Philosophy's Movement Toward Cognitive Science

Early General Metaphysical Speculation: Philosophical Materialism and Tenuous Dualism

The development of the notion of "the mind" arguably traces back to the development of the Greek notion of the soul. Two features of the development of the soul figure prominently in this rather superficial history. First, the development of the Greek notion of the soul represents a slowly disentanglement of notion of living vs non-living, animate vs inanimate, and mental vs non-mental. Second, thinkers from Thales until Descartes allow themselves a considerable degree of ambiguity within their explanatory and theoretic frameworks as regards the nature of the soul and its relationship to/place in their respective overarching ontological and conceptual framework. Additionally, the development of the Greek notion of the soul also illustrates a common dilemma that theorists have faced throughout the historical development of theories of mind: (D1) Physicalist theories face the difficulty of formulating physical mechanisms plausibly explaining various mental functions. In contemporary times many researchers allege that, qualitative consciousness, viz., conscious experiences of red, represents such a mental function that seems to resist explanation by known physical mechanisms.(Chalmers, 1995) In contrast, (D2) Dualist oppositional theories face the difficulty of formulating accounts of how two fundamentally different types of objects could possibly interact in such a seemingly continuous and seamless fashion. Dualist theories generally face difficulties in explaining mental functioning in that, by their very nature, mental substances do not obvious have any mechanistic or causal elements.

Perhaps the earliest mention of a soul in Greek literature occurs in Homeric poems, which exert a strong influence on early Greek culture. Scholars commonly suppose that Homer lived and

wrote in the 8th or 9th century BCE, though speculation has placed his life as far back as the 12th century BCE. In the *Illiad* and the *Odyssey* Homer refers to the soul as an entity unique to humans that gives life with its presence and death with its absence. The soul leaves the body at death, continuing to exist in the underworld as a shade or image of the person. In fact, as late as the 5th century BCE the most common Greek words for soul, thumos (θυμός) and psyche (ψυχά) translate as alive, breath, and spirit.

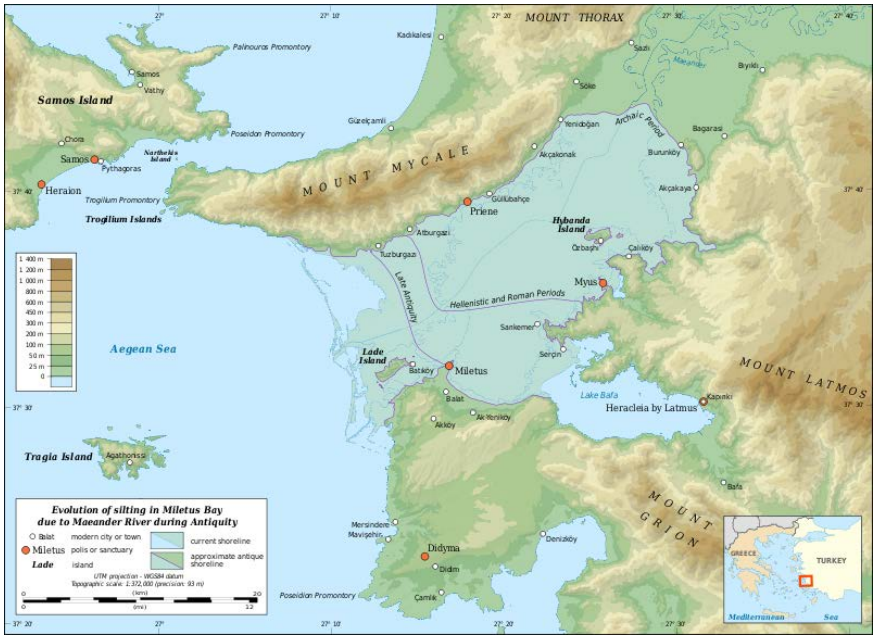
Just as today, many ordinary Greeks and religious thinkers of the time likely believe in immortal souls. Indeed, a 2009 Harris online poll found that 71% of the survey subjects indicated belief in a soul that continues to exist after death with only 10% professing disbelief. In contrast, only 45% expressed belief in evolution.(Taylor, 2009) For the Greeks in Homer's time the soul is a uniquely human, quasi-physical entity the presence or absence of which marks the distinction between life and death in humans. During the centuries that follow Homer's writings, the Greek notion of the soul undergoes an expansion: both in terms of the sorts of entities that can possess souls and in terms of the functions that Greek's attribute to the soul.

Most of what we know about the early Greek philosophers comes from fragments of their writings and reports of their views in the works of later writers. For example, scholars often identify Thales of Miletus (624-546 BC) as the first philosopher in the western tradition and Miletus, a city on the coast of present-day Turkey, as western philosophy's point of origin. Early Greek philosophy tends not to distinguish strongly between different areas of inquiry. For instance, early Greek philosophers do not distinguish most of what one now thinks of as science and mathematics from philosophy. Indeed, Thales' thought seems to include aspects of observation-based astronomy as well as more abstract "philosophical" theoretical speculation. To wit, Thales reportedly predicts a solar eclipse in 585BC, an accomplishment that moves many researchers to identify Thales's work as marking the beginning of western science in addition to philosophy.(Lorenz, 2009; Wikipedia, 2012)

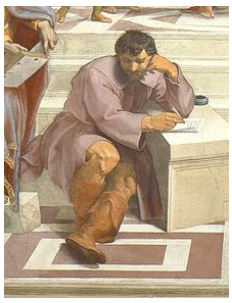
Thales, like many of the earliest Greek philosophers, speculates as to the most basic elements of the world and how these elements result in all other objects, properties, and events. Thales supposes that water is the most basic element and that all other objects, properties, and events result from changes to water. Thus, one can understand the early Greek philosophical thinkers as attempting to develop a general monistic ontological framework for understanding the world. Thales and most of the early Greek philosophers are physicalists (or materialists), holding that all that exists is matter and the void. As a result, Pre-Socratic theories about the soul presuppose its physical nature. For instance, Aristotle reports in *De Anima* that "Thales, too, to judge from what is recorded about him, seems to have held soul to be a motive force, since he said that the magnet has a soul in it because it moves the iron."(Book 1, Part 2, Paragraph 14)(Aristotle, 350 B.C.E) Thales thus expands the function of the soul to include

causing movement, specifically self-generated movement, as well as expanding the kinds of potentially ensouled the entities.

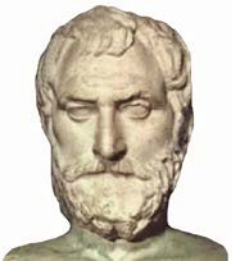
Similarly, Heraclitus of Ephesus (500 BCE) proposes fire as the most basic element. He follows Pythagoras (570 to 490 BCE) in linking wisdom to the soul. Heraclitus further suggests that control of motor functions emanate from the soul, which he seems to hypothesize consists of fire or air. Both of mental and motor functions deteriorate, according to Heraclitus, if the soul becomes wet; "A dry soul is wisest and best. … A man when he is drunk is led by an unfledged boy, stumbling and not knowing where he goes, having his soul moist." (Fragments 230 & 231, p.203)(Kirk *et al.*, 1983) Pythagoras (570 to 490 BCE)(Fairbanks, 1898c; Kirk *et al.*, 1983), Anaxagoras (500 to 428 BCE)(Fairbanks, 1898a; Curd, 2011), Empedocles (490 to 430 BCE)(Fairbanks, 1898b), and Democritus (460-370 BCE)(Democritus, 2007; Berryman, 2010) all propose that plants and animals have souls. Thus, by the end of the 5th century BCE the Greek notion of the soul consists in a physical, all be it rarified, entity that serves to explain the difference between living and non-living things. The soul likewise causes self-generated motion, emotional responses, and thought.



Map showing Miletus from http://commons.wikimedia.org/wiki/File:Miletus_Bay_silting_evolution_map-en.svg



Painting of Heraclitus from Raphael's School of Athens



Bust of Thales (624-546BCE) from http://www.daviddarling.info/encyclopedia/T/Thales.html

Specialized Greek Philosophy Tracts Emerge and Dualism Becomes Less Tenuous

Around 400 BCE philosophers who have grown up within the general Pre-Socratic monistic ontological framework for understanding the world, like Plato (427-347BCE) and Aristotle (400-320BCE), begin to write works covering more or less specific areas of inquiry. They also spend

significant time considering investigative methodology. Both of these thinkers contribute to the development of two general areas of inquiry that dominate thought about the mind for the next several centuries: Epistemology (The Sub-discipline Exploring the Nature, Sources, & Limits of Knowledge) & Philosophy of Mind (The Sub-discipline Exploring the Nature of the Mind). Indeed, when Plato, writes the *Meno* (Plato, 1871a) and later the *Theatetus* (Plato, 1871c), both of which prove influential in epistemology, he alters the status quo by offering entire works on a single philosophical topic or sub-specialty.

Epistemology Multiplies Ontology

Epistemic ruminations date back to the Presocratics and continue today. However, the

Plato (427-347BCE)

Aristotle (400-320BCE)

reflections of the Presocratics upon epistemology appear as part of more general discussions. With Plato one starts to see texts with specific topical foci and the emergence of two general types of epistemological questions: On the one hand, Plato asks questions about the nature of knowledge and what distinguishes knowing from other states. One can think of these questions as primarily concerning about the nature and function of knowledge in cognition. On the other hand, one can also ask how one can (or ought to) go about generating knowledge or evaluating knowledge claims about some topic. For instance, there are two general epistemic questions in the philosophy of mind. (A) How, and to what extent, can one know about one's own mentality? Theorists often call this the problem of self-consciousness or the problem of self-knowledge. (B) How, and to what extent, can one know about the mentality of others? Theorists often call this the problem of other minds. For the purposes of this class one can think of the first type of epistemic questions--questions regarding the nature, sources, and function of knowledge--as seeking to understand and/or clarify mental functioning. Answers to these questions provide a framework through which theorists attempt to understand the nature of the mind and its functioning.

Plato seeks answers to the most central of epistemological questions; "How can creatures come to know about the nature of the world?" Indeed, all of his works are informed by Plato's proposed answer to the above epistemic question: Plato supposes that creatures come to know the nature of the world via knowledge of another kind of world—the intelligible world. For Plato, the sensible world is inherently flawed insofar as the objects of the sensible world appear

to retain their identity despite changing their properties—even admitting of contradictory properties—over time and in relation to one another. For instance, in the *Theatetus* Socrates suggests that the same wine can seem sweet to a healthy sommelier and bitter when that same sommelier becomes sick. Yet, the same entity cannot be both bitter and sweet because sweetness and bitterness contradict each other. In order to make sense of knowledge Plato supposes that knowledge comes from recognizing the constancy amidst the ever-changing, flux—the reality under the sensations.

For Plato constancy comes from the entities in the intelligible world, i.e., the forms. Unlike the changeable entities of the sensible world, the changeless forms admit of no contradictions either over time or in relation to one another. Objects of the sensible world remain constant insofar as they "partake" of the forms. Thus, the sensible wine partakes of the form of wine and so remains constant as wine and the sommelier can know it as wine. But the wine only "partakes" or "participates" in the form of wine, making it imperfectly wine. This imperfection means that the sensible wine can seem both bitter and sweet to different people or at different times.

Beginning as early as the *Phaedo* (Plato, 1892), Plato outlines a theoretical framework that construes the sensible world and the intelligible world as fundamentally distinct. He characterizes entities in the former as perceptible, changeable, and destructible aggregates while the latter prove imperceptible, changeless, and indestructible unities. (77-81)(Plato, 1892) Though Plato does not equate the soul with the forms, he does tell readers that, "…the soul commands, the body serves: in this respect too the soul is akin to the divine, and the body to the mortal." (80) (Plato, 1892) Thus, Plato's dichotomy between the sensible and the intelligible introduces a much more robust dualism than that of the Presocratics—a dualism of ontological kinds sharing no essential properties. Nevertheless, one still sees Plato exhibit a considerable laxness when it comes to locating the soul within his dualist framework.

Theoretical Explanations of Mental Functions

In *The Republic* (Plato, 1871b), a work he devotes primarily to political philosophy, Plato introduces yet another highly influential view--the tripartite division of the soul. The doctrine of the tripartite division of the soul builds upon the expansion of the soul's functions in the works of the Presocratics and informs a great deal of future thought regarding the nature of the mind and its operations. According to Plato the soul has three parts; the appetitive soul, the spirit or passionate soul, & the thinking or rational soul. Each element of the soul has its own characteristic desires. The good for humans consists in the subjugation of the appetitive soul to the passionate soul, which is in turn subjugated to the rational soul. Thus, reason, emotion, and appetite become separate in Plato. One might argue that this represents the first attempt to understand the mind in terms of constitutive elements of the mind, the functions they perform,

and the relationships that emerge. Interestingly, this theory of the soul supposes that the soul has properties that the forms cannot possess. Specifically, the forms are changeless and indivisible while Plato's tripartite soul proves both changeable and divisible.

Aristotle

In *De Anima* (Aristotle, 350 B.C.E), Aristotle considers not only human mentality, but nature of the souls of all living creatures. Indeed, *De Anima* includes discussions on methodology, the senses, as well as thought and reasoning. Aristotle seems to return to the materialistic framework of the Presocratics in that he claims that the form of an object is not a distinct entity, but rather is "blended" with matter to create an individual entity with its characteristic properties and capacities. However, in *De Anima* Aristotle appears to make an exception for the soul within his overall theory of form and matter.(Aristotle, 350 B.C.E)

> Therefore, since everything is a possible object of thought, mind in order, as Anaxagoras says, to dominate, that is, to know, must be pure from all admixture; for the co-presence of what is alien to its nature is a hindrance and a block: it follows that it too, like the sensitive part, can have no nature of its own, other than that of having a certain capacity. Thus that in the soul which is called mind (by mind I mean that whereby the soul thinks and judges) is, before it thinks, not actually any real thing. For this reason it cannot reasonably be regarded as blended with the body: if so, it would acquire some quality, e.g. warmth or cold, or even have an organ like the sensitive faculty: as it is, it has none. It was a good idea to call the soul 'the place of forms', though (1) this description holds only of the intellective soul, and (2) even this is the forms only potentially, not actually. (Book III, part 4, paragraph 3)

Unlike other individual entities, like the body, Aristotle describes the soul, not as informed, but as "'the place of forms'." The difficulty Aristotle faces emerges again and again in theories of the mind and its function, namely the difficulty in formulating a physical theory that seems to explain mental functioning. As a consequence, Aristotle hypothesizes that plants possess souls allowing them to gain nourishment and reproduce; animal souls have the additional capacities of sense perception and ambulation. However, only human souls have the capacity for intelligence, and only the intelligent aspects of the soul are immortal and for Aristotle.

Euclid's Axiomatic Treatment of Geometry as a Model for Knowledge and Reason

One of the most underappreciated figures in shaping the western notions of mathematics, philosophy, science, rationality and mentality is Euclid of Alexandria (325BCE-265BCE). Euclid is a Greek mathematician, who likely received his training in geometry in Athens from students of Plato before moving to Alexandria. In *The Elements* (Euclid, 1956)(approximately 300BCE), Euclid's best-known work, he systematically and rigorously organizes geometrical knowledge in

terms of indubitable axioms from which he deduces all other truths by careful proof. *The Elements* also includes a treatment of basic number theory. *The Elements* provides readers with a comprehensive collection geometrical theorems and proofs developed by earlier mathematicians such as Thales, Pythagoras, Plato, Eudoxus, Aristotle, and Menaechmus. Euclid's accomplishment in *The Elements* is not its content, per se, but the organization and rigor of its presentation. Indeed, academics use Euclid's book as a mathematics text as late as the beginning of the 20th century. Euclid's rigorous axiomatization creates a model for mathematics that remains influential today. Moreover, its influence extends to other disciplines such as philosophy and science, and comes to serves as the dominant model for rational thought and knowledge for many, many thinkers.

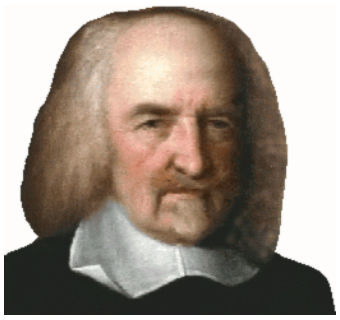
Indeed, Euclid's geometry proves so imapctful that it influences great thinkers holding very different theories about the nature of the mind. For instance, Thomas Hobbes (1588–1679) advocates a hard-bitten mechanistic physicalism. Hobbes views all things, including politics and the mind, in terms of mechanistic operations upon physical matter. Hobbes speculates in his *Elements of Philosophy* (Hobbes, 1671) that

> PHILOSOPHY is such knowledge of effects or appearances, as we acquire by true ratiocination from the knowledge we have first of their causes or generation: And again, of such causes or generations as may be from knowing first their effects. … By ratiocination [reasoning], I mean computation. (pp. 6-7)

Hobbes views computation as analogous to simple arithmetical operations upon words, where words come to signify the objects of our experiences stored memory. As we will see below, René Descartes (1596–1650) models both his epistemology and his scientific method on Euclid, though he famously holds--in contrast to Hobbes--that the mind is immaterial. Baruch de Spinoza (1632–1677) writes his famous, posthumously published work, *Ethics (or Ethica Ordine Geometrico Demonstrata*)(Spinoza, 1677) in an axiomatic format. In the *Ethics* Spinoza argues that the universe consists of one infinite, necessary, and deterministic substance that he seems to equate with both God and nature as well as with both mind and body. So, despite the diverse nature of their views, all these thinkers portray one's knowledge--and one's rationale belief corpus--as having (or ought to have) an organizational structure and genesis comparable to the Euclidian geometry of *The Elements*. That is, all of one's knowledge flows from careful arguments based upon premises (axioms), the truth of which one cannot doubt. Deductive reasoning transmits the certainty and truth of one's initial principles to all other beliefs.

Thus, the impact of Euclid consists in providing a paradigmatic instance of intellectual accomplishment, which can and does serve as an extremely influential conception of reason itself--and often all mentality. In this Euclidian vision of the mind thought consists in deductive

operations on statements. Each statement traces its origin back either to the certainty of immediate experience, to a set of statements held to be certain and indubitable, or some combination of the two. That is, one explains one's beliefs in terms of logical operations on truth-functional representations (i.e., representations that can be true or false). One cannot underestimate the impact of this conception of reason and mentality upon our theoretical musings upon rational inquiry, reason, and the mind.

			
Euclid of Alexandria (325BCE-265BCE)	Thomas Hobbes (1588–1679)	Baruch de Spinoza (1632–1677)	Rene Descartes (1596-1650)

Euclid's Axioms

1.) To draw a straight line from any point to any other.

2.) To produce a finite straight line continuously in a straight line.

3.) To describe a circle with any centre and distance.

4.) That all right angles are equal to each other.

5.) That, if a straight line falling on two straight lines make the interior angles on the same side less than two right angles, if produced indefinitely, meet on that side on which are the angles less than the two right angles.

One of the oldest surviving fragments of Euclid's *Elements*, found at Oxyrhynchus and dated to circa AD 100. The diagram accompanies Book II, Proposition 5. From Wikipedia http://en.wikipedia.org/wiki/Euclid

Descartes and Substance Dualism

Scholars generally hold that the European Renaissance began in the 14th century city state of Florence located in Tuscany, Italy. The increase in commerce, artistic, and religious activity associated with the period from the 14th to the 17th century also brought the increased scientific activity that eventually lead to what historians call the Scientific Revolution. Hisotrians generally associate the beginning of the scientific revolution with the publication of two important works: Nicolaus Copernicus' (1474-1543) privately circulated manuscript called *Commentariolus* (Little Commentary) is published in Germany under the title *De Revolutionibus Orbium Coelestium* (*On the Revolutions of the Heavenly Spheres*, published in 1543 at Nuremberg, Germany) after his death in 1543 (Copernici, 2007). The physician Andreas Vesalius (1514-1564) publishes his seven volume text on anatomy called *De Humani Corporis Fabrica* (*On the Fabric of the Human body*) in 1555 (Vesalius, 1543). Both works challenge traditional theories and figures in their respective areas. Copernicus forwards the heliocentric conception of the universe in contrast to Ptolemy. Vesalius challenges many aspects of the anatomical teachings of Galen. These works and many others serve to create a tradition of deterministic mechanism in science. This growing tradition increasingly seeks to understand all phenomena in terms of universal physical laws discovered through controlled empirical experimentation--even life and the mind.

The tension between the religious or immaterial worldview and this hard-bitten deterministic physicalism builds as the European Renaissance and Scientific revolution gain momentum. But, it is not until one hundred years later that a scientist, Rene Descartes (1596-1650), publishes his *Meditations on First Philosophy* (or *Meditationes de prima philosophia, in qua Dei existentia et animæ immortalitas demonstratur*) (Descartes, 1901) in 1641. Descartes work represents perhaps the first and clearest systematic presentation of what we now understand as substance dualism. Like all thinkers of the time, the French philosopher, physicist, mathematician, and anatomist is also dualist (though his many endeavors are not particularly distinct at the time). Indeed, Descartes' mediations prove so influential in philosophy in part because Descartes makes the tension between the spiritual or immaterial world view and the mechanistic physical world view explicit and stark.

Descartes' Early Life

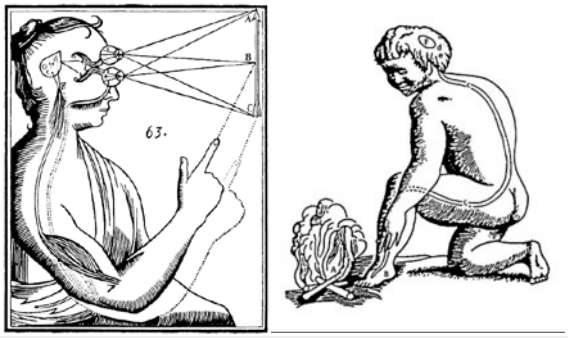
Descartes comes to science rather indirectly: He attends a Jesuit school located at La Flèche, France called Collège Royal Henry-Le-Grand in 1607. His graduation from Henry-Le-Grand sees him earn his degree and license in Law at the University of Poitiers in 1616. Descartes joins the army of the Dutch Republic for a brief time in 1618, during which time he meets the Dutch philosopher and scientist Isaac Beeckman. Beeckman reignites Descartes' interest in physics

and mathematics. Descartes claims to have had dreams shortly thereafter which he interprets as a divine sign that he should found a unified science of nature based upon mathematics.

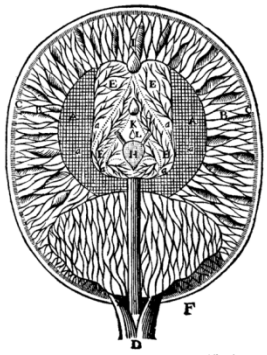
The *Meditiations* and their Impact

Meditations on First Philosophy, proves important for many reasons. For instance, Descartes' view proves important, in part, because it and Descartes himself become very influential in intellectual circles. However, this discussion focuses upon two ideological reasons: First, as a scientist and mathematician, Descartes brings the goal scientific explanation through rigorous methodology to philosophical speculation regarding the mind. Importantly, this emphasis on methodology and explanation inspired by mathematics and science leads Descartes to seek an explanation for why only some physical entities appear to have a mind. Though a dualist, Descartes makes some of the first steps towards psychology and neuroscience. Descartes maintains a very strong long-term interest the workings of the physical body, and spends a

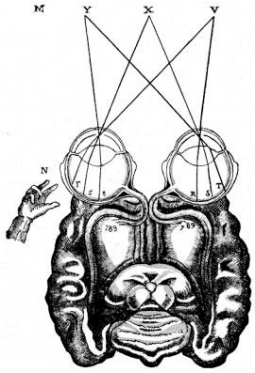
René Descartes (1596-1650)



Descartes' diagrams depicting the pineal gland facilitating visual-motor function (left) and the communication of pain (right) in *Meditations Métaphysiques.*



A diagrammatic section of human brain from René Descartes' *Treatise on Man*



Descartes' diagram depicting visual processing from *La Dioptrique*

great deal of time dissecting cadavers. In 1637 Descartes publishes *La Dioptrique* as one of three appendices to his *Discourse on Method* .(Descartes, 1649) In each appendix, Descartes offers an example illustrating the method he outlines for science in *Discourse*. *Dioptrique* is a treatise on optics. Though not particularly original in its results from optics, it articulates the

corpuscular theory of light and suggests for the first time that the retina projects directly onto brain (in Descartes view, onto the walls of the ventricles). Though *Dioptrique* represents Descartes first publication on the topic of mind-body interaction, Descartes' exposition in *Dioptrique* reflects his theoretical speculation from a work he began long before, *Traite de l'homme* (Descartes, 2003) (Treatise on Man, published 1664, written 1637).

Descartes bases his theory of mind-body interaction upon his knowledge of gross neuroanatomy. Specifically, (A) Descartes posits the pineal gland as the "seat" of mind-body interaction. He hypothesizes, contra Galen, that the pineal gland plays a role in sensation, imagination, memory and the causation of bodily movements as early as his first work, *Treatise of Man* (written 1637, published 1662). (Descartes, 2003) Thus, the pineal gland serves as the principle organ for *sensus communis*--the communication between the body and the soul. Both the soul and the body's animal spirits can affect the pineal gland by literally moving it, thereby allowing each to act on the other. Additionally, (B) Descartes adopts Galen's hypothesis that the nerves are hollow tubes that contain "…a certain very subtle wind, or rather a very lively and pure flame, which is called 'animal spirits'." (Descartes, 2003)(p.19) Ironically, though Descartes is a substance dualist, he actually furthers the mechanistic picture in that he views the body as an elaborate machine. Moreover, he takes pride in his claim to have furthered mechanistic explanation of human and animal behaviors.

So, the *Meditations* has importance in the development of science because of its basis in physiology--though he is mistaken on numerous points regarding the pineal gland, etc.. In fact, Descartes views the body as a machine capable of autonomous action--thereby indirectly furthering physical explanations of the mind. Indeed, he notes that,(Descartes, 2003)

> …it is not necessary to conceive of this machine as having any vegetative or sensitive soul or other principle of movement and life, apart from its blood and its spirits, which are agitated by the heat of the fire burning continuously in its heart—a fire which has the same nature as all the fires that occur in inanimate bodies. (p.113)

In addition to the goal of understanding the mental and its relationship to the physical, the same epistemic concerns that motivate Plato also drive Descartes' theorizing. For instance, in the Mediations Descartes asks readers to (Descartes, 1901)

> Take, for example, this piece of wax; it is quite fresh, having been but recently taken from the beehive; it has not yet lost the sweetness of the honey it contained; it still retains somewhat of the odor of the flowers from which it was gathered; its color, figure, size, are apparent (to the sight); it is hard, cold, easily handled; and sounds when struck upon with the finger. In fine, all that contributes to make a body as distinctly known as possible, is found in the one before us. But, while I am speaking, let it be

> placed near the fire--what remained of the taste exhales, the smell evaporates, the color changes, its figure is destroyed, its size increases, it becomes liquid, it grows hot, it can hardly be handled, and, although struck upon, it emits no sound. Does the same wax still remain after this change? It must be admitted that it does remain; no one doubts it, or judges otherwise. What, then, was it I knew with so much distinctness in the piece of wax? Assuredly, it could be nothing of all that I observed by means of the senses, since all the things that fell under taste, smell, sight, touch, and hearing are changed, and yet the same wax remains. (M II, ¶12)

As a result, Descartes seeks to explain both how people can come to know (and fail to know) about the world in the face of perceptual flux as well as how there could be a distinction of kind between physical objects and minds. To explain these facts, Descartes sketches an explicit and clear substance dualism. Specifically, Descartes hypothesizes that the mental and the physical constitute distinct substances having opposing essential properties. Plato's form vs sensible object dualism and Descartes substance vs matter dualism both rely essentially upon the supposition of irreducible differences between their respective ontological posits. Like Plato, Descartes defines mental and physical substance through a cluster of essential properties, thereby further articulating the sorts of properties and causal connections that ought to underlie any explanation of the mental. Descartes characterizes mental substance as a non-extended thinking substance manifesting mental properties like consciousness and belief. As Descartes tells his readers, mental substance "…is a thing that doubts, understands, [conceives], affirms, denies, wills, refuses; that imagines also, and perceives." (M2, ¶8) (Descartes, 1901) In other words, Descartes hypothesizes mental substance is an ontological kind characterized exclusively by mental properties. In contrast, Descartes defines physical substance as essentially extended, having properties of shape, size, position, and number. Thus, for Descartes physical substance has no mental properties; in effect, it is completely foreign to the mind. Like Plato, Descartes locates knowledge—not in the physical object or sensations caused by physical objects—but in mental judgment regarding sensations. Error occurs because sensation cannot provide knowledge without the proper exercise of judgment. Knowledge occurs in so far as the mind judges properly regarding the import of sensations. In short, Descartes explains the seeming difference between physical bodies that can have minds and bodies that cannot have mentality by proposing that the world has two ontological kinds. He then explains the epistemic phenomena by reference to the indispensably speculative inferences thinkers must make based upon interaction between these two fundamentally different sorts of ontological kinds.

The second reason for the influence of Descartes' *Mediations* lies in the seeming challenges of trying to understand how these two opposite ontological kinds could possibly interact in the seemingly fluid and highly integrated way we observe in everyday life. Thus, because of his

dualist conception of the mind, and because of his scientific slant on philosophy, the *Meditations* together with his *Les Passions De L'ame* (Passions of the Soul) (Descartes, 1989) and *Traite de l'homme* (Treatise on Man) (Descartes, 2003) lay the groundwork for a switch in emphasis in the philosophy of mind. Whereas philosophic speculation regarding the mind has had a strong epistemic and functional emphasis before Descartes, the emphasis turns somewhat away from epistemology and towards ontology. That is, philosophers become increasing interested in understanding if/how the mind could be physical in nature and explained through science, and if not, how one could understand the apparent seamless integration of the mental and the physical within a dualist framework. This interest, at least with the former slant, continues today and leads to the explicit formulation of a variety of theories regarding the nature of the mind and its relationship to the physical world.

Science, Representations, and Ideas

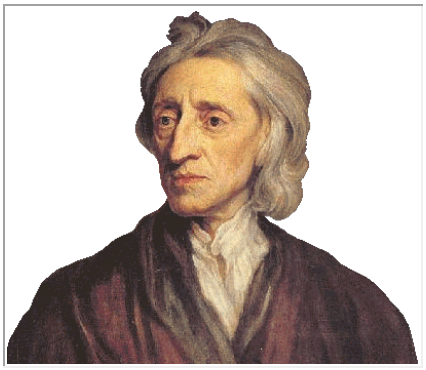
Ironically, it is the emphasis on science, observation, and physicalism that inspires still another ambiguous dualistic posit—the idea. John Locke (1632-1704) writes his *An Essay Concerning Human Understanding* (Locke, 1979)(1690) to flush out the corpuscularian philosophy (essentially the hypothesis that the physical world is composed of atoms and "the void" which he learns from the great chemist Robert Boyle) with regard to the mind. Like all British Empiricists, Locke seeks to understand the mind in order to more accurately understand and theorize about the nature, limits, and sources of knowledge. David Hume (1711-1776), shares Locke's project of understanding the nature of the mind in order to understand the nature, sources, and limits of knowledge. However, reflection upon observations--as opposed to a particular ontological picture--drive Hume's theorizing in works like, *A Treatise of Human Nature* (Hume, 2005) (1739-40) and *An Enquiry concerning Human Understanding* (Hume, 2007) (1748). Hume's speculations famously lead him to the conclusion that empiricist theories of mind undermine one's claim to knowledge of physical objects and causality. Locke and Hume both outline theories of mind that have representations and operations on those representations. Unlike Hobbes--but like Descartes--Locke's and Hume's model for ideas, the medium of mental representations, is pictures. Locke and Hume both seek to explain the functioning of mental processes underlying thought and reasoning in terms of ideas and operations upon ideas. Of particular significance, Hume views human reasoning about experience as resulting from operations of association rather than by deduction. For example, Hume proposes that cause and effect reasoning results from habitual associations between ideas because of their constant conjunction in experience. In the *In the An Abstract of a Book lately Published: Entitled A Treatise of Human Nature etc.* (Hume, 1740) tells readers that,

> Tis evident that all reasonings concerning matter of fact are founded on the relation of cause and effect, and that we can never infer the existence of one object from

> another, unless they be connected together, either mediately or immediately... Here is a billiard ball lying on the table, and another ball moving toward it with rapidity. They strike; and the ball which was formerly at rest now acquires a motion. This is as perfect an instance of the relation of cause and effect as any which we know, either by sensation or reflection. (¶8-9)

The third famous British Empiricist George Berkeley (1685-1753), differs from Locke and Hume in that his work emphasizes ontological issues. Indeed, in his works, *A Treatise Concerning the Principles of Human Knowledge, Part I* (1710) (Berkeley, 2002) and *Three Dialogues Between Hylas and Philonous* (1713) (Berkeley, 2010), Berkeley argues against materialism in favor of a view called idealism, in which nothing exists but minds and their ideas.

Thus, with Berkeley one sees the three major classes of theories regarding the ontological nature of the mind and body. First, materialism (or reductive materialism) posits only one type of substance, material substance. The mind and all mental properties result from modifications of the same substance as all other things, i.e., the mind = the body. Second, dualism (or substance dualism) posits two distinct kinds of substance, mental substance and physical substance. The mental substance underlies minds and mental properties, while physical substance underlies all physical objects and physical properties. Finally, idealism posits only one kind of substance, mental substance. All seemingly physical objects and physical properties actually consist of ideas and their properties. These basic positions have many permutations.

		
John Locke (1632-1704)	David Hume (1711-1776)	George Berkeley (1685-1753)
		
Thomas Reid (1710-1796)	Immanuel Kant (1724-1804)	

Similarly, the line of development outlined here does not exhaust the theoretic permutations. For instance, Thomas Reid (1710-1796) rigorously rejects the notion of a representational mind at about the same time that people are reading Hume and Locke. Another sort of objection, this time to the idea of a scientific psychology comes from Immanuel Kant (1724-1804). Kant, a physicist and philosopher, adopts the same general project of understanding the nature of the mind in order to further epistemological theorizing as Hume. However, in his book, *The Critique of Pure Reason* (Kant, 2003)(Kemp Smith's English translation 1929), Kant wants to counter Hume's skeptical conclusions. Kant argues that much of our knowledge flows from the innate presuppositions necessary for experience itself. Interestingly, though Kant develops and draws heavily upon a theory of the mind in his work, he argues that a science of the mind is impossible because the field cannot be mathematicized.

The Twentieth Century
Substance Dualism

Despite Kant's skepticism, scientific psychology does eventually begin to develop. By 20th century concerns over how best to understand and explain the mind's physical origins drives philosophical speculation regarding the mind, supplanting the emphasis on epistemology. Additionally, concerns arising from philosophical interests in language and mathematics begin to pervade the philosophy of mind. Particularly in the second half of the twentieth century, philosophers expand upon the basic theories of mind just discussed. It is, therefore, convenient to use this section to outline the standard positions in the philosophy of mind, including those that developed during this period.

As noted above, each view--materialism, dualism, and idealism constitute classes of ontological frameworks in which multiple theoretical permutations exist. For instance, in the case of dualism philosophers commonly note three distinct positions: Descartes held the most common position--interactive dualism. Interactive dualism holds that mental substance and physical substance causally interact with one another. Interactive dualism might seem like the only possibility. However, two other possibilities emerge if one denies that mental and physical substances interact. Such a denial might seem ridiculous given the apparent connection between mental phenomena and physical phenomena. For instance, if someone steps on your foot (a physical phenomenon) you will likely experience a feeling of discomfort in your foot (a mental phenomenon). However, Descartes' clarity and rigor in differentiating mental and physical substance, ironically, raises a significant challenge to interactionism.

Recall that mental substance is essentially non-spatial, lacking all physical properties. Likewise, physical substance is essentially spatial, lacking all mental properties. If the mind and the body are fundamentally different sorts of stuff, one must ask, "How could these two substances

possibly causal interact with one another?" For that matter, given that the mind is non-spatial, where could they possibly causally interact? It seems indubitable given experience that the mind and the body interact with one another, and so interactive dualism must explain how such causal interaction could possibly occur. Philosophers articulate many difficulties with interactive dualism, but most agree that the difficulties with causal interaction rank very high. In addition to difficulties with the very idea of inter-substance causation, another serious difficulty emerges almost immediately from dualistic interactionism. In a mechanistic, deterministic physical science, all changes in the physical world should be explicable (at least in principle) by universally applicable purely mechanistic, deterministic physical laws. But, if mental substances and causal substances causally interact, mental causation renders universal purely mechanistic, deterministic physical laws impossible. Mental to physical causation will always fall outside purely physical laws.

One possible solution to this last worry involves denying interactionism--at least in one direction. Epiphenomenalism is the view that changes in physical substances can causal mental phenomena, but that changes in mental substances cannot cause changes in physical substances or their properties. Thus, one can still hold that some causal connections exist between the mental and the physical, but mental causation will never violate universally applicable purely mechanistic, deterministic physical laws. While epiphenomenalism might allow for deterministic physical laws, it implies that mental phenomena never cause physical phenomena--violating the seeming obvious nature of mind-body interactions. Worse still, epiphenomenalism must explain why causation only runs from the physical to the mental, and not vice versa.

The second dualist solution to the problem of interaction also denies interactions. Parallelism is the view that mental and physical substances only appear to causally interact. Instead of causal interaction, mental and physical changes merely mirror one another, creating the illusion of interaction. One might find one version of anti-interactionism less plausible than the next. However, considering the difference between causation and correlation might make parallelism seem somewhat more plausible. The time on my watch may always correlates with the time on your watch, but no one supposes that our watches causally interact. One can summarize the various substance dualistic positions in the following table:

Possible Substance Dualisms		
	Mental to Physical Causation	Physical to Mental Causation
Interactionism	YES	YES
Epiphenomenalism (mental)	NO	YES
Epiphenomenalism (physical)	YES	NO
Parallelism	NO	NO

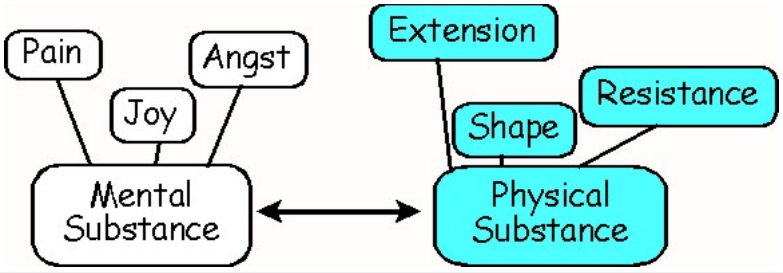


Diagram (above) depicting the different sorts of substance dualism. Diagram (below) depicting the position called substance dualism (interactionism) according to which minds and physical bodies are ontologically distinct. They are different types of substances, each of which can have distinct types of properties. Here conveniently yet inaccurately modeled by bubbles.

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