Remote Learning Module for 24 April 2020

Lecture Notes for Fernando Espinoza's *The Nature of Science*, Chapter 8

— René Descartes —

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Last time we examined the work of Galileo and Hobbes in their efforts to advance modern science and mathematics by way of replacing the longstanding methods and metaphysics of Aristotle with mechanical accounts of the workings of both natural and social worlds. The axis of both their projects was centered on the idea of causality: where Aristotle and his successors had explained the behavior of both natural and political bodies by way of *intrinsic* causes, Galileo and Hobbes offered new explanations exclusively in terms of *extrinsic* causes; in short, they replaced teleological accounts with mechanical ones. Today we turn our attention to the figure of René Descartes, who has often been called the Father of Modern Philosophy.

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(1) When Descartes was born into an aristocratic family on the 31st of March in 1596, Galileo was 32 years old and Hobbes, an 8 year old boy. The young Descartes was educated by Jesuits at a newly founded school in Anjou, a rich farming area in central France. It was there that he learned of Galileo's discoveries of the moons of Jupiter, which stimulated a lifelong interest in astronomy and physics. His father, Joachim, held a number of administrative posts in the French provincial government, so it was natural for him to expect his son to follow in his footsteps. And indeed, upon reaching his twentieth birthday, Descartes took a law degree, with intentions of commencing a career in the legal profession.

(2) But two years later, in 1618, the Thirty Years War broke out in Europe, whereupon Descartes left France to take military training in Holland, first in the service of Prince Maurice of Nassau, and later under Duke Maximillian of Bavaria. Early on he met the celebrated mathematician, Isaac Beekman, from whom Descartes acquired the knowledge and skills in quantitative reasoning that would shape his future career. As a gentleman soldier during the Thirty Years War, Descartes' most likely contributions would have been as military engineer, occupied with the new techniques of siege warfare: the building of defensive bulwarks and the offensive use of cannon fire to demolish them. His military service did not last long, however, and in 1622 he returned to France where he met another prominent mathematician, Marin Mersenne, with whom he would form a lasting intellectual friendship.

(3) Mersenne's influence on Descartes was considerable. In 1623 Mersenne published a work on scientific method in this *Questiones Celeberrimal*, wherein he advocated new rules for conducting the business of natural science:

(a) Reject all previous authority;
(b) Base all results exclusively on observation and experiment; and
(c) Ground all understanding of natural phenomena in mathematics.

These rules came to ignite the mind of Descartes so thoroughly that they would guide his subsequent inquiries in both astronomy and biology, as well as his philosophical preoccupation with the relation between evidence and truth, over the remainder of his life. During his time with Mersenne, Descartes developed the cardinal insight that would lead him to the invention of the Cartesian coordinate system—a method for representing geometrical figures in algebraic formulas. Although the story of this discovery is probably apocryphal, it is delightful to imagine, as the tale supposes, that whilst sitting in Mersenne's monastic cell outside the city of Paris, Descartes wondered how he might anticipate the path of fly buzzing about the room so as to launch a pellet from a slingshot, and thereby dropping the fly to the ground; and thus he imagined attaching a set of cross-hairs to his slingshot, on which points might be plotted, and the line of the fly's path determined by an algebraic equation.

(3) Politics in France at this time were anything but peaceful, with a struggle between the forces of Cardinal Richelieu (advisor to the young Louis XIII) and Louis' mother, Marie de Medici, the Queen Regent, dominating the entire country. Bordering on civil war, this struggle would later serve as the backdrop for Alexander Dumas' tale of the *Three Musketeers*. As it happened, Descartes found himself on at odds with Richelieu's contingent, and once Louis took the throne, Descartes left France, again for Holland, where he would remain until the death of the Cardinal.

(4) In Holland, however, Descartes was able to live comfortably and in relative seclusion from the throes of war. He completed a work on astrophysics, *Le Monde* (or, The World) in 1633, in which he advocated the Copernican model of the Solar System. But upon learning of Galileo's condemnation by the Holy Office of the Inquisition in June of 1632, Descartes abandoned publication of this book, turning his attention instead to the study of geometrical optics. Over the course of the next four years his investigations would lead him to a series of discoveries that would establish his fame on the European intellectual scene on a par with Galileo.

(5) By adapting Mersenne's rules for conducting the business of natural science to his own purposes, Descartes produced his first published work, in French, the *Discours de la Methode* which served as the preface to three treatises: the *Dioptrique* (Optics), in which he formulated the laws of reflection and refraction using his new analytic geometry; the *Météors* (Meteorolgy), in which he presented the first published correct theory of the rainbow, and his new *Geometrie*. Still convinced that Galileo's fate before the Inquisition was not only a rank injustice, but a serious failing of the Roman Catholic Church to embrace the best science of the day, Descartes took it upon himself to reformulate the new scientific method he'd offered in the *Discours* as a basis for metaphysical thinking about the very nature of reality—a reformulation he hoped would bring the theologians of his day to follow Galileo's dictum: the scriptures tell us how to go to heaven, not how the heavens go. And so Descartes published, in 1640, his *Meditationes de prima philosophia* (Meditations on First Philosophy).

(6) His ambitions were not rewarded by the theologians, however, and the *Meditations* would spark widespread condemnation. In 1642, for example, the Academic Senate of the University of Utrect forbade the book to be taught, citing it as

(a) opposed to traditional philosophy by undermining its foundations (that is, the authority of scripture);
(b) leading the youth away from traditional philosophy and rendering it incomprehensible to them; and
(c) leading to false and absurd opinions (that is, contradicting orthodox theology).

As with Socrates and Galileo before him, Descartes was accused of impiety and corrupting the youth

(7) Undaunted, if disappointed, however, Descartes went on to produce a textbook, the *Principles of Philosophy* he hoped might one day supplant the standard texts of Scholastic philosophy, and in 1649, after a series of philosophical exchanges (by letter) with Princess Elizabeth of Bohemia, he presented his arguments on the relation between the human mind and the human body in *The Passions of the Soul.*

(8) In February of 1649, after reading his *Principles of* Philosophy, Queen Christina of Sweden invited Descartes to her Royal Court to instruct her. Although he was reluctant to go (writing to Mersenne that Sweden was a place of little more than "bears, rocks, and ice,"), he eventually arrived in October. At first, Descartes found himself "wasting time," composing a pastoral, a ballet, and a set of Statutes for an Academy of Science since the Queen was otherwise preoccupied with matters of state. You might note that the Swedish Academy is the body that nowadays awards Nobel Prizes. In any case, the young Queen eventually began her studies with Descartes—quite early in the morning (starting at 5:00 A.M. in fact), profoundly disturbing Descartes sleep habits. Combined with the cold and drafty castle walls where he stayed, his new teaching schedule brought on a pneumonia, from which Descartes died on the 11th of February of 1650.

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— The Meditations —

(1) In the work for which he is best known today, Descartes argued that in order to find new foundations whereby natural science might proceed to investigate the natural world without falling into the traps of either dogmatism or skepticism, we must begin, just as Mersenne had advocated, by rejecting all previous authority. For Descartes, this dictum implied a species of *radical doubt*—of doubting any claim of which one cannot be absolutely certain. His point was methodological: while we may have little reason to doubt the existence of material objects in practical affairs, or even in engineering, for metaphysics, we should begin with the realization that we have *unknowingly* made mistakes in the past, and so, unless we begin with absolute certainty, we can't be sure we are not making mistakes in the present; this, in a nutshell, is Descartes' Method of Doubt: subtract from the store of your beliefs everything you can possibly doubt.

(2) He begins with *sensory qualities*: perhaps colors, for example, are not real properties of things, but merely modifications or our sense organs; let us subtract them from the store of our beliefs. Next, consider *physical qualities*: perhaps weight is not a real property (as we now know, weight is a *relation* between gravitational masses), so let us subtract these from our store of beliefs as well. But surely there is an external world. Ah, says, Descartes, when we dream we believe ourselves to be moving around in real space, but in this we are deceived; so how do we know we are not dreaming now? This question has come to be known as the Dream Argument, and given the mere *possibility* that we might be living in an elaborate dream, we shall have to subtract the idea of our living in a real three-dimensional world from the store of our beliefs. But the truths of mathematics do not depend on the existence of an external world; even in dreams the sum of two and two must be four. Here, Descartes asks: But might there not be an *evil genie* (a powerful but malevolent being) whose malice consists in deceiving us even when we are carrying out mathematical operations? What if, in other words, God is a Deceiver? It is just here that Descartes formulates the first principle of his philosophy: even an evil genie could not deceive him into thinking he exists when he does not, for he would have to exist to be the object of the genie's deception. Descartes would have to entertain the thought that he is not thinking, which is absurd. And thus he pronounces his most famous assertion: *cogito ergo sum*, or "I think, therefore, I am."

(3) From this first principle, Descartes goes on to add back to the store of his beliefs any and all the conclusions he can show must follow *logically* from the certainty of his own existence as a thinking thing. Considering that all of our ideas must be caused by something, and that he has ideas that he could not have acquired from his sensory experience, he asks: What then can have caused me to have ideas like the idea of God or the idea of the infinity of the natural numbers. In the case of the idea of God, Descartes considers that putting scriptural traditions to one side, he still thinks of God as an infinite and perfect being. Being neither infinite nor perfect himself, Descartes reasons that God must be the actual cause of this very idea, and if so, being perfect, God would not be Deceiver. Thus, according to Descartes, we can avoid the threat of the evil genie, assured that our logical abilities, once informed by perfectly clear and distinct ideas, can avoid error in the sciences. From this vantage, Descartes goes on to demonstrate that the material world must indeed be three-dimensional (for otherwise, we should be *logically* deceived, and God is no Deceiver).

(4) Descartes concludes his *Meditations* with the view that has come to be called Cartesian Dualism: there are two kinds of things in the world: thinking things and extended things, in other words, minds and bodies. God is an infinite mind, you and I are finite minds, and our bodies, though substantially united with our minds (*not* like Plato's pilots on bodily ships), are just finite regions of space endowed with properties like solidity, mass, volume, and so on. This conclusion, however, leaves the manner in which immaterial minds interact with material bodies quite mysterious.

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Next time, we'll review the Darwinian Revolution we first encountered in our reflections on the nature of scientific reasoning before we abandoned our class room for these adventures in remote learning. Be well everyone; stay safe, stay strong, and stay put.