

Lectures on Science and Theology
Philosophical and Historical
Perspectives



Documentazione Interdisciplinare di
SCIENZA & FEDE

Lecture 5

The Christological Dimensions of the Cosmos

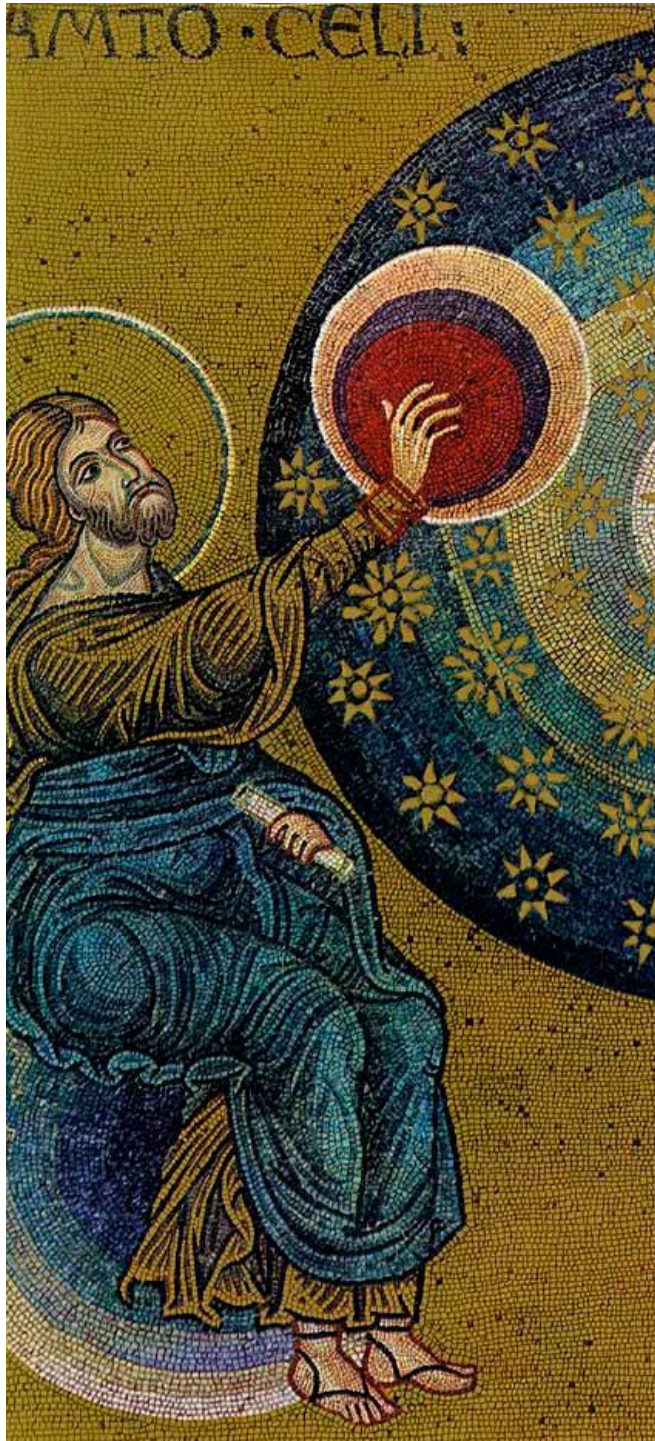
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Summary

I. Questions in science and philosophical answers in understanding physical reality

II. Philosophical ways of speaking of the *Logos* and of the originality of Christian Logos

III. A world created through the Word-Logos and in the sight of the Incarnate Logos: which consequences for the work of science?

IV. Concluding Remarks



I. Questions in science and philosophical answers in understanding physical reality

■ When scientists reflect on the foundations of scientific knowledge, they come across some philosophical questions:

- the question of the foundation of Being (cosmology)
- the quest for truth and the foundation of logics
- the source of the intelligibility of nature (the physical sciences in general)
- the cause of the information that is present in nature (physics, chemistry and biology)
- why *our* universe is fine-tuned to the appearance of life (cosmology, physics, chemistry, biology)
- the reason for the arrow of time (thermodynamics)
- the reason for the increasing complexity of life forms (biology, up to anthropology)

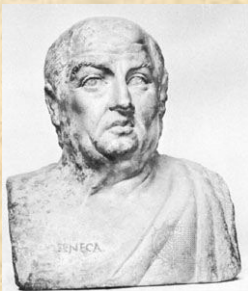
■ *Philosophical* answers provided by Classical thought:



- God/Logos is the foundation of the whole of reality and the ultimate source for its intelligibility (Plato and Neo-platonists)



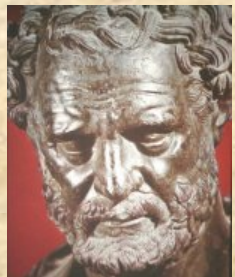
- God is the cause of all movement (energy) present in nature: He is fullness of Thought and Life (Aristotle)



- God/the divine is the end towards which all things move, and the ultimate rule for all transformation occurring in nature (pre-Socratics, Plato and Aristotle)

- Logos/the divine is the origin of the general and cosmic law which all things comply with (Stoics)

However, as a counter-stream line of thought:



- All is chance, reality is undetermined and chaotic, gods included, there is no finality at all (Democritus, Lucretius, atomists)

- ☞ Did Judaeo-Christian Revelation offered any contribution to answer questions about the “foundations of physical reality”?
- ☞ Is there a specifically *Christian* interpretation of nature and history?
- ☞ Where does the *specificity* of the Judaeo-Christian view concerning nature and history lie?



Old Testament (Wisdom-Sophia)

New Testament (Verbum-Logos)

Justin, Irenaeus of Lyon, Gregory of Nyssa,
Maximus the Confessor, Augustin of Hippo

Thomas Aquinas, Bonaventure, Nicholas Cusano

Pierre Teilhard de Chardin, Raimon Panikkar,
Thomas Torrance...

Jean Mouroux, Romano Guardini...

■ Among the others, three specific subjects seem to bring about major implications:

- a theology of *creation ex nihilo* (alongside a specific metaphysical view about causality and participation);

- the progressive successful employment of the notion of *natural laws*;

- a theology of the *Logos*, as a meeting-point between theology, philosophy and the natural sciences



“In theology *number* and *logos* find their most certain and precise meeting point – though not always so defined – in the mutual comparison of different allusions to a pre-existing Wisdom, Spirit, *Nous* or *Logos* which since the beginning had stood next to the highest Being and all creation has depended upon.

This *Logos* is the place of the mathematical understanding of things; it is the **Christian dogma of the Incarnation** that has partly determined the fate of science, in its belief that we can see positively in the world the signs of the *Logos*’ own perfections [...].

The great shift from early to modern science lays in this: in looking on earth at what was previously scrutinised in the heavens; in scrutinising in the properties of numbers and of matter the signs of the divine world, not in order to return to that world, but to get to know on the earth the intimate and divine essence of things and, subsequently, the only immanent laws of their workings.”

Paolo Zellini, *Numero e Logos* (Milan: Adelphi, 2010), pp. 178 and 223-224.



*In the beginning was the Word (Logos),
and the Word was with God
and the Word was God.
He was in the beginning with God.
All things came through him
and without him nothing came to be.*
Jn 1:1-3



*In him (Logos made flesh) were created all things
in heaven and on earth,
the visible and the invisible...
All things were created through him and for him.
He is before all things,
and in him all things hold together.*
Col 1:16-17

*In these last days, [God] spoke through his Son,
whom he made heir of all things and through whom he
created the universe, who is the refulgence of his
glory, the very imprint of his being, and who sustains
all things by his mighty Word (Logos).*
Heb 1:2-3

■ To foster a dialogue with the natural sciences, a *Christian* theology of the *Logos* should accomplish some courageous tasks:

- to explain the **whole of the doctrine on the Logos**, including that the uncreated Logos became flesh, and his true humanity experienced suffering and death
- to accept the debate (the conflict?) between a canon of **universality** (familiar to science) and a canon of **singularity** (proper to Christianity), seeking ways of reconciling these two views
- to realize that nature and history have therefore a ***Christological dimension***, and theology must be able to explain what does it mean...

Once accomplished these tasks, a new question can be addressed:

☞ Which consequences for our understanding of nature would arise from stating that the world was made through the Word-Logos and in the sight of the Word made flesh?



II. Philosophical ways of speaking of the *Logos* and of the originality of Christian Logos



In Greek thought, the word *lógos* takes on the many meanings of the verb *léghein*:

to say, to tell, to list, to choose, to measure, to collect

It indicates, then,

Word, Discourse, Reason, Proportion, Ratio and rationality, Logics, Order and ordering, Law

In Latin the same root gives rise to two different meanings:

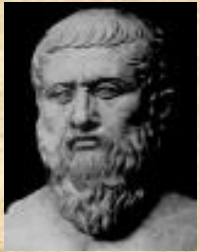
the notion of **reason, rationality** (Lat. *ratio*),

the notion of **speech, word** (Lat. *oratio*)

This last meaning usually flows into the term *Verbum*, which means the dialogical dimension of the Word



Heraclitus (550-480 B.C.): the *logos* is a universal reason, responsible for the world's harmony and order, endowed with a divine character.



Plato (427-347 B.C.): *logos* is used to define, to provide the reason for something by listing its elements; and also to declare the agreement of something with truth. Plato's Logos belongs to the world of ideas, the Demiurge-Maker looks at, when shaping the cosmos according to numerical relations.



Aristotle (384-322 B.C.): the *logos* is at the origin of logics, i.e. the analysis of "rational speech," through which it becomes possible to reach and present conclusions concerning any kind of knowledge.



Stoic philosophers (from 3rd Cen. B.C.): the Logos is totally immanent in matter, a universal law guiding and expressing the order of all things, ultimate source for ethical norms.

Philo of Alexandria (20 B.C.-50 A.D.): the Logos is to a great extent identified with Jahvè's own Wisdom (*Sophia*), being assigned some of the traits of Plato's Demiurge: it is through his Logos-Sophia that God creates the universe.

■ To sum up, in the context of Classical thought the term *lógos* designates a number of different meanings:



- in logics, the rules of speech;
- in physics (natural philosophy), the active principle present in all things, as a seminal reason endowed with a creating force;
- in ethics, the law to which we have to adjust our lives, in order to behave according to nature;
- in a religious view of the world, the Wisdom by which God creates and governs all things

Despite these different meanings, the notion of Logos refers above all to the **rational** and **intelligible** character of nature, to the possibility of knowing and explaining the rational principles which govern the world, given that nature is made *according to reason*.

☞ To think in terms of a “Logos” is nothing but the “**attempt to give a reason (*ratio*) for the whole**”, seeking the causes of intelligibility and order, which have to be found in the meta-empirical realm.

■ The New Testament refers to the **Logos** speaking of him as a **real person**. He is the Person of the Son, con-substantial with the Father, in the life of the One and Triune God



■ According to John (cf. *Jn* 1:1-18), the Logos satisfies both the logic of a **ratio**, and the logic of a **verbum**.

An **accessible Logos**, that our eyes have seen and our hands touched (cf. *1Jn* 1:1), but also a **heavenly Logos**, transfigured and risen from the dead, the eschatological judge of the Apocalypse (cf. *Rv* 19:13).

■ Paul's Letters present the headship of Christ, the **Incarnate Logos**, on the whole of the universe and on history (cf. *Eph* 1:3-10; *Col* 1:15-20; *Heb* 1:1-3; *Rom* 16:25-26; *1Cor* 8:6); He has an **all-encompassing cosmic impact**, as He provides:

- the **final revelation** of God's plan on creation;
- the **recapitulation** of all created things and their submission to God the Father;
- the **reconciliation** of the whole of creation with God Creator, by means of His **Paschal Mystery**



■ The philosophical originality of Christian Revelation lies in the *simultaneous proposition of the transcendence and immanence* of the Word-Logos, a reflection of the two natures, human and divine, possessed by the unique person of the Incarnate Logos.

■ The “consubstantiality” of the Word-Son with the Father is a key-attribute of the Christian Logos. The **Greek Logos** was sure a divine a creature, but **lesser than God**, the One. **Greek Logos creating power was limited**, on the one hand, by the existence of a pre-existing matter, on the other hand by a divine, external rationality present in the the world of ideas.

■ The **Christian Word-Logos** is a Person different from God-the Father, yet God like the Father; **different from matter** just as God is, but **capable of taking matter on**, to the extent of incarnating and becoming man.



in him were created all things [...] all things were created through him and for him
Col 1:16

☞ Claiming that all things were made *for Him* seems to reveal that creation points to the humanity of the Word-Logos, as a summit, and that creation reaches here its most perfect expression.

We are taught about a *coherent and global divine plan*, which the Man-God reveals and expresses in Himself. Here the Logos makes manifest a lex, the *Lex Incarnationis*

He has made known to us the mystery of his will in accord with his favor that he set forth in him as a plan for the fullness of times, to sum up all things in Christ, in heaven and on earth
Eph 1:9-10

☞ "To sum up all things in Christ" (*anakephalaiósastai tà pánta*) includes the meanings of "recapitulating", "summing up", "giving back a head", "setting up". In Him, all things are recapitulated and summarized. The recapitulation of Christian Logos *has a cosmic influence*: it embraces all things in the heavens and on earth, whether visible or invisible.



Despite the great expansion of the space-time horizons brought about by contemporary science, surprisingly Christian creed keeps proclaiming that Jesus Christ is the *center of the cosmos and of history*:

“We believe in one Lord, Jesus Christ, the only Son of God, eternally begotten of the Father. [...] Through him all things were made” (*The Nicene Creed*)

“The Redeemer of man, Jesus Christ, is the centre of the universe and of history” (John Paul II, *Redemptor hominis*, n. 1)



III. A world created through the Word-Logos and in the sight of the Incarnate Logos: which consequences for the work of science?



■ What does the Christian doctrine on the *Logos* suggest for the understanding of the physical world, which is the subject of the analysis of sciences?

1. The cosmos as a uni-verse: the *identity* and the *universality* of cosmic rational components
2. Nature's dialogical dimension: the cosmos as a *Word spoken to man*
3. *Information* is an original component for a cosmos created in the Word-Logos
4. The cosmos as a *uni-verse*: the natural history can be understood as a *global and unified development*
5. Primacy of *cognitive realism* and the role of induction



1. The cosmos as a uni-verse: the *identity* and the *universality* of cosmic rational components

■ If the whole universe depends on the logic of a single Logos as a source of rationality and of intelligibility, then the rational categories of *identity* and *universality* become meaningful, capable of embracing the whole of reality. Then it becomes possible:

- the process of **deducing wide-range properties**, starting from the observation of local properties
- to conceive the universe **as a single object** and a unified whole, as contemporary cosmology does
- the search for global and **unifying properties**: principles of **symmetry**; principles of **invariance**; principles resorting to a totalizing methodological approach

☞ Actually, all these procedures are part of ordinary scientific work



“One feature of the elementary-particle world, which is totally unexpected when compared with our experience of everyday things, is the fact that elementary particles come in populations of universally identical particles.

Every electron that we have encountered, whether it comes from outer space or a laboratory experiment, is found to be identical. All have the same electric charge, the same spin, the same mass, to the accuracy of measurement. They all behave in the same way in interaction with other particles [...].

We do not know why particles are identical in this way. We could imagine a world in which electrons were like footballs--everyone slightly different from all the others. The result would be an unintelligible world.”

J. Barrow, *Theories of Everything* (Oxford: Clarendon Press, 1991,) p. 197



2. Nature's dialogical dimension: the cosmos as a *Word spoken to man*

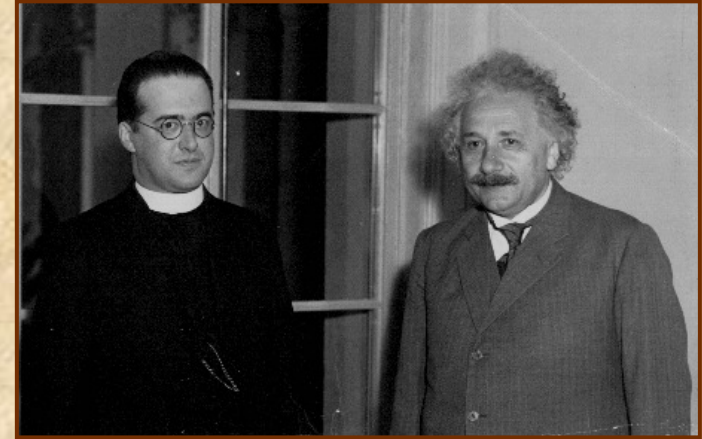
- As the effect of an personal Word-Logos, the universe **conveys a meaningful content**. The human person, is called to (and capable of) recognizing such a **meaning** and deciphering the **information** there contained.
- The universe is then **comprehensible**, as prerequisite for any idea of objectivity and rationality. Different observers can acquire a "common understanding" of a same object, in spite of their different sensible experiences.
- The physical universe becomes the site of a **meaningful dialogue between God and the human being**: scientific research is nothing but the way in which such a dialogue takes place (questions & answers)
- Here the metaphor of **Nature as a Book** takes shape, one bearing multiple consequences for scientific work as well.

“Both of them, (the believing scientist and the non-believing scientist) endeavor to decipher the palimpsest of nature, in which the traces of the various stages of the long evolution of the world are overlaid on one another and confused.

The believer has perhaps the advantage of knowing that the enigma has a solution, that the underlying writing is, when all is said and done, the work of an intelligent being, therefore that the problem raised by nature has been raised in order to be solved, and that its difficulty is doubtless proportionate to the present or future capacity of mankind.

That will not give him, perhaps, new resources in his investigation, but it will contribute to maintaining in him a healthy optimism without which a sustained effort cannot be kept up for long.”

G. Lemaître, in O. Godart, M. Heller, *Les relations entre la science et la foi chez Georges Lemaître*





“Can you, or anyone else, reach the central order of things, or events, whose existence seems beyond doubt, as directly as you can reach the soul of another human being? I am using the term ‘soul’ quite deliberately so as not to be misunderstood.

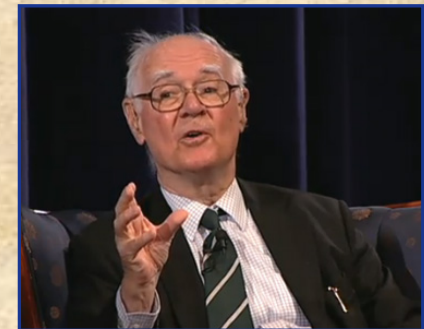
If you would put the question like that, the answer is yes.”

W. Heisenberg, *Physics and beyond* (1927), in dialogue with W. Pauli and P. Dirac

“Physicists laboriously master mathematical techniques because experience has shown that they provide the best, indeed the only, way to understand the physical world.

We choose that language because it is the one that is being ‘spoken’ to us by the cosmos.”

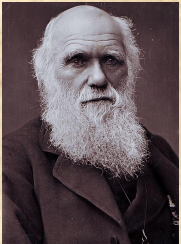
J. Polkinghorne, *One World* (1986)



■ How meaningful is the intelligibility of reality and how truly significant is the harmony between the rationality of nature and our cognitive rules?



Kantian approach: it is the human being who imposes his "a priori knowledge categories" upon reality, because these are the only ones by which we can express our judgments



Evolutionary approach: the intelligibility of reality and our mind's harmony with it, is a product of natural selection

However,

☞ most researchers adopt a *realist and non-idealist* approach to scientific knowledge

☞ it is difficult to interpret the agreement between nature's intelligibility and our mind's rationality in terms of natural selection

...also because mind abstraction seems to operate on a level different from that of brain's biochemical laws



"A crucial feature of the latter [science and technology of our times] is the systematic use of mathematical tools to be able to act upon nature and to make its immense powers serve our needs. Mathematics as such is a product of our intelligence: however, the match between its structures and the real structures of the universe arouses our admiration and sets a huge question. It does entail that the universe itself is structured in an intelligent manner, so that the subject's reason and nature's objectivized reason may be matched at a deeper level.

Then it becomes inevitable to wonder whether there must be a single original intelligence, which may be the common source for both of them. Thus, it is precisely reflecting on the development of sciences that brings us back towards the Logos as creator. This overturns the trend to grant primacy to the irrational, to chance and to necessity, to refer back to it even our intelligence and our freedom.

On these bases it is again possible to widen the scope of our rationality, to reopen it to the great issues of truth and the good, to mutually combine theology, philosophy and sciences, while fully respecting their own methods and their mutual autonomy, but also in the awareness of the inner unity holding them together."



Benedict XVI

*Speech held
in Verona,
Italy,
19.10.2006*

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
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3. *Information* is an original component for a cosmos created in the Word-Logos

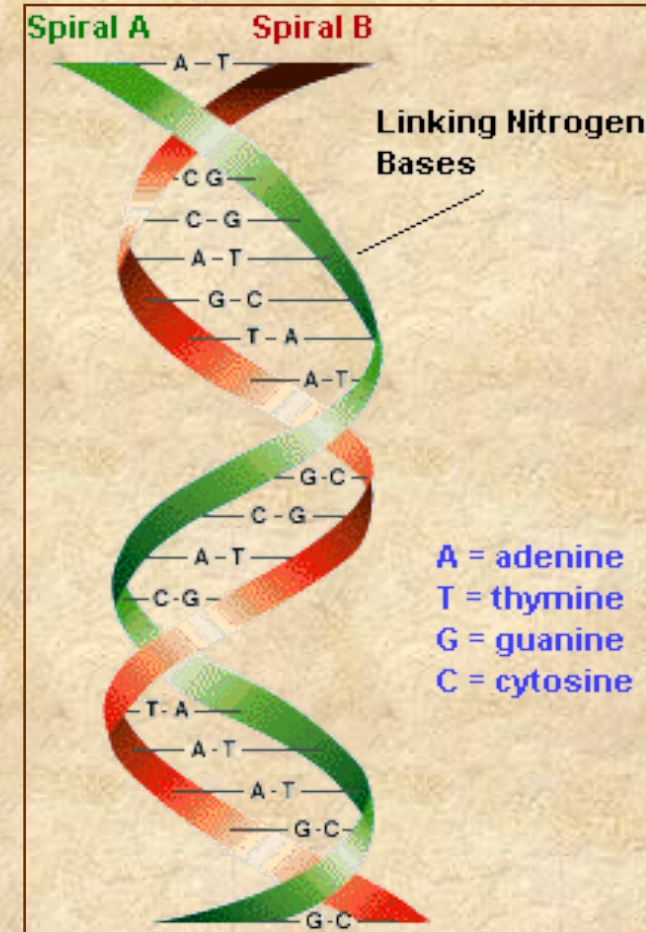
- As the result of an intelligent Word, a world created in the Word-Logos has a **positive content of information**, capable of being preserved and becoming manifest along history
- The evolution of the universe, then, **bears a meaning and embodies a project**
- In addition to matter and energy, also information must be an original component of the universe.
- Information is the object of a **philosophy of nature** (formal causes, natural properties, specificity, *quidditas*), but it has consequences upon the **empirical analysis** (properties of elementary particles, laws of nature, symmetry principles...)
- ☞ Scientific work is consistent with the hypothesis that information be an essential component of reality. Think, for instance, to ordered structures such as: the standard model of elementary particles, Mendeleev Table, the DNA structure, etc.

Periodic Table of Elements

1 IA		2 IIA												NOBLE GASES					18 VIIIA
ALKALI METALS		ALKALINE EARTH METALS												HALOGENS					He
1	2	3	4	5	6	7	8	9	10	11	12	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA		
Li	Be	Symbol 										B	C	N	O	F	Ne		
Na	Mg	Al	Si	P	S	Cl	Ar												
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe		
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn		
Fr	Ra	Ac	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

TRANSITION ELEMENTS										REPRESENTATIVE ELEMENTS													
LANTHANIDES										Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
ACTINIDES										Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
INNER TRANSITION ELEMENTS																							

DNA



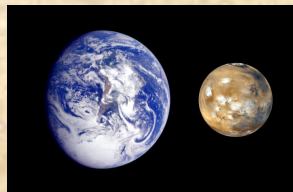
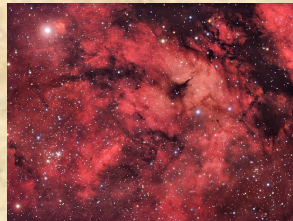
The Standard Model

		Fermions			Bosons		
Quarks	u	c	t	γ	Z	W	g
	Up	Charm	Top				
Leptons	d	s	b	W boson	g	H	Higgs boson
	Down	Strange	Bottom				
Leptons	ν _e	ν _μ	ν _τ	g	H	Higgs boson	
	electron neutrino	muon neutrino	tau neutrino				
Leptons	e	μ	τ	g	H	Higgs boson	
	electron	muon	tau				

Standard model

■ *In a certain way*, the presence of information may be considered as the expression of an **intentionality**. Information is usually associated to a **personal intelligence**, able to produce information and extract information.

■ If the universe is the effect of an intelligent Logos, then information in it results from a Word pronounced in sight of an end



- The Universe can have a “history,” and this history points to an end

- The Universe has an origin and has a goal, a beginning and a end, an **A** and a **Ω**

- Differently, the myth of an “eternal return” would erase any information history could have produced, dissolving all emergence and novelty



4. The cosmos as a *uni-verse*: the natural history can be understood as a global and unified “development”

- A universe created *in* the Word-Logos, and *for* the Incarnate Logos, acquires a strong unity, that of a *single design* on a large scale.
- The whole universe *is one* not only because the effect of the one and same First Cause, but also because *the project of the one and same Final cause*.
- In a universe created for Christ and in the sight of Christ, inanimate *matter is for life, life for the human being, the human being for Christ, Christ for God* (cf. *1Cor 3:22-23*). Each and every segment of the history of the world becomes significant, *nothing is redundant*.
- In such a universe, life is the expression of an *intentional and free finalism*, not the result of *chance or necessity*



■ Embedded in the dynamics of time, the unity and coherence of a universe created in Christ may be understood as a “cosmos in progress”, in “development”, an **evolving cosmos**

■ As paradoxical as it may seem, a *truly* evolutionary cosmos, showing increasing order and complexity, is only possible within a **Christian theology of creation**, where **information and intentionality** are in effect

■ In such a cosmos, the appearance of life is **not an accidental emergence**, due to local contingent circumstances, but something towards which “all” the universe had been directed **since the beginning**

■ The **finalism** expressed by the Word-Logos’ intentionality does not mean **determinism**. Neither the properties of physical-chemical reality, nor the morphologies of the living beings, are deterministic: God is free and He creates in freedom **but knows what He wants and why He wants it.**



P. Teilhard de
Chardin

"The prodigious expanses of time which preceded the first Christmas were not empty of Christ: they were imbued with the influx of his power. [...]"

It was the travail preceding his birth that accelerated the development of instinct and the birth of thought upon earth.

[...] the fearful, anonymous labours of primitive man, the beauty fashioned through its age-long history by ancient Egypt, the anxious expectancies of Israel, the patient distilling of the attar of oriental mysticism, the endless refining of wisdom by the Greeks: all these were needed before the Flower could blossom on the rod of Jesse and all of humanity.

All these preparatory processes were cosmically and biologically necessary that Christ might set foot upon our human stage. And all this labour was set in motion by the active, creative awakening of his soul inasmuch as that human soul had been chosen to breathe life into the universe. When Christ first appeared before men in the arms of Mary he had already stirred up the world."

Mon Universe (March, 25, 1924), Eng. transl. by G. Vann, in *Hymn of the Universe* (New York: Harper and Row, 1969), pp. 76-77



5. Primacy of *cognitive realism* and the role of induction

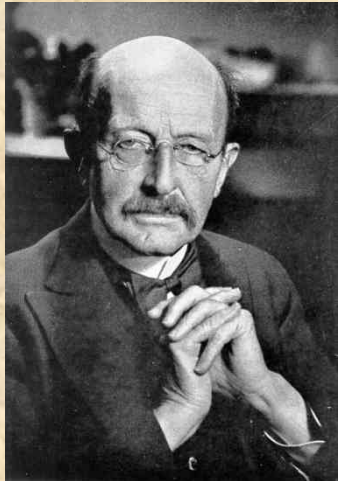
- The simultaneous **transcendence** and **immanence** of the Christian Logos suggests that nature's rationality should not be sought only *in our minds*, but it resides also *in the things*
- It is not a rationality wholly immanent in matter (Stoics), nor is it wholly immanent in the subject (Kant)
- The reason that "explains" the rationale of the universe is not human reason, but **God's reason**
- A universe shaped by the Christian Logos is more in tune with a **realist approach to knowledge**, than with idealism, conventionalism or functionalism
- The **inductive method** becomes the main way to know physical reality
- The "truth" of things does not reside only in our minds, nor does it mean only abstract consistency or coherence: seeking truth implies moving towards the things, "adjusting to" the truth of things. **Truth is *adaequatio rei et intellectus***



Like most scientists, I believe that the advance of science is concerned not just with our ability to manipulate the physical world, but with our capacity to gain knowledge of its actual nature.

In a word, I am a realist.

J. Polkinghorne, *Belief in God in an Age of Science*, 1998.

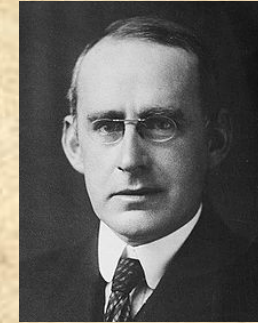


What has led me to science and made me since youth enthusiastic for it is the not at all obvious fact that the laws of our thought coincide with the regularity of the flow of impressions which we receive from the external world, [and] that it is therefore possible for man to reach conclusions through pure speculations about those regularities.

Here it is of essential significance that the external world represents something independent of us, something absolute which we confront, and the search for the laws valid for this absolute appeared to me the most beautiful scientific task in life."

M. Planck, *Wissenschaftliche Selbstbiographie*, 1948

A comparison between the realist approach and the idealist approach in evaluating our knowledge of the universe is summed up by a metaphor, employed by two different authors...



Arthur Eddington sees scientists investigating nature as those who, walking on a beach, look for the origin of some footprints and, only later, end up discovering that those were the very footprints left by their own feet; and thus come to the conclusion that man only rediscovers in science the very ideas that he himself has put in it through his own research activity.

Isaac Newton, likewise imagining to be walking on a beach, at the end of a life devoted to science, compared himself to a child who was only able to enjoy himself with a cobble and some shells, while the endless ocean of knowledge, with all its objectivity, still lay before him.

IV. Concluding remarks

- An “irrational”, chaotic world, lacking any order and any principle marking the unity and the universality of its laws/ components, could not actually exist, nor could life arise within it
- Rationality in nature (which theology suggests be the effect of a Creator *Logos*) is a pre-condition both for the world’s comprehensibility and for its very existence
- The world’s rational character, its comprehensibility and its existence are three aspects of one and the same reality
- Scientific thought is *consistent* with the idea that the world’s rationality, comprehensibility, and existence may be unified by the hypothesis of a personal Logos, a God Creator transcending empirical reality

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