

STUDY MATERIALS: The Science Before Science

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Lesson 1: Science Without Wisdom

Required Reading

Chapters 1-3 in "The Science Before Science"

Written Assignment

What is infra-scientific knowledge?

What is proper knowledge?

Describe what evidence *you personally* have that the *earth moves* around the sun and then catalog what is open to doubt about your belief that the earth is round, relative to your sharp proper knowledge of things like the paper in front of you right now.

Give one further example of a "commonly known" scientific fact that is not, in fact known at all in the proper sense of the word, but unrecognized (blind) faith based on authority to some large degree for most.

Give an experiment/reasoning that you could do to help bring the given instance of improper knowledge closer to or into the realm of proper knowledge. Note the experiment does not have to be one you personally could do, but must be possible in principle.

How can I be both 1028 atoms and one thing?

Which comes first, in the sense of requiring no trust or use of probable reasoning, our knowledge of ourselves or that of the atom? Explain.

Give another paradox that seems to imply the radical untrustability of the senses. Unwind the paradox and explain why the senses in the end arbitrate its truth.

Comment on the statement "I believe that it is possible to understand" or said another way, "I believe that I may understand." In particular, why is it so important to inculcate this understanding despite the fact that we know that we know.

I read the following autobiographical account by a woman on the Web. In the days before color television, she saw the Fechner's Disk displayed on captain Kangaroo. She was only a child at the time, and she rushed to tell her mother. Her mother would not believe her no matter how she pleaded the truth of her story. Effectively no one believed her because, they told her, it is impossible that she could have seen *color* on the *black and white* TV's. As a result of this childhood experience, she became a subjectivist believing all is one's opinion. What went wrong with her thinking and those around her? Catalog the mistakes in thinking involved here.

One of M.C. Escher's paintings shows stairs that at one moment appear to start from level A and descend to what appears to be a lower level B and, the next moment the stairs appear to start from the same level A and *climb* to a *higher* level B. Does this prove something can be simultaneously higher and lower than something else? Explain.

Define form and matter. Give examples of standard English uses of the words *form* and *matter* and words derived from them. Identify where the usages correspond with and where they diverge from the technical usage of philosophy.

Define potentiality, act and material change.

State the principle of contradiction, also known as the principle of identity.

Locate a physics book or encyclopedia that discusses the constituents of electrons and nuclei; what are those constituents if any? You will find that nuclei are composed of protons and neutrons, which are in turn composed of quarks, it would seem that they, like the electron, are (empirically) points. Is a nucleus mostly nothing? Why or why not?

Give an example of sensorial knowledge.

What is the imagination? What are phantasms?

Why should we be careful of leaning on the imagination too much in philosophy?

What is the difference between material and immaterial "change"? Note that change in this latter sense is an extended meaning of a word often reserved for material change only.

Lesson 2: What is Truth?

Required Reading

Chapter 4 in "The Science Before Science"

Written assignment

What is fundamentally wrong with Descartes famous statement "I think therefore I am."? What is right about it? How does it connect with Godel's Theorem?

What does using Godel's theorem to say we cannot know truth tell us about our current psychological state?

In what sense does everything we know come from the senses?

Why does knowledge always have an element of immateriality to it? Hint: why can't my knowledge of a ball be similar to a ball touching another ball, making contact rather than having to be *united* with the thing immaterially?

Which of the nine categories of accidents has no analogy in immaterial realm; that is, which must be absent from immaterial being? Of these just listed, which is the basis for the other material accidents?

How do I get my ideas of things?

What is an idea?

Ideas are general whereas phantasms are what?

Is a mathematical circle the same as the *idea* of a circle? If not what's the distinction?

What does spiritual mean?

Explain the concept of essence: how does it relate to existence?

How are essence and potentiality in the general sense related?

Why is our ability to conceive a pure mathematical triangle proof of the immateriality of the human intellect?

How are the arms and legs of a man related to his substantial form?

What is truth?

In what sense are all things true? Isn't it possible to tell lies?

List the transcendentals and explain what they are.

Why cannot a unified theory of physics, a so-called theory of everything, ever be shown to be necessarily true?

Explain why the material world is the most connatural to man's intellect, yet not easy for him to understand in two other ways related to the nature of abstraction and the level of being of material things.

When we try to understand something, what are we trying to get at about it? Is not cataloging the properties of a thing (defined simply as something separate from other things) sufficient for understanding?

Give one further example of a being of reason. Give one example of a real being.

Why do we say ultimately God is Truth?

In these first lessons, why have we not used the specialized sciences, such as modern physics or biology in our discussions? Are we implicitly saying they are invalid?

Lesson 3: On Animals, Men and Robots

Required Reading

Chapter 5 in "The Science Before Science"

Written Assignment

What is the essence of an animal?

Explain how an animal could start a fire? Doesn't this take an intellect?

Is it possible for a mere animal (without intellectual capacities) to understand what justice is? Explain why or why not?

Why does something with sensorial powers probably need locomotive abilities?

What is the essence of a man?

How is it that physical, vegetative, sensorial as well as intellectual activity can all exist in one creature, man?

Explain why knowledge *always* precedes love; or more generally explain why the actions of the cognitive powers precede the action of the appetitive powers.

What is wrong with the following logic? The laws of nature are now known to great precision and range of validity. These laws are generally formulated as differential equations. These laws have been tested within the range of things that apply to man. Thus, ultimately these laws govern man and his behavior. More particularly, the mind (intellect) and body of man is ultimately reducible to a set of differential equations to be solved.

Why is it, in principle, possible to make a plant, but not, in the proper sense, a man?

What is an organism?

Why is man's immaterial substantial form, of itself, indestructible?

What is the principle of causality? The principle of sufficient reason, given at the end of Chapter 4, is the principle of causality viewed from the standpoint of intelligibility. Explain.

Explain why a computer's ability to beat a man at chess is not relevant to whether or not a computer is intelligent in the full sense of the word.

How does a purely immaterial creature get its ideas?

In some areas of the chapter we made use of conclusions from the specialized sciences for the first time. Catalog the conclusions that we used from the specialized sciences in this chapter.

Lesson 4: Galileo vs. St. Thomas

Required Reading

Chapter 6 in "The Science Before Science"

Written Assignment

What proof can be given using common experience, not historical analysis, that modern science is *not* opposed to philosophy?

Is a circle a real being or a being of reason? Explain.

What is being?

Define philosophy and science in both the wide sense and their narrow (modern) senses. What is the danger of seldom speaking of the unity of the sciences? In particular, why is having a vocabulary that designates that unity important?

List the three degrees of abstraction and what they mean. Draw the diagram of Maritain that uses spheres to show the various levels.

Make a table listing the pure sciences of physica, mathematica and metaphysica. For each of these, list two areas of study. List two applied sciences and two methodological sciences.

How is the concept of square root of minus one reductively real?

Define physica, how is it that so much of modern science has excluded large parts of physica, except somewhat unconsciously.

What is quantity? What is quality? What is a major difference between them?

Give an example of a minimally empiriometric portion of physica, like the deducing that the earth is round from a lunar eclipse.

Give an example of a maximally empiriometric theory, where the deductions from the observations involve intertwined concepts that lead only to conclusions about real beings in an indirect and probable way.

What does the statement "the empiriological method is a tool of physica" mean?

Why does the empiriometric method work so well in modern physics?

Since one can conclude from direct conversion of empiriometric theory approached from quantum and classical sides that light is a respectively both localized and not localized, one must conclude what? Is light both localized and not localized at the same time and the same way?

What is the largest danger of mistaking the empiriological for the ontological?

How does one determine if a being is a one of reason or real?

Kant's regulative ideas fit well with empiriological science, but not with the final goal of science, which is to understand the real things as they are. Explain.

Can we judge things merely by the clarity of our ideas?

Why is mathematica at its base connatural to the human mind? What dangers does judging the world by mathematical standards alone present? List the dangers and give examples.

Given that most assign a preeminent role to Galileo in the establishment of modern science and that modern science was born live nowhere else in the world but within the Catholic generated culture of Europe. How is it that so many buy the simplistic argument that modern science was born against a tide of anti-science characteristic of Catholicism? Further, why have so few noted the fact that Galileo was a Catholic, even one who tried to be a devout Catholic, and learned directly from other Catholics and breathed the intellectual air of the Catholic culture?

Did Aristotle know about the mixed sciences, particularly about the empiriometric?

Newton, did not invent the empiriometric method. What then was Newton's great and unique contribution?

Did Galileo have predecessors?

We said Aristotle was right up to a point and then went wrong. In what way was he wrong? Does this undermine the things that we said in previous chapters? Why or why not?

List and explain three essential cultural beliefs that are needed to sustain a culture in which science thrives. What is the fourth?

What quote from the Bible was popular in the middle ages?

Lesson 5: Problems in Modern Science

Required Reading

Chapter 7 in "The Science Before Science"

Written Assignment

Is inertia as presented in the Middle Ages a purely empiriometric concept? Why or why not?

Does inertia need a cause? Does inertia disprove the principle of causality? Can details from the specialized sciences disprove the principle of causality?

How do cultural beliefs affect the physics that is proposed by even a genius like Aristotle?

Give two cultural influences that Aristotle had to deal with that St. Thomas did not?

Explain how these might have impeded the development of inertia in classical Greece and in general spurred a priori thinking and/or give rise to doubts about the physical unity of the universe.

Define place and locomotion. In what sense is locomotion relative and in what sense is it not?

In what sense does special relativity take more account of the real, i.e. make less use of beings of reason, than Newtonian physics?

Is it really true that if I go to another planet and come back that more time would have gone by on earth than for me?

Is backward time travel truly possible?

Is real "pure" space Euclidean or not? How do we know? Note: we are not here talking about physical space or space as mathematicians think of it. Physical space is defined by the interaction of various things and decided by experiment. Mathematical space is considered to exist if it is not self-contradictory in its construction; as far as the

mathematician is concerned, it doesn't have to be a real being, it can be a being of reason.

Explain why one should take seriously the predictions of empiriometric theories and hence why we go to lengths to explain Thorne's paradox.

Why does the big bang theory not prove creation had a beginning in time? Does inflation theory, which recent maps of the cosmic background radiation have lent support to, significantly modify one's answer?

Does quantum mechanics disprove causality? Discuss whether it is possible for a theory such as quantum mechanics to disprove causality? Does it prove things don't exist until you observe them? Compare these conclusions to the conclusion against causality from Newtonian physics; why are they the same mistake at different levels?

Can one have an infinite number of actually existing things?

Is it possible for God to delegate the creation of the substantial form of man to a secondary cause? For example, could an angel make a man?

How will empirioschematic theories handle causes that do not fit in the schema chosen?

Does natural selection, as an empirioschematic device, automatically exclude the action of God? Why or why not? Explain why then it is so necessary to consciously move from the schema to the real, keeping in mind what the method includes and what it leaves behind?

Is there such thing as absolute chance? Explain.

Why is the distinction between 1) a real being considered as it is itself and 2) that same being considered for its sign value (referencing something outside of itself) so important in understanding the empiriological sciences?

Explain generally why the ontological implications of an empiriological theory **cannot** really undermine the foundational principles of physics discussed in the first chapters. In so doing explain what the major purpose of this chapter is.

Lesson 6: God

Required Reading

Chapter 8 in "The Science Before Science"

Written Assignment

What are Carl Sagan's main objections to the existence of God?

The first proof for God's existence starts with what undeniable truth? Why cannot an infinite chain of causes account for the effects we see?

The second proof starts from causality and proceeds to what?

The third proof is also analyzing efficient causality, but this time from necessity and contingency, what does it conclude to?

What mistake do modern physicists often make with respect to theories of everything such as String Theory? If what they say about them is true, that is they are necessary (cannot not be), what does this (absurdly) mean they must be?

What is the answer to Hawking's question? That is: What breathes fire into the equations?

The fourth proof leads one to see that all things have their being in the Supreme Being; it brings in formal causality and thus puts what part of Plato's thinking in its proper context?

Explain the transcendental "good."

How does the fifth proof manifest God's Providence?

From the five proofs what do we learn about God?

Who caused God?

Are angels Pure Act? Why or why not?

Can angels, of themselves, be destroyed?

What does "He who is" mean?

Can one think of God as not existing? Explain.

Explain why the mind cannot rest with changeable being that it confronts directly through the use of sensorial knowledge.

What evidence do the five proofs give that God is an interested God?

What are the two types of evil?

Explain how corrupt angels can be responsible for deadly genetic illnesses, if DNA errors are known to be the cause? Consider for example, the evolutionary process.

Lesson 7: Mathematical Morality

Required Reading

Chapter 9 in "The Science Before Science"

Written Assignment

What is moral philosophy? This science provides the first principles for which of the three sciences: the pure, the applied or the methodological?

What is the catch phrase of moral relativism? Why is it contradictory and what is one left with after parsing it?

Why is there no such thing as half a principle?

Give an example of a situation where a moral relativist would preach differently than he would act.

Why is it necessary to have a realist epistemology to advance an objective standard of morality?

Why cannot a purely mathematical morality work?

An objective morality can use the empiriometric tool, polls and the like, to probe the moral realm. What are the limitations of such a method? Can we expect anywhere near the success in the moral domain as we saw in the physical domain? Indeed, could it lead us astray in ways not possible in physics? Why or why not?

The foundation of morality is in which of Aristotle's four causes?

Give a statement of the principle of finality.

Give a physical example of the ordination of potentiality to act.

What is evil?

What is the first principle of morality? Why is it self-evident?

Define conscience. Is it a separate power of man?

What determines what is good for a man?

What is man's ultimate good? Give St. Augustine's articulation of this principle.

How is it that we say all things are good in so far as they are, yet we still say certain things are bad? For example, if one decides contraception is morally wrong, in what sense could the birth control pill be good?

What are the two categories of human needs? List needs in both categories, arrange the categories and items in order of importance.

In isolation from other factors, is getting a stamp out of a machine for the purpose of mailing a birthday card or the like a moral or an immoral act? Explain.

Why is it evil to tell a lie? Give examples of lies of various degrees of severity.

Define virtue and vice.

Is it best to leave one's emotions out of intellectual life? Why or why not? If so what other areas of life should emotions be left out of? Which man is more virtuous: the one who suppresses all emotion or the one whose emotions are at the service of right reason?

Explain what it means to use things, including ones passions, ordinally rather than inordinately?

Is anger always inordinate?

Why is the Cosmic Fixer (the man who does evil that good may come of it) bound to fail in the end?

Can a true atheist ever be happy? Why or why not?

Why did Feynman's solution of letting people come to the same practical conclusions independent of how they came to those conclusions work to some large degree in 1963?

In what sense is our current culture like the frog in the gradually heated water: give an example.

Explain why operating on a human embryo for any other reason than improving the embryo's life is wrong.

When we *live* the truth, why do we respond with greater facility and correctness in our moral decisions? Give an example from sports where a similar form of connatural knowledge plays a role.

Lesson 8: How Then Should We Do Science?

Required Reading

Chapter 10 in "The Science Before Science"

Written Assignment

Summarize succinctly, chapter by chapter, using a series of bullets for each, what you learned in each chapter; lump chapters one and two together.

How can modern science be undermined if the science before science is not consciously applied at certain points?

What about philosophy (narrow sense) is "before" science?

How is it that Mano Singham could say that modern science is not truth directed? What part of science is he likely talking about?

What happened to Nietzsche when he tried the "there is no truth" experiment?

What is wrong with Guth's statement that the universe burst forth from nothing?

Was Newton's aim in the Principia to give physical causes?

What does virtually present mean?

Are atoms real? How can they be real, and yet I be one at the same time?

If people have seen atoms, like the Barium atom described in "The Science Before Science," why do we still say that atoms are not proper knowledge in the sharp sense, but only so highly likely as to be a practical certainty? We do not know it with the certainty that we know a table in front at arms reach in front of us.

Are atoms really composed of nothing between the electrons and the nucleus? Explain.

If atoms were completely inert, that is completely non-interacting, explain why one could not even stack them? If atoms just allowed stacking, explain why one could not hope to have even a simple salt crystal?

What should be done differently in the empiriometric science? If nothing why so? What is a relatively big change that should happen in the use of the empiriometric?

How is proper understanding of science connected with our happiness?