

STUDY MATERIALS: The Philosophy of Nature

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Lesson 1: Fundamental Concepts

"*Modeling*" = *The Modeling of Nature* (Catholic Univ. Press, 1996), Page Nos.

"*Elements*" = *The Elements of Philosophy* (Alba House, 1977), Sec. Nos.

Readings

Modeling -- pp. 118-126 on knowledge, sensation, perception; pp. 131-139 on concepts; pp. 170-173 on sciences; pp. 300-308 on the demonstrative regress

Elements -- sec. 2 on logic; sec. 8 on predicables; sec. 9 on categories; sec. 12 on demonstration; sec. 13 on science; sec. 37 on epistemology; sec. 38 on knowledge.

Questions

1. How would you define knowledge? sense knowledge? intellectual knowledge?
2. What is the difference between a percept and a concept?
3. What is the difference between a real concept and a logical concept?
4. How does natural philosophy differ from mathematics? from metaphysics?
5. How do the concerns of the natural philosopher differ from those of the modern scientist?
6. Identify the two types of demonstration that are involved in the demonstrative regress.

Lesson 1 Figures:

| <i>Lecture Title</i> | <i>Aristotle's Physics</i> |
|--------------------------------------|--------------------------------------|
| 1. Fundamental Concepts | Book I |
| 2. Nature: The Inner Dimension | Book II |
| 3. Nature's Powers and Natural Kinds | Book II, plus <i>De anima</i> , etc. |
| 4. Nature's Property: Motion | Book III |
| 5. Nature's Measures: Place and Time | Books IV through VI |
| 6. Nature's First Unmoved Mover | Books VII and VIII |

Fig. 1.1 The Lectures as Related to Aristotle's *Physics*

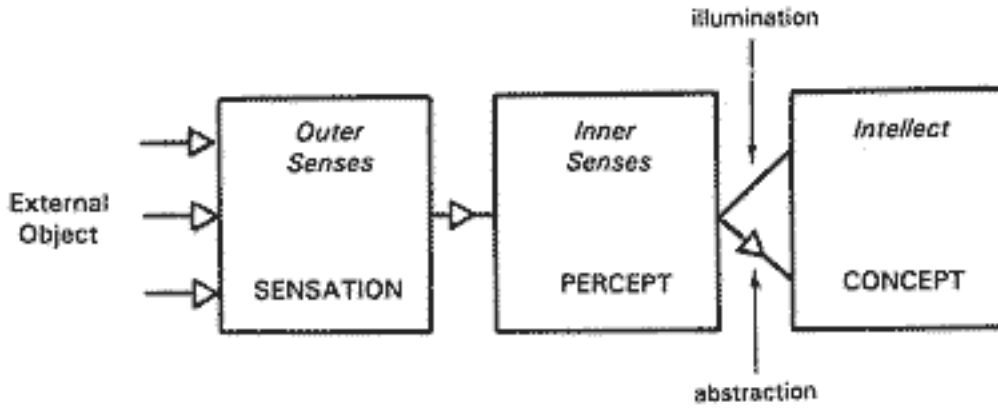


Fig. 1.2 The Process of Concept Formation

| OUTSIDE MIND | INSIDE MIND | |
|---|--|--|
| Percepts | Concepts | Abstraction |
| <p>this red apple</p> <p>this lead ball</p> | <p>PHYSICAL</p> <p>apple fruit red</p> <p>lead metal heavy</p> | <p>from individual matter to sensible matter</p> |
| <p>three apples</p> <p>this ball</p> | <p>MATHEMATICAL</p> <p>three</p> <p>sphere</p> | <p>from sensible matter to intelligible matter</p> |
| | <p>METAPHYSICAL</p> <p>being existent</p> | <p>from all matter to being as such</p> |

Fig. 1.3 A Basic Typology of Concepts

| OUTSIDE MIND | INSIDE MIND | |
|----------------------|------------------------|---|
| Percepts | Real Concepts | Logical Concepts |
| | PHYSICAL | GRAMMATICAL |
| this red apple | apple fruit red | <i>subject</i> <i>predicate</i> |
| this lead ball | lead metal heavy | PREDICABLES <i>genus</i> <i>species</i> |
| | MATHEMATICAL | CATEGORIES |
| three apples | three | <i>substance</i> <i>quantity</i> <i>quality</i> |
| this ball | sphere | |
| | METAPHYSICAL | |
| | being | |
| | existent | |

Fig. 1.4 A Fuller Typology of Concepts

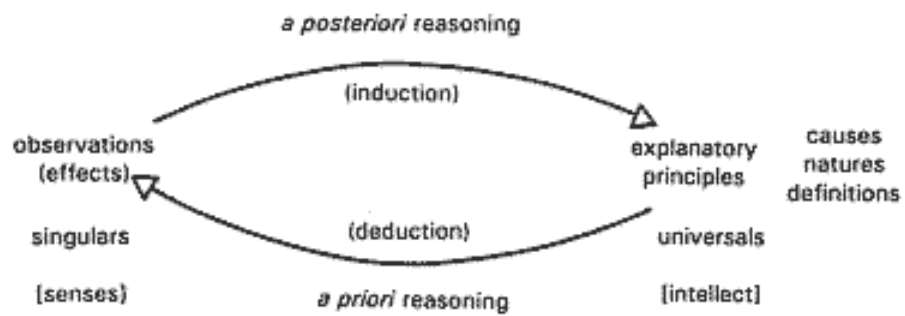


Fig. 1.5 Methodology in the Science of Nature

Lesson 2: Nature - The Inner Dimension

Readings

Modeling -- pp. 3-7 on causality; pp. 7-18 on the four causes in nature; pp. 22-31 on the inner dimension, the individual natural body

Elements -- sec. 15 on philosophy of nature; sec. 16 on matter and form; sec. 17 on nature; sec. 34 on substance and accidents; sec. 35 on causality and its kinds.

Questions

1. How would you define natural form? protomatter?
2. Which is more intelligible, natural form or protomatter? Explain.
3. Identify three different meanings of end or final cause.
4. Explain why a thing's nature can be called its "inner dimension."
5. Enumerate the basic constituents of an individual natural body.
6. Give three examples each of substances and accidents that are found in the order of nature.

Lesson 2 Figures:

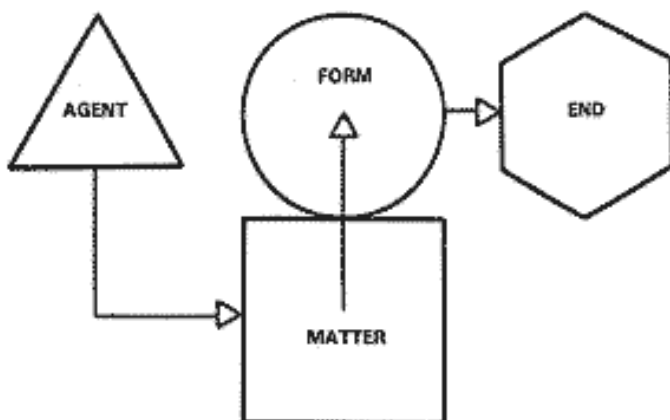
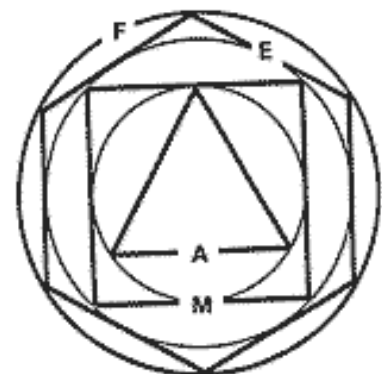


Fig. 2.1 The Causal Model



F: Form or Formal Cause
 M: Matter or Material Cause
 A: Agent or Efficient Cause
 E: End or Final Cause

Fig. 2.2 The Inner Dimension

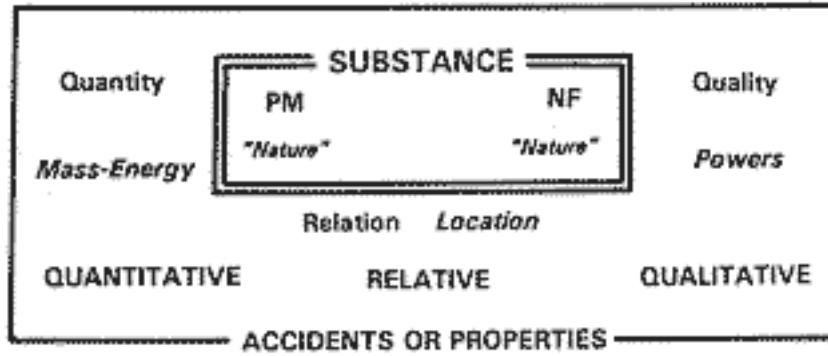


Fig. 2.3 The Individual Natural Body

Lesson 3: Nature's Powers and Natural Kinds

Readings

Modeling -- pp. 31-34 on modeling various natures; pp. 134-135 on human cognitive powers; pp. 180-185 on human powers in operation; pp. 38-45 on the elements; pp. 45-73 on modeling inorganic natures.

Elements -- sec. 24 on sensation and perception; sec. 25 on intellection; secs. 26-27 on appetite and sensitive appetites; sec. 28 on volition; sec. 29 on man; sec. 22 on life and soul.

Questions

1. Identify the basic powers found in human nature. How may they be represented in a stimulus-response model?
2. How are protomatter and natural form represented in the powers model of an inorganic nature?
3. Compare the Aristotelian model of an inorganic nature with that of the modern physicist.
4. How can the Bohr model of the atom cast light on the function of the natural form in inorganic processes?
5. Contrast the modern chemist's explanation of chemical combination with that of the natural philosopher.

- Contrast the modern physicist's explanation of radioactivity with that of the natural philosopher.

Lesson 3 Figures:

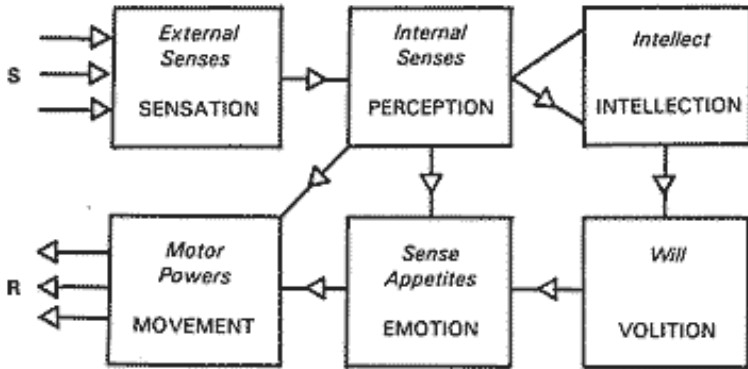


Fig. 3.1 Human Cognitive and Appetitive Powers

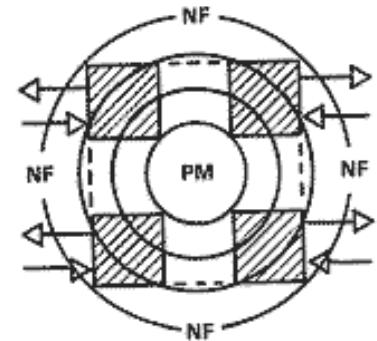


Fig. 3.2 A Powers Model of a Nature

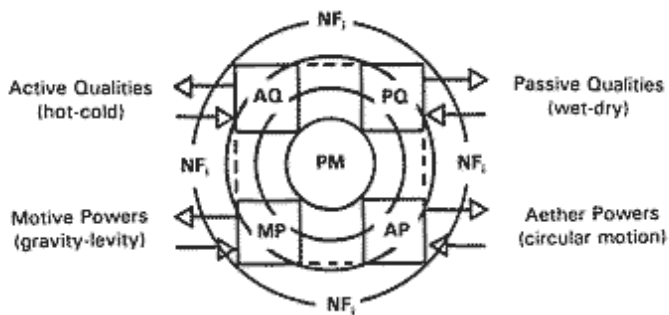


Fig. 3.3 Aristotle's Powers Model of an Inorganic Nature

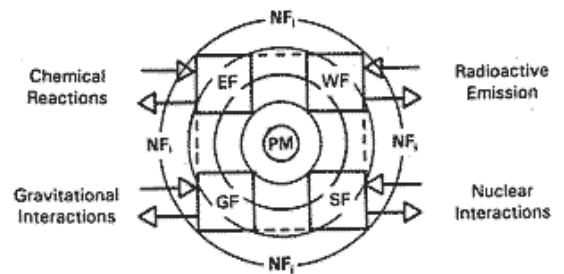


Fig. 3.4 An Improved Powers Model of an Inorganic Nature

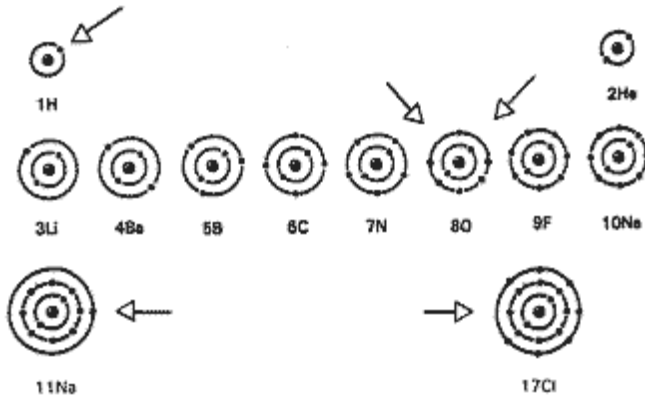


Fig.3.5 Iconic Models of Elements in the Periodic Table

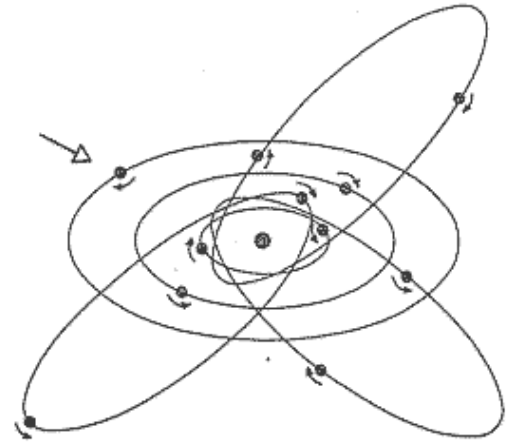


Fig. 3.6 The Bohr-Sommerfeld Model of the Sodium Atom

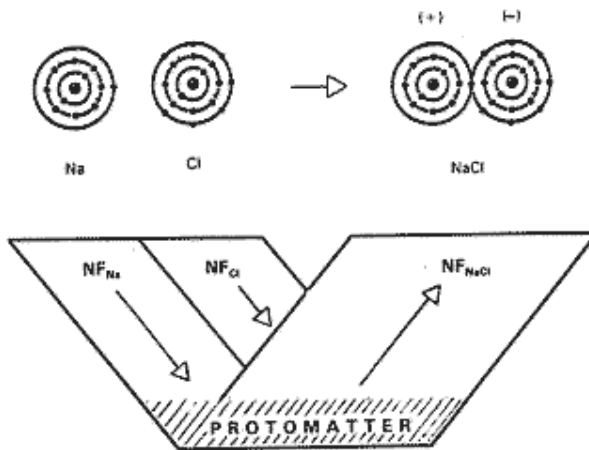


Fig.3.7 The Generation of a Compound: Sodium Chloride

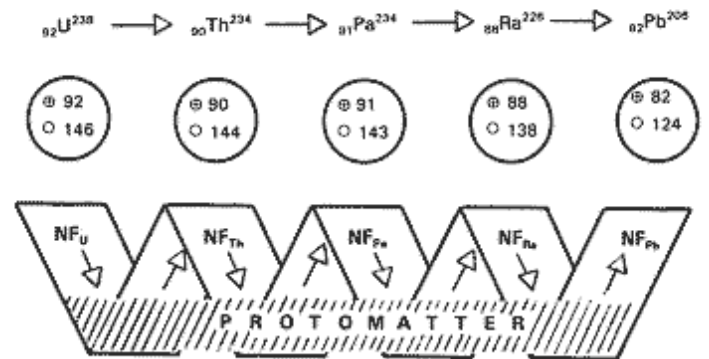


Fig. 3.8 Natural Radioactivity: From Uranium to Lead

Lesson 4: Nature's Property - Motion or Change

Readings

Modeling -- pp. 76-97 on plant natures and their activities; pp. 97-113 on animal natures and their activities.

Elements -- sec. 18 on motion; sec. 66 on philosophy of science; sec. 67 on methodological concepts; sec. 68 on physical sciences.

Questions

1. How are the activities of plants and animals different from those of inorganic natures?
2. What different meanings are assigned to the terms "motion" or "change" in natural philosophy?
3. What is Aristotle's first definition of motion?
4. Apply the elements of this definition to the heating of water.
5. How is Aristotle's first definition of motion related to his second definition of motion?
6. How does Aristotle define action and reception, and how are both related to motion?

Lesson 4 Figures:

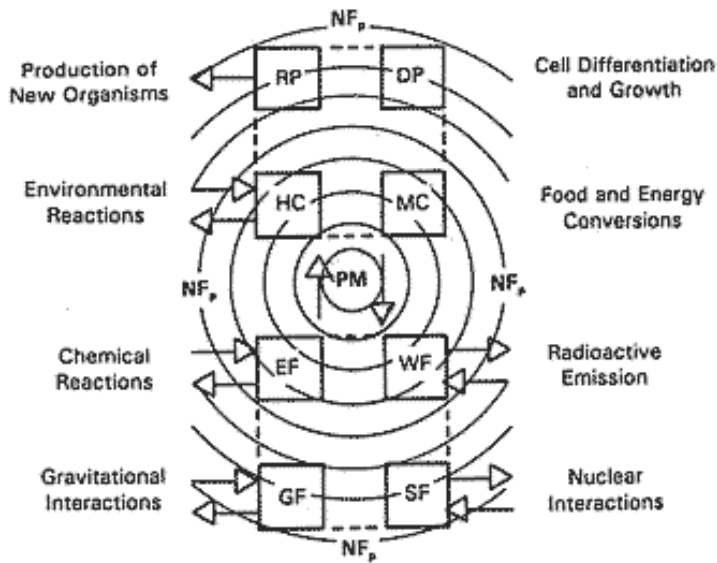


Fig. 4.1 A Powers Model of a Plant Nature

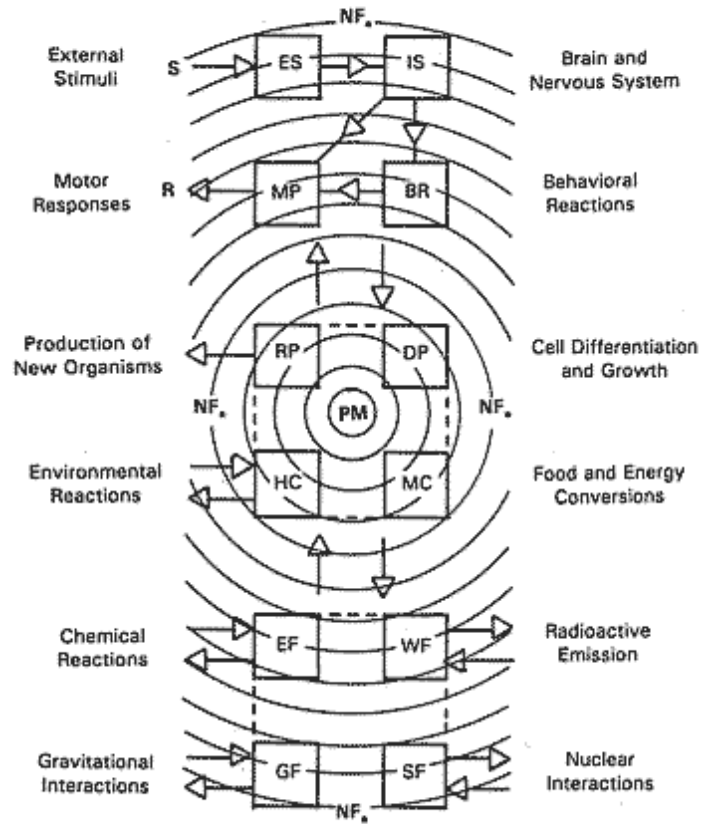


Fig. 4.2 A Powers Model of an Animal Nature

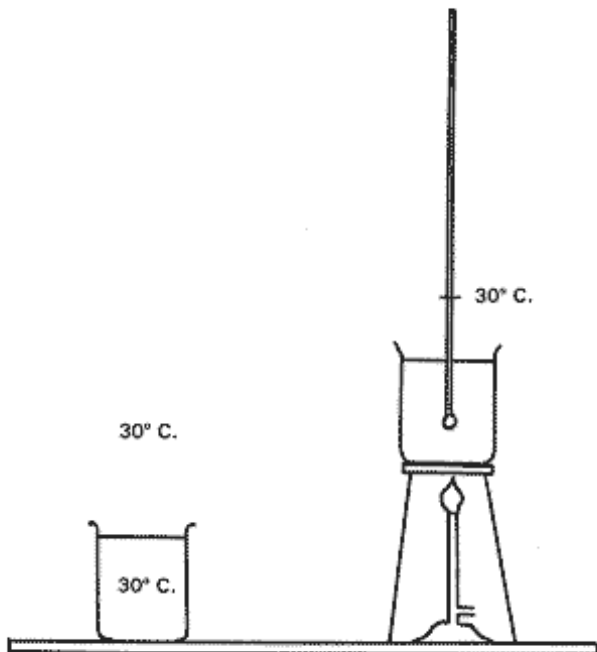


Fig. 4.3 The Heating of Water

The actualizing of what is in potency insofar as it is in potency is the actualizing of the moveable (changeable) insofar as it is moveable (changeable).

But, motion is the actualizing of what is in potency insofar as it is in potency.

Therefore, motion is the actualizing of the moveable (changeable) insofar as it is moveable (changeable).

Fig. 4.4 The Proper Subject of Motion

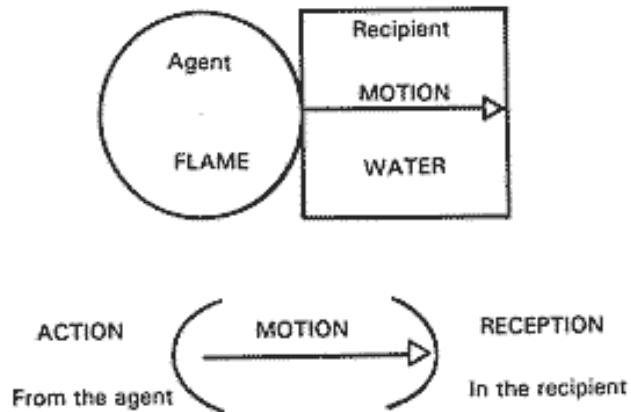


Fig. 4.5 Motion, Action, and Reception

Lesson 5: Nature's Measures - Place and Time

Readings

Modeling -- p. 29 and 62 on quantity as individuating; pp. 29, 136, and 240 on continuous quantity; pp. 239-244 on measurement and metrical concepts.

Elements -- sec. 19 on place and time; sec. 63 on the philosophy of mathematics; sec. 64 on number and the continuum.

Questions

1. What is Aristotle's definition of place?
2. In this definition, to what does the expression "primary motionless" refer, in Aristotle's world and in our present universe?

3. What is the concept of space? Is there such a thing as empty space?
4. Explain Aristotle's definition of time and its relationship to motion.
5. Why are time and motion referred to as "flowing continuums"?
6. How can time and motion be said to exist?

Lesson 5 Figures:

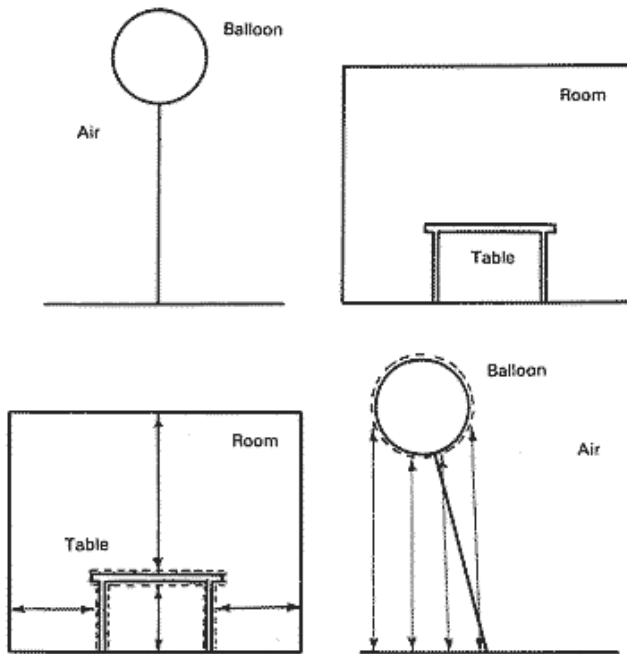


Fig. 5.1 The Definition of Place

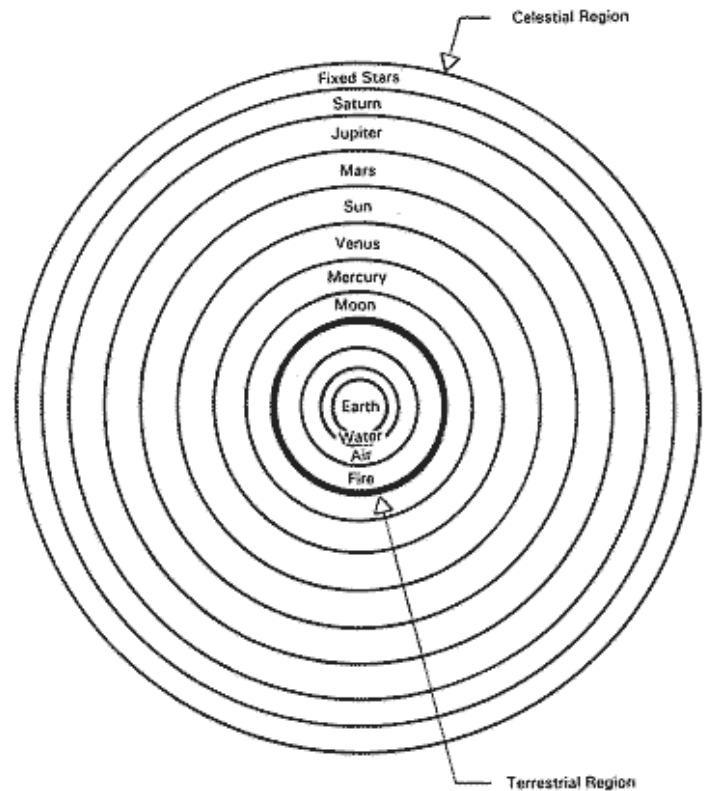


Fig. 5.2 The Concentric Spheres of Aristotle's Universe

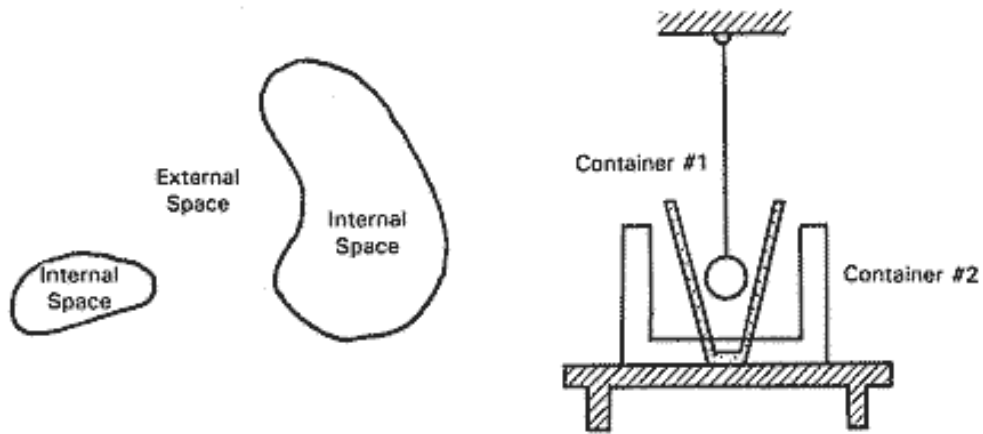


Fig. 5.3 Types of Space

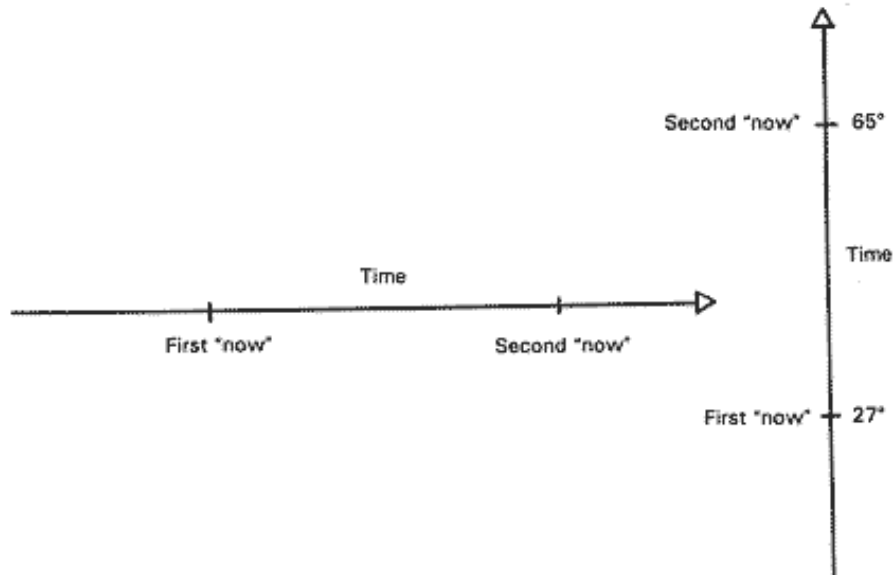


Fig. 5.4 The Nature of Time

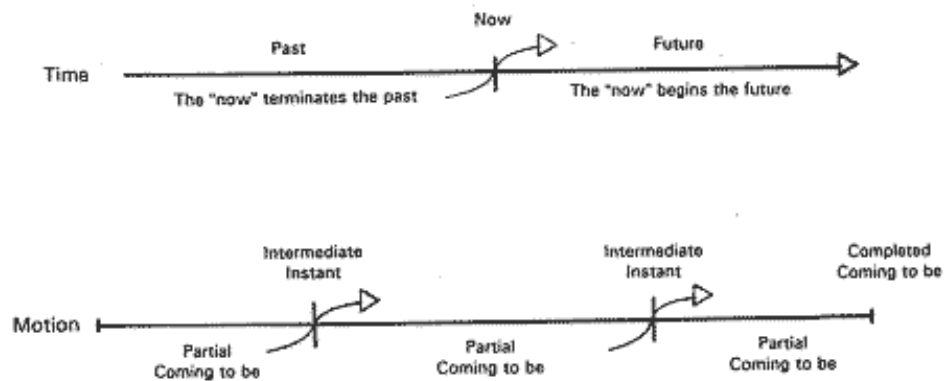


Fig.5.5 The Existence of Time and Motion

Lesson 6: Nature's First Unmoved Mover

Readings

Modeling -- pp. 359-363, 406-409 on Newton on the nature and cause of gravity.

Elements -- sec. 20 on the First Unmoved Mover; sec. 41 on natural theology; sec. 43 on proofs of God's existence; sec. 47 on divine causality.

Questions

1. What is the basic structure of Aquinas's proofs of God's existence?
2. Outline the elements of Aquinas's "first proof," the *prima via*.
3. What is the motor causality principle?
4. In his commentary on the *Physics*, Aquinas offers a demonstration of this principle. Is it based on efficient or material causality? Explain your answer.

5. Give three examples of how the principle can be verified when applied to movers in local motion.
6. What is Aquinas's objection from nature to his proofs of God's existence, and what is his final resolution of the difficulty?

Lesson 6 Figures:

FOUR STEPS

1. An observational datum exists
2. This datum is an effect
3. This effect demands a proper cause
4. Therefore, the proper cause exists

EXEMPLIFIED IN FIVE WAYS

- a. as movement
- b. as causal efficacy
- c. as contingency
- d. as degrees of perfection
- e. as an order observable in the universe

AND TERMINATING AT

- 1st A First Unmoved Mover
- 2nd A First Uncaused Cause
- 3rd A Necessary Being
- 4th A Most Perfect Being, and
- 5th A Supreme Intelligence or Ordering Principle

Fig. 6.1 Proofs for God's Existence

It is an evident fact that some things in the universe are in movement. But whatever is in movement is dependent on something extrinsic to itself, for nothing that moves can be the complete and adequate explanation of its own motion, and so it must be moved by another. But if the mover that moves the thing in motion is itself moved, then it is necessary that it be moved by another, and it in turn by another, and so on. In such a chain of moved movers actually moving, however, regress to infinity is impossible. For if the chain extend to infinity, then there would not be any first mover actually moving, and since none of the intermediate movers move except insofar as they are moved by the first mover, none of the other movers would move either. Therefore it is necessary to come to some first mover that is moved by no other. This is the First Unmoved Mover, whom everyone understands to be God.

Fig. 6.2 Aquinas's *Prima Via* or First Way

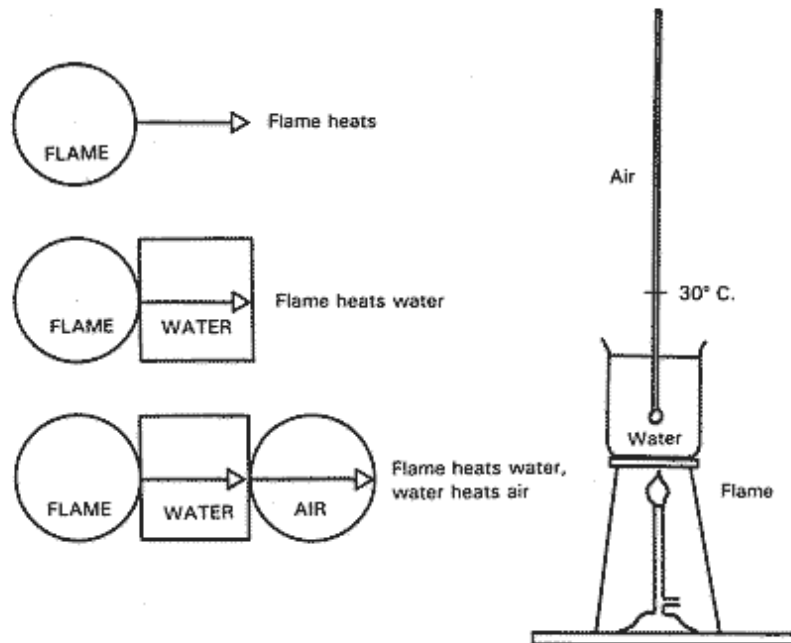
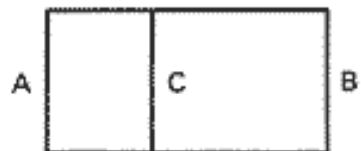


Fig. 6.3 A Subordinated Chain of Movers and Moveds

It seems obvious that everything in motion is necessarily moved by some thing. Yet there are cases where the source of the motion seems to be within the object moved, and thus the possibility arises that the object moves itself. If it can be shown, however, that the object stops because some other thing stops, this will count as evidence that the object is not moved primarily and essentially by itself, but is being moved by another thing. So, let the object moved be a body AB, and since as a body it is divisible, let it be divided at C.

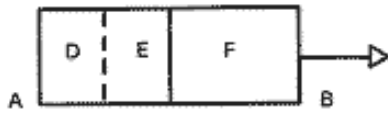


Now assume that the part CB stops, and then the whole AB must stop also. If AB does not stop, then assume that it is in motion. In this case, if part CB continues at rest it is possible that part AB be in motion. Should this be so, however, AB could not be in motion primarily and essentially, although it might be moved through a part or only accidentally. Since what is of concern here, however, is an object that is in motion primarily and essentially, in this respect it must be held that the whole AB stops when something else stops, namely, its part CB. Therefore it is being moved by another.

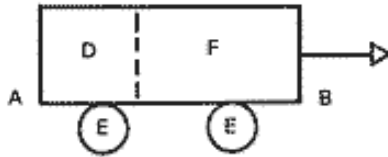
Fig. 6.4 Aristotle's Proof of the Motor Causality Principle

MOUSE

(a) Live

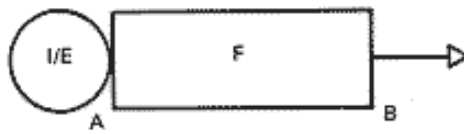


(b) Mechanical

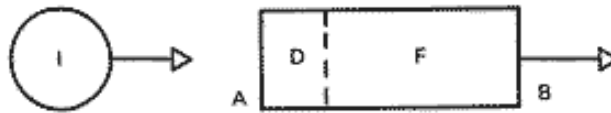


WOOD

(c) Pushed



(d) Thrown



(e) Dropped

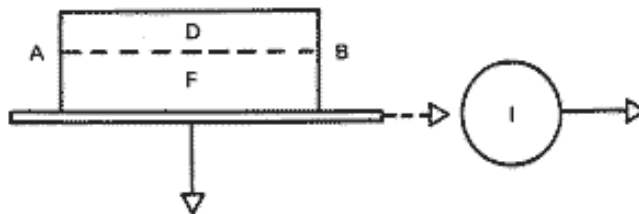


Fig. 6.5 Three Cases of Local Motion

Consider that God moves things to operation not only by applying their forms and powers to work in the way a craftsman applies the axe to cutting, without giving the axe its form; he also gives these forms to created agents and conserves them in being. Thus he is not only the cause of action by way of giving the form that is the principle from which the action proceeds, the way in which the generator is said to be the cause of the movements of heavy and light bodies. He is also the cause as one who conserves these various forms and powers in being, just as the sun is the cause of colors' appearing in that it gives and maintains the light by which they are seen.

It further follows that God acts interiorly in all things, because the form of anything is within it, and the more so the more basic and universal the form is. For all things God is properly the universal cause of *esse* or being, and *esse* is innermost in all things. This is the reason why in Holy Scripture the operations of nature are attributed to God as to one operating within nature itself.

Fig. 6.6 God's Operation in Nature