

Speeches to Scientists and Academicians

(Pontifical Academy of Sciences and
Academic Community of Prague)

Benedict XVI

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ADDRESS TO THE PONTIFICAL ACADEMY OF
SCIENCES

(Rome, Monday, 6 November 2006)

Your Excellencies, Distinguished Ladies and
Gentlemen,

I am pleased to greet the members of Pontifical Academy of Sciences on the occasion of this Plenary Assembly, and I thank Professor Nicola Cabibbo for his kind words of greeting in your name. The theme of your meeting –“Predictability in Science: Accuracy and Limitations”– deals with a distinctive attribute of modern science. Predictability, in fact, is one of the chief reasons for science’s prestige in contemporary society. The establishment of the scientific method has given the sciences the ability to predict phenomena, to study their development, and thus to control the environment in which man lives.

This increasing ‘advance’ of science, and especially its capacity to master nature through technology, has at times been linked to a corresponding ‘retreat’ of philosophy, of religion, and even of the Christian faith. Indeed, some have seen in the progress of modern science and technology one of the main causes of secularization and materialism: why invoke God’s control over these phenomena when science has shown itself capable of doing the same thing? Certainly the Church acknowledges that “with the help of science and technology..., man has extended his mastery over almost the whole of nature”, and thus “he now produces by his own enterprise benefits once looked for from heavenly powers” (*Gaudium et Spes*, 33). At the same time, Christianity does not posit an inevitable conflict between supernatural faith and scientific progress. The very starting-point of Biblical revelation is the affirmation that God created human beings, endowed them with reason, and set them over all the creatures of the earth. In this way, man has become the steward of creation and God’s “helper”. If we think, for example, of how modern science, by predicting natural phenomena, has contributed to the protection of the environment, the progress of developing nations, the fight against epidemics, and an increase in life expectancy, it becomes clear that there is no conflict between God’s providence and human enterprise. Indeed, we could say that the work of predicting, controlling and governing nature, which science today

renders more practicable than in the past, is itself a part of the Creator's plan.

Science, however, while giving generously, gives only what it is meant to give. Man cannot place in science and technology so radical and unconditional a trust as to believe that scientific and technological progress can explain everything and completely fulfil all his existential and spiritual needs. Science cannot replace philosophy and revelation by giving an exhaustive answer to man's most radical questions: questions about the meaning of living and dying, about ultimate values, and about the nature of progress itself. For this reason, the Second Vatican Council, after acknowledging the benefits gained by scientific advances, pointed out that the "scientific methods of investigation can be unjustifiably taken as the supreme norm for arriving at truth", and added that "there is a danger that man, trusting too much in the discoveries of today, may think that he is sufficient unto himself and no longer seek the higher values" (*ibid.*, 57).

Scientific predictability also raises the question of the scientist's ethical responsibilities. His conclusions must be guided by respect for truth and an honest acknowledgment of both the accuracy and the inevitable limitations of the scientific method. Certainly this means avoiding needlessly alarming predictions when these are not supported by sufficient data or exceed science's actual ability to predict. But it also means avoiding the opposite, namely a silence, born of fear, in the face of

genuine problems. The influence of scientists in shaping public opinion on the basis of their knowledge is too important to be undermined by undue haste or the pursuit of superficial publicity. As my predecessor, Pope John Paul II, once observed: "Scientists, precisely because they 'know more', are called to 'serve more'. Since the freedom they enjoy in research gives them access to specialized knowledge, they have the responsibility of using that knowledge wisely for the benefit of the entire human family" (*Address to the Pontifical Academy of Sciences*, 11 November 2002).

Dear Academicians, our world continues to look to you and your colleagues for a clear understanding of the possible consequences of many important natural phenomena. I think, for example, of the continuing threats to the environment which are affecting whole peoples, and the urgent need to discover safe, alternative energy sources available to all. Scientists will find support from the Church in their efforts to confront these issues, since the Church has received from her divine founder the task of guiding people's consciences towards goodness, solidarity and peace. Precisely for this reason she feels in duty bound to insist that science's ability to predict and control must never be employed against human life and its dignity, but always placed at its service, at the service of this and future generations.

There is one final reflection that the subject of your Assembly can suggest to us today. As some of the papers presented in the last few days have emphasized,

the scientific method itself, in its gathering of data and in the processing and use of those data in projections, has inherent limitations that necessarily restrict scientific predictability to specific contexts and approaches. Science cannot, therefore, presume to provide a complete, deterministic representation of our future and of the development of every phenomenon that it studies. Philosophy and theology might make an important contribution to this fundamentally epistemological question by, for example, helping the empirical sciences to recognize a difference between the mathematical inability to predict certain events and the validity of the principle of causality, or between scientific indeterminism or contingency (randomness) and causality on the philosophical level, or, more radically, between evolution as the origin of a succession in space and time, and creation as the ultimate origin of participated being in essential Being.

At the same time, there is a higher level that necessarily transcends all scientific predictions, namely, the human world of freedom and history. Whereas the physical cosmos can have its own spatial-temporal development, only humanity, strictly speaking, has a history, the history of its freedom. Freedom, like reason, is a precious part of God's image within us, and it can never be reduced to a deterministic analysis. Its transcendence vis-à-vis the material world must be acknowledged and respected, since it is a sign of our human dignity. Denying that transcendence in the name

of a supposed absolute ability of the scientific method to predict and condition the human world would involve the loss of what is human in man, and, by failing to recognize his uniqueness and transcendence, could dangerously open the door to his exploitation.

Dear friends, as I conclude these reflections, I once more assure you of my close interest in the activities of this Pontifical Academy and of my prayers for you and your families. Upon all of you I invoke Almighty God's blessings of wisdom, joy and peace.

ADDRESS TO THE PONTIFICAL ACADEMY OF
SCIENCES

(Rome, Friday, 31 October 2008)

Distinguished Ladies and Gentlemen,

I am happy to greet you, the members of the Pontifical Academy of Sciences, on the occasion of your Plenary Assembly, and I thank Professor Nicola Cabibbo for the words he has kindly addressed to me on your behalf.

In choosing the topic Scientific Insight into the Evolution of the Universe and of Life, you seek to focus on an area of enquiry which elicits much interest. In fact, many of our contemporaries today wish to reflect upon the ultimate origin of beings, their cause and their end, and the meaning of human history and the universe.

In this context, questions concerning the relationship between science's reading of the world and

the reading offered by Christian Revelation naturally arise. My predecessors Pope Pius XII and Pope John Paul II noted that there is no opposition between faith's understanding of creation and the evidence of the empirical sciences. Philosophy in its early stages had proposed images to explain the origin of the cosmos on the basis of one or more elements of the material world. This genesis was not seen as a creation, but rather a mutation or transformation; it involved a somewhat horizontal interpretation of the origin of the world. A decisive advance in understanding the origin of the cosmos was the consideration of being qua being and the concern of metaphysics with the most basic question of the first or transcendent origin of participated being. In order to develop and evolve, the world must first be, and thus have come from nothing into being. It must be created, in other words, by the first Being who is such by essence.

To state that the foundation of the cosmos and its developments is the provident wisdom of the Creator is not to say that creation has only to do with the beginning of the history of the world and of life. It implies, rather, that the Creator founds these developments and supports them, underpins them and sustains them continuously. Thomas Aquinas taught that the notion of creation must transcend the horizontal origin of the unfolding of events, which is history, and consequently all our purely naturalistic ways of thinking and speaking about the evolution of the

world. Thomas observed that creation is neither a movement nor a mutation. It is instead the foundational and continuing relationship that links the creature to the Creator, for he is the cause of every being and all becoming (cf. *Summa Theologiae*, I, q.45, a.3).

To “evolve” literally means “to unroll a scroll”, that is, to read a book. The imagery of nature as a book has its roots in Christianity and has been held dear by many scientists. Galileo saw nature as a book whose author is God in the same way that Scripture has God as its author. It is a book whose history, whose evolution, whose “writing” and meaning, we “read” according to the different approaches of the sciences, while all the time presupposing the foundational presence of the author who has wished to reveal himself therein. This image also helps us to understand that the world, far from originating out of chaos, resembles an ordered book; it is a cosmos. Notwithstanding elements of the irrational, chaotic and the destructive in the long processes of change in the cosmos, matter as such is “legible”. It has an inbuilt “mathematics”. The human mind therefore can engage not only in a “cosmography” studying measurable phenomena but also in a “cosmology” discerning the visible inner logic of the cosmos. We may not at first be able to see the harmony both of the whole and of the relations of the individual parts, or their relationship to the whole. Yet, there always remains a broad range of intelligible events, and the process is rational in that it reveals an order of

evident correspondences and undeniable finalities: in the inorganic world, between microstructure and macrostructure; in the organic and animal world, between structure and function; and in the spiritual world, between knowledge of the truth and the aspiration to freedom. Experimental and philosophical inquiry gradually discovers these orders; it perceives them working to maintain themselves in being, defending themselves against imbalances, and overcoming obstacles. And thanks to the natural sciences we have greatly increased our understanding of the uniqueness of humanity’s place in the cosmos.

The distinction between a simple living being and a spiritual being that is *capax Dei*, points to the existence of the intellectual soul of a free transcendent subject. Thus the Magisterium of the Church has constantly affirmed that “every spiritual soul is created immediately by God –it is not ‘produced’ by the parents– and also that it is immortal” (*Catechism of the Catholic Church*, 366). This points to the distinctiveness of anthropology, and invites exploration of it by modern thought.

Distinguished Academicians, I wish to conclude by recalling the words addressed to you by my predecessor Pope John Paul II in November 2003: “scientific truth, which is itself a participation in divine Truth, can help philosophy and theology to understand ever more fully the human person and God’s Revelation about man, a Revelation that is completed and perfected

in Jesus Christ. For this important mutual enrichment in the search for the truth and the benefit of mankind, I am, with the whole Church, profoundly grateful”.

Upon you and your families, and all those associated with the work of the Pontifical Academy of Sciences, I cordially invoke God’s blessings of wisdom and peace.

ADDRESS TO THE ACADEMIC COMMUNITY

(Vladislav Hall in the Prague Castle, Sunday, 27
September 2009)

Mr President, Distinguished Rectors and
Professors, Dear Students and Friends,

Our meeting this evening gives me a welcome opportunity to express my esteem for the indispensable role in society of universities and institutions of higher learning. I thank the student who has kindly greeted me in your name, the members of the university choir for their fine performance, and the distinguished Rector of Charles University, Professor Václav Hampl, for his thoughtful presentation. The service of academia, upholding and contributing to the cultural and spiritual values of society, enriches the nation’s intellectual patrimony and strengthens the foundations of its future development. The great changes which swept Czech society twenty years ago were precipitated not least by movements of reform which originated in university and student circles. That quest for freedom has continued to

guide the work of scholars whose diakonia of truth is indispensable to any nation's well-being.

I address you as one who has been a professor, solicitous of the right to academic freedom and the responsibility for the authentic use of reason, and is now the Pope who, in his role as Shepherd, is recognized as a voice for the ethical reasoning of humanity. While some argue that the questions raised by religion, faith and ethics have no place within the purview of collective reason, that view is by no means axiomatic. The freedom that underlies the exercise of reason—be it in a university or in the Church—has a purpose: it is directed to the pursuit of truth, and as such gives expression to a tenet of Christianity which in fact gave rise to the university. Indeed, man's thirst for knowledge prompts every generation to broaden the concept of reason and to drink at the wellsprings of faith. It was precisely the rich heritage of classical wisdom, assimilated and placed at the service of the Gospel, which the first Christian missionaries brought to these lands and established as the basis of a spiritual and cultural unity which endures to this day. The same spirit led my predecessor Pope Clement VI to establish the famed Charles University in 1347, which continues to make an important contribution to wider European academic, religious and cultural circles.

The proper autonomy of a university, or indeed any educational institution, finds meaning in its accountability to the authority of truth. Nevertheless,

that autonomy can be thwarted in a variety of ways. The great formative tradition, open to the transcendent, which stands at the base of universities across Europe, was in this land, and others, systematically subverted by the reductive ideology of materialism, the repression of religion and the suppression of the human spirit. In 1989, however, the world witnessed in dramatic ways the overthrow of a failed totalitarian ideology and the triumph of the human spirit. The yearning for freedom and truth is inalienably part of our common humanity. It can never be eliminated; and, as history has shown, it is denied at humanity's own peril. It is to this yearning that religious faith, the various arts, philosophy, theology and other scientific disciplines, each with its own method, seek to respond, both on the level of disciplined reflection and on the level of a sound praxis.

Distinguished Rectors and Professors, together with your research there is a further essential aspect of the mission of the university in which you are engaged, namely the responsibility for enlightening the minds and hearts of the young men and women of today. This grave duty is of course not new. From the time of Plato, education has been not merely the accumulation of knowledge or skills, but *paideia*, human formation in the treasures of an intellectual tradition directed to a virtuous life. While the great universities springing up throughout Europe during the middle ages aimed with confidence at the ideal of a synthesis of all knowledge, it was always in the service of an authentic *humanitas*, the

perfection of the individual within the unity of a well-ordered society. And likewise today: once young people's understanding of the fullness and unity of truth has been awakened, they relish the discovery that the question of what they can know opens up the vast adventure of how they ought to be and what they ought to do.

The idea of an integrated education, based on the unity of knowledge grounded in truth, must be regained. It serves to counteract the tendency, so evident in contemporary society, towards a fragmentation of knowledge. With the massive growth in information and technology there comes the temptation to detach reason from the pursuit of truth. Sundered from the fundamental human orientation towards truth, however, reason begins to lose direction: it withers, either under the guise of modesty, resting content with the merely partial or provisional, or under the guise of certainty, insisting on capitulation to the demands of those who indiscriminately give equal value to practically everything. The relativism that ensues provides a dense camouflage behind which new threats to the autonomy of academic institutions can lurk. While the period of interference from political totalitarianism has passed, is it not the case that frequently, across the globe, the exercise of reason and academic research are –subtly and not so subtly– constrained to bow to the pressures of ideological interest groups and the lure of short-term utilitarian or pragmatic goals? What will happen if our

culture builds itself only on fashionable arguments, with little reference to a genuine historical intellectual tradition, or on the viewpoints that are most vociferously promoted and most heavily funded? What will happen if in its anxiety to preserve a radical secularism, it detaches itself from its life-giving roots? Our societies will not become more reasonable or tolerant or adaptable but rather more brittle and less inclusive, and they will increasingly struggle to recognize what is true, noble and good.

Dear friends, I wish to encourage you in all that you do to meet the idealism and generosity of young people today not only with programmes of study which assist them to excel, but also by an experience of shared ideals and mutual support in the great enterprise of learning. The skills of analysis and those required to generate a hypothesis, combined with the prudent art of discernment, offer an effective antidote to the attitudes of self-absorption, disengagement and even alienation which are sometimes found in our prosperous societies, and which can particularly affect the young. In this context of an eminently humanistic vision of the mission of the university, I would like briefly to mention the mending of the breach between science and religion which was a central concern of my predecessor, Pope John Paul II. He, as you know, promoted a fuller understanding of the relationship between faith and reason as the two wings by which the human spirit is lifted to the contemplation of truth (cf. *Fides et Ratio*,

Proemium). Each supports the other and each has its own scope of action (cf. *ibid.*, 17), yet still there are those who would detach one from the other. Not only do the proponents of this positivistic exclusion of the divine from the universality of reason negate what is one of the most profound convictions of religious believers, they also thwart the very dialogue of cultures which they themselves propose. An understanding of reason that is deaf to the divine and which relegates religions into the realm of subcultures, is incapable of entering into the dialogue of cultures that our world so urgently needs. In the end, “fidelity to man requires fidelity to the truth, which alone is the guarantee of freedom” (*Caritas in Veritate*, 9). This confidence in the human ability to seek truth, to find truth and to live by the truth led to the foundation of the great European universities. Surely we must reaffirm this today in order to bring courage to the intellectual forces necessary for the development of a future of authentic human flourishing, a future truly worthy of man.

With these reflections, dear friends, I offer you my prayerful good wishes for your demanding work. I pray that it will always be inspired and directed by a human wisdom which genuinely seeks the truth which sets us free (cf. Jn 8:28). Upon you and your families I invoke God’s blessings of joy and peace.

ADDRESS TO THE PONTIFICAL ACADEMY OF SCIENCES

(Rome, Thursday, 28 October 2010)

Your Excellencies, Distinguished Ladies and Gentlemen,

I am pleased to greet all of you here present as the Pontifical Academy of Sciences gathers for its Plenary Session to reflect on ‘The Scientific Legacy of the Twentieth Century’. I greet in particular Bishop Marcelo Sánchez Sorondo, Chancellor of the Academy. I also take this opportunity to recall with affection and gratitude Professor Nicola Cabibbo, your late president. With all of you, I prayerfully commend his noble soul to God the Father of mercies.

The history of science in the twentieth century is one of undoubted achievement and major advances. Unfortunately, the popular image of twentieth-century science is sometimes characterized otherwise, in two extreme ways. On the one hand, science is posited by

some as a panacea, proven by its notable achievements in the last century. Its innumerable advances were in fact so encompassing and so rapid that they seemed to confirm the point of view that science might answer all the questions of man's existence, and even of his highest aspirations. On the other hand, there are those who fear science and who distance themselves from it, because of sobering developments such as the construction and terrifying use of nuclear weapons.

Science, of course, is not defined by either of these extremes. Its task was and remains a patient yet passionate search for the truth about the cosmos, about nature and about the constitution of the human being. In this search, there have been many successes and failures, triumphs and setbacks. The developments of science have been both uplifting, as when the complexity of nature and its phenomena were discovered, exceeding our expectations, and humbling, as when some of the theories we thought might have explained those phenomena once and for all proved only partial. Nonetheless, even provisional results constitute a real contribution to unveiling the correspondence between the intellect and natural realities, on which later generations may build further.

The progress made in scientific knowledge in the twentieth century, in all its various disciplines, has led to a greatly improved awareness of the place that man and this planet occupy in the universe. In all sciences, the common denominator continues to be the notion of

experimentation as an organized method for observing nature. In the last century, man certainly made more progress –if not always in his knowledge of himself and of God, then certainly in his knowledge of the macro- and microcosms– than in the entire previous history of humanity. Our meeting here today, dear friends, is a proof of the Church's esteem for ongoing scientific research and of her gratitude for scientific endeavour, which she both encourages and benefits from. In our own day, scientists themselves appreciate more and more the need to be open to philosophy if they are to discover the logical and epistemological foundation for their methodology and their conclusions. For her part, the Church is convinced that scientific activity ultimately benefits from the recognition of man's spiritual dimension and his quest for ultimate answers that allow for the acknowledgement of a world existing independently from us, which we do not fully understand and which we can only comprehend in so far as we grasp its inherent logic. Scientists do not create the world; they learn about it and attempt to imitate it, following the laws and intelligibility that nature manifests to us. The scientist's experience as a human being is therefore that of perceiving a constant, a law, a logos that he has not created but that he has instead observed: in fact, it leads us to admit the existence of an all-powerful Reason, which is other than that of man, and which sustains the world. This is the meeting point between the natural sciences and religion. As a result, science becomes a place of dialogue, a meeting between

man and nature and, potentially, even between man and his Creator.

As we look to the twenty-first century, I would like to propose two thoughts for further reflection. First, as increasing accomplishments of the sciences deepen our wonder of the complexity of nature, the need for an interdisciplinary approach tied with philosophical reflection leading to a synthesis is more and more perceived. Secondly, scientific achievement in this new century should always be informed by the imperatives of fraternity and peace, helping to solve the great problems of humanity, and directing everyone's efforts towards the true good of man and the integral development of the peoples of the world. The positive outcome of twenty-first century science will surely depend in large measure on the scientist's ability to search for truth and apply discoveries in a way that goes hand in hand with the search for what is just and good.

With these sentiments, I invite you to direct your gaze toward Christ, the uncreated Wisdom, and to recognize in His face, the Logos of the Creator of all things. Renewing my good wishes for your work, I willingly impart my Apostolic Blessing.

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