wszechświata badanego przez naukę rodzi pytanie dotyczące rozumienia nas samych we wszechświecie, a ostatecznie o naszą relację do Boga Stwórcy. W *Fides et ratio* Jan Paweł II stwierdza, że „ostateczna prawda o życiu człowieka” jest „darem” oraz że „każda odkryta prawda jest zawsze tylko etapem drogi ku owej pełnej prawdzie” (nr 2). Ponadto w encyklice powtórzył to, co powiedział w Krakowie z okazji 600-lecia Uniwersytetu Jagiellońskiego: „Przedstawiciele nauk przyrodniczych są w pełni świadomi tego, że poszukiwanie prawdy nawet wówczas, gdy dotyczy ograniczonej rzeczywistości świata czy człowieka, nigdy się nie kończy, zawsze odsyła ku czemuś, co jest ponad bezpośrednim przedmiotem badań, ku pytaniom dającym dostęp do Tajemnicy” (nr 106).

<sup>18</sup> John Paul II, *Fides et Ratio...*, Note 6, No. 2.

<sup>19</sup> Op. cit., Note 6. No. 106; Address of John Paul II at the Jagiellonian University, June 8, 1997, *L'Osservatore Romano*, June 9–10, 1997, 12.