The Cultural Values of Science
Pontifical Academy of Sciences, *Scripta Varia* 105, Vatican City 2003
www.pas.va/content/dam/accademia/pdf/sv105/sv105-maldame.pdf

NEW SCIENTIFIC PARADIGMS AND CHANGING NOTIONS OF THE SACRED

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It may seem surprising to mention religious language in relation to natural sciences. As a matter of fact, the great contests about the relationship between faith and science which have been carried out these last few years, dealt with the questions of the beginning of the world, the origin of life and the origin of man. They are still going on, about questions raised by technological advances, regarding the status of the human embryo, regarding genetic engineering, or the protection of the environment. In such context, spiritual questions seem to be of secondary interest; but they are not. This is why I suggest that we pay attention to questions which, in all likelihood, will be at the very heart of the debates of this century which is just beginning – and which are related to what is commonly called spirituality. Is spirituality a value of science?

It is in relation to this religious concern, that we can measure the present change of attitude. If the immediate object of Science is to master the ways and means towards a distinct improvement of life – like going ever farther and faster, a better protection against climatic or environmental aggressions, better food, a better-performing health service, more comfortable homes and a more rational organisation of traffic in our cities – our reflexion addresses the justification of such an aspiration. Indeed, a number of significant changes have accompanied the progress of scientific knowledge.

1. Spiritual Concerns and Rationalism

The foundation of science has long rested with the confidence which men placed in Reason. Their trust is based on the philosophy which sup-

ports what we call classical science. It began in the 17th century and boomed in the 19th century. It has been taught in schools throughout the 20th century and is strongly going on today.

1.1. According to this philosophy, science is founded on laws made rigorous through the language of mathematics. Such a language enables us to anticipate future occurrences: astronomy allows us to foresee various phenomenons that take place in the universe; like solar or lunar eclipses and other astral occurrences, or – in the more immediate context of daily life – like the setting up of calendars, improving the functioning of machines, developing means of communications, etc. All this was made possible through an increasingly efficient management of space, time and organic matter.

1.2. In this global view of life, Reason must always be able to claim victory over Chaos and cope with the Unexpected. It relies upon a deterministic paradigm, voiced by the mathematician named Laplace.

There are cultural values of science. Reason is indeed an eminent quality of intelligence, at the service of Truth. Its practice has a moral dimension: rectitude, and a logical dimension: intellectual rigour. Reason has always insisted on being 'pure Reason' – a specifically human faculty which must keep away from all sorts of contaminations, like prejudices, emotions and other passions involving soul or body. Clear Reason insists on being the sovereign good. This is why it has criticised all forms of religious language, as being guilty of emotional attitudes and because it has surrendered to the authority of Tradition. But such an attitude does not go without a spiritual dimension: that of an ideal of transparency and purity.

1.3. In spite of these criticisms of religious thought, this kind of rationalism allowed some sort of spiritual attitude: that of clarity, linked to the demands made by objectivity. Subjectivity, or personal idiosyncrasies must give way to the demands of Truth, which by its very nature, has to be the same for all. It is an attitude of exacting disinterestedness.

Thus, within European culture, a specific spiritual dimension has developed, ideally implying total freedom of mind, through the independence of Reason and a critical attitude towards prejudices. Concurrently with the success of Science, a spirituality has emerged, promoting intellectual work and calling for keener intellectual perceptions and a more complete ascendency over the body.

Besides, classical science is also linked to a sharp consciousness of the limits of reason. It is thus in full compliance with a certain attitude of renunciation, which is at the very heart of the mystical experience. Reason reflects on itself: it is fully aware of the fact that it does not know much. Such is the predicament of the Christian, who prays and lives in the perpetual awareness of the difficulty of meeting the absolute of God, whose transcendence is overwhelmingly present.

So, it is possible to say that is a spirituality linked to the exercise of reason, in its classical form of objectivity, logical line of thought, and disinterestedness. The French tradition has several representatives of this sort of spirituality. Among the philosophers are Paul Valéry and the philosopher Alain. But also the Christian philosopher Simone Weil belongs to that tradition.

But this way of seeing things was shattered by the emergence of a new science in the twentieth century. Is it a denial of Reason? Or a turn-back to the past and a way to go out of scientific methodology? If it is the realisation that its exercise was more flexible than the rationalists had first imagined, it is also a danger to go in philosophical and religious monism. So we have to be careful. I limit my enquiry to Physics and to some theological research.

2. A new Approach to Nature

The emergence of quantum mechanics, at the beginning of the 20th century, came as a surprise to those who had been accustomed to the vision of classical science.[1] A long time elapsed before this new theory could be conveyed in concatenating words.[2] Although research is still going on, one must not believe that quantum theory can better explain a number of phys-

[1] In 1889, Max Planck introduced the notion of discontinued energy exchanges between organic matter and the earth's radiation. In 1905, Einstein explained that photoelectric effects were caused by the ejection of atomic electrons.

[2] Louis de Broglie was the first to attribute undulatory properties to electrons. Since then, progress has gone on endlessly. First, on a purely theoretical level, a mathematical formulation called 'undulatory mechanics' (to use E. Schrödinger's expression) or 'matrix mechanics' (according to W. Heisenberg) came into existence. Then, on an experimental level, the knowledge of the elements constituting the nucleus of the atom has improved. Lastly, quantum mechanics have kept being verified through technical innovations, like laser technology, which is now of current use, superconductivity, or optoelectronics.

ical phenomenons. Not only such phenomenons as take place in particle accelerators, but also those which take place in stars (neutron stars, quasars, and even black holes), thus serving as a basis for cosmology, which offers a global explanation of the Universe.

This new language has resulted in making physics look like an enigma to those who had been trained in classical physics – and even for some of them like an opening to mystery. This has also resulted in a new set of references for scientists. Traditional mechanics had grounded its basic elements on the most systematic rationalism. As the new mechanics could not follow suit, some founders of the new science felt the need to inscribe the results of their researches into a global vision of nature, which was quite different from the current one. In order to do so, they drew on a tradition which can be described as 'mystical', in so far as the word refers to realities which diverge from what classical physics, influenced by determinism, consider as 'reasonable'. Several examples of this can be mentioned, depending on the various aspects of the new physics used by the authors to sustain their argument: indetermination, logics, participation and symbolism. It is necessary to examine that topics, before giving a critical judgment.

2.1. *Indetermination*

The first thing which gave rise to mystical considerations, was the breaking away from determinism. This is a well-known fact. Everyone has heard about Heisenberg's uncertainty principle. The inequality it has brought to light shows that one cannot expect to locate particles in space, and time, or determine its energy, with absolute accuracy. This inequality does show that the language of new physics is no longer determinist, but based on statistics. Resorting here to calculation of probability has nothing to do with the limits of human knowledge: it intrinsically belongs to the phenomenon under scrutiny.

Faced with this new perspective, Arthur Eddington's reaction was significant. He recorded the decline of determinism in new physics with delight, in his *The Nature of the Physical World*.[3] The book opens with a first chapter on 'the failure of classical physics'. He then enters the discussion of the great concepts of physics, like time, gravitation, quantum, and questions of method, like causal relations, the future, the place of man in the

[3] *The Nature of the Physical World*, AMS Press, reprint ed., 1995.

Universe (or more precisely, the conditions of life in the biosphere). The book ends with a chapter on 'Science and mysticism'. In his conclusion, after raising the question of abstract knowledge, he writes:

> As a conclusion to the arguments produced by modern science, it may perhaps be possible to say that religion became an acceptable option for scientific minds from 1927 onwards [...] If the view is confirmed that 1927 witnessed the final elimination of strict causality by Heisenberg, Bohr, Born and others – then that year will certainly remain as one of the most important landmarks in the history of scientific thought.

Freedom seemed to be ruled out, within the framework of physics ruled by the determinist pattern, where everything followed everything out of absolute necessity. The unpredictable nature of fundamentals removes this difficulty. Certain authors think that human freedom fits into the neuronal function governed by quantum indetermination. Karl Popper or John Eccles see in the indeterminate comportment of particles the ontological foundation of freedom.[4]

2.2. *Another Logic: Paradoxes and Dialectics*

The second aspect of spiritual developments is linked to the paradoxical nature of the languages of new physics. Since the tenets of new physics could be verified at the experimental level and were coherent at the level of mathematical expression, the logic that presided over classical mechanics was called into question – in particular the Aristotelian principle of the third party or third man-argument.

This theme appears in Niels Bohr's thought, whose coat of arms, following the Yin and the Yang signs, carried the Latin motto *Contraria sunt complementa*. Through this, Bohr revived the thought categories of the Renaissance theologian Nicolas de Cues, the Romantics and some implications of Hegel's thoughts.

The notion of paradox thus found itself elevated to a paradigmatic level within the framework of a certain logic – a logic which had no longer anything to do with the framework of classical thought and through which the mystics gained renewed acceptance. In a spiritualist context, B. Nicolescu coined the neologism 'trialectic' to express the

[4] John Eccles, *How the Self controls its Brain*, Springer-Verlag, Berlin/New York, 1994.

notion of going beyond classical logic and to challenge the logical principle of the third party argument.[5] His intention was thus to go beyond materialism through a form or dialectics that do not only apply to the level of matter. In order to achieve this, he introduced the ontological notion of 'level of reality'. The fundamental antagonisms that are found in physics are overcome and lead to a superior reality. Like, for instance, the theological discourse. Thierry Magnin has not failed to explore this spiritualist opening, reading Christian Mystery and discussing the classical Christian assertions in terms of dialectic opposition as 'complementary in contradiction'.[6]

2.3. *Philosophy of the Spirit*

Another aspect of the convergence of the language of new physics and the language of mystical experience is illustrated by the fact that in quantum mechanics, observation is interactive, since no one can observe anything at a primary level without modifying what is observed.

The philosophy that follows postulates that one should give up the concept of objectivity which classical physics claimed to be fundamental to truth. It interprets the interactive process of measurement by saying that the observer can no longer claim to be neutral: he is involved in the process as a 'participant'.

> The most important thing about quantum mechanics is that it has done away with the concept of an external world, seen as a distinct area located 'out there' by an observer standing behind a ten-foot thick glass window. Even in order to examine an object as minuscule as an electron, the observer must break through the glass window. He must reach out to it. He must set up his measuring instruments. It is up to him to decide whether he is going to observe a position or a 'moment'. In any case, he cannot measure both at the same time. Besides, the operation modifies the condition of the electron. The Universe won't be quite the same afterwards. In order to describe what has taken place, one must replace the old

[5] Bassarab Nicolescu, *Nous, la particule et le monde*, Paris, 2002.

[6] Thierry Magnin, *Entre Science et Religion*, Monaco: Edition du Rocher, 1998. He reads the Christian Mystery in this light and discusses the classical Christian assertions in terms of dialectic opposition as complementary in contradiction.

> word 'observer' by the new one: 'participant'. Strangely enough, the Universe is a universe of participation.[7]

The word 'participation' is understood in the sense it has in mystical communion. It is referred to in many works. The Tao of Physics by F. Capra is the best-known one; the book betrays the author's concern to find in modern physics patterns identical to those found in Tao mysticism. F. Capra speaks of physics and mysticism as converging experiences. The latter one is an experience of the whole world; a cosmic experience.

A number of Christian authors consider the formal aspect of quantum mechanics as one of the main characteristics of human consciousness. The very heart of reality then becomes consciousness. This is the thesis defended by Jean Guitton following the publication of a book by the brothers Bodganov which was greatly successful. For them, quantum mechanics negate materialism:

> The fundamental distinction between matter and spirit has been changed deeply and in a non-reversible way. Hence a new philosophical concept which we have called 'metarealism'; for the first time, we have made materialism compatible with spiritualism, we have reconciled realism and idealism.[8]

2.4. *Symbolic language*

Another link between science and mysticism has been suggested by the works of another pioneer of new physics, Wolfgang Pauli. His concern for spirituality originated in his interest in the success of abstract formalism. He found a first convergence of scientific language with religious language in the Cabala, noticeable for its formulation of equivalences between numbers and letters. He tried a unifying approach to the problem. In order to show how those conceptual registers were related, he decided to turn to Jung's archetypes.

[7] John A. Wheeler, *The Physicist's Conception of Nature*, quoted by Michael Talbot, *op. cit.*, p. 27.

[8] Dieu et la Science: Vers un Métaréalisme, Paris: Gresset, 1991. The book was reviewed in *La Recherche*, n° 237, Nov. 1991, Vol. 22, pp. 1350-1352. The review was made by François Russo, Elisabeth Giacobino, Serge Reynaud and Antoine Danchin. The book was denounced as a fraud by the scientist, the theologian and the epistemologist. It deserves to be mentioned here only because of the sociological phenomenon which was revealed by its success.

A long correspondence with the psychoanalyst who had specialised in symbols led him to explore the fundamental aspects of the psyche. He established a link between physical experiences and psychological experiences. Reality being composed of two parts – one psychological, and the other one physical, the two approaches should meet in a unifying vision. The reference to Jung is overwhelmingly present among circles interested in finding unifying links between science and mysticism.[9]

At the end of this brief account, one must acknowledge that the issues raised by the relationship between science and religion have changed, since scientists establish converging links between scientific language and spiritual language. The updating of traditional perspectives has led theologians to address a number of its requirements; it has in the first place helped them to do away with a certain form of rationalism, inherent to classical theology. Such an evolution can be found among several theologians who must now be rapidly discussed: they are facing up to the challenges posed by the altered vision of the scientific world – which does not have only happy outcomes.

3. Effects on Christian Theology

One initial critical remark is necessary. The themes developed by scientists are not so original as they may appear. They belong to a tradition which has always been part of western civilisation. Often, the circuitous approach to the problem through oriental religions is an artifice used to get back to religious currents which belong to western culture. The convergence between new physics and mysticism goes back to the tradition which acknowledges an immanent rationality in the world, or – to use the old vocabulary – a *logos* or a *pneuma*. A long theological debate has been conducted among the Fathers, bearing on the interpretation of these words.[10] Today, theologians who echo the above mentioned convergence are reviving the fundamentals of Christian theology. So if I quote some theologians, it is not my personal approach of the creation.

[9] The correspondence between Wolfgang Pauli and Gustav Jung has been translated and published in Paris Albin Michel, 2000.

[10] See G. Verbecke, *L'Evolution de la doctrine du Pneuma du Stoicisme à Saint Augustin,* Paris, 1945.

3.1. *Science considered as a Spiritual Quest*

A first echo of the new approach is perceived in the way in which certain theologians accept to consider science as an adventure of the spirit, more than an adventure of reason – as a spiritual experience, in the full meaning of the word. Alexander Ganoczy witnesses such an attitude in a huge theological work. In particular, in a synthesis where he defends the forms of religious thought which refer to science in explicit relation to the mystical process: *Suche nach Gott auf den Wegen, der Natur, Theologie, Mystik, Naturwissenschaften – einer kritischer Versuch*.[11]

He notes that the main leaders of modern science are no longer filled with the positivist or rationalistic spirit. The Themes of mysticism are present in their minds. He then devotes an important part of his reflexion to the way in which a spiritual experience is encouraged, like Hinduism, Taoism, Zen Buddhism and Christian mysticism, as illustrated by the tradition of German mystics (Hildegard von Bingen, and the Flemish Dominican from the Rhineland. A. Ganoczy examines the spiritual attitude of the scientist). He finds it illustrated in one of Einstein's texts about the religious mind:

> The most beautiful experience we can have, is about the mystery of life. It is the primordial feeling in which all art and all true science originate. When one doesn't have such an experience, when one is no longer able to wonder at life, it is as if one were dead, as if the light in our eyes had gone out. The experience of the mystery even mixed with awe has given rise to religion. The little we know about an inscrutable reality – the manifestations of the truest reason and of the utmost beauty, which are accessible to human reason only in their most primitive forms – such knowledge and such an intuition nurture the true religious experience.[12]

While approving of such an attitude, A. Ganoczy looks at it with a critical eye. He is well aware that one cannot upgrade from a romantic vision of nature to the Christian vision, unless one is ready to go beyond pantheism.

> To conclude, I would put forward that it is possible to perceive a certain similarity between Einstein's actual or (alleged) pantheism – and Christian theology. I have in mind what he says about the

[11] Düsseldorf, Patmos Verlag, 1992.

[12] Quoted from Albert Einstein, *Mein Weitbild,* 1930. On that topics, see Max Jammer, *Einstein and Religion*, Princeton University Press, 1999.

> 'inscrutable' or the 'mysterious', which arouse in the scientist a religious attitude in front of the cosmos and which are constitutive elements of science (*op. cit.* p. 65).

3.2. *The Value of Mystical Language*

If religious feelings are part of the scientific approach, it follows that the mystical language is more than any other kind of language apt to account for it. A. Ganoczy's approach is a justification of the mystical language as a help to understand nature.

For him, the language of mysticism which is present in sciences is that of the spirit, which is above that of reason. He is very close to the kind of theology which interprets the passage in the Bible about Man having been 'made in God's image' in a way that is not limited by reasoning, or by the Cartesian project of making Man into 'the master and owner of nature'.

If it is through his spirit that Man-Adam is the image of God, then the conquests of science are 'divine works'. Biblical monotheism comes to terms with the demands of other religions – including 'the religion of science'.

As a matter of fact, the believer gets involved in the adventure of science in a fuller and better way than others:

> He who follows Christ Jesus and allows his Spirit to inspire his own motivations, cannot ignore nature, or divide it into two parts, as does the dualistic approach. But he does not have, either, to bury himself in the bosom of Mother-Nature, or wish he could dissolve into it in some sort of mystical trance, as though an adult being could crawl back into the original womb. In a Christ-centred perspective, or from a pneumatologic point of view, he is called upon to exercise his responsibilities towards nature, which for him is God's creation (*op. cit.*, p. 330).

The acknowledged confluence of terms used in quantum physics and the experiences described within those traditions, calls for a critical reflexion on the concept of Nature (with a capital N) – thus going back to the themes of Romanticism. Nature is endowed with a great power for renewing itself; it is a creative force, in fundamental physics as well as in biology.

3.3. *The Action of the Holy Ghost*

A third form of theological renewal, in connexion with the new science, can be seen in the way in which the Christian language introduces the

theme of Trinity, in order to take into account the demands of a reference to the spirit or The Spirit. This theme is found in J. Moltmann who, in *Gott in die Schöpfung,*[13] proposes a theology which takes the dimension of science into account. He breaks away from rationalistic dogma and in a way, through the themes of ecology, joins the romantic tradition.[14]

J. Moltmann's theology insists on the Trinitarian dimension of the creative act, in which the Holy Ghost has a specific role. Through its very nature, the Holy Ghost affords the possibility of making the themes of transcendence agree with those of immanence, and of distancing oneself from deism (too much marked by rationalism) and from determinism (too close to the mechanistic pattern). Theology, thus, acknowledges the immanence of God in his creation:

> An ecological treatise of creation implies a new reflection on God. It will no longer center on the distinction between God and the world, but on the knowledge of God's presence in the world and the presence of the world in God (p. 27).

In order to develop his new theological approach, J. Moltmann challenges the notion of essential causality, dear to the determinist approach, which implies a long-distance of essential domination. J. Moltmann proposes a theology based on immanence, which makes sense at the interactive level, already discussed:

> The creation of the world is different from the causation of the world. If, by virtue of his Spirit, the Creator is himself present in the creation, then his relationship with the creation must be thought of as a complex network of unilateral, multilateral and reciprocal relationships. In such a network, 'to create', 'to retain', 'to maintain' and 'to accomplish' do indeed refer to the major unilateral relationships, but 'to inhabit', 'to sympathise', 'to participate', 'to accompany', 'to suffer', 'to rejoice' and 'to glorify' are reciprocal relationships, which represent a cosmic community of life between God, the Spirit and all his creatures (p. 29).

Such a theology of creation of the world extends into an anthropological vision, where the spirit of man and the Spirit of God are in communion,

[13] München, Chr. Kaiser Verlag, 1985.

[14] See John Jedley Brooke, *Science and Religion,* Some Historical Perspectives, Cambridge: Cambridge University Press, 1991; see also the acts of a symposium edited by Andrew Cunningham & Nicolas Jardine, *Romanticism and the Sciences,* Cambridge, Cambridge University Press, 1990.

non only under the species of grace, but also under the species of nature. The notion of conscience is the privileged locus for such an exchange, which can be understood from the viewpoint of the new patterns given by science:

> Such a conception of God within the creation in the form of creation in the Spirit makes it possible for one to consider creation and evolution no longer as contradictory concepts, but complementary ones. There is a creation of evolution, because evolution cannot be explained of its own; there is an evolution of creation, because the creation of the world is oriented towards the kingdom of glory and for that very reason, transcends itself in time. The concept of evolution must be that very reason, transcends itself in time. The concept of evolution must be understood as the fundamental concept of self-motion of the divine Spirit in creation (p. 33).

As one can see, the novelties of the scientific language have been introduced into the very heart of the divine mystery. Non only the approach to creation, but to God himself, at the most inward part of his being. Coming back ten years later to this new approach, J. Moltmann confirmed it:

> The Trinitarian God does not only face his creation, but enters it through his eternal Spirit, penetrates all things and communes with the creation by inhabiting it. Hence follows a new conception of the relationship between all things, which is no longer a mechanistic one.[15]

J. Moltmann's developments are not centered on these notions, but he utilizes them freely. Clearly, the language of science as based on the unpredictable and randomness is accepted by the theological discourse, even when it is not in direct touch with the sciences of nature.

Many more authors could be quoted from. As far as the activities of this Academy are concerned, the authors mentioned should suffice to outline the main lines of the subject.

4. Taking seriously the Contingent Nature of the World

Another dimension of the theological reflexion rests with the contingent nature of the world, which is now being addressed and taken seriously. It is a part of the new vision of the world, where scientists no longer talk of pre-

[15] Der Geist des Lebens. Eine ganzheitliche Pneumatologie, Gütersloh, Chr. Kaiser Verlag, 1991.

cision or lack of precision, but of determination or indetermination. What now lies in the foreground of all scientific debates, is the notion of contingence, which has a philosophical dimension. Contingence does not only mean fragility; in accordance with the new scientific vision, contingence appears as a possible way towards new approaches. This last point has been taken by theologians anxious to connect the natural order with the supernatural order and to give the latter precedence over the former.

Lutheran theologian G. Siegwalt has developments in that direction.[16] He devotes two volumes to the theology of creation in a huge dogmatic synthesis. For him, 'the doctrine of soteriology is the key to cosmology' (p. 57). The very close link between soteriology and creation is one of the most important aspect of this study, which gives to the word creation a specific theological meaning, based on the conviction that 'revelation [...] throws light on reality' (p. 175) because on the one hand it makes one look in the direction of a new creation (p. 117) and on the other hand, it gives the humanity of Christ a privileged place to express the meaning of the whole cosmology.

The fact that modern science has broken away from rationalistic determinism appears to him to be an opportunity to be seized, in order to give the Christian discourse its full dimension, without reducing it. The reduction of the vision of the world entailed by positivism is thus avoided. The breaking away from determinism makes it possible to liberate the spirit from materialism and G. Siegwalt can make room for the world of the Spirit. Theology insists on the meaning of the word creativity, which conveys the notion of the ability given by God to his creatures to find fulfilment. This gift is actual.

The author's prudent approach makes it clear that there can indeed be converging patterns between theology and the vision of the sciences of nature. A number of concepts can help bridge the gap between both disciplines – both regarded as ways to access reality.

Conclusion

To close this attempt at putting these theological questions in perspective, I would like to give my personal point of view on the subject – very shortly to respect the time allowed for my speech.

[16] Gérard Siegwalt, *Dogmatique pour la catholicité évangélique,* t. III, *Cosmologie Theologique*; vol. 1: *Sciences et Philosophies de la nature,* t. 2: *Théologie de la création*, Paris, éd. du Cerf, 2001.

1. In the first place, I am delighted to see that open-mindedness has prevailed over the rationalists' narrow attitude. But this doesn't go without some ambiguity. Particularly on two points, about which I have personal reservations. Fundamentally, the perspective offered tends to revive certain forms of monism. It seems to me that it is important to keep up fighting pantheism.

On the other hand, the new physics tend to encourage the merging of the language of mystical theology with that of science, as though they were identical: this is a confusing issue, because the difference between modern science and theology must be strictly maintained.

2. One thing can help ward off such the danger: the concept of incarnation (it is usually mentioned by theologians who are anxious to manifest the specificity of their faith in Christ). The word is used in its strict meaning by Christian theology in order to convey what happened to the Word of God, the *Logos*, the Eternal Son of God, who could not under any circumstance be identified as a force of nature.

Incarnation is not the emergence of a latent process in the evolution of the Cosmos. It is a breaking away from the old, a real innovation. The word implies that the otherness of God should be acknowledged. The transcendence of the Word of God is not abolished. The theme of incarnation emphasizes God's transcendence and the freedom of his acts. The Christian faith acknowledges the otherness of God. It is not repealed by the acknowledgement of his coming through incarnation.

3. This is why the attitude of science which is founded on otherness agrees with such an acknowledgement. Scientists do not seek to hold a religious communion with reality. They observe it, in order to understand it better, which means that they keep a distance from it and remain critical towards personal emotional attitudes. Such an attitude agrees with the attitude of Christian prayer.

As a Catholic theologian, I think we have to stay somewhat vigilant on this point. Vigilance does not run counter to the scientific spirit, quite to the contrary, it is a way of showing respect for its exacting fundamental demands.

DISCUSSION ON THE PAPER BY MALDAMÉ

SINGER: When I made my remark to say something, I was very much afraid that you were actually pursuing the point of view that was pursued by the people you were citing, namely that religion would now try to reconcile contradictions between the scientific procedures and belief systems by trying to explain the unexplainable by the unexplainable, like taking quantum physics in order to solve the mind-body problem. Now I see that you don't do this, and I am very happy that you didn't do this, because it's my firm belief that these two systems are orthogonal, and that theology or belief systems would not do what they should do if they tried to reconcile what is knowable through scientific approaches with what they know through their internal belief systems, *Offenbarung* in German, or *révélation* in French. This is what esoterism does, and I think it's a disaster, and there are many physicists, and I deplore this very much, who supply arguments to the esoterists to make their systems scientifically sound. So, a scientific foundation of the belief system would be a disaster, because believing starts beyond the rational explanation that science can give. But, as an example of how dangerous this can be, I may refer to our conviction as cultural beings that we are free in our will and in our self-determinism. This was certainly in conflict with the positivistic mechanistic world view of the nineteenth century, and is of course not resolved by quantum physics at all, because it simply replaces firm deterministic causality by a probabilistic process. But if our brain processes depend on probabilistic processes, then hazard plays the game, and not freedom. One replaces determinism by hazard, which is not a gain at all. This is just one example of the many pitfalls that one runs into if one tries to take scientific advances as they have been put forward in quantum physics to explain other mysteries. Quantum physics probably doesn't apply very much to the brain, because it's a warm, big system. This warning was written down before you came to your end, so I apologise, I just wanted to repeat that point because I consider it important.

GERMAIN: Yes, thank you. I think that is not a convergence between science and religious discourses. Je vais dire en français. Il faut séparer les deux languages, et si ils se rencontrent c'est dans une médiation philosophique, mais pas scientifique.

MALDAMÉ: The topic is: the frontier between science and belief; the more science can explain things like ontogeny or evolution, the less there is a need for belief systems to fill these gaps, so they can start to work beyond those frontiers and what happens is a continuous moving out of these frontiers beyond which belief systems are necessary, so there is a rephrasing, but it's not an incorporation.

SINGER: Yes, yes, I think so.

GERMAIN: Merci, Monsieur le Président. Je dois avouer que cette communication me cause un certain malaise. Je suis d'accord avec la conclusion, mais alors je me demande pourquoi le développement, qu'est-ce que le Père Maldamé souhaite nous faire comprendre, à nous Académie des Sciences, qu'est-ce que ça nous apporte? En particulier, pour parler d'une chose que je connais bien, vous avez cité le livre de Guitton en disant effectivement qu'il a eu un succès considérable. Bon, mais j'ai eu trois quarts d'heure de discussion avec Jean Guitton, c'est un livre terrible. Quand je discutais avec Jean Guitton, au bout d'un moment je lui ai dit: "Mais, cher Monsieur Guitton, où avez-vous pris votre image de la science?", et il m'a parlé de Platon, Aristote, Saint Thomas d'Aquin et puis Bergson, et encore de Maritain, Maritain que j'aime bien mais quand-même moins quand il raconte des choses sur la science. On pourrait discuter tout ce que vous avez dit, mais en conclusion, si j'ai bien compris la discussion avec le Professeur Singer, vous arrivez à un problème qui pour moi est central qui est l'unité de l'esprit, l'unité de l'esprit quand on est à la fois chrétien, vivant sa foi aussi profondément qu'on peut, et puis scientifique, mais on ne va pas discuter de l'unité de l'esprit à l'Académie des Sciences, ça me paraît déplacé. Je voulais simplement remarquer que j'ai éprouvé un certain malaise en tant que membre de l'Académie Pontificale des Sciences, et en tant que chrétien. La conclusion, alors là je me retrouve avec un certain nombre de choses, aussi bien avec par exemple des mots de Menon, et ce que vous dites pour la spiritualité du chrétien que je suis, cela c'est très intéressant, mais comment voulez vous que ce qui est intéressant pour moi puisse servir à la majorité de nos confrères qui sont là, comme moi d'ailleurs, pour parler de la science avec la société.

MALDAMÉ: J'ai fait état d'un certain nombre de publications dont le livre de Jean Guitton; je suis d'accord avec vous qu'il ne vaut rien au plan scientifique, mais ce livre a eu un très grand succès. Nous sommes attentifs à l'image de la science. C'est par rapport à cela qu'il me semblait qu'il était important d'être vigilants. Avec ce livre, on sort d'un certain rationalisme fermé, mais en même temps la manière d'en sortir est une confusion. Tel était le but de mon intervention, puisqu'on parle des valeurs de la science: montrer qu'il y a les valeurs de la raison, qui s'accordent avec une certaine dimension spirituelle. Jusqu'ici il y avait le désintéressement, l'objectivité, mais on a introduit au cours des derniers décennies de nouvelles valeurs spirituelles; il me semble important d'en faire une évaluation et que ceci fait partie, me semble-t-il, des travaux d'une assemblée comme la nôtre. J'ai cité bien des auteurs mais, comme vous l'avez bien compris par ma conclusion, ce n'est pas pour les approuver.

ZICHICHI: I would like to support your conclusion. Vous dites la différence entre science moderne et théologie doit être strictement maintenue. In fact, science is the most rigorous way of studying the immanent part of our existential sphere, while theology is the rigorous study of the transcendental part of our existential sphere. I'm sorry about my poor English. I can speak physics in English, but philosophy is different. However, it is very important to emphasise, and I agree with Professor Germain when he says he has difficulties, that the difference must be maintained despite the fact that great physicists like Pauli and others have tried to study the connection of the two spheres.

I think that the great mystery of our existence is exactly there: there are two spheres, one is transcendental; the other is immanentistic. Science is there, even if you speak about the new symbols, the new mathematics, the new rigorous strategy to understand the immanentistic sphere. Still whatever we do must in the end produce reproducible results, while the transcendental part is completely different, the two spheres are different. If you confuse the two spheres, sooner or later you reach the conclusion that science should prove the existence of God. This science can never do, because God is not science only, He is everything. When, in five billion years, the sun will stop burning – by the way, the sun will not explode, it has been said that it will explode but the sun expands, it does not explode, it's too light to become an explosive star, this has been said on other occasions, not by you – and will come where we are, the transcendental sphere of our existence will 100% be there. This is why we

must keep the two spheres completely separated. You emphasise the extremely important point that we should not be influenced by great physicists when they speak about the transcendental part of our existence; they are not theologians. We must keep the two components strictly independent and try to see what conclusions we can draw. The fascinating aspect of our existence lies in exactly the fact that the two spheres are independent, and each one has its own laws. I repeat: in five billion years the immanentistic component of our existence will be completely different. The transcendental one will not be.

JAKI: Well, first a very brief remark. You quoted Eddington, 1927 (the year when Heisenberg proposed his indeterminacy principle), that religion for the first time became respectable for a rationalist individual or rational man. But you see, Eddington withdrew his statement, so here is a very factual defect of your presentation. And there are others, but I do not want to list those because we've not enough time. Then, for over two pages in your English text you speak about Moltmann and Siegwald, two theologians, but you never raise the question, you never investigate what is the scientific training of these theologians, and I strongly doubt the statements of anyone about science who doesn't have a serious training in science. Duhem, Pierre Duhem, whom you know well, already stated this one hundred years ago, and it fell upon deaf ears among Catholic theologians. Now, I would like to bet my bottom dollar that neither Moltmann nor Siegwald has as much as a Bachelor of Science in any of the hard sciences. Finally, and this is a very serious remark, excuse me, you are a dear friend, but my feeling was that if I ignore the last three lines of your presentation as a Catholic theologian and so forth, I think I am not entitled to conclude in an unambiguous way that the author of this paper was a Catholic theologian, let alone a priest, let alone a Son of Saint Dominique. One more thing from which your paper would have greatly profited, and this has already been indicated by Professor Zichichi, if you had paid attention to what Einstein said: 'When you deal with scientists, ignore what they write and what they say, and watch carefully what they do'.

MALDAMÉ: I have nothing to say about Moltmann and Siegwald, they are theologians, and they are well known as theologians.

JAKI: The question is their training in science, because they talk profusely about science, and this is what bothers me.

DE DUVE: J'ai écouté le Père Maldamé avec énormément d'intérêt. Je suis un petit peu déçu de constater que, comme la plupart des philosophes qui se penchent sur les relations entre philosophie et science, il établit pratiquement une équivalence entre le mot "science" et le mot "physique". Quand il parle d'une nouvelle vision de la nature, il nous parle de la vision de la nature qui nous a été donnée par Planck, par Heisenberg, par les physiciens. Or, je ne vais par répéter ce que j'ai dit hier, mais je crois que la biologie est aujourd'hui devenue beaucoup plus importante que la physique dans le message, je dirais, philosophique qu'elle nous transmet.

MALDAMÉ: Oui, je suis d'accord avec vous. Dans mon intention première je voulais aborder la question de la biologie, par le biais de la contingence, mais les limites du papier ont fait que je n'ai pas abordé la question. Mais je suis tout à fait d'accord avec vous; il y a eu un glissement au cours des dernières années qui fait que la science fondamentale pour notre vision du monde est passée de la physique à la biologie. Donc, j'avais l'intention de faire un peu la même chose, de relever la même équivoque à propos de l'affirmation bien connue que "la vie est sacrée", qui donne la même confusion.

MITTELSTRASS: Just a very short remark on your introductory remarks on reason and rationalism: I think you said that reason always insisted on being pure reason. This is certainly true, at least in a Kantian tradition, but did it always insist on being purely rationalistic? Blaise Pascal may pass as an example, but what we call non-rationalistic or even mystic could also be something like the incognito of reason, so pure reason and rationality is not necessarily the same, and I don't think that it has been the same in the history of science and philosophy.

MALDAMÉ: Yes, there a lot of things to be said about reason. I think that when I speak of pure reason I am thinking of Kant, and I think there is a lot of influence of Kantian philosophy on university work in France and in Europe. Personally, I think that there is no opposition in Pascal between science and reason, no systematic opposition, but factual opposition, and the movement of the Pensées of Pascal, is to use some physical or scientific concept in his apologetics. But it's another problem. But you are right, I can't say everything about reason. I taught in the university tradition, and the Kantian influence that was very strong in France.

CABIBBO: We now tend to consider Jung as a sort of mystic. Maybe at that time people saw him as a scientist, and maybe also Paoli would consider him as such. I mean, Jung and Freud were considered scientists in the past. I don't know what would be the present evaluation on the scientific standing of their doctrines.