Science before Science Study Group

Week Twelve

St. Thomas Aquinas,
Pray for us.

St. Albert the Great,
Pray for us.

Prayer before Study

Almighty God, You who are the creator of all things and our loving Father, send us Your Holy Spirit to illuminate our minds so that we can understand how You have revealed Yourself to us through the world around us.

Grant to us
keenness of mind
capacity to remember,
skill in learning,
subtlety to interpret,
and eloquence in speech.

May You guide the beginning of our work, direct its progress, and bring it to completion.

We ask this through Thy Son, Jesus Christ, Our Lord.

Amen

Chapter 6: Summary

- Galileo versus St. Thomas – problem of our cultural milieu
- Three levels of abstraction – *physica, mathematica, metaphysica*
  - How Descartes, Einstein and Aristotle views the world
- The division of the sciences
  - Pure, Applied and Methodological Sciences
- Modern physics in part of *physica* – a tool !
  - A mixed science – formally mathematical and materially physical
  - Understand changeable being as quantitative – empiriological
- Empiriological versus Ontological
  - Ontological ascend to the intelligible (the essence)
  - Empiriological descend to the observable

Chapter 6: Summary (continued)

- Nature of physics
  - Water waves and light waves
  - Light is both extended and a particle!
  - Water waves – metaphor for light – we have same mathematics representing two totally different phenomena
  - Approximate character of measurements
  - Ontological explanations of empiriometric results can change quickly and drastically
  - Work of trying to establish the ontological ground of the empiriometric is little done
- Kant’s Attempt to Ground Modern Physics: Kant’s Gödel's Theorem
  - Take the empiriometric as the whole of *physica*
  - Basically proved Gödel's theorem 150 years before Gödel
  - Empiriometric physics cannot prove its own foundations
  - Easy to take the empiriometric construct to have everything – forget what was left behind
  - Metaphor of people who are experts at chess – explaining all things in term of chess
  - Mathematics is abstracted from the real that empiriometric science is so powerful

Chapter 6: Summary (continued)

- Mathematics
  - St. Thomas – is connatural to man – easy mode for man's nature – resolved in the imagination – more comfortable at lower levels of thinking
  - The less a thing the closer to the first property – quantity – the more it can be described by mathematics
  - The four causes in mathematics – formal, material, efficient and final
    - Lack of final causality in mathematics means there is no good in mathematics
  - Motion in mathematics? Time is treated as if all moments existed at one time.
    - Modern physics – return of Parmenides error
  - Three pitfalls: serial thinking, algorithmic thinking and beings of reasons
- Chemistry and Biology
  - As these subjects become more complex systems – empiriometric becomes less and less effective
  - More properly ruled by the empirioschematic
- Return to Stephen Hawking's comments

Chapter 6: Summary (continued)

- Returning to Galileo
  - Is modern science radically different from what came before it
    - Yes and no.
    - Yes – Newton's first empiriometric theory – whole area brought into it
      - Not a sudden thing but a culmination of much work done in the Middle Ages
    - No -

Chapter 6: Galileo versus St. Thomas

- Claim: Aristotle and St. Thomas' thinking had to be overturned to enable science to progress
  - Its demise was brought on by Galileo and Newton
- Stephen Hawking Quote
  - Galileo was responsible
  - Conflict with the Catholic Church
  - Could understand world by observing it
- Dilemma for us
  - Incontrovertible truths of philosophy
  - Do we need to abandon to do modern science?
- We need to look more deeply at what is philosophy and modern science
- Much of the confusion – due to improper knowledge – comes from our cultural milieu

Chapter 6: Galileo versus St. Thomas (continued)

- Short answer: No. Our philosophizing shows no opposition between the two and in fact calls for it.
- Many do not know what philosophy is and also what the modern sciences are!
- Let see how our knowledge fits together
- Our purpose is
  - To know reality
  - To conform with reality
  - To find and hold onto truths
  - Do work and care to avoid falling into error

Hawking's Statement

1. Modern science is radically different from what came before
2. Galileo was largely responsible for its birth
3. Catholicism is intrinsically opposed to modern science
4. Galileo was first to argue that man could hope to understand the world
5. Galileo was first to argue that we could understand the world by observing it

We will address all of these in this chapter.

Three Levels of Abstraction

- We think by abstracting from sensorial images
- Three Levels
  - Physica
  - Mathematica
  - Metaphysical
- ***Physica*** *(wide sense)*
  - Abstract the general from the particular
    - Leaves behind particular matter
  - The study of changeable being

Three Levels of Abstraction - Mathematica

- ***Mathematica***
  - Leaves behind all sensible aspects of a thing except quantity
    - Not all qualitative aspects – i.e. shape
  - Quantity is primary – I can conceive of quantity without the other properties
    - Never forget that we only know quantity through quality
  - Quantity is extension; that which has parts outside of each other
  - Quantity is the basis of quality
  - Quantity is something that if I add two pieces of a quantity together I get a quantity twice as big (unlike quality)
  - I can't take a number of mediocre mathematicians and put them together and get a great mathematician like Gauss or Euler. Put the heat contain in many ice cubes together to boil water. Or put two reds together and get something that is twice as red.
  - Qualities do not have parts outside of each other and so they cannot be assembled out of lesser pieces of the same type the way quantity can
  - Qualities can be more or less whatever they are. They can be more red, more hot, more hard etc. But with 2 you can't have more 2.

Three Levels of Abstraction - Metaphysics

- ***Metaphysica***
  - Leaves behind all material aspects
    - Considers being as being
    - Process of separation – separates what can exist without matter and what cannot
      - Immaterial things – exist without matter – like angels and God
      - Material things – exist in matter or without – human soul, quality, potency, substance, causes, unity and all the transcendentals

Three Levels of Abstraction

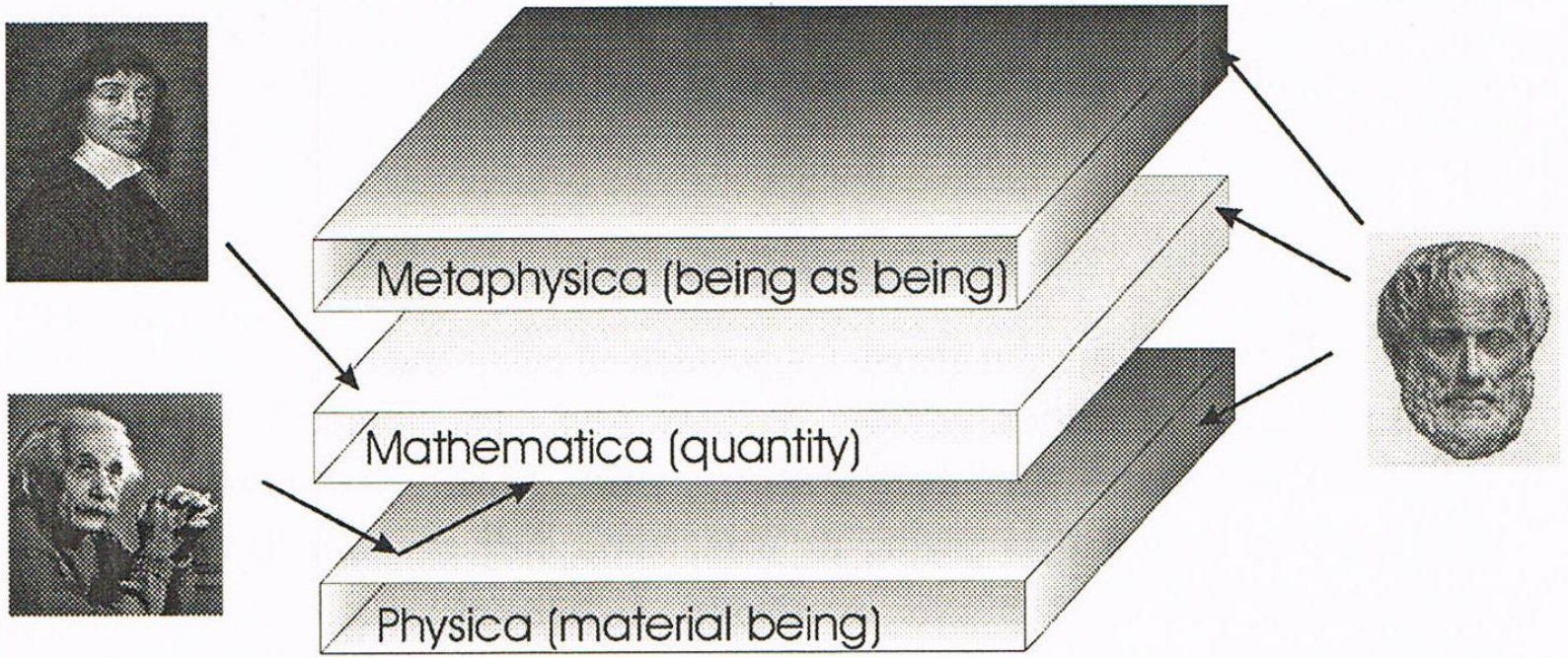

Figure 6-1: The three levels of "abstraction" are shown. The three planes represent the three fields of intelligibility within the world of mental (intentional) existence. Descartes is shown looking at *mathematica*, Einstein at *physica* as reflected in *mathematica,* and Aristotle at all three.

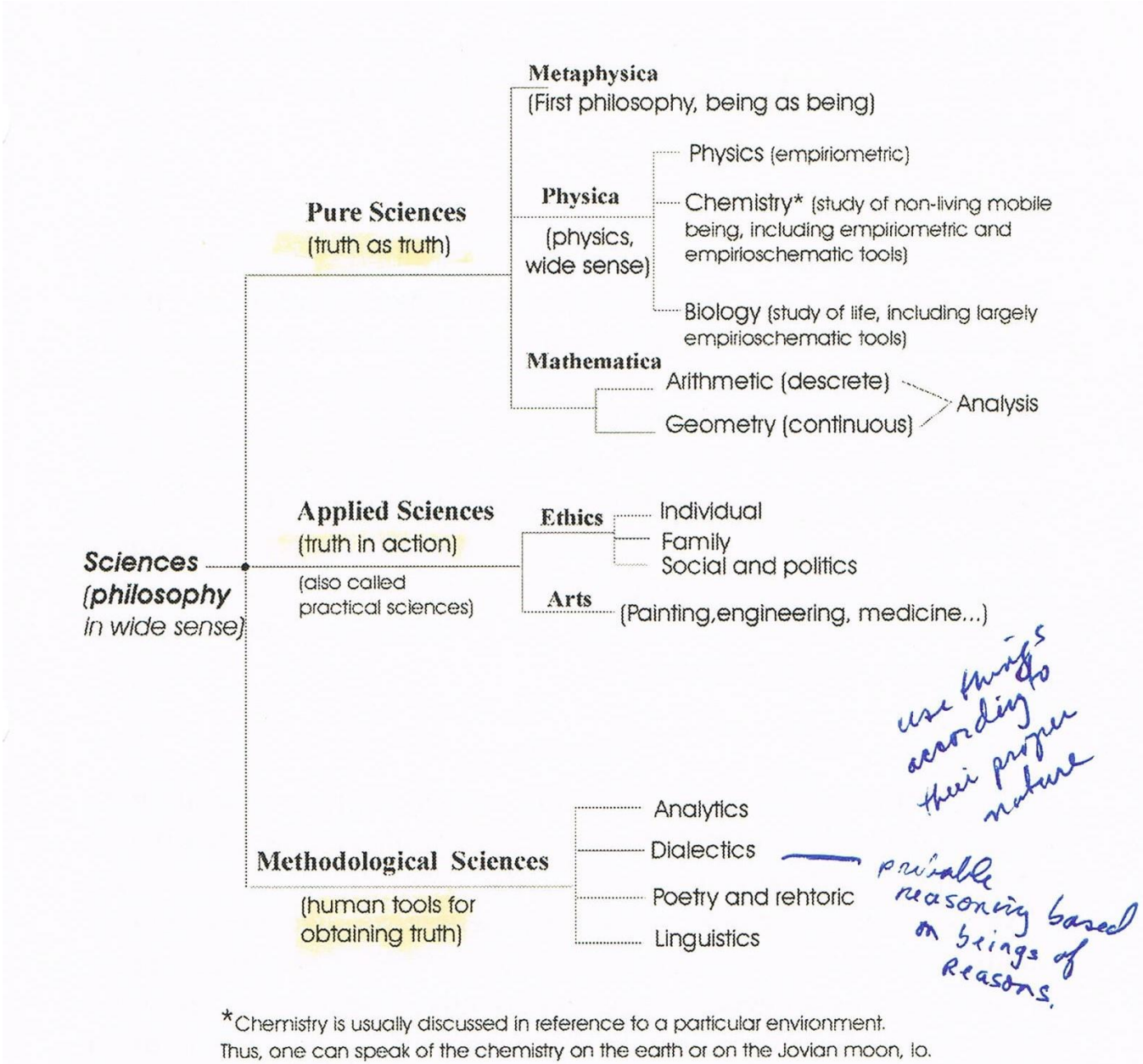

Figure 6-2: The division of the sciences is shown. The diagram proceeds from top to bottom beginning from arenas of most importance (in terms of containing the general principles in some way for the ones below it), except for the last categories in each branch which are not in any particular order. Note: this order is not necessarily the order in which our knowledge *proceeds*. For example, ***we*** must start with *physica* (i.e., what comes through our senses) to get to *metaphysica*.

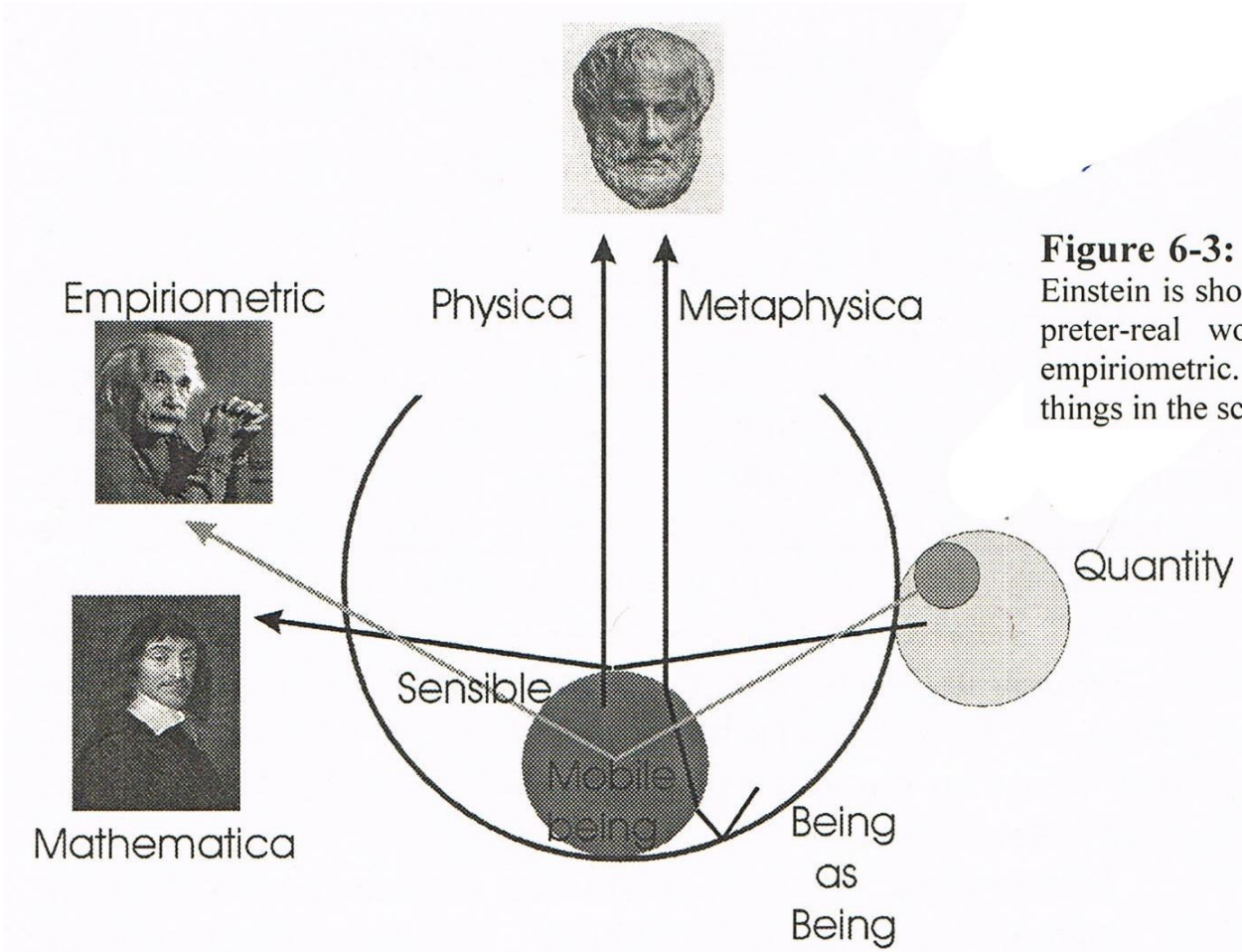

Figure 6-3: Aristotle is shown studying *physica* and through it *metaphysica*. Einstein is shown looking at the material world as reflected into a subset of the preter-real world of quantity; this is the mixed science that we call empiriometric. Descartes is shown looking only at the quantitative aspects of things in the science of *mathematica*.

Returning to Hawking's Statement

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Returning to Stephen Hawking's Statement

- Is modern science radically different from what came before it
  - Yes and no.
  - Yes – Newton's first full empiriometric theory – whole area brought into it
    - Not a sudden thing but a culmination of much work done in the Middle Ages
  - No – Because St. Thomas and Aristotle knew and used all areas including the empiriological

Returning to Stephen Hawking's Statement

- Why then did they get the reputation for not knowing modern sciences (i.e. empiriometric physics)
  1. Many of the promoters of modern sciences did not understand the nature of the modern sciences and treated them as pure ***physica*** (confusing the real with the schemas) and with disdain those who remembered real changeable being.
  2. Aristotle was interested in philosophy and biology and made errors in mechanics; St. Thomas was a theologian and softened some of Aristotle but didn't correct mechanical.
     - Both men's accomplishments were tremendous; can't fault for not leaning everything!
  3. Thomism became rote and non-living – due to Black Plague
  4. Deep-seated prejudice in the modern mindset – Anti-Catholicism
     - Catholicism is the single greatest force in the development of our western culture (a matter of improper knowledge – who can you trust?)
     - If Catholic church was wrong about science – we need to know it!

Returning to Stephen Hawking's Statement

- Hawking says that the CC intrinsically opposed to science
  - If false, we have ground for our charge of prejudice and rejection by the Enlightenment's rejection of all things medieval including St. Thomas
- Science develop in the heart of the Catholic culture
  - Not in Japan, China, Greece or anywhere else?
  - Was there a poisoned garden?
  - These teaching essential for the growth of science
    - The world exists independent of us and is orderly
    - We can understand it
    - We should have no aversion to observing and working with nature (i.e. do experiements)
- Pierre Duhem – set out to discover the roots of science
  - To his surprise found that science's roots are in the Middle Ages – he wrote ten-volume series documenting the fact
- Galileo deserves credit for the birth of modern science that was realize with Newton's theory but
  - They stood on the shoulders of giants!
- They cannot be opposed because the physica of Aristotle and St. Thomas is the foundation supporting the structure of modern science
- Next Chapter –discuss several problems that arise because of misinterpreting the empiriological for the directly ontological.

Some questions to review Chapter 5

- Give the essence of an animal?
  - An animal is an organism with sensorial powers. It is a substance with physical, vegetative and sense powers.
- Can a mere animal understand what justice is?
  - No
  - Because justice requires general understanding. So justice is not accessible to the physical realm or pure sense knowledge. Also justice is about the immaterial world, so it’s doubly removed from the material world. It’s about giving the other what he is due, and that involves the will, which is immaterial.

More questions on Chapter 5

- Define man.
  - Man is a rational animal having physical, vegetative, sensorial and intellectual powers.
- Why is it possible in principle to make a plant but not in a proper sense a man?
  - Because a plant is purely material, whereas the core of the substantial form of a man is immaterial. One can make things that have parts outside of each other, which is not the case for immaterial things.
- Why is man's substantial form indestructible?
  - Man's substantial form has no parts outside of itself so there is not a way to take it apart. Thus it cannot be destroyed.