

Faith of Fundamental Science



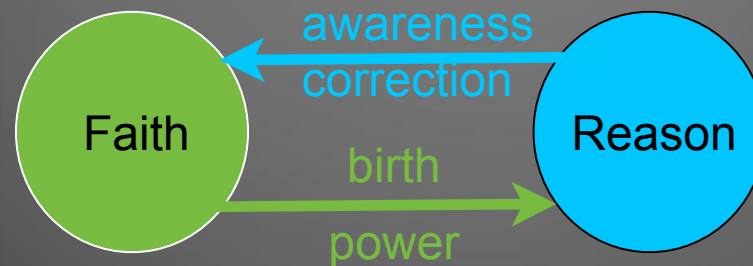
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Faith and Reason

- Three approaches to the problem:
 - Reason => Faith ? (Platonism, Natural Theology, Scientific Atheism)
 - Reason || Faith (Complete separation)
 - Reason and faith are vital for each other. Einstein: Faith without reason is blind; reason without faith is lame.

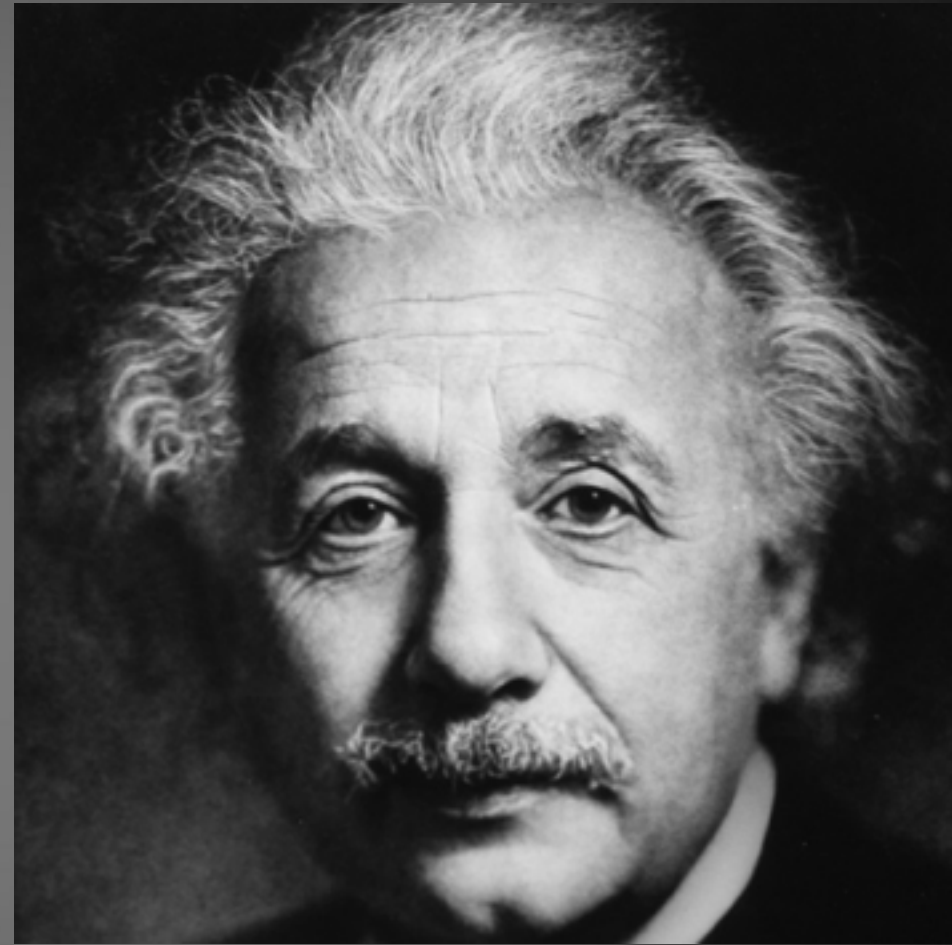
- Thus, according to Einstein, reason is empowered by faith, while faith has to be seen and tested by reason:



- Let's see how does it work for fundamental science. What faith empowered it? Is anything to be corrected in that faith?

Cosmic Religious Feeling

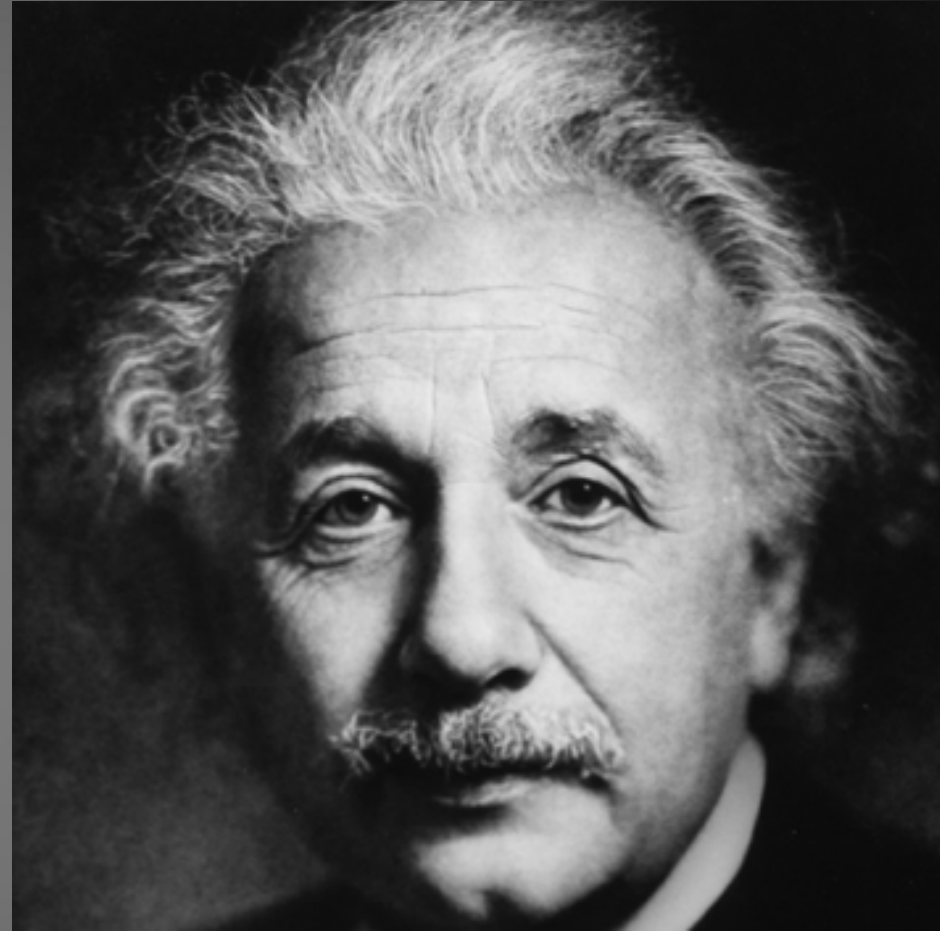
“I maintain that the cosmic religious feeling is the strongest and noblest motive for scientific research. Only those who realize the immense efforts and, above all, the devotion without which pioneer work in theoretical science cannot be achieved, are able to grasp the strength of the emotion out of which alone such work, remote as it is from the immediate realities of life, can issue. What a deep conviction of the rationality of the universe and what a yearning to understand, were it but a feeble reflection of the mind revealed in this world, Kepler and Newton must have had to enable them to spend years of solitary labor in disentangling the principles of celestial mechanics!



Cosmic Religious Feeling

Those whose acquaintance with scientific research is derived chiefly from its practical results easily develop a completely false notion of the mentality of the men who, surrounded by a skeptical world, have shown the way to kindred spirits scattered wide through the world and through the centuries. Only one who has devoted his life to similar ends can have a vivid realization of what has inspired these men and given them the strength to remain true to their purpose in spite of countless failures. It is **cosmic religious feeling that gives a man such strength**. A contemporary has said, not unjustly, that in this materialistic age of ours the serious scientific workers are the only profoundly religious people.”

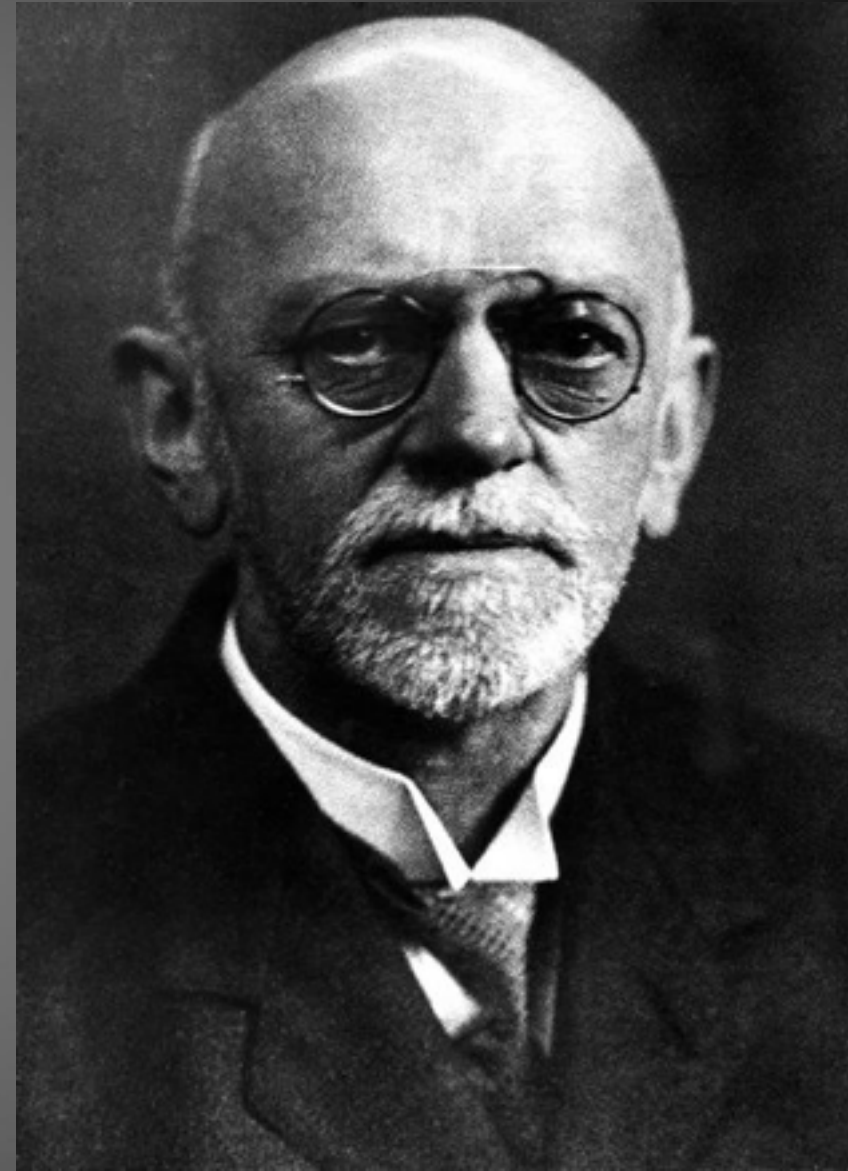
A. Einstein, *Religion and Science*, 1930.



Duty and Prophecy

We must know.
We will know.

D. Hilbert,
Retirement Address, 1930



Martyrdom

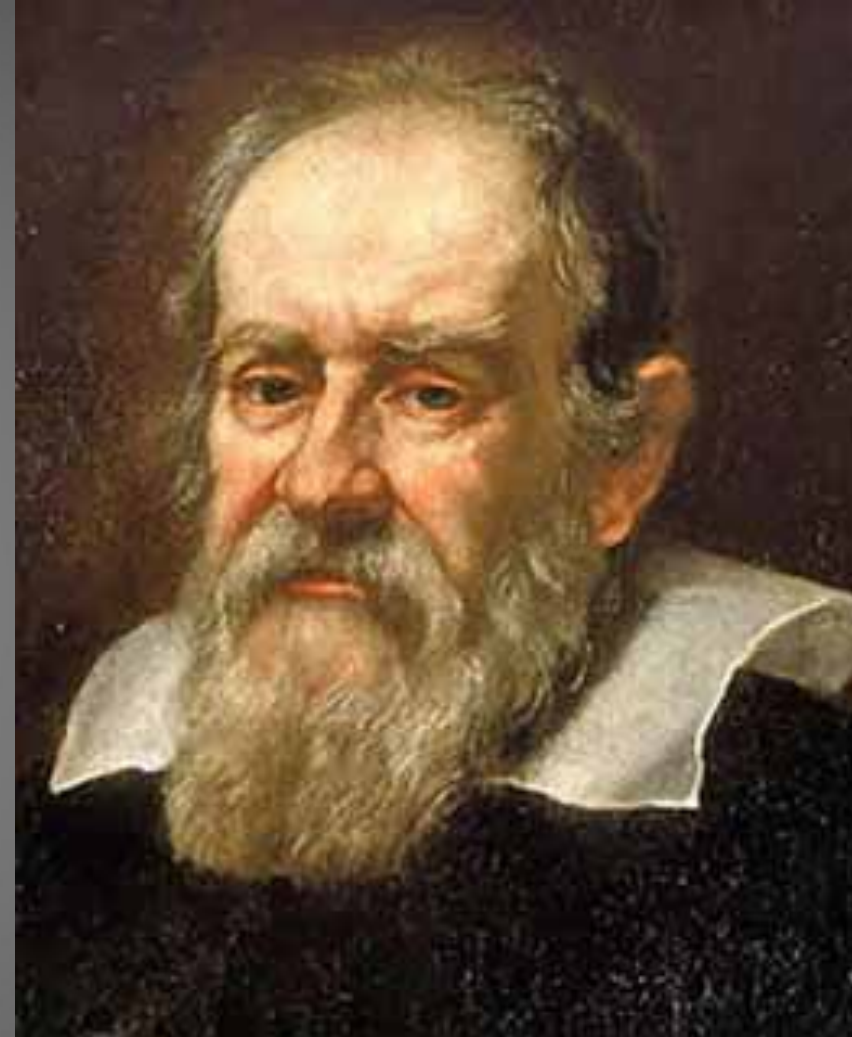
1633:

For his “Dialogue”, Inquisition sentenced Galileo to home arrest, continued until the end of his life, 9 years. All his writings were banned from publication. He lived in his villa in Arcetri, near Florence. Visiting Florence was strictly forbidden for him. He starts working on a book which became his main masterpiece: “Two New Sciences”.

1638:

His health was getting worse; he became completely blind. A permission to travel Florence for medical advises was given. Meanwhile, “Two New Sciences” was published in Holland. As a result, the permission to visit Florence was revoked just after a few months after it was given.

Until his death at 1642: Complete home arrest.

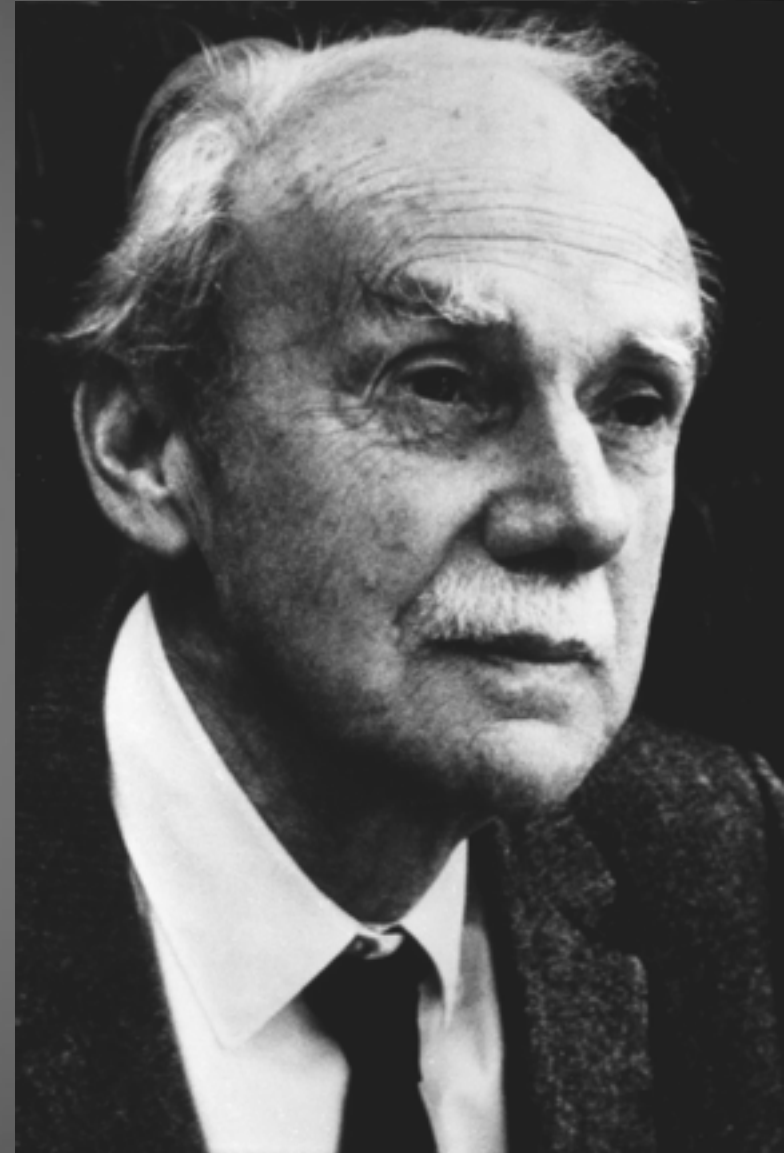


Galilei (1564-1642)

Mystic Experience

“If you are receptive and humble, mathematics will lead you by the hand. Again and again, when I have been at a loss how to proceed, I have just had to wait until I have felt the mathematics lead me by the hand. It has lead me along an unexpected path, a path where new vistas open up, a path leading to new territory, where one can set up a base of operations, from which one can survey the surroundings and plan future progress.”

P.A.M. Dirac, *unpublished note*, 1975.



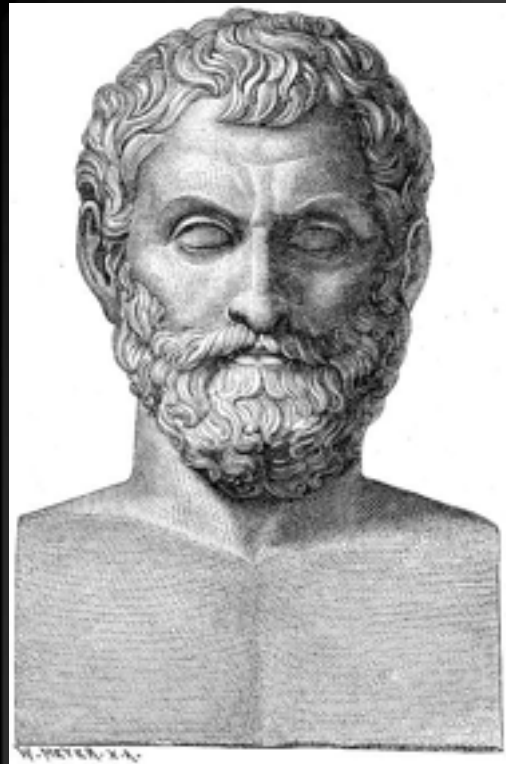
What is a Creed of this faith?

- **Fundamental Physics (FP)** is a long-term human enterprise; starting from **Pythagoras**, a father of theory, it is about **2500** years old.
- Fathers of science of various epochs expressed their faith. Let's hear them, try to understand them and see a source of their inspiration and power of their devotion.
- Let's think and try to formulate universal metaphysical premises of this faith.
- Thus, in our research of the scientific faith we will proceed both historically and logically.

Thales (c.624-546), Anaximander (c.610-546)

There is a unity of everything existing

Water



Apeiron (unbounded)

Pythagoras



Πυθαγόρας, c. 570-495

- Legendary figure. “The teacher said so”.
- *Stobaeus*: “Things that were alike and of the same kind had no need of **harmony**, but those that were unlike and not of the same kind and of unequal order – it was necessary for such things to have been locked together by harmony, if they are to be held together in an ordered universe.”

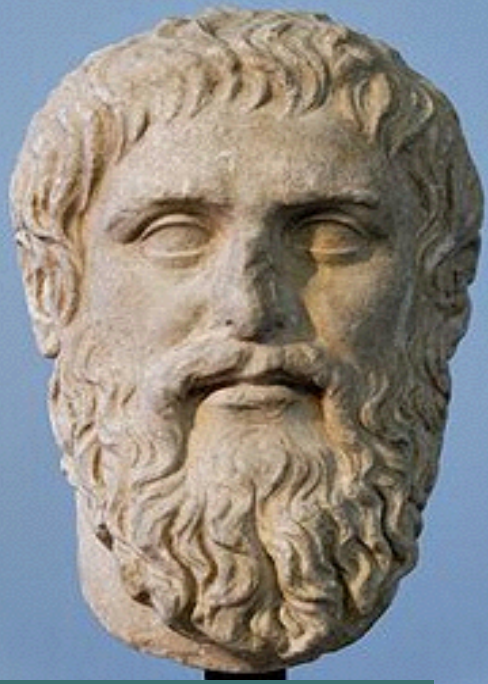
P. introduced: “Harmony”, “Cosmos” (ordered by harmony), “Theory” (theorein, contemplate), “philosophy”, “mathematics” (learning).

Theory as the way of salvation from the wheel of life.

B. Russel on Pythagoras

The combination of mathematics and theology, which began with Pythagoras, characterized religious philosophy in Greece, in the Middle Ages, and in modern times down to Kant. Orphism before Pythagoras was analogous to Asiatic mystery religions. But in Plato, St Augustine, Thomas Aquinas, Descartes, Spinoza, and Leibniz there is an intimate blending of religion and reasoning, of moral aspiration with logical admiration of what is timeless, which comes from Pythagoras, and distinguishes the intellectualized theology of Europe from the more straightforward mysticism of Asia... I do not know of any other man who has been as influential as he was in the sphere of thought. I say this because what appears as Platonism is, when analysed, found to be in essence Pythagoreanism. The whole conception of an eternal world, revealed to the intellect but not to the senses, is derived from him. But for him, Christians would not have thought of Christ as the Word; but for him, theologians would not have sought logical proofs of God and immortality.

Plato, Euclid



Plato teachings on forms and salvation follow Pythagorean philosophy.

Platonic myth about creation of World and Man (“Timaeus”) is close to the Book of Genesis in several essential aspects:

- Monotheism
- Void as a substance of World
- Humans are created in God similarity

Πλάτων, 428-348

- **Euclidian** geometry had nothing to do with practical needs; it was neither motivated by them nor added a single practically important result to what was well-known already for centuries in Egypt and Babylon.
- The goal of **Euclid** was purely spiritual: to see the divine reality of **Logos/Harmony/forms**, hidden under a veil of phenomena.
- “Give him three obols and let go”



Εὐκλείδης, c. 300 BC
(Florence, Bell Tower, XIVc.)

Aristotle (384-322)

World=forms+matter

World is rational and purposeful, led by Mind (Nous) to Good

Human nous is an only part of the souls coming directly from God, not from parents; it is a specific human gift, turning humans to be similar to God.

Since the specific purpose for humans is to think, the best human life is a thinker, philosopher.



Platonism: religion, ethics and science

- **Albinus**, “Schoolbook on Platonic Philosophy”, c. 145 AD:
- “The soul, when it contemplates (*theorein*) the divine and the thoughts of the divine, is said to experience bliss, and this experience is called wisdom, which one could say is nothing else but **assimilation to the divine**.”

And later: “Geometry is also very valuable for knowledge of the **Good**, provided one does not study it for practical ends but uses it to ascend towards what always is, not wasting time with what comes to be and passes away.”
- Ancient fundamental science was contemplative (theoretical). It was assumed that there is a single reasonable way for things to be; hence, the philosopher is able to see truth by pure *theorein* - following contemplation of his divine soul.
- **Platonic science, ethics and religion combined a single entity.**

Summary on ancient rationalism

- The visible world is underpinned by perfect structure of divine Thought (Harmony, Logos, Forms), atemporal and absolute, as integer numbers. This is the true Being, thoughts of the absolute Mind (Nous).
- Everything nebulous and ambiguous is due to non-being (me-on), or chaos, or matter or nothingness which enters as a “second parent” of the world, or “the receptacle, and as it were the nurse, of all Becoming” (Plato, “Timaeus”). The physical world is then a fluctuating shadow, or rough copy of the true being, the world of forms.
- Humans are divine souls/minds inside physical bodies. Thanks to our divinity, we are able to dis-cover the truth (ἀλήθεια) and to contemplate it (theorein), which is our destiny or the way of salvation.
- Platonism, mathematics and experiments.
- Aristoteles vs Plato

Summary on ancient rationalism

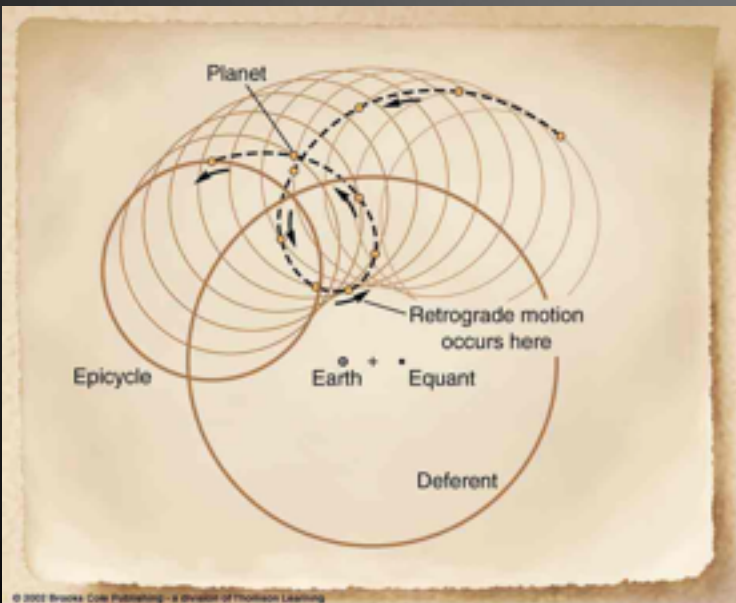
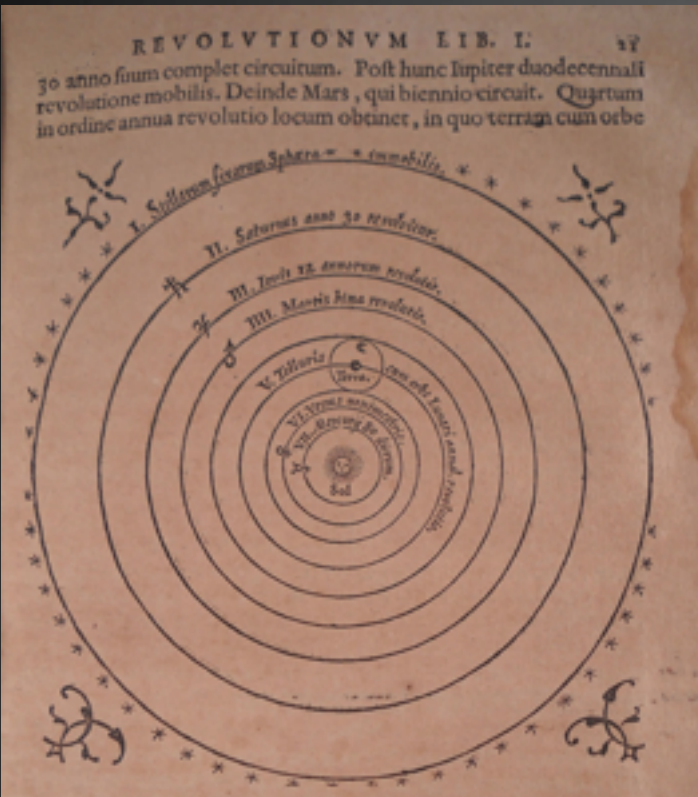
- Platonism, a cult of mathematics “Let no man ignorant of geometry enter here.” (engraved at the Academy door, also the epigraph of “On the Revolutions of the Celestial Spheres”).
- Aristoteles vs Plato: Does the world of forms exist by itself?
- Why greeks did not care about experiments?



Bible Cosmizm (Genesis, Job, Psalms)

- The world as a highest masterpiece: “...and God saw that it was good”. Thus, it deserves highest attention (compare with Platonism).
- God was free to make the world in one or another way. Thus, it's impossible to conclude about world from the pure reason only. To read the letters of God, one has to observe the world.
- Christianity accepted in itself the main currents of the ancient thought: Platonism, Aristotelianism, Stoicism, Cynicism, Skepticism... As to the fundamental science, it was inspired predominantly by Platonism with its greatest metaphysical revelation of the Cosmic Logos open to humans.

Copernicus/Ptolemy = Euclid / Egyptians



For all **practical** purposes, Ptolemy model was good.

Copernicus rejected it on the **aesthetic** ground only.

Why the true theory must be beautiful?

Because the Cosmic Logos is divine...

Copernicus shared this Pythagorean belief -
but he failed to find this beauty...

Kepler, Newton

Johannes Kepler (1571-1630): “Geometry is one and eternal shining in the mind of God. That share in it accorded to humans is one of the reasons that humanity is the image of God.”

“I feel carried away and possessed by an unutterable rapture over the divine spectacle of heavenly harmony... I write a book for the present time, or for posterity. It is all the same to me. It may wait a hundred years for its readers, as God has also waited six thousand years for an onlooker.”



Isaac Newton (1643-1727) wrote more on Theology than on Physics.

“This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an intelligent and powerful Being... This Being governs all things, not as the soul of the world, but as Lord over all; and on account of his dominion he is wont to be called Lord God παντοκράτωρ, or Universal Ruler”



Galilei, Descartes

Galilei (1564-1642): Universe is a great book written in the mathematical language. Ignoramuses of this language wander in vain through a dark labyrinth.



“I do not feel obliged to believe that the same God who has endowed us with senses, reason, and intellect has intended us to forgo their use and by some other means to give us knowledge which we can attain by them.”

For **Rene Descartes (1596-1650)**, trust in God was a precondition to trust our ability to see true reality:

“Finally, if there be still persons who are not sufficiently persuaded of the existence of God and of the soul, by the reasons I have adduced, I am desirous that they should know that all the other propositions, of the truth of which they deem themselves perhaps more assured, as that we have a body, and that there exist stars and an earth, and such like, are less certain...”





Cartesian Circle

“When I imagine a triangle, even though such a figure may exist nowhere in the world except in my thought, indeed may never have existed, there is nonetheless a certain nature or form, or particular essence, of this figure that is immutable and eternal, which I did not invent, and which in no way depends on my mind.” (Platonic World)

These immutable eternal clear and distinctive (C&D) forms may come only from a perfect absolute mind, i.e. from God.

God, being perfect, does not deceive, so the C&D statements are true.

This is the “Cartesian Circle”.

Is it a logical fallacy?

What does it actually prove or express?

- It was Spinoza who first clearly proclaimed religion of the totally ruling Substance – impersonal Substance – instead of personal God.
- His Substance was omnipotent and omnipresent, leading to total determinism and refutation of the free will.
- Ironically, his main book was called “Ethics”, but it was ethics which was actually negated by this book, as it is negated by any coherently deterministic worldview.

All the values lost their power when the old God was killed and impersonal Substance was enthroned instead.

What forced him to do that?



B. Spinoza (1632-1677)

What forced him to do that?

Spinoza at some moment of his life started to believe that there must be only one explanatory principle of the World. He saw that there were two of them: Reason and Person. Thus, one had to be sacrificed.

That is why divine personality was refuted by him. God was equated to the totality of ruling reason, sort of Cosmic Software.



Consequence:

"For the reason and will which constitute God's essence must differ by the breadth of all heaven from our reason and will and have nothing in common with them except the name; as little, in fact, as the dog-star has in common with the dog, the barking animal."

Personal God vs Impersonal Reason

- **Descartes**: God was free to create the World in any way He wanted. Truth is what God wanted to make true. Two plus two is four because God wanted that to be so.
- **Leibniz** did not agree: Truths of Reason came into God's mind without asking any permission. Leibniz accused Descartes on a blasphemous idea of God's irrationality.
- Why does this question matter? This is a question of the free will of God and humans. This is a big question about personal God and human personalities. All the values and meanings are extremely sensitive to that.

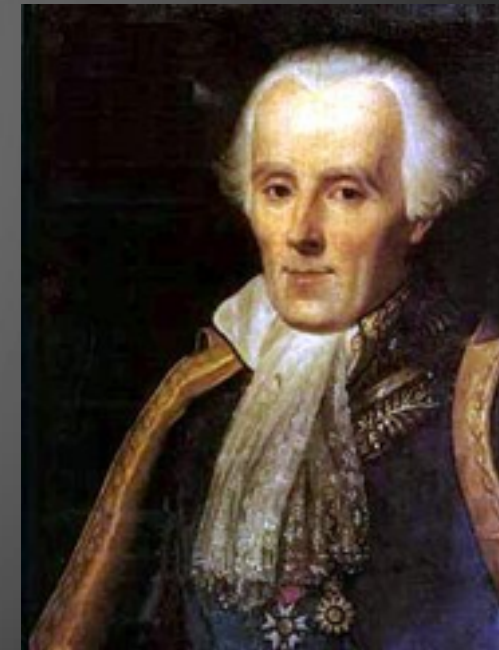


G.W. Leibniz (1646-1716)

Pure Mathematical God: Deism

Deism is a faith in a pure **mathematical God**:

- World functions according to impersonal Reason: World is created as a perfect Machine.
- Since the Design is perfect, God **does not intervene** after creation.
- Man has a divine gift of reason, so he is able to discover theories.
- Scientific cognition is one of the loftiest endeavors of humanity.
- While deistic seeds could be already found in **Aristotle (384-322BC)** and **Averroes (1126–1198)**, it really starts to spread from XVIIIc.: **Spinoza (1632-1677)**, **Leibniz (1646-1716)**, **d'Alembert (1717–1783)**, **Laplace (1749-1827)**.



P. S. Laplace, 1749-1827



P. S. Laplace, 1749-1827

- Some leading philosophers of Enlightenment (XVIII sec) assumed the Spinoza's worldview, or the totality of the inanimate impersonal scientific Logos.

“Laplace’s demon”:

We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which at a certain moment would know all forces that set nature in motion, and all positions of all items of which nature is composed, if this intellect were also vast enough to submit these data to analysis, it would embrace in a single formula the movements of the greatest bodies of the universe and those of the tiniest atom; for such an intellect nothing would be uncertain and the future just like the past would be present before its eyes.

Deism: Discussion

Consequences:

- After the act of Creation, there are no true miracles.
- Prayers have only a psychological sense for unenlightened people.
- Communication between God and a human is impossible.

Problems:

- If God does not intervene, how could Man receive his divine gift long after Creation?
- What is a reason to believe that God has finished His creative work?
- Why would God refrain from hearing and responding to humans?
- If Man cannot communicate with God, why should he care about the Grand Design?

*End of Part 4:
to be continued...*