

*The Proceedings  
of the Plenary Session on*

SCIENTIFIC INSIGHTS  
INTO THE EVOLUTION  
OF THE UNIVERSE AND OF LIFE

*31 October – 4 November 2008*

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EX AEDIBVS ACADEMICIS IN CIVITATE VATICANA

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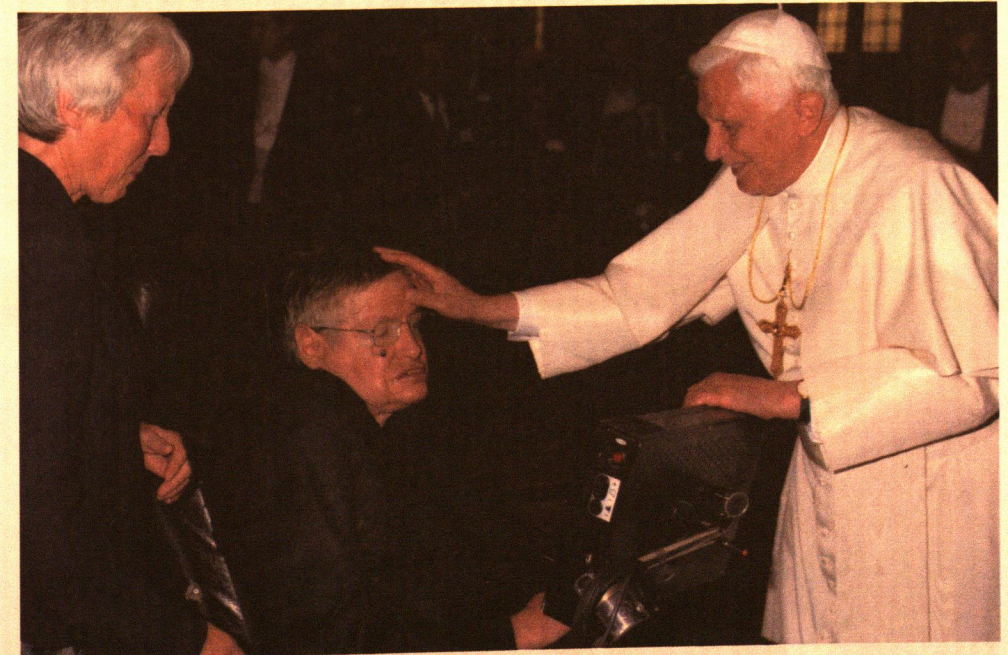
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VATICAN CITY



His Holiness Pope Benedict XVI



The Participants of the Plenary Session of 31 October-4 November 2008



Papal Audience of 31 October 2008



The Participants of the Plenary Session of 31 October-4 November 2008

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## INTRODUCTION

Research into the origins and evolution of the universe, of matter and of life belongs to the focal topics of the natural sciences. The Pontifical Academy of Sciences has repeatedly paid attention to these questions both in plenary sessions and in specialised meetings. In recent years relevant basic scientific knowledge has been considerably enriched, in particular by the introduction of novel and powerful research strategies. Cosmic investigations can reach ever greater distances, while particle physics and the nanosciences allow scientists to explore structures of ever smaller dimensions. The results of these largely interdisciplinary studies considerably enrich our knowledge about natural reality and they also raise new questions. These concern, for example, a postulated multiverse or dark matter and, more generally, cosmic evolution. In the life sciences more precise structural knowledge on genetic information and on gene products provides insights not only into functional characteristics but also into molecular mechanisms that contribute to the occasional generation of genetic variants – the drivers of biological evolution.

By definition, evolution implies a changing reality. This is what the sciences have postulated as holding both for the inanimate cosmos and for the living world. Ever more powerful research strategies continue to strengthen the validity of these postulates.

The Council of the Pontifical Academy invites the Academicians to present in the forthcoming Plenary Session any scientific contributions that may validate or falsify evolutionary theories and can provide a deeper insight into the evolutionary processes of the living and of the non-living world. This might allow our Academy to update its own knowledge base and to transmit this knowledge to human society to bring its science-based worldview up to date. In addition to traditional wisdom, religious beliefs and educational values, scientific knowledge forms an essential part of the guiding knowledge that we need to make individual and socio-political decisions.

## THE CATHOLIC CHURCH AND EVOLUTIONARY THEORY: A CONFLICT MODEL<sup>1</sup>

GEREON WOLTERS

### I. PRELIMINARY CONCEPTUAL REMARKS

The relationship between the Catholic Church and the Theory of Evolution is a specific area of research within the increasingly popular field of Science and Religion. Science and Religion is, in turn, a special facet of the Reason and Faith debate that has featured prominently in the teachings of the Church from the very beginning.<sup>2</sup> The corresponding relationships have always been very complex. The interaction between science and religion can take on four basic forms.<sup>3</sup> Science and religion can:

- 1) conflict with each other,
- 2) be complementary, 'each answering a different set of human needs',<sup>4</sup>

<sup>1</sup> I am grateful to the Netherlands Institute for Advanced Study (NIAS) for providing me with the opportunity, as a Fellow-in-Residence, to complete this paper. I gratefully acknowledge the great support of my work by the NIAS, especially the help of Petry Kievit-Tyson B.A. (Hons) who edited the text.

<sup>2</sup> This topic is particularly dear to the heart of Pope Benedict XVI. It was during his tenure (1981-2005) as Prefect of the Sacred Congregation for the Doctrine of the Faith (SCDF) that Pope John Paul II promulgated the Encyclical Letter *Fides et Ratio* (September 14, 1998) (John Paul II, 1998). Apart from that there is e.g. an interesting exchange between Cardinal Ratzinger and Jürgen Habermas on this topic (Habermas/Ratzinger, 2005). Pope Benedict has addressed it furthermore in important speeches, e.g. in his controversial lecture ('Faith, Reason and the University: Memories and Reflections') at the University of Regensburg, Germany, on September 12, 2006, which stirred much controversy in the Muslim world (Benedict XVI, 2006); or in the lecture he planned to give during a visit to the Roman university *La Sapienza* on January 17, 2008 (Benedict XVI, 2008).

<sup>3</sup> Cf. Brooke (1991), 2f. Brooke mentions only the first three.

<sup>4</sup> Brooke (1991), 2. This is basically the content of the NOMA (NON-overlapping MAgisteria) conception of Stephen Jay Gould (cf. Gould, 1999). According to NOMA science

3) be cooperative, working 'to the advantage of both'. This seems to be the position Pope Benedict advocated at a conference meeting when he discussed the 'cooperation (*Zusammenspiel*) of various dimensions of reason'<sup>5</sup> with his former students,

4) or they can be *incommensurable*, where each side talks about fundamentally different things, or about the same things but in a fundamentally different way, so that mutual agreement becomes impossible.<sup>6</sup> There is much to be said about each of these views. The confines of this paper mean that I can only discuss the type of interaction between science and religion that is characterised by conflict. Inevitably, this means the paper will be rather one-sided.

It is important to define different types of conflict. The *first* is a doctrinal conflict in which science and religion hold conflicting, mutually exclusive, views about a particular situation. The most important example of this type of doctrinal conflict was seen in the case of Galileo and, to honour him, I term these kinds of conflict, *Galilean conflicts*. The most recent example of such a *Galilean conflict* is the debate surrounding evolutionary theory.

The *second* type of conflict is not so much about doctrine itself. It is more about scientists' attempts to refute that religion is a phenomenon in its own right. Such explanations are also called 'naturalistic' or 'scientific'. In this vein, Karl Marx described religion as the 'opium of the people'. Freud viewed religion as a collective neurosis and some modern brain researchers even regard it as an illusion produced by the limbic system. Others, in turn, see religion as an important component of the evolution of social behaviour; while others like Richard Dawkins explain religion as a by-product of evolution. Because in all these approaches religion appears as illusory, I would like to term these types of conflicts as *Freudian conflicts*, because the word 'illusion' appears in the title *The Future of an Illusion* of Freud's book on the topic.<sup>7</sup>

In any debate about the relationship between science and religion, two central questions need to be asked: 1) What should be done if scientific findings contradict the Word of the *Bible*? 2) What should be done if there

has exclusive competence in the realm of facts, whereas religion has exclusive competence for norms, values and meaning.

<sup>5</sup> In: Horn/Wiedehöfer (eds.) (2007), 150.

<sup>6</sup> Cf. Wolters (1997), 140. A protagonist of this view is the philosopher Ludwig Wittgenstein (1889-1951).

<sup>7</sup> Freud (1927) (*Die Zukunft einer Illusion*).



are contradictions between science and the teachings of the *Church*? St. Augustine (354-430) already gave an answer to the first question in his commentary on the book of *Genesis* (*De genesi ad litteram*) although his view has been largely ignored in almost all Galilean conflicts. St. Augustine recommends an allegorical, i.e. figurative understanding of the respective texts in cases where a literal reading of the Holy Scripture would lead to contradictions or be at variance with 'highly certain results of reasoning or with empirical evidence' (*certissima ratione vel experientia*, Augustine, 1961/1964).<sup>8</sup> Augustine advised not to become embroiled in the type of conflicts termed here as *Galilean conflicts* because this would only make religion look ridiculous (*deridetur*), which in turn could jeopardize its propagation. With respect to the second question, about whether science contradicts the teachings of the Church, matters are somewhat more complex, because the teachings of the Church are binding to very different degrees. Teachings can even be infallible.<sup>9</sup> Needless to say, a collision between a supposedly infallible teaching of the Church and a piece of scientific theory confirmed by evidence will create very special epistemological problems, but certainly not just epistemological problems, theological, political and other issues as well.

People today believe, as St. Augustine did much earlier, that scientific questions are answered by means of scientific knowledge and not by religious authority.

To conclude these preliminary conceptual remarks, I would like to emphasize another fundamental distinction: the distinction between *natural* and *his-*

<sup>8</sup> Particularly instructive is book I, chapter 19 (quotation there), where Augustine distinguishes central tenets of faith (he mentions the resurrection of Christ and the hope for an eternal life) from what is said about the material world. For Augustine there is 'nothing more embarrassing, dangerous and to be avoided' (*turpe est autem nimis et perniciosum ac maxime cavendum*) than insiting on wrong statements about matters of fact with reference to the Bible. In parts of Protestant theology, e.g. Rudolf Bultmann, the allegorical reading extends also to those parts of the Bible, whose literal understanding is – different from e.g. astronomical matters of fact – essential for the Catholic Faith. This holds, for example, for the resurrection of Christ from death.

<sup>9</sup> There are basically three types of teachings, which under certain conditions are regarded as infallible: (1) Pronouncements of ecumenical councils; (2) Papal proclamations *ex cathedra*, and (3) teachings of the 'ordinary and universal magisterium' of the college of bishops while dispersed throughout the world, but maintaining the bond of communion among themselves and the Pope. Whereas the first two types of infallible teachings, which form the *extraordinary* magisterium, are comparatively easily identifiable, there is with respect to the third much dispute about the lack of clear identity criteria.

*torical facts*, on the one hand, and *meaning, norms and values*, on the other. Statements about facts express how things *are*, normative or evaluative statements tell us how things *ought to be*, in other words, which value or meaning should be attached to them.

## II. GALILEAN CONFLICTS ON EVOLUTION

The Galileo affair has been an embarrassment to the Church ever since the second half of the 17th century when it became clear to almost everybody in Rome that Copernicanism was far from being 'philosophically absurd and false' as had been stated in the verdict against Galileo. However, the Church's embarrassment is mainly linked to the fact that the verdict against Galileo declared Copernicanism to be 'formally heretical'.<sup>10</sup> This fallacious aspect of the verdict means that the Church had erred with respect to a matter of faith. The danger is that this could undermine other pronouncements concerning the very core of faith, which is a far more serious matter than, merely, not believing an astronomical theory like Copernicanism.

When evolutionary theory spread throughout the educated world during the second half of the 19th century, most Catholic circles merely viewed this as just as another threat to Faith from the materialist sciences.<sup>11</sup>

According to the above definition of a *Galilean conflict*, we would have expected to see more conflict surrounding evolution. However, throughout the first hundred years of Darwinian evolutionary theory, the ecclesiastical authorities seemed to keep a low profile. They seemed to have learnt their lesson from the Galileo Affair and kept their noses out of scientific debates, at least as far as making any official announcements about evolutionary theory.<sup>12</sup> The highest-ranking Vatican Institution, the 'Supreme Sacred Congregation of the Roman and Universal Inquisition' (in 1908 renamed to 'Supreme Sacred Congregation of the Holy Office' it became in 1965 'Sacred Congregation for the Doctrine of the Faith', before the 'sacred' was

<sup>10</sup> A teaching is 'formally heretical', when its author *knows* that it contradicts the teachings of the Church. This is true in the Galileo case because prior to his condemnation in 1633 Galilei had received a warning in 1616 not to advance Copernicanism.

<sup>11</sup> The charge of 'materialism' is a recurrent theme in the archival materials in the Congregation for the Doctrine of Faith.

<sup>12</sup> For details see Artigas/Glick/Martínez (2006), 281ff.

dropped in 1983 as with all other Vatican Congregations) did not address evolutionary theory. Evolution was only mentioned in the less important 'Sacred Congregation of the Index',<sup>13</sup> and then only with respect to the denunciation of certain books. Overall, it can be said that on the side of Vatican authorities 'there was, in a sense, no policy at all' with respect to evolutionary theory. They 'responded to particular circumstances, not to a carefully designed plan'.<sup>14</sup> Furthermore, one could say that the authorities took a low-key stance. An examination of the available sources (presently only up to 1929), shows that, notwithstanding the flood of polemics from theologians against the theory of evolution, there has not been one official denouncement of evolutionary theory by the Catholic Church. Only a few authors – mostly Catholic priests who tried to reconcile evolution and Catholicism – ended up on the Index of Prohibited Books. The available sources on the Index contain no evidence of any discussion of books by non-Catholic authors, even those that were clearly anti-Christian or anti-Catholic such as, for example, the biologist Ernst Haeckel (1834-1919). The reason for this focus on Catholic writers is that 'books written by Catholic authors and in Catholic countries [...] were more likely to disturb the life of the Church'. In addition, Pope Leo XIII in his *Constitutio de Prohibitione et Censura Librorum* (1900) had decreed: 'Books written by non-Catholics that treat religion professionally are prohibited, unless it is ascertained that there is nothing in them contrary to Catholic faith'.<sup>15</sup> This meant that, in effect, non-Catholic authors were given more leeway because the criterion 'treating religion professionally' was vague. It was assumed that all the enemies of Faith and of the Church would be on the Index anyway. The problem was that readers could not judge in advance whether the content of the book they were about to read was such that it would end up being put on

<sup>13</sup> The Index Congregation was dissolved in 1917, and its task of prohibiting books was transferred to the Holy Office. In 1966, finally, the Index was abolished.

<sup>14</sup> Artigas/Glick/Martínez (eds.) (2006), 4. The book gives a careful analysis of documents preserved in the Archive of the Congregation for the Doctrine of the Faith, which contains material both from the former Congregation of the Index of Prohibited Books and the Holy Office. They, furthermore, relate these documents to publications in the leading Jesuit journal *Civiltà Cattolica* that fiercely opposed 'evolutionism'. The authors address the policy issue extensively in the last chapter of the book (270ff.). I am grateful to Elliott Sober (University of Wisconsin – Madison) for directing my attention to this book.

<sup>15</sup> Artigas/Glick/Martínez (2006), 14. I have rendered the Latin 'ex professo' as 'professionally'.

the Index. Readers would probably not even be sure after reading the book because of the vague criterion applied.<sup>16</sup>

There were three main kinds of objection that the, so-called, Consultors of the Index Congregation could raise that would result in the explicit condemnation of a book.

(1) Arguments against evolutionism were mainly along the lines of the following quote: 'On the basis of Scripture and Church tradition, focusing on a very few, narrowly defined issues such as the origin of Adam, or whether Adam's body, along with his soul, had to be created directly, immediately, and simultaneously by God, or whether his body might have been previously prepared to receive a soul by a natural process like evolution'.<sup>17</sup> This quote reflects a typical Galilean conflict, i.e. science says *G*, whereas the Church, based on the Word (Bible) and tradition, says *non-G*. Catholic authors who tried to reconcile Faith and evolution, and who had come to the attention of the Congregation of the Index, typically accepted evolution in the animal kingdom as being a fact but, rather arbitrarily, left Adam out of the story of evolution and conceded his special creation by God. However, this concession alone was not enough to save their books from being condemned.

(2) The Consultors not only answered issues by recourse to Scripture or Tradition, they often also put forward supposedly scientific arguments. This reminds us of the case of Galileo where the Church condemned Copernicanism as being 'philosophically absurd and false'. In our case it is the argument for the fixity of species, which is based on hybridity. This argument rested mainly on the erroneous idea that speciation occurs a) exclusively by hybridization, b) among individuals, rather than within populations and c) the concept of species is typological or essentialist, expressing a fixed set of immutable characteristics, rather than population associated. In other words, it relates to the dynamic distribution of characteristics and to various speciation processes. An example of such a process is allopatric speciation. This occurs when a small group is first geographically separat-

<sup>16</sup> But behind this restraint was certainly also the insight that it was practically impossible to skim the international bookmarket for 'heretical' literature with respect to evolution. This problem is, by the way, almost as old as the Index of Prohibited Books itself. Cf. the Introduction to Wolf (ed.) (2005), Vol. I. Wolf's edition that in its first phase covers the documents of the Holy Office and the Index Congregation on the prohibition of books between 1814 (return of the archives from Paris) and 1917 (end of the Congregation of the Index) is an invaluable instrument of research.

<sup>17</sup> Artigas/Glick/Martínez (2006), 92.

ed from the main population which means it is then effectively reproductively isolated from the source population, and this results in the course of relatively few generations in a new species.<sup>18</sup>

(3) Furthermore, we find condemnations of the hermeneutic principles used by the authors. Here an excerpt from the expert opinion on a book placed on the Index (*New Studies in Philosophy. Lectures to a Young Student* (1877) by Raffaello Caverni): 'Caverni's rules for biblical exegesis are absurd, omitting any divine inspiration, and therefore infallibility, from anything that can be considered the object of natural science. A corollary is that Darwinism or any other physiological, geological, etc. system is all admissible, even though manifestly opposed to the Bible'.<sup>19</sup> This passage can be read as a rejection of Stephen Jay Gould's NOMA principle *avant la lettre*, i.e. the methodological principle of keeping the two Magisteria – Science and Religion – completely separate. This principle can already be detected during Galileo's lifetime in an ingenuous formulation by Cardinal Cesare Baronio: 'The Holy Spirit had in mind to teach us how to go to heaven and not how the heavens go'.<sup>20</sup>

In the case of Caverni's book,<sup>21</sup> as in the Galileo Affair, the Church authorities claim to supersede factual scientific findings by referring to the Scriptures or traditional teachings. There are, however two remarkable differences between Caverni's book and the case of Galileo. 1) His topic, i.e. humanization, is much closer than Copernicanism to the Catholic faith because it is linked to the central theological doctrine of the Original Sin, which, in turn, is one of the foundations of Redemption by Jesus Christ. 2)

<sup>18</sup> More information is provided by Coyne/Orr (2004), who gives a splendid overview of the field. My biology colleague in Konstanz, Axel Meyer, referred me to this book. Relying exclusively on hybridization the Consultants could easily exclude speciation as a natural phenomenon, because also for contemporary standards this form of speciation ought to be very rare, because hybridization in most cases leads to no offspring or sterile offspring at best.

<sup>19</sup> *Ibid.*, 44.

<sup>20</sup> The quote is in Brandmüller/Greipl (eds.) (1992), 295, as quoted by a consultant in the case of the physicist and priest Giovanni Settele (1770-1841). Settele's book that advanced Copernicanism was – after long discussions – *not* put on the Index. Whether this bureaucratic act (or better: *non-act*), known only to those personally involved in the case, can count as 'fine della controversia', as the editors claim in the subtitle of their book on Copernicanism and the Settele case, seems rather doubtful. Cf. also Gould (1999), 6 for the Baronio quotation.

<sup>21</sup> In my points (1) and (3), to be exact.

In the case of Caverni, the Church authorities kept a low profile even though evolutionism is possibly of immense importance in matters of faith and it is significant that there was no public condemnation of the theory of evolution, when the book was put on the Index.<sup>22</sup>

*Excursus:* in all Galilean conflicts, there is the question of who has the expertise and is competent to judge on questions about facts, either historical or about the natural world. NOMA, which assigns the world of facts to Science and the realm of meaning, values and norms to Religion, would seem, at first glance, to have solved all problems. However, this is not the case. There are aspects of the teachings of the Church that are of a factual nature. For example, in the *Catechism of the Catholic Church* of 1994, one finds a thesis on the monogenetic origin of humankind.<sup>23</sup> Here the Church is – with reference to the *Acts of the Apostles* 17, 26<sup>24</sup> – advancing a thesis that *incidentally* coincides with scientific evidence. The question is what would happen, if in the future sufficient scientific evidence emerged to support *multiple* origins of humankind. Other fact-related teachings by the Church are the historicity of the so-called original sin, the resurrection of Jesus Christ from death, and the possibility of miracles in general.<sup>25</sup> The epistemological impossibility of supporting statements about facts by reference to Scripture and tradition has led some Protestant theologians to abstain from factual claims altogether, thus taking up a position similar to NOMA.<sup>26</sup> How-

<sup>22</sup> Only people directly involved in the decision of the Congregation of the Index could know that the book was condemned because of its 'evolutionism'. Caverni himself e.g. thought that his critique of the Jesuits had led to the condemnation. (Cf. Artigas/Glick/Martínez, 2006, 49).

<sup>23</sup> Catechism (1994), Nr. 360, p. 82. The encyclical *Humani Generis* (Pius XII, 1951), no. 37 makes it clear, consequently, that polygenism is not compatible with Catholic Faith, and that 'the children of the Church' do not have the liberty to embrace it. More on *Humani Generis* see below.

<sup>24</sup> 'And [God] hath made of one blood all nations of men for to dwell on all the face of the earth'.

<sup>25</sup> Catechism (1994), no. 397ff., p. 89ff (original sin). The historicity of resurrection of Christ from death (no. 639, p. 146) is certainly in conflict with what biology and medicine have to tell us about death. This, however, does not amount to a Galilean conflict, because the teachings of the Church do not generally reject bio-medical laws. They rather claim miraculous exceptions to their action. The issue of miracles, therefore, is not a scientific issue, but rather an epistemological one. Here epistemological conceptions about miracles are in opposition to each other.

<sup>26</sup> Rudolf Bultmann's program of demythologization seems to be a first step in this direction.

ever, with respect to the factual claims quoted above, I do not believe this option to be available to Catholic theologians.<sup>27</sup> They will always be faced with the 'friction zone' between science and religion.<sup>28</sup>

The next official document I will discuss is the Encyclical *Humani Generis*, promulgated by Pope Pius XII in 1950. This is the first explicit public statement on evolution by a Church authority. On the whole, this Encyclical expresses a rather relaxed position with respect to evolution.<sup>29</sup> It does not instigate a Galilean conflict but it does intimate only *possible* problems. The text is somewhat obfuscated, however, by the low epistemological expertise, which characterizes documents of the Church up to the present day.

The Pope distinguishes between 'clearly proved facts' and 'hypotheses' in empirical science. However, as, by definition, all universal statements in empirical science are hypotheses, it seems more likely that the Pope is actually distinguishing between hypotheses that are strongly supported by

<sup>27</sup> Consequently NOMA is rejected by Cardinal Schönborn (in: Horn/Wiedenhofer, eds., 2007, 86).

<sup>28</sup> This felicitous expression was used by Wolf Singer in the discussion of this talk.

<sup>29</sup> Here is the text of the relevant passages: '35. It remains for Us now to speak about those questions which, although they pertain to the positive sciences, are nevertheless more or less connected with the truths of the Christian faith. In fact, not a few insistently demand that the Catholic religion take these sciences into account as much as possible. This certainly would be praiseworthy in the case of clearly proved facts; but caution must be used when there is rather question of hypotheses, having some sort of scientific foundation, in which the doctrine contained in Sacred Scripture or in Tradition is involved. If such conjectural opinions are directly or indirectly opposed to the doctrine revealed by God, then the demand that they be recognized can in no way be admitted. 36. For these reasons the Teaching Authority of the Church does not forbid that, in conformity with the present state of human sciences and sacred theology, research and discussions, on the part of men experienced in both fields, take place with regard to the doctrine of evolution, in as far as it inquires into the origin of the human body as coming from pre-existent and living matter – for the Catholic faith obliges us to hold that souls are immediately created by God. However, this must be done in such a way that the reasons for both opinions, that is, those favorable and those unfavorable to evolution, be weighed and judged with the necessary seriousness, moderation and measure, and provided that all are prepared to submit to the judgment of the Church, to whom Christ has given the mission of interpreting authentically the Sacred Scriptures and of defending the dogmas of faith. Some however, rashly transgress this liberty of discussion, when they act as if the origin of the human body from pre-existing and living matter were already completely certain and proved by the facts which have been discovered up to now and by reasoning on those facts, and as if there were nothing in the sources of divine revelation which demands the greatest moderation and caution in this question'. (Pius XII, 1950)

empirical evidence and hypotheses that lack sufficient empirical evidence.<sup>30</sup> In this light, we can say that Pope Pius XII:

1) accepts evolutionary theory as a scientific theory as long as it does not contest God's creation of the human soul or the monogenic origin of mankind,

2) believes that evolutionary 'hypotheses' have to be 'submit(ted) to the judgement of the Church'. Whether this also holds for 'proved facts', remains unclear,

3) invites the Faithful to scrutinize carefully whether the evidence for various evolutionary hypotheses is sufficient, in order to class them as 'clearly proved facts' or only as 'hypotheses'. He seems to assume here that evolutionary hypotheses do not belong to his category of 'proved facts',

4) does not speak out on whether he thinks that evolution is a historical fact of the history of the earth.<sup>31</sup>

The next pronouncement of the Church concerning evolution can be found in the *Monitum*, a warning against the writings of Jesuit palaeontologist Teilhard de Chardin, issued by the Holy Office on June 30, 1962 and reiterated on July 20, 1981.

Several works of Fr. Pierre Teilhard de Chardin, some of which were posthumously published, are being edited and are gaining a good deal of success. Prescinding from a judgement about those points that concern the positive sciences, it is sufficiently clear that the above-mentioned works abound in such ambiguities and indeed even serious errors, as to offend Catholic doctrine.<sup>32</sup>

The above text illustrates two important points: 1) The Church is not interested in engaging in a Galilean conflict about evolution and explicitly

<sup>30</sup> He generally holds that 1) all universal statements of empirical science ('for all  $x$  holds...') have the logical status of hypotheses; and that 2) for logical reasons there can be no empirical 'proof' of a universal empirical hypothesis, because empirical confirmations come always in form of singular confirming instances. Empirical hypotheses are, rather, distinguished from one another by the degree of evidence that exists in their support. The most important form of evidence is empirical confirmation. Other forms of evidence are compatibility with well supported other hypotheses, range, explanatory power etc.

<sup>31</sup> I wonder how Gould (1999), 80 could celebrate Pius XII as accepting the NOMA principle of the two non-overlapping *Magisteria* of science and religion, when the Pope states that the hypotheses of the 'positive sciences, are [...] more or less connected with the truths of the Christian faith' and that the Church has the last word in case of contradictions of scientific hypotheses to the Catholic Faith. These claims of the Pope constitute a major incursion into and, therefore, overlap between the two *Magisteria*.

<sup>32</sup> Holy Office (1962/81).

refrains from interfering with matters of science.<sup>33</sup> 2) The Church maintains a cautious and expectant position with respect to evolutionary theory.

This caution seems to be thrown to the wind in a famous letter by John Paul II to the Pontifical Academy on October 22, 1996. In this letter, Pope John Paul II confirms the position taken by Pius XII in *Humani Generis*, but with one decisive qualification:

Today, almost half a century after the publication of the Encyclical [*Humani Generis*] new knowledge has led to the recognition of the theory of evolution as more than a hypothesis.<sup>34</sup> It is indeed remarkable that this theory has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge. The convergence, neither sought nor fabricated, of the results of work that was conducted independently is in itself a significant argument in favour of this theory.

The above quote, like several other passages not quoted here, can be interpreted as follows:

1) Pope John Paul II acknowledges the theory of evolution to be an adequately confirmed theory or, as formulated in Vatican epistemological terminology, it has risen above mere 'hypothesis' and is beginning to be something like a 'proven fact',<sup>35</sup>

<sup>33</sup> Teilhard's understanding of evolution as a goal-directed process is not shared by current evolutionary biologists. In recent months there has been an ongoing press campaign in Italy with the aim to lift the ban on Teilhard's writings. In the context of this campaign Teilhard's case is often compared to the verdict on Galileo. Such a comparison shows poor judgement, because in Teilhard's case the ammonition was based exclusively on theological issues.

<sup>34</sup> The whole text of the letter is in: Pontifical Academy (2003), 370-374. Embarrassingly enough the English translation there ('new knowledge has led to the recognition of more than one hypothesis in the theory of evolution') of the French original of this passage is wrong. On the Vatican website there is only a Spanish version: 'Hoy, casi medio siglo después de la publicación de la encíclica, nuevos conocimientos llevan a pensar que la teoría de la evolución es más que una hipótesis'. ([http://www.vatican.va/holy\\_father/john\\_paul\\_ii/messages/pont\\_messages/1996/documents/hf\\_jp-ii\\_mes\\_19961022\\_evolutione\\_sp.html](http://www.vatican.va/holy_father/john_paul_ii/messages/pont_messages/1996/documents/hf_jp-ii_mes_19961022_evolutione_sp.html)). The French original and a correct English translation were published in John Paul II (1997).

<sup>35</sup> This evaluation is, however – again in the terminology of Vatican epistemology – contradicted by Pope Benedict, who maintains that John Paul II 'had reasons, when he said this [evolution more than a hypothesis]'. But it holds at the same time that the theory of evolution is not yet a complete scientifically verified theory'. (Horn/Wiedenhöfer, eds., 2007, 151). Whatever the Pope may mean – as is well known there is no 'verification' of theories – he certainly wants to play down the evaluation of his predecessor.

2) Only the monogenetic origin of mankind and God's direct creation of the soul remain as possible points for a Galilean conflict. As previously mentioned, the thesis of the monogenetic origin of mankind is pretty much in accordance with scientific evidence while the question of the soul is a special conceptual issue that, to the best of my knowledge, the pertinent sciences probably are not that concerned about.<sup>36</sup>

The result of this short analysis of Galilean conflicts in the context of evolutionary theory is that since the letter by John Paul II there seems hardly any room for such conflicts. In addition, John Paul II, as is well known, had taken great pains to lay Galileo's Galilean conflict to rest. Pope John Paul II implemented a clear and judicious epistemological strategy to get the Church out of the line of fire and withdraw from a battlefield where there is little to be gained but a lot to lose. This could also be a consequence of realizing that the Church does not have the expertise to pontificate on scientific matters.

Therefore, it is most surprising that recently the Church, in the person of one of its most senior Cardinals, seems to have taken up arms again and marching head-long back on to this Galilean battlefield. In an article ('Finding Design in Nature') that was published in the *New York Times* on July 7, 2005 Christoph Cardinal Schönborn was widely perceived as siding with the most recent incarnation of American Creationism, the so-called Intelligent Design Theory, ID for short. As this paper focuses on epistemological issues, I will not address all of the many other interesting aspects of this article but I will concentrate here on two pertinent quotations:

- 1) 'The Catholic Church, while leaving to science many details about the history of life on earth, proclaims that the human intellect can readily and clearly discern purpose and design in the natural world, including the world of living things',
- 2) 'Evolution in the sense of common ancestry might be true, but evolution in the neo-Darwinian sense – an unguided, unplanned process of random variation and natural selection – is not. Any system of thought that denies or seeks to explain away the overwhelming evidence for design is ideology not science'.

<sup>36</sup> That the concept of soul is not a concept of empirical science, but rather of philosophy or theology is also emphasized by Sánchez Sorondo (2008), who gives an argument for the compatibility of scientific and philosophico-theological views on man, that is based on the Kantian distinction of the two complementary forms of reason: theoretical reason as the basis for scientific knowledge and practical reason as the basis for 'practical wisdom'.

As to the first quotation, I should remark that one of the founding methodological principles of modern science and a precondition of its success since the time of Galileo is its methodological materialism, I underscore *methodological* materialism. This implies that science exclusively looks for natural causes when explaining natural phenomena. Evolutionary biology in the course of its 150 years of existence has been able to explain thousands of design-like structures in living beings in terms of evolution, of which natural selection, as proposed by Darwin, is the most important but not the only factor. Before the advent of Evolutionary Theory, such structures were believed to have been drafted by an omnipotent designer.<sup>37</sup> To answer Cardinal Schönborn's first point in just one sentence: the human intellect, indeed, is able to discern purpose and design in the natural world, but explains this *scientifically* in terms of functional adaptations brought about mostly by natural selection.<sup>38</sup>

As to the second point, tens of thousands of biologists all over the world will be astounded to hear that by relying on the two principles of evolutionary theory: random variation and natural selection, they are ideologists rather than scientists. Taking Cardinal Schönborn's assessment seriously and dismissing random variation and natural selection would put an end to both evolutionary biology, and most other areas of biology, as we know them today.

In September 2006 in Castel Gandolfo, at the abovementioned meeting on evolution of Pope Benedict with his former students, Cardinal Schönborn reiterated and reinforced the position he took in his article in the *New York Times*:

I dare say that at present there does perhaps not exist any scientific theory, which is subject to so many grave objections and which at the same time is defended as sacrosanct by many people. (96)

He then lists several such supposed objections that are well known from creationist literature and that by their mantra-like repetition do not get closer to the truth:

- 1) The supposedly missing 'missing links' between species,

<sup>37</sup> In fact, William Paley's (1743-1805) famous 'argument from design' that contends that the perfections of living nature can hardly be explained as having developed by chance as can a watch that is found on a beach was convincing only *before* evolutionary theory offered a third way of explanation of design-like structures, i.e. natural selection. For an excellent analysis of the argument cf. Sober (2000), chapter 2.

<sup>38</sup> Of course, this scientific account does not exclude a religious *interpretation* ('reading') of such design-like, functional structures in the theological language of creation and creator, or 'design', respectively.

- 2) 'The often admitted fact that until now no evolution beyond the species level has been proved',

- 3) The supposed impossibility of a transition from living systems like reptiles to birds by small mutations,

- 4) The problematical status of the concept of survival of the fittest.

Both evolutionary biology as well as the philosophy of biology have dealt with these objections and have disproved them on countless occasions<sup>39</sup> – to no avail.

It is not clear, however, whether Cardinal Schönborn *really* intended to do what he actually did: launch a new Galilean conflict; and whether he really wanted to side with ID. There is some evidence that he did not want this and that he merely meant to engage in a *Freudian* conflict but that he applied the arguments the proponents of ID implement in their *Galilean* fight against evolutionary theory. The quotations below confirm this view and seem to show that in order to secure a space for Faith, Schönborn criticizes Evolutionary Theory. However, Evolutionary Theory, as long as it not involved in a Freudian conflict, does not actually compete with Faith for space. Neither Faith nor Faith based *interpretations* of nature are significant issues within evolutionary biology.

Another argument in Schönborn's critique of evolutionary theory (which seems to be shared by Pope Benedict) is that scientifically unexplainable teleology of nature is a necessary counterpart to the Church's teaching that God can be understood through his creation by reason alone.<sup>40</sup>

### III. FREUDIAN CONFLICTS ON EVOLUTION

Freudian conflicts arise when a particular science tries to explain away religion as a phenomenon in its own right. They do not specifically affect the Catholic Church, but religion in general. Therefore, the first task of those who wish to wage a Freudian conflict should be to develop an adequate def-

<sup>39</sup> A comprehensive recent study by a Catholic author is Ruse (2005). Sober (2008) gives a magisterial analysis of the issue of evidence for evolutionary theory.

<sup>40</sup> Cf. Catechism (1994), No. 286: 'Human intelligence is surely already capable of finding a response to the question of origins. The existence of God the Creator can be known with certainty through his works, by the light of human reason, even if this knowledge is often obscured and disfigured by error'.

inition, or at least a satisfactory characterization, of the concept of religion. So far nobody seems to have achieved this and, unfortunately, most of those waging Freudian conflicts hardly even acknowledge this as a major problem. The second task would be to adduce sufficient scientific evidence in order to substantiate their Freudian claims in explaining religion.

Marx's explanation of religion as 'the opium of the people',<sup>41</sup> is based on the assumption that 'religion' provides the hope of a happy afterlife. It is psycho-socially explained as the last resort for people who live a materially and socially miserable life. The definition of religion as a belief in the afterlife is, on the one hand, far too narrow, because there are many more aspects to religion than this alone. On the other hand, there are religions like Buddhism that do not know this sort of compensation for terrestrial misery in a heavenly afterlife. Moreover, the fact that religion can flourish in a relatively wealthy country such as the United States is strong evidence against Marx's claim.

Freud's conception of religion as a collective neurosis suffers from the same shortcomings as his psychoanalytical theory, which was criticised mercilessly by Adolf Grünbaum (1984).

In terms of *evolutionary* Freudian conflicts, I would like to emphasize right at the outset that biological explanations of behavioural and cultural phenomena are legitimate undertakings within evolutionary theory. Evolutionary theory has successfully explained not only the anatomical and physiological features of organisms but – within the animal kingdom – also certain behavioural characteristics. The relevant biological discipline is called 'sociobiology'. However, how far sociobiological explanations hold for human behaviour is much contested. Examples of evolutionary explainable social behaviour in humans have been documented: the incest taboo is one,<sup>42</sup> but the complexity of human cultures means that studies are limited.<sup>43</sup>

<sup>41</sup> 'The wretchedness of religion is at once an expression of and a protest against real wretchedness. Religion is the sigh of the oppressed creature, the heart of the heartless world and the soul of soulless conditions. It is the opium of the people. The abolition of religion as the illusory happiness of the people is a demand for their true happiness'. (Marx, 1970, 131)

<sup>42</sup> Cf. Bischof (1994).

<sup>43</sup> One has to be very careful not to declare without evidence every universal feature of human behaviour as evolved by natural selection. Universal characteristics of behaviour may also be a consequence of the general intelligence of humans, which may lead to similar problem-solving behaviour.

The first Freudian conflict in the context of evolution was launched by the Harvard entomologist Edward O. Wilson in the mid-1970s.<sup>44</sup> Wilson regards religion as an adaptation that intensifies internal cohesion within groups. Conceiving of religion as the glue that keeps human groups together is certainly an interesting notion. However, as in other examples of a Freudian conflict, this is hardly an adequate characterization of religion. In addition, Wilson also fails to provide adequate empirical or other evidence for his view. Instead of hard evidence, he delivers what Stephen Jay Gould has aptly called an 'Adaptationist just-so-story'. The adaptationism of just-so-stories is characterized by two epistemological shortcomings: firstly it accepts each identifiable characteristic of an organism as being an adaptation even without proof.<sup>45</sup> Therefore, religion is *per se* an adaptation and has to be explained by evolutionary arguments, based on natural selection. Secondly, one has to tell only a halfway plausible evolutionary story about what sort of adaptation might apply in the case of religion and how it could have come about by the workings of natural selection. The story that Wilson tells falls far short of the empirical standards that are required in the natural sciences. He delivers hypotheses without evidence, and develops a philosophical position rather than a scientific one.<sup>46</sup>

The same can be said of other such undertakings. To conclude, we will take a look at Richard Dawkins, whose controversial book *The God Delusion* has aroused much controversy recently. In Chapter 5 ('The Roots of Religion'), it is clear that Dawkins has difficulties in pinpointing the direct adaptational value of religion, in the way Wilson had done. After rejecting expla-

<sup>44</sup> See the last chapter of Wilson (1975), in which Wilson extends his evolutionary explanation of social behavior ('sociobiology') from animals to humans, and in a more elaborated and extended form in Wilson (2004) (1st edition 1978). I have dealt with Wilson's position at length in Wolters (1997), 148ff.

<sup>45</sup> Although it is perhaps the most important heuristic principle of evolutionary theory to look for possible adaptive explanations of identifiable characteristics of organisms, it is by no means true, however, that each such characteristic *is* an adaptation. This has, rather, to be convincingly shown by empirical and other evidence. Meanwhile the classical and frequently reprinted text against adaptationism is Gould/Lewontin (1979).

<sup>46</sup> Wilson himself (2004), 192 seems to be somehow aware of this because he regards his position of 'scientific materialism' as an 'alternative mythology that until now has always, point for point in zones of conflict, defeated traditional religion'. Whatever the merits of scientific materialism may be, it is a *philosophical* position and not the result of scientific research. This implies that what Wilson has to tell us about religion is a *philosophical* view, as long as it is embedded in the 'epic' of scientific materialism.

nations based on group selection, Dawkins starts with the confession: 'I am one of an increasing number of biologists who see religion as a by-product of something else' (174). The idea of by-product, i.e. the idea that a structure that at some period in time had evolved according to certain selective pressures is later used for other purposes than the one it was originally selected for, is quite common in evolutionary biology. This phenomenon is called 'exaptation' of a structure, which is distinct from adaptation. Dawkins goes on to present the bold idea that: 'natural selection builds child brains with a tendency to believe whatever their parents and tribal elders tell them. Such trusting obedience is valuable for survival' (176). Religion is just a by-product of this brain structure.

Here again we find the two typical shortcomings of a Freudian attack on religion. Firstly, to assume that religion is above all or even exclusively about 'trusting obedience' seems a rather narrow view of a monotheistic religion let alone a non-monotheistic religion. Secondly, as far as evidence is concerned, Dawkins just presents us with another just-so-story that abounds with 'might', 'could' and similar linguistic indicators of uncertainty and speculation. If natural science were conducted in this way, there could be no natural science in the sense that know and trust. In fact, Dawkins is much aware of the weakness of his position. 'I must stress', he admits 'that it is only an example of the *kind* of thing I mean, and I shall come on to parallel suggestions made by others. I am much more wedded to the general principle that the question should be properly put [i.e. religion as a by-product of the evolutionary process], and if necessary rewritten, than I am to any particular answer' (174). In response to this, it must be said that the very principle of scientific research is that ideas have to be supported by evidence. What is virtually missing from Dawkins' claim is the evidence that religion is a 'by-product of something else'.

The criticism of Freudian attacks on evolutionary explanations of religion given here only targets their claims of being scientific and meeting the standards of natural science. This is what I take issue with; true Freudian conflicts fail to meet empirical standards.

They could, however, although this may not be the intention of their proponents, be regarded as science-related *philosophical* conceptions. Whether they succeed philosophically depends on the criteria of philosophical success or failure, which are different from those used in natural science. Whatever the case, there is room for interesting philosophical discussions.

It could be that Cardinal Ratzinger also had a similar view of what this paper calls Freudian conflicts, in mind when in 1986 he criticized the naturalistic extension of the conception of 'evolution' describing it as a:

model of thinking (*Denkmodell*) that claims to explain the whole of reality and that has, thus, become a sort of first philosophy. If the Middle Ages tried to reduce all science to theology (Bonaventura), one may speak here of a reduction of the whole of reality to evolution that believes to be able to also deduce cognition, ethics and religion from the universal formula (*Generalschema*) evolution.<sup>47</sup>

During the abovementioned meeting at Castel Gandolfo in 2006, Pope Benedict reassures:

To me it seems important to underline that evolutionary theory implies questions, which have to be assigned to philosophy and transcend the realm (*Innenbereich*) of natural science.<sup>48</sup>

This statement seems to show that Church authorities are trying to enter the *Freudian* discussion about evolution without siding with the preposterous *Galilean* claims particularly as advanced in American creationism in its many forms.

#### IV. CONCLUSION

The discussion of Galilean and Freudian conflicts dealt with in this paper brings forth two epistemological recommendations for the ecclesiastical authorities:

1) Keep out of Galilean conflicts! You will lose these battles and turn yourselves and Faith into a laughing-stock: a danger St Augustine long ago was acutely aware and afraid of,

2) Do not be unnerved by Freudian conflicts! Up to now, their hypotheses have merely been science related philosophical speculations, not sound scientific hypotheses based on sufficient empirical evidence. It is not likely that this will improve in the near future.

<sup>47</sup> As quoted in Horn/Wiedenhofer (eds.) (2207), 9.

<sup>48</sup> *Ibid.* 150.



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## DISCUSSION ON PROF. WOLTERS' PAPER

PROF. PHILLIPS: You described Cardinal Schönborn's *NY Times* article as being widely perceived as supporting intelligent design, but I thought I heard him say, here, in this room, that he did not like intelligent design very much and I am wondering whether you heard it the same way and what you think about that?

PROF. WOLTERS: Well, what I think about *this* is a bit speculative. As a matter of fact, in his presentation at the Castel Gandolfo conference he gave a sort of criticism of intelligent design, which he does not, however, in the article. I have heard, I am not sure whether this is true, that his article was drafted at the Discovery Institute in Seattle, a sort of think tank of American creationism, and there are, in my view, clear traces of this and there are also clear traces of this in his presentation at Castel Gandolfo when he extensively takes a position to the, above all, American issue of teaching evolution in schools. So his basic framework about what evolution is is not taken from biology textbooks, let alone from original articles, but it is taken from the textbooks of Creationists. And if you look at the literature he quotes, the only literature he quotes is from that camp and sometimes he quotes an evolutionary biologist but only to criticize him, but not in order to find out what evolutionary biology is all about.

PROF. ZICHICHI: I had the privilege of talking to Cardinal Schönborn here, a few days ago, and the point we discussed was what is the evolution theory. Now, evolution theory – as I have discussed in my lecture and mentioned several times during our discussion – does not exist. It has to be specified, as I have repeatedly said, whether you mean evolution of inert matter, of living matter or of living matter endowed with reason. Now, we have to agree on what are the basic principles of Galilean science. You quote Galilei's contradiction: this has nothing to do with science. The reason why Galilei is the father of science is not because of the book concerning heliocentric versus geocentric systems but because of the book *Dialogues on the Two New Sci-*

*ences (Discorso sulle due nuove scienze)*, where the first fundamental laws of nature are reported. If these laws exist we cannot be the product of chaos but of a rigorous Logic. If there is a Logic, the Author of this Logic must exist. Now, I would like to bring you back to the foundations of science, otherwise we just create confusion. The Cardinal you mention fully agrees with the fact that, if evolution has to be taught in schools, it should be scientifically-based evolution, which means that those people who think they have understood everything about evolution should be confronted with rigorous science. So, you cannot attack Cardinal Schönborn on science, because he has never said that he is against teaching evolution on the basis of the transitions which go from Big Bang 1 to Big Bang 2 and Big Bang 3. He fully agrees with the scientific principles to be explained and taught to young fellows concerning the theory of evolution, based on the three Big Bangs. So why do you insist on these losing and winning stories?

PROF. WOLTERS: I will first of all criticize you, Professor Zichichi, for your absolutely narrow concept of science and I think you are pretty lonely with this concept. Given this I can very well understand that Cardinal Schönborn liked your approach, because he has doubts about the scientific character of the evolutionary theory.

PROF. CABIBBO: Please, I think it is inappropriate to have personal attacks, it is not part of the aim of this meeting.

PROF. WOLTERS: It is not my intention to engage in personal attacks. I was asked for a hypothesis why Cardinal Schönborn took a certain position. I would very much like to have him here and to have his personal views about the issue, but I take, of course, your advice, as the President, to just stop here.

PROF. VICUÑA: I just wanted to say something that may be obvious to you, but it is not obvious for everybody. When we speak of intelligent design, we must distinguish between the intelligent design doctrine supported by Dembski, Behe and so on, and the belief in an overall design of Nature by a supernatural being that is guiding the process through natural means. In the former case, supporters of intelligent design make a big epistemological mistake because they mix science and religion. Thus, they believe in evolution but they require to have God intervening periodically in the process. This mistake can be compared to that of materialists such

as Dawkins and Dennett, who think that because there is a mechanistic explanation for evolution, there is no need for a supernatural being. Of course, believing that the world was designed by God requires a personal attitude, since you cannot deduce from the wonders of nature that there is God either. The latter is simply a matter of faith.

PROF. WOLTERS: Yes, I do not object to this and I think you beautifully made this distinction, and it is also made by Pope Benedict, in a somewhat different context, when he warns against making the theory of evolution a new *prima philosophia*. I think it fits very nicely with my distinction of Galilean and Freudian conflicts. What the Freudian conflict people are sort of aiming at is just giving a comprehensive explanation of everything by using a conceptual framework that has done great service in looking at special problems in the evolution of life and that they are just overusing it, and I think this is your point and so all the advantages and all the certainty that scientific methods confer on what biologists are doing, they do not confer on this approach, on this overall – as it were – metaphysical approach.

H.E. MSGR. PROF. SÁNCHEZ SORONDO: I would like to say that the Catholic Church is a little more complex than your presentation.

PROF. WOLTERS: I was forced to because of the...

H.E. MSGR. PROF. SÁNCHEZ SORONDO: Yes, but not only. I think that we need to recognise that it is the only Church that has had an Academy of Sciences for many years. And Cardinal Pacelli was the collaborator of Pius XI in the restoration of the Academy and, at that time, the Academy had a collection of the most important scientists. All the Magisterium of Pius XII was based on a scientific approach. For example, we studied the signs of death and we follow Pius XII's idea that it is up to doctors to judge primarily the state of death. On the other hand, the question of the soul is not out of date and, probably, the existence of the soul is not properly a scientific question, it is an anthropological and metaphysical one, as Pope Benedict XVI repeated in the address he gave to us. I think that a limitation of your exposition is that you did not approach the issue from this philosophical-metaphysical view.

PROF. WOLTERS: My answer would have to be a bit longer than is permitted now, but I agree absolutely with what you said in the first part of your

comment that the Catholic Church has retained a very close connection to science, unlike other religious orientations, which is admirable, no question about this. I agree completely with that, otherwise we would not be here, as you rightly remarked.

PROF. LÜKE: I missed the differentiation of the special dignities in the Church declarations. We have dogma and Papal encyclicals, and if the Pope says something it is only infallible when he speaks 'ex cathedra' and on questions of faith and morality. And the word of a bishop is not as important as a dogma or an encyclical, I think we agree on this. The second thing I want to say is that perhaps the problem with the soul is not a problem. Perhaps you can say the soul is a cipher or symbol for the immediate relation between God and every person. Every human being is immediate to God, is face-to-face with his God. And this relationship has not been established for us by our father or our mother or the Pope or somebody else. And then the soul symbolizes the human dignity that each one of us has, because he is immediate to God. A problem may be to find out the beginning or the emergence of a soul in phylogenesis and the emergence of a soul in ontogenesis. That may be the main problem.

PROF. WOLTERS: Short answer. Two points: there are various degrees of obligation of the Faithful to what the Church says, but I am not going into detail here. Second, the soul, again I agree also with Monsignor Sánchez-Sorondo. As I said in my presentation, 'soul' is not a concept of present empirical science. You said it is a metaphysical concept. With this I agree very much.

PROF. M. SINGER: I would like to clear the air a bit about intelligent design. The evidence indicates that intelligent design is basically a new way of talking about what used to be called 'creation science'. A book that was written for creation science twenty years ago has been republished as a book for intelligent design, and the only change is that every place that creation science was written has been changed to read 'intelligent design'. Creation science itself was always talking about the creation story in the Judeo-Christian bible. Yet in the worlds we live in today, worlds with populations that belong to many traditions, we have an added problem in talking about creation science because it is based on the Judeo-Christian bible.

PROF. WOLTERS: No comment, I share your view.

PROF. W. SINGER: I would like to make a reconciling remark. I have felt urged to do that for quite some time. Couldn't we agree on the fact that the science systems are epistemically closed systems, they are orthogonal to belief systems because they cannot talk about metaphysics while the latter can? Of course, there are areas where these two worlds meet and these little areas of friction require recalibration and that is what we are going to do here, recalibrate certain points. This is natural, since natural sciences extend the borders of the known towards the unknown, thus, there will be a recalibration of the borders from physics to metaphysics and that is unavoidable, but there will always be enough space for metaphysics beyond that border, we are just pushing it a little bit. So, if you could agree on that, I think that we should refrain from entering the metaphysics, we can neither prove it nor disprove it, all we can do is we can move that border and I think this is what we are going to do here all the time.

PROF. WOLTERS: You have nicely described my intention.

PROF. W. SINGER: So I misunderstood you.

PROF. WOLTERS: Yes.

PROF. ZICHICHI: I have a telegraphic statement to make. My definition of science is not a narrow definition of science, it is the only rigorous definition of science.