

Motion and Empiriological Physics (part 1)

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O Creator ineffable, who of the riches of Thy wisdom didst appoint three hierarchies of Angels and didst set them in wondrous order over the highest heavens, and who didst apportion the elements of the world most wisely: do Thou, who art in truth the fountain of light and wisdom, deign to shed upon the darkness of my understanding the rays of Thine infinite brightness, and remove far from me the twofold darkness in which I was born, namely, sin and ignorance. Do Thou, who givest speech to the tongues of little children, instruct my tongue and pour into my lips the grace of Thy benediction. Give me keenness of apprehension, capacity for remembering, method and ease in learning, insight in interpretation, and copious eloquence in speech. Instruct my beginning, direct my progress, and set Thy seal upon the finished work, Thou, who art true God and true Man, who livest and reignest world without end. Amen.

(St. Thomas Aquinas *Oratio ante studium*)

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Empiriological Physics is Marked by Experiment

- Logical empiricism: “whatever cannot be known by the method of empiriological physics is not knowable.”
- Positivism = “empirical [experimental] test” “last tribunal of truth”
- ¿Is empiriological physics a science in the traditional sense of *scientia* (science):
 - “certain knowledge through causes”
 - “certain, evident knowledge obtained by reasoning only from indisputable principles.”

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Empiriological Physics is Marked by Experiment

- Does experiment or the application of mathematics distinguish empiriological from philosophical physics?
- Croce & Vico agree “that man can truly know only what he makes,” as in experiments he makes.
- Kant’s *Critique of Pure Reason*: “They [great experimenters] learned that reason has insight only into that which it produces after a plan of its own, ... constraining nature to give answer to questions of reason’s own determining.”

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Empiriological Physics is Marked by Experiment

- “Galileo’s method of control”:
 - Bodies inert (Law of Inertia)
 - Bodies *are* to the forces exteriorly acting on it.
- This is encapsulated in Newtons 3 Laws:
 - “Every body continues in a state of rest or of uniform motion in a straight line, except in so far as it is compelled by forces to change that state.”
 - “Change of motion is proportional to the force and takes place in the direction of the straight line in which the force acts.”
 - “To every action there is always an equal and contrary reaction; or, the mutual actions of any two bodies are always equal and oppositely directed along the same straight line.”

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Empiriological Physics is Marked by Experiment

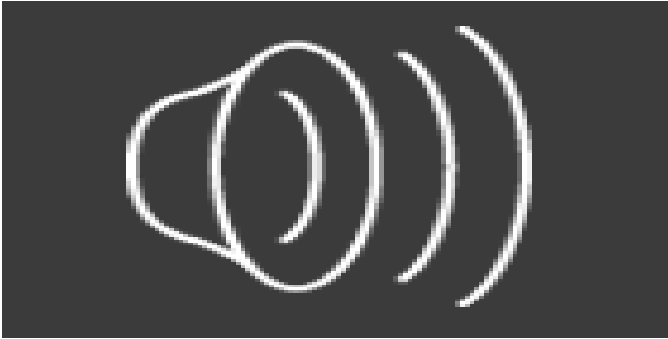
- “Einstein asked: ‘What is observable, i.e., experimental?’”
 - Relativity theory (which Einstein preferred to call the “theory of invariances”) purified “experiment from the non-experimental which Newtonians projected into it.”
- Heisenberg: experimenter always interferes with experiment
 - Heisenberg’s idea the basis of quantum mechanics

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Empiriological Physics is Marked by Experiment



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Empiriological Physics is Marked by Experiment

- Philosophical physics: “[T]he order is to know first and to control in the light of what one knows.”
- Empiriological physics: control first, know later
- Control is not knowledge.
- The empiriological physicist must not forget about his prior cenoscopic knowledge
 - Cenoscopic (as opposed to ideoscopic) knowledge is that obtained from philosophical physics.
 - There is a “science before science.”

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Empiriological Physics is Not Strict Science

- Modern philosophy has tried to answer the question: “What is modern science?”
 - It took centuries for philosophers to identify what philosophy is, so it’s not surprising that after at least 3 centuries, modern science “is still awaiting a satisfactory diagnosis of itself.”
- Something is known scientifically if we know its *What?* and *Why?*
- Two types of knowledge:
 - Speculative (knowledge for its own sake)
 - Practical (applied knowledge)

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Empiriological Physics is Not Strict Science

- Philosophy is a science, but is empiriological physics?
- Measurement \Rightarrow experimental law \Rightarrow theory (“hypothetical background”)
 - Duhem: a physical theory is an “economizer of thought” or “classification of laws”
 - Theories should predict new phenomena.
 - Any experiment can test a theory; \therefore , theories are not the final word.
 - Theories have a transient character.

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Empiriological Physics is Not Strict Science

- V. E. Smith: “A theory is timely rather than timeless, provisional rather than certain, dynamic rather than settled, questionable rather than apodictic.”
- Knowledge: “becoming another while remaining yourself” (V. E. Smith says: “being become”)
 - Naturalism’s definitions of knowledge:
 - Dewey: “having”
 - Alexander: “enjoyment”
 - Whitehead: “feeling”
- Knowledge in empiriological physics comes from philosophy, which “has a right to interpret empiriological data.”

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Pure Empiriological Physics Tends to Subjectivity

- Northrop: method is only constant throughout intellectual history.
- The study of method began with Descartes’s famous discourse.
- Kant’s “pure reason” a “method without content”
- Method is an *ens rationis* (being of the mind).
- Aristotle: “It is absurd to seek at the same time knowledge and the way of attaining knowledge [method]!” (*Met.* 995a13)

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Pure Empiriological Physics Tends to Subjectivity

- Thus, an emphasis on method leads to a study of the subjective, logical, formal, and non-real.
- If “real” = “entities empiriological physics studies,” and ∴ empiriological method is one of control, then what is real must have pure passivity or receptivity to control. This is prime matter, which is not ontologically real; ∴, empiriological physics does not study the ontologically real.

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Pure Empiriological Physics Tends to Subjectivity

- Law of Inertia implies a passive universe
 - “The only way of formulating this principle,” Kant agrees, “is to admit that every material change has an extrinsic cause.”
 - Thus, no intrinsic causes implies only prime matter remains.
- Law of Inertia = empiriological preference for control
- Dewey: “evidence is always extrinsic”
 - Kant: We can’t know a thing-in-itself (*Ding an sich*)

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Pure Empiriological Physics Tends to Subjectivity

- Leibniz:
 - If *causa æquat effectum* (“cause equals effect”) or *effectus integer causam plenam vel ejus gemellum reproducere potest* (“The whole effect can reproduce the full cause or its exact equal”),
 - then effect = pure passivity.
- Newton equated causes and effects.
 - He said “*Hypotheses non fingo.*” (“I do not fake hypotheses.”) when he wanted to avoid “occult (unknown) causes.”
 - One of his “rules for philosophizing” (*Scholium* of his *Principia*): “We are to admit no more causes of natural things than such as are both true and sufficient to explain the appearances.”
- Thus, “nothing could ever be an effect.”
- Empiriological physics “is more method than matter.”

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Pure Empiriological Physics Leads to Nihilism

- Nihilism = “*Philos.* The belief or theory that the world has no real existence; the rejection of all notions of reality.” (*OED*)
- Empiriological physics tends toward unity. E.g.:
 - Maxwell’s theory unifies electric and magnetic theory.
 - Quantum mechanics unifies radiation theory and mechanics.
 - Einstein’s theory unifies electromagnetic and gravitational theories.

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Pure Empiriological Physics Leads to Nihilism

- Fate of empiriological physics one meaningless equation?
- Descartes wanted physics: “to render us masters and possessors of nature.” (*Oeuvres*)
- Bacon, who said Knowledge is Power, “wanted a science of works rather than of thoughts.”
- We cannot control everything; we cannot “make or break,” e.g., act or being.

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Empiriological Method Implies Undefined Terms

- Kurt Gödel: “empiriological method must contain a certain number of undefined terms,” “the undecidables.”
- Grelling: The empiriological method is *heterological* (*OED*: “not having the property it denotes,” like the word “silent” when spoken)
 - Thus it cannot verify itself with itself.
- V. E. Smith: “A yardstick [in empiriological physics] is known to be a yard long ultimately because it is seen to be so, not because it is measured by something outside itself.”
- Science must begin with what is self-evident, not with what is “undecidable” or “indeterminate.”

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References

- V. E. Smith's *Philosophical Physics*
 - Please read first half of ch. 5 (Motion and Empirical Physics).
 - We will send out a scanned PDF of this required reading.