

Lectures on Science and
Theology



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Philosophical and Historical
Perspectives

Lecture 2

Is the notion of God meaningful to Scientific Culture?

The Openness of Science to the Quest for Truth and Meaning

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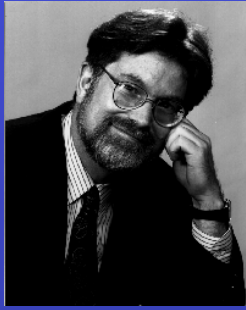


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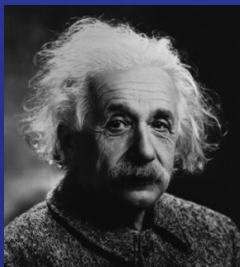
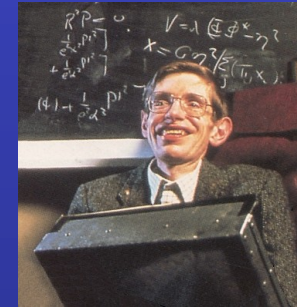
'The hubble telescope is providing us with incredibly distant images of a very early universe.'

THE SPECTATOR 19 August 1995



“We had observed the oldest and largest structures ever seen in the early universe [...].
If you're religious, it's like seeing God.”
(George Smoot)

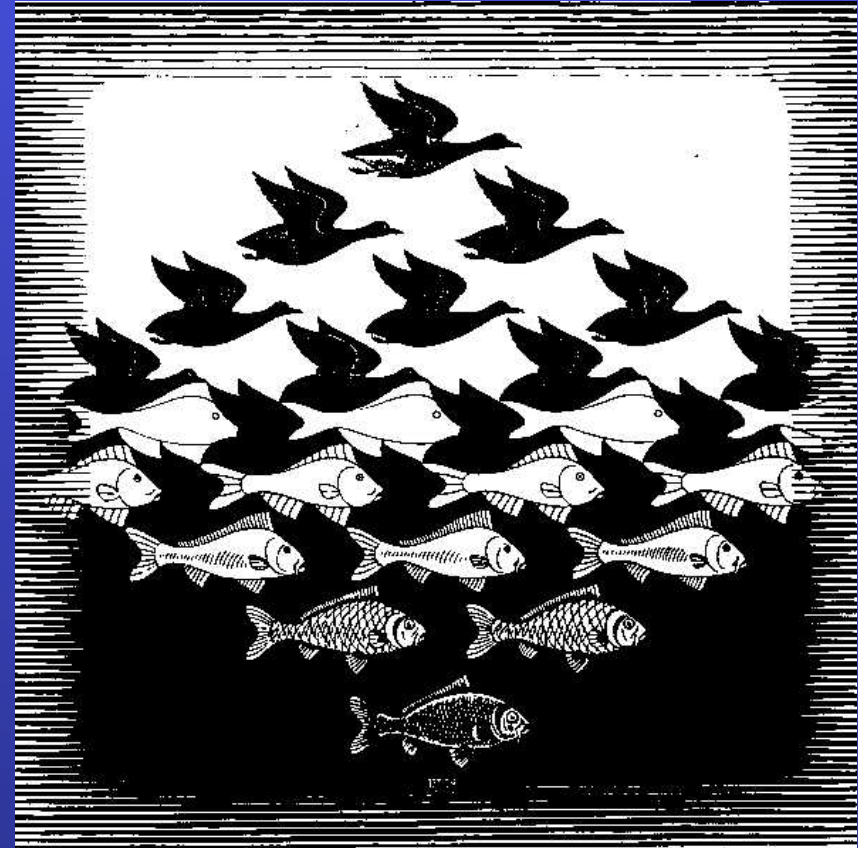
“So long as the universe had a beginning, we could suppose it had a creator. But, if the universe is really self-contained having no boundary or edge, it would have neither beginning nor end, it would simply be. What place, then, for a creator?” (Stephen Hawking)



“I want to know how God created this world. I am not interested in this or that phenomenon. I want to know his thoughts; the rest are details.”
(Albert Einstein)

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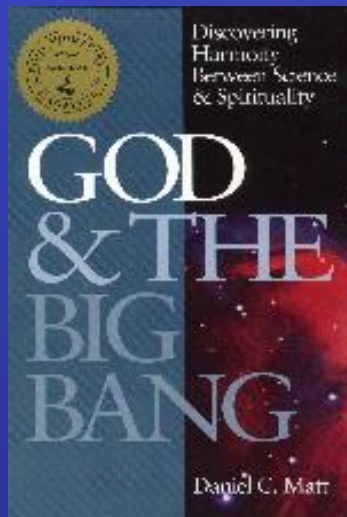
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1. Some Epistemological Clarifications

■ Science popularization, and also some scientists' philosophical reflections, call into debate the **notion of God**, to affirm or deny it.

References to God usually appear in the following scientific contexts:



- ✓ the quest about "the origins"
- ✓ the inquiry about the source of the intelligibility and information existing in nature (maths, physics, chemistry, biology)
- ✓ the debate on finalism in nature (life sciences, Anthropic principle)

☞ Why does it appear? The notion of *God*, as discussed in the philosophical and theological contexts, cannot be object of the natural sciences, as these investigate nature in its experimental and quantitative aspects...



Questioning about “the access to the notion of God in the context of scientific rationality”

✓ **does not mean** to argue about any demonstration of the existence of God starting from the analysis of science (it would be inconsistent)

✓ **it means, rather,** to ask if a notion of God is meaningful also for a **subject** whose rationality (mind) is shaped by contemporary scientific culture

Is it reasonable, **for such a subject:**

✓ to take into consideration what philosophy might say about God?

✓ to listen to biblical Revelation / theology, when speaking of a Word of God addressed to human beings?

Philosophy, Theology and Science on the notion of God



- **Philosophy** speaks of God (Absolute, Primary Cause, etc.), when offering rational paths to God's existence, starting both from the cosmos (natural theology, metaphysics), and from the human being (theistic existentialism, moral natural law, etc.)
- **Theology** speaks of God starting from a divine Revelation (for instance, the Judaeo-Christian Revelation about One God, Creator of the world and Lord of history)
- **Scientific rationality** is not asked to speak of God, nor to demonstrate any scientific path which leads to Him.
- ☞ However, **science** can be asked to say whether some notion of God contradicts or not the analysis of the empirical sciences, or whether can be considered nonsensical
- ☞ **Scientist** can judge whether some notion of God is in tune with the existential dimensions of his/her research activity.

Remembering the famous **5 ways** towards God suggested by Thomas Aquinas (1225-1274), these ways show **two parts** in their reasoning:



a) a **philosophical path**, able to reach a Prime Mover, a First efficient Cause, a *per se* Necessary Being, the infinite cause of all perfections, and an Intelligent Final Cause of the Universe;

b) a **statement**: "... and they all call it God" (*intelligunt, nominant, dicunt Deum*),

☞ We want to investigate here whether the second part of the articulation "**...and they all call it God**", which refers to a pre-comprehension of the term "God," is still meaningful for those who study reality according to the methods of science.



☞ To let a theological or philosophical notion of God be recognized as meaningful in the context of scientific rationality, and not refused as nonsensical, we need to show that:

- ✓ scientific method remains open to *meanings* (semantic areas) which transcend it;
- ✓ these “areas of meaning” are available for a discourse on a Logos (or on the Absolute), as made by philosophy or theology;
- ✓ speaking of God (Logos, Absolute, Cause of the whole Being, etc.) does not contradict any scientific knowledge, nor it comes into conflict with the scientific analysis of nature.

However, a *logos on God* can be judged either meaningful or, on the contrary, nonsensical, also depending on:

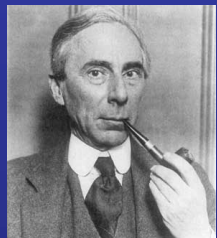
a) the meaning we give to terms as:

Being, existence, reality, reason, rationality, matter, etc.,

b) some philosophical pre-comprehensions we could have – idealistic, reductionist, or sometimes ideological



- all that exist must be object of experimental and quantitative knowledge (that is, all that exist does not transcend matter)



- the only truth we can manage is the logical truth; the only idea of reason / rationality is that associated to the empirical sciences

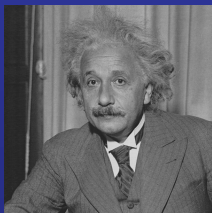
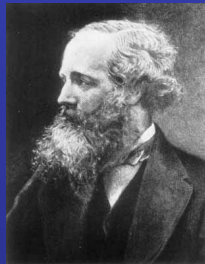


- the subject and his/her categories are the beginning and the principles of all knowledge

- starting from sensible effects is not possible to infer causes which transcend empirical knowledge

■ Consider the following **4 incompleteness**. They put in light the existence of meaningful areas which lie *outside of* scientific method. Scientific analysis *seem to point to* these areas, from within.

They are good “candidates” to show that a meta-language is possible, where a logos on God can be judged meaningful also by scientific rationality.



a) **logical incompleteness** of formal languages: reality is more than language

b) **ontological incompleteness** of scientific analysis of nature: being is more than becoming

c) **incompleteness of matter and energy** in nature: where does information come from?

d) **incompleteness** of scientific method: scientific activity needs ends and meanings

■ Each **incompleteness** operates as **an openness** of science towards a knowledge/meaning which transcends it

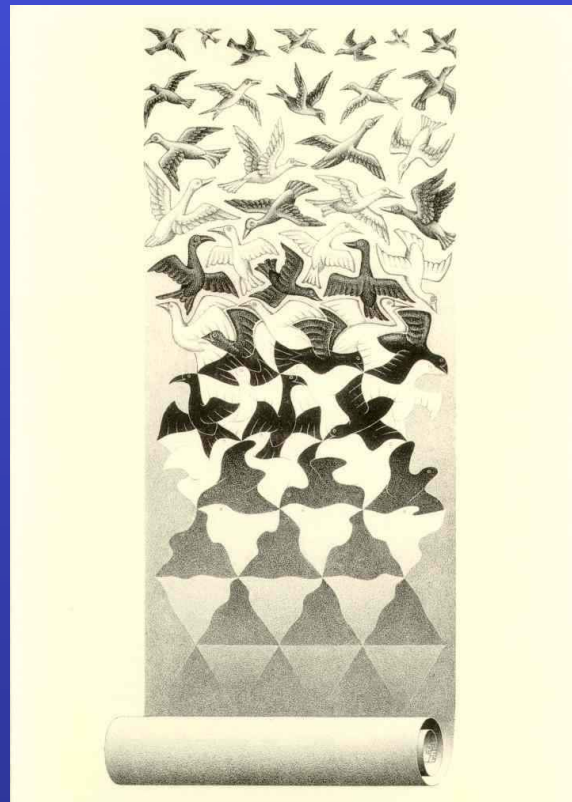
Each of these openings are associated to 4 **foundations** of scientific activity:

- ✓ *logical-epistemological foundation*
- ✓ *ontological foundation*
- ✓ *rational foundation*
- ✓ *anthropological foundation*

Scientific rationality, and scientist who makes science, acknowledge the meaningfulness of these areas corresponding to those foundations: they transcend both scientific language and empirical analysis.

☞ **In the house of science there are 4 windows.** They belong to the house, but let scientists see the wide world outside...



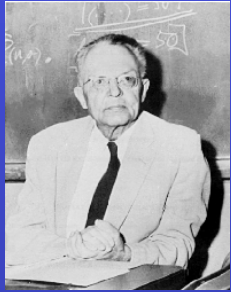


2. The meaning of a reference to the Absolute, beyond the formal language of science

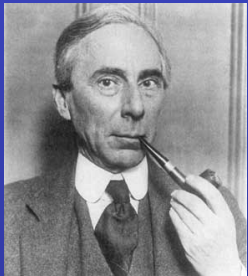


Immanuel Kant's (1724-1804) critical philosophy represents the most severe denial of any access to the notion of God from the context of the activity of sciences.

- “to know” (*erkennen*) belongs to the realm of Pure Reason; “to think” (*denken*) belongs to the realm of Practical Reason, the only one where a reference to God (moral values) makes sense;
- within the field of Pure Reason, the existence of something transcending the empirical level cannot be affirmed nor denied; the idea of God is an antinomy, there is no “experience” of it;
- then, in the frame of scientific knowledge, the notion of God is meaningless;
- as a consequence, any discourse about God (or on moral principles), has no universal-objective value and it remains non-communicable on the bases of pure reason.



According to logical neo-positivism, the notion of God **does not make sense in any context**. Under the perspective of ontological reductionism, there is no reality beyond logical and empirical categories



The Program of logical neo-positivism was to build up an axiomatic complete and self-referential language, capable of expressing all reality through axiomatic, formal statements, linked in a non-ambiguous way to the world of facts...

Logic was thought to have the property of a foundational theory, and this same property was affirmed of mathematics, as capable of a complete axiomatization.

Finally, as all the other "sciences" depend on the language of maths, all knowledge could be reduced to the empirical knowledge of the natural sciences.

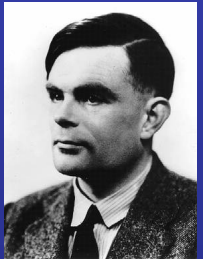
However, this Program resulted non-practicable. It had to clash with **two serious limits**:

■ **The impossibility to** build a logical-mathematical, axiomatic system, which was capable to offer, from within, all the elements needed to take all decisions and perform all computations.



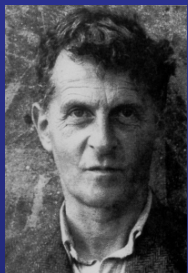
K. Gödel: theorems of incompleteness of axiomatic systems

A. Tarsky: the elements to decide the truth of a statement must be received from outside the starting language



A. Turing: automatic computation is intrinsically limited

■ **The need to frame** any system and any language within a more general system or language (meta-language): all language must be supplied with the *meanings* of the terms there used.



L. Wittgenstein, the meaning of reality lies outside the world of facts; the truth of statements depends on subject's witness



A philosophical path indicating that “there is room” for a discourse on the Absolute was outlined by Ludwig Wittgenstein’s (1889-1951) thought

Formerly involved in the foundation of a language capable of avoiding all ambiguities and nonsensical concepts, trying to establish a rigorous connections between words and facts, Wittgenstein ends by finding that such a program was unable to deny the meaningfulness of notions belonging to a moral order.

“We feel than even when *all the possible* scientific questions have been answered, the problems of life remain completely untouched.” (*Tractatus Logico-Philosophicus*, 6.52)

“The meaning of the world must be outside the world” (*ibidem*, 6.41)

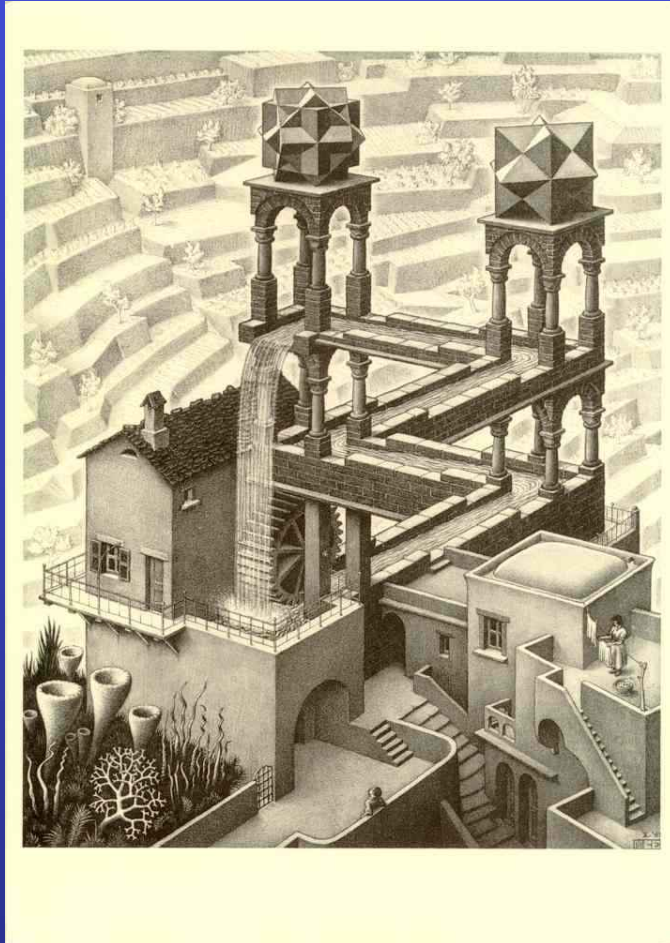
“There is indeed the inexpressible. This *shows* itself; it is the mystical [...] Not *how* the world is, is the mystical, but *that* it is.” (*ibidem*, 6.522 and 6.44)

☞ Reality is more than our words

☞ Semantic is more than syntactic

Wittgenstein's lesson in a nutshell:

- ✓ Only if we could distance ourselves from the "world of facts" and look at this world from the outside, then we would realize that the problem of meaning does exist. However, we cannot define it in terms of formal languages.
- ✓ Different from Kantian philosophy, the question of meaning and the openness to the inexpressible both arise *from within scientific knowledge*
- ✓ Like the neo-positivists, Wittgenstein drew a line between what we can speak of and what we must remain silent about...
... but different from neo-positivists Wittgenstein had *something* to keep silent about.
- ✓ According to neo-positivists, only that which we can speak about is important in life; Wittgenstein, on the contrary, passionately believed that what is important in human life is that which we cannot speak about.



3. The ontological incompleteness of physical, contingent reality, and the opening to a metaphysical necessary foundation




■ The need for an (implicit) ontological foundation of the scientific knowledge can be put in light considering that:

☞ at the basis of all the natural sciences there is a “philosophy of nature”;

☞ at the basis of all philosophy of nature there is an “ontology”;

☞ ontology faces with the “problem of contingency,” and then the difference between *being contingent* and *Being necessary*.

☞ science cannot provide the very reason for the existence of material entities (to have being), nor for the ultimate why of “being” as such, as science is concerned only with the transformation of a material entity into another



■ The work of science is possible thanks to some ontological *pre-suppositions*, at the basis of all scientific analysis:

- ✓ material entities **must exist**

- ✓ they must **exist according a specific nature** (properties, essence, *quidditas*), i.e. they are the way they are and not otherwise

- ✓ in addition to matter and energy, we need also specific (non material) **information**

☞ Science acknowledges the need for an ontological foundation, external to its method, whenever it recognizes that any analysis of **physical reality must start with some measurable quantity** (mass, space-time, physical void, geometry, virtual energy, etc.).

It is starting from these quantities that we can infer the probability that any other material entity may come into being.



■ The existence of an ontological foundation

- ✓ which gives reason of the being of material entities,
- ✓ of their specific properties (nature, essence);
- ✓ and which is also the ultimate reason for the existence of physical contingent reality, as such,

indicates that a semantic area exists, where these notions (foundation of all being, the *quidditas* of material entities, etc.) acquire a meaning also in the context of scientific reason, although scientific method is unable to define or handle them.

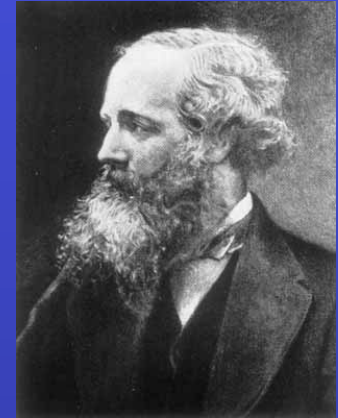
☞ In other words, the existence of this semantic area, the idea of a **Logos which gives reason for that**, cannot be judged as nonsensical or meaningless by those whose mind is shaped by scientific rationality.

“Science is incompetent to reason upon the creation of matter itself out of nothing. We have reached the utmost limit of our thinking faculties when we have admitted that because matter cannot be eternal and self-existent, it must have been created.

It is only when we contemplate, not matter in itself, but the form in which it actually exists, that our mind finds something on which it can lay hold. That matter as such should have certain fundamental properties—that it should exist in space and be capable of motion, that its motion should be persistent, and so on—, are truths which may, for anything we know, be of the kind which metaphysicians call necessary.

We may use our knowledge of such truths for purposes of deduction, but we have no data for speculating as to their origin.”

J.C. Maxwell, in W.D. Niven (ed.) *The Scientific Papers of James Clerk Maxwell* (New York: Dover, 1965), v. II. pp. 376-377.





“However successful our scientific explanations may be, they always have certain starting assumptions built in. For example, an explanation of some phenomenon in terms of physics presupposes the validity of the laws of physics, which are taken as given. But one can ask where these laws come from in the first place.

One could even question the origin of the logic upon which all scientific reasoning is founded. Sooner or later we all have to accept something as given, whether it is God, or logic, or a set of laws, or some other foundation for existence.”

P. Davies, *The Mind of God*, Simon & Schuster, New York 1992, p. 15

■ A philosophical **discourse on the Logos**, meaningful also for science, is possible within the two intelligible semantic areas previously recognized as

☞ the **opening of scientific language** to a meta-language that transcends the formal language of science

☞ the **opening of scientific analysis to an ontological foundation** which transcends physical reality



Let us see now two aspects of the researcher's activity, where such a *Logos* seems to be perceived as:

- a rational information present in the material cosmos
- a dialogical and personalistic *Otherness*



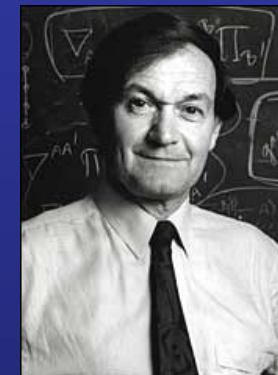
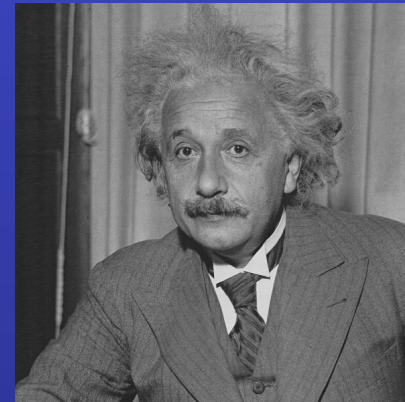
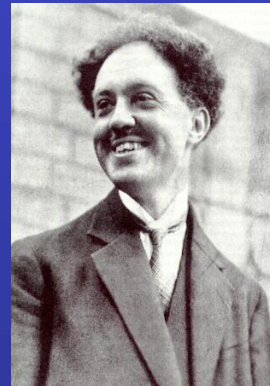
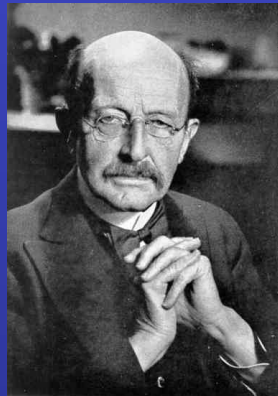
4. The acknowledgment of a Logos, as an objective, rational order in nature
(*logos ut ratio*)

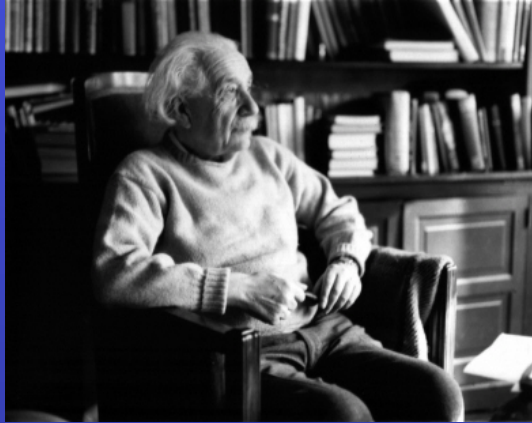
■ Scientists *approach* the notion of Logos when they wonder about the **origin of the rationality** of the physical cosmos, about the **intelligibility of the laws** of nature, about the **origin of information**

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- ✓ we can understand the physical universe in mathematical terms
- ✓ its laws are effective over large scale space and long based time
- ✓ the same elementary particles have identical properties all over the space-time,
- ✓ the chemical-physical properties of chemical elements follow ordered structures
- ☞ The physical behavior of the cosmos seems to show a kind of "rational foundation," with which the researcher "comes into contact."

The "enigma" of intelligibility has been pointed out by James Clerk Maxwell, Max Planck, Louis De Broglie, Albert Einstein, Paul Davies, John Barrow, Roger Penrose...





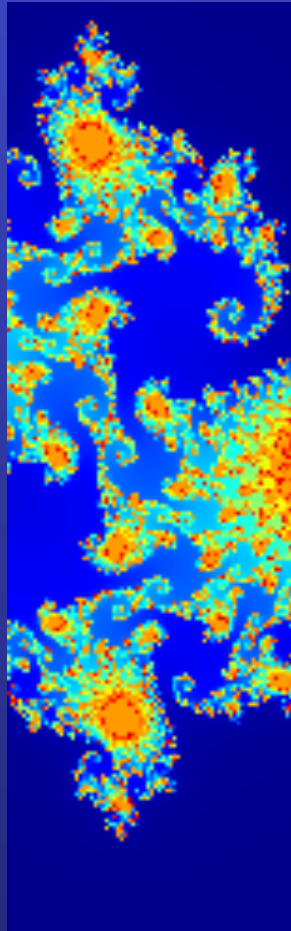
Albert Einstein, Letter to M. Solovine, March 30, 1952

«You find it surprising that I think of the comprehensibility of the world... as a miracle or an eternal mystery. But surely, a priori, one should expect the world to be chaotic, not to be grasped by thought in any way.

One might (indeed one should) expect that the world evidenced itself as lawful only so far as we grasp it in an orderly fashion. This would be a sort of order like the alphabetical order of words. On the other hand, the kind of order created, for example, by Newton's gravitational theory is of a very different character. Even if the axioms of the theory are posited by man, the success of such a procedure supposes in the objective world a high degree of order, which we are in no way entitled to expect a priori.

Therein lies the miracle which becomes more and more evident as our knowledge develops. And here is the weak point of positivists and professional atheists, who feel happy because they think that they have preempted not only the world of the divine but also of the miraculous.»

■ The reflection on the **rationality** and **intelligibility** of the cosmos, and the question on the origin of **information** seem to concern the following fields of scientific activity:

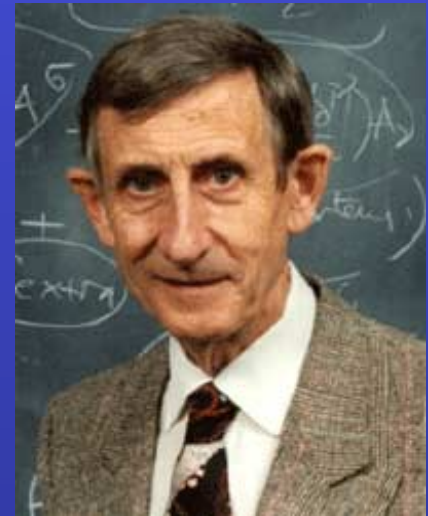


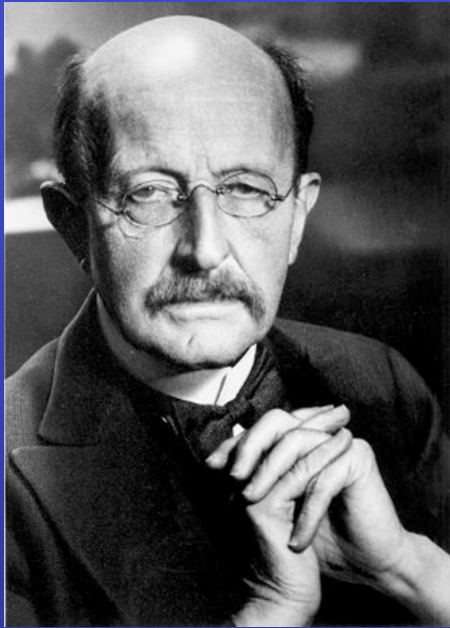
- ✓ the debate on the epistemological status of the **laws of nature** and the theoretical framework of **particle physics**
- ✓ the wonder about the ultimate source for the **order in nature**, as independent from the intellectual categories of the knowing subject
- ✓ The way of approaching the **nature of life** in system biology
- ✓ the debate on the meaning of the **Anthropic Principle**
- ✓ a more general debate, on the possible presence of a **design in nature**

“The universe is an unexpectedly hospitable place for living creatures to make their home in. Being a scientist, trained in the habits of thought and language of the twentieth century rather than the eighteenth, I do not claim that the architecture of the universe proves the existence of God.

I claim only that the architecture of the universe is consistent with the hypothesis that mind plays an essential role in its functioning.”

F. Dyson, *Disturbing the Universe* (London: Harper and Row, 1979), p. 251





“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, *Scientific Autobiography*, 1948

■ Order, rationality and information: is there a Logos *beyond* the cosmos?

- Order, rationality and information make science possible, but science seems unable to give a complete account of them: they are simply *given*.
- Speaking about order, rationality and information is nothing but to speak of a *ratio (logos)* which transcends the physical reality, something *beyond* the physical cosmos.
- Such a discourse exceeds the formal language of science, but it is meaningful for the world of science: in this sense, this *logos* is adequate for a logos on God.

■ What if this *ratio* were a mind *behind* the cosmos?

- Could this logos simply be a mind *immanent in physical reality*, one and the same thing with the cosmos itself?
- On the basis of scientific method only, it remains *undecidable* whether the source of rationality and information is an “*impersonal computer*” or a “*personal intentionality...*”
- If it were the same as the cosmos, *it would be contingent*, and then subject to transformation, just like the whole of physical reality
- By resorting to the *illative sense*, that is, by relating what science says about the rationality of the cosmos to *other philosophical and existential insights*, we could infer that the Logos, which gives reason of both the existence and the rationality of physical reality, is *Other-than-the World*.



5. The acknowledgment of a Logos, as dialogical “otherness”, speaking through nature (*logos ut verbum*)

■ When performing scientific activity, researchers also perceive reality as “something objectively in front of them.” Scientists are surprised that they can “dialogue” with nature, putting questions and receiving answers. They recognize nature and its laws as a “dialogical otherness.”

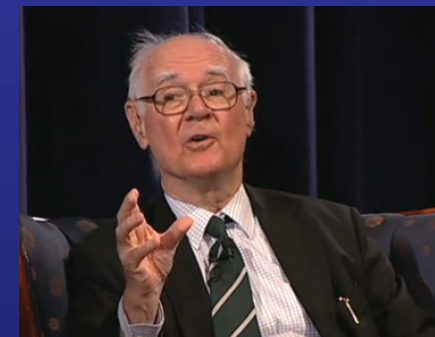


“Can you, or anyone else, reach the central order of things, or events, whose existence seems beyond doubt, as directly as you can reach the soul of another human being? I am using the term 'soul' quite deliberately so as not to be misunderstood. If you would put the question like that, the answer is 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)





This world does not explain itself.

It may be a miracle with a supernatural explanation;

it may be a conjuring trick with a natural explanation...

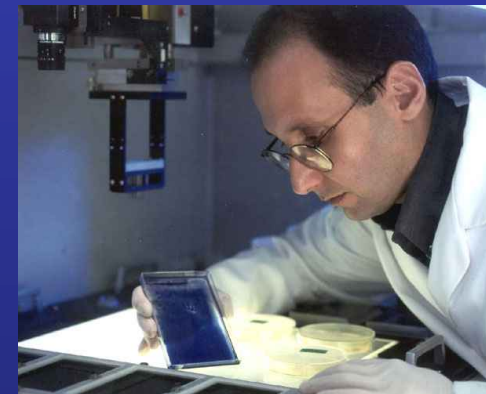
There is something personal in the world, as in a work of art; whatever it means it means violently.

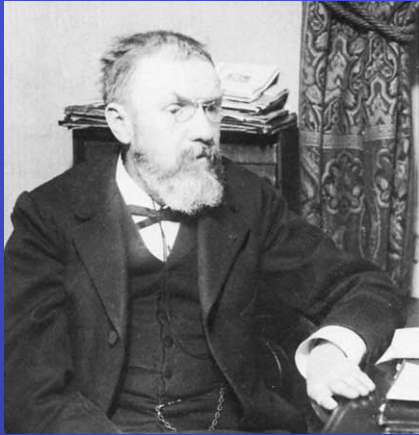
G.K. Chesterton, *Orthodoxy*, Doubleday, Garden City (NY) 1959, p. 65.



■ Scientists judge the natural world as something **worth of being studied**. The interest for knowing in depth the “central order of things” motivates their intellectual work, while nature’s beauty and the quest for truth **nourish all the efforts that work requires**. Scientific research is seen as a **commitment for truth**.

■ The feelings of awe and reverence scientists have towards the order and the beauty of nature, lead them up to make an “**experience of foundations**,” coming into contact with the deep bases of physical reality. It is an “experience of revelation,” like **an encounter with the Absolute**.



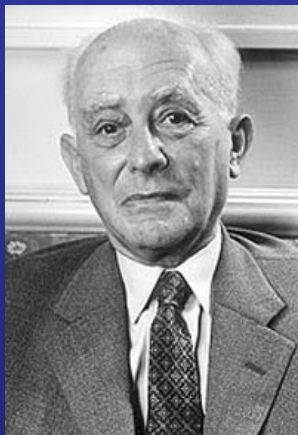


"The scientist does not study nature because it is useful to do so. He studies it because he takes pleasure in such a study; and he takes pleasure in it because nature is beautiful. If nature were not beautiful, knowing about it would not be worth while and life would not be worth living."

H. Poincaré, quoted by S. Chandrasekhar, "The Beauty and the Quest for Beauty in Science," *Physics today*, July 1979, p. 25.

"For the greatest scientists, scientific experience of truth is, in a sense, 'theoria,' that is, a vision of God"

M. von Laue, *History of Physics* (New York: Academic Press, 1950), p. 4.



"This pleasure is a little like that known to anyone who solves crossword puzzles. Yet it is much more than that, perhaps even more than the joy of doing creative work in other professions except art. It consists in the feeling of penetrating the mystery of nature, discovering a secret of creation, and bringing some sense and order into a part of the chaotic world. It is a philosophical satisfaction."

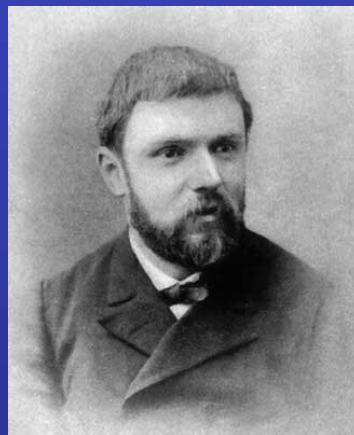
M. Born, *My Life and Views* (New York: Scribner, 1968), p. 47



- Physical reality, then, brings about a meaning, conveys a message, it moves to respect and gratitude, even to praise. This “experience of awe and reverence,” or “experience of foundations,” cannot be expressed by the formal language of science, although meaningful to scientific rationality.
- The discourse (*logos*) able to speak of such an experience, is adequate for a logos on God.
- The notion of God associated to this experience points to a mystery, which is expected to contain the ultimate reason of the world.
- For this reason, the research activity has been often described as “experience of the sacred.”

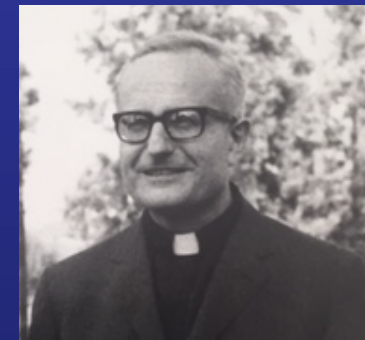
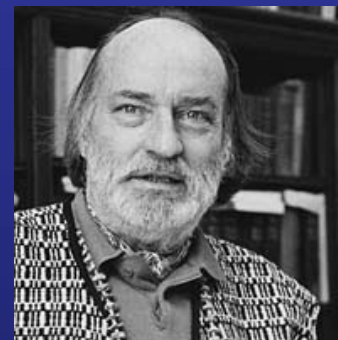
Among scientists who spoke of a religious dimension inner to scientific activity:

James C. Maxwell, Georg Cantor, Max Planck, Augustin Cauchy, Henri Poincaré, Luitzen Brouwer, Werner Heisenberg, Albert Einstein, George Simpson, Theodosius Dobzhansky.



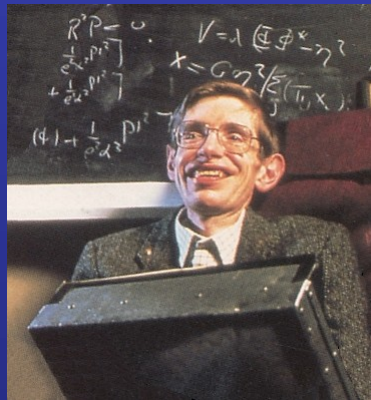
Among philosophers and theologians who reflected on this dimension:

Langdon Gilkey, Enrico Cantore, Olaf Pedersen, Gualberto Gismondi



Learning from an episode occurred in Rome around 1980

*Why and how to speak of God in the context of science:
Stephen Hawking and John Paul II*



«So long as the universe had a beginning, we could suppose that it had a creator. But if the universe is really completely self-contained, having no boundary or edge, it would have neither beginning nor end: it would simply be. What place, then, for a creator?»

(A Brief History of Time, London 1988, pp. 140-141)

During a General Assembly of the Pontifical Academy of Sciences, Stephen Hawking, a member of the Academy, gave a talk on his cosmological model without any initial singularity, a model which describes the existence of the universe "out of nothing". Commenting on this model, Hawking affirmed publicly that for this model working there was no need of any Creator... John Paul II was there, during the talk. Hawking revealed —and in one occasion he also wrote— that after that talk he expected to be condemned by the Catholic Church as a "Galileo n. 2". However, the scientist was deluded, because John Paul II did not make any comment.



Stephen Hawking receives by Paul VI the Pious XI Medal, April 9, 1975, for his studies on black holes.

Some time after, during an informal meeting with scientists at Castel Gandolfo, Joseph Zycinsky asked John Paul II why he had no reaction after Hawking's talk at the Pontifical Academy. Zycinsky also reported to the Pontiff Hawking's "delusion" to have not been condemned by him...

John Paul II answered that in physics there was no reason to mention the Creator (and in this Hawking was right). However, he added that physics pre-supposes philosophical questions, like, for instance, why the laws of nature exist, or why the cosmos is intelligible, and he was persuaded that Hawking would not have denied the meaningfulness of such questions. Only in that case, if these questions would have been denied, he, as Pontiff, had to say something...

Source: Joseph Zycinski (2006),
private communication





■ Conclusions / 1

- ✓ Scientific knowledge is knowledge about reality, but it does not exhaust **all that reality means and conveys**.
- ✓ Scientific rationality lies upon **foundations** which transcend scientific method, while making that method possible.
- ✓ In scientific rationality are **openings** which point to meanings and contents that, while unable to be expressed with the formal language of science, are nonetheless significant for those who work in science.



■ Conclusions / 2

- ✓ The **logical** and **ontological** foundations of scientific knowledge, the **rationality** and **information** present in physical reality, and finally the **meanings** that physical reality contains and expresses, make it possible to introduce a notion of *logos*.
- ✓ Starting from this notion, philosophy and theology can develop **a discourse on God** intelligible also to those who work in science.
- ✓ Also in the context of science, the natural world continues to be and manifest itself as a **mystery**, and it is reasonable to ask **whether the world has an explanation**.
- ✓ The search for this explanation points to an intelligible area of meaning which justifies, even in this context, the possibility of a **discourse on God**.

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