

Philosophy's Movement Toward Cognitive Science

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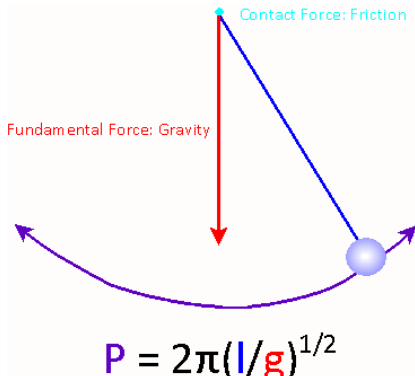
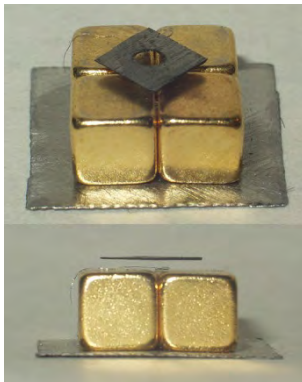
Ontological Frameworks

Philosophical and scientific theories of the mind throughout history seek to understand mental phenomena and the place of such phenomena in relationship to physical phenomena. A prerequisite for any theorizing involves formulating and agreeing upon constraints in order to focus investigation and frame theories. For instance, most people do not think that logically impossible situations can serve as counterexamples to a theory. So, when told that circles consist of sets of points equidistant from a center point on a Euclidean plane, it strikes people as irrelevant to object, "But what if the circle is a square?"

All of the thinkers this text and in this course consider adopt one of the most basic constraints on inquiry, what I'll call an **ontological framework**. An ontological framework articulates a hypothesis regarding number and often the nature of the fundamental categories for some domain. **Fundamental categories** consist of the set of categories considered essential and ineliminable in any adequate account of the phenomena in some domain. These categories further constrain the sorts of attributions and dynamical interactions theorists can utilize. For example, prior to general relativity physicists consider space and time to be distinct elements of the universe. After general relativity, space and time become a single element space/time. Similarly, the ontological framework of modern physics includes the category of force. Thus, modern physicists claim that adequate theories of physical phenomena must include forces.

The category of forces illustrates some important aspects of an ontological framework. First, some of the elements of an ontological framework prove less central than, even dependent upon, other elements. Indeed, modern physics recognizes two general categories of forces. On the one hand, physicists appeal to "contact forces." **Contact forces** transfer energy by direct mechanical contact. For example, friction is such a force. On the other hand, physicists also posit the category of "fundamental forces." **Fundamental forces** (sometimes called field forces or interactive forces) constitute the current hypothesis as to the number and nature of essential and ineliminable forces in modern physics. Thus, contact forces prove dependent upon fundamental forces in that all contact forces ultimately result from fundamental forces acting on objects. For example, friction at the pivot of a pendulum results from the surfaces dragging against one another during the swing of the pendulum (see Diagram A below). The swing itself as well as the contact pressure that results in the drag (the frictional contact force) comes from gravitation (a fundamental force).

Currently physicists recognize four fundamental forces; [gravitation](#), [electromagnetism](#), [strong nuclear force](#), and [weak nuclear force](#). Fundamental forces illustrate a second important point regarding ontological frameworks; the elements and properties of an ontological framework can change as inquiry progresses. In the history of physics, the number and nature of fundamental forces can and has increased and decreased over time. Indeed, prior to [James Clarke Maxwell's](#) publication of "On Physical Lines of Force," on 1861 and [Treatise on Electricity and Magnetism](#) in 1873.[1, 2] physicists treat electric force and magnetic force as separate fundamental forces. Today, however, physicists no posit a single force, electromagnetic force. Indeed, Maxwell's book represents a synthesis of work that begins around 1820 with the Danish chemist and physicist [Hans Christian Ørsted](#). Ørsted reports his discovery that an electric current can deflect a compass needle in his *Experimenta Circa Effectum Conflictus Electrici in Acum Magneticam* in 1820.[3]

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| <p>Hans Christian Ørsted (1777–1851) From: http://fi.wikipedia.org/wiki/Tiedosto:%C3%98rsted.jpg</p> | <p>Michael Faraday (1791–1867) From: http://historyofsurgery.co.uk/Web%20Pa%20ges/0121.htm</p> | <p>Sir Humphry Davy (1778-1829) From: http://en.wikipedia.org/wiki/File:Davy_Humphry_desk_color_Howard.jpg</p> | <p>James Clerk Maxwell (1777–1851) From: http://www.bbc.co.uk/arts/yourpaintings/paintings/james-clerk-maxwell-18311879-fellow-physicist-134688</p> |
|  | |  | |
| <p>Diagram A illustrating how both contact and fundamental forces operate in pendulums. Since all contact forces result from fundamental forces acting on objects, the pendulum's swing as well as the contact pressure that results in the drag at the arm pivot result from the fundamental force of gravitation (in red). The contact force, friction (in light blue), operates at the pendulum arm pivot resulting from the surface drag during the swing of the pendulum.</p> | | <p>Diagram B Picture of "A small (~6mm) piece of pyrolytic graphite levitating over a permanent neodymium magnet array (5mm cubes on a piece of steel). Note that the poles of the magnets are aligned vertically and alternate (two with north facing up, and two with south facing up, diagonally)." This is an example of diamagnetism.</p> <p>Description and picture from: http://en.wikipedia.org/wiki/File:Diamagnetic_graphite_levitation.jpg</p> | |

The next significant contribution to the unification of electric and magnetic forces comes from the work of [Michael Faraday](#), an English chemist and physicist.

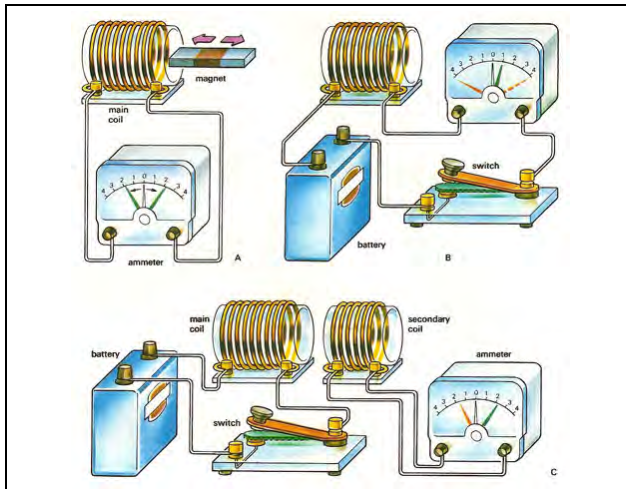
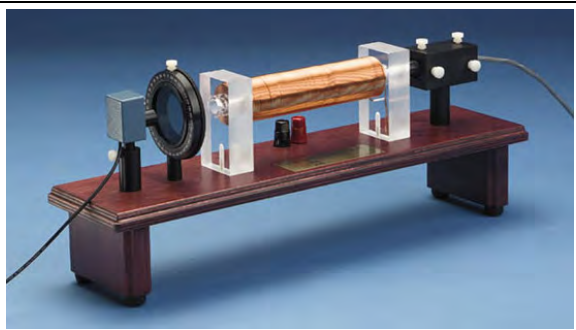


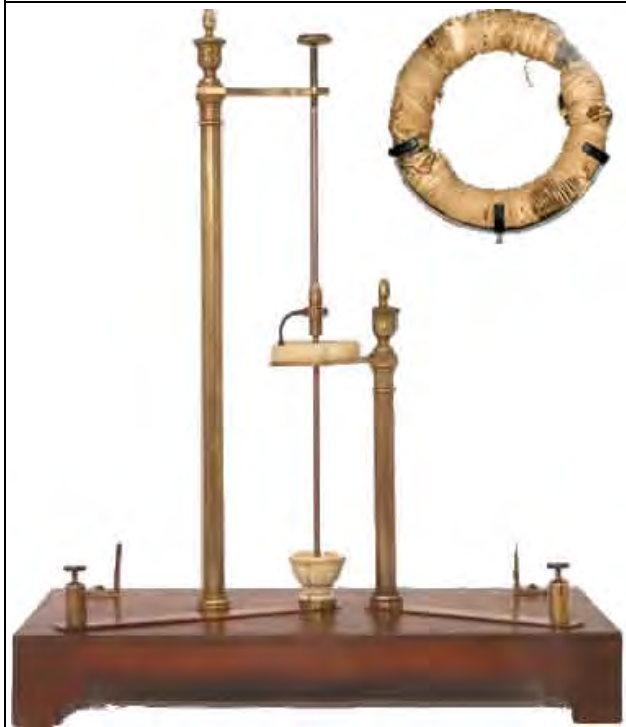
Diagram depicting electromagnetic induction. From: http://www.davidarling.info/encyclopedia/E/electromagnetic_induction.html
Link to java applet that illustrates electromagnetic induction: <http://micro.magnet.fsu.edu/electromag/java/faraday2/>



Picture of a device to create a Faraday Effect: the Signal Processor/Lock-In Amplifier (SPLIA1-A). From: <http://www.teachspin.com/instruments/faraday/index.shtml>



Video of homemade homopolar engine Click to view video. From: <http://www.youtube.com/watch?v=2wlbPwmXLMk>



Picture of Faraday's actual magnet and total apparatus for creating the Faraday Effect. From: <http://physics.info/law-faraday/>

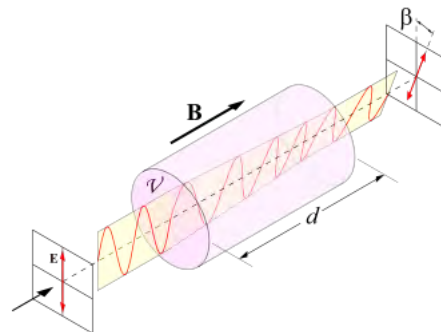


Diagram of light rotation polarization due to Faraday effect. From: <http://en.wikipedia.org/wiki/File:Faraday-effect.svg>

Faraday's family could not afford to give him much formal education and he begins his career as a book binder's apprentice. However, Faraday reads the books he binds extensively and

attends scientific lectures. Faraday attends a lecture given by the English chemist [Humphry Davy](#). Faraday is so impressed with Davy, Faraday seeks employment in Davy's lab. Faraday submits a letter together with a 300 page book based upon notes from Davy's lectures. Davy hires him first as a secretary and later as an assistant. Faraday designs experiments that result in the [homopolar motor](#) (an electric motor with a fixed magnetic polarity), reveal [electromagnetic induction](#) (the flow of an electric current through a conducive medium [like a wire] by changing the electric field), [diamagnetism](#) (the property of some materials to create an opposing magnetic field when one applies a magnetic field to that material; see diagram B on page 2 above), and that show that magnetic forces can affect light ([the Faraday Effect](#)). Faraday also argues that electric phenomena result from a single kind of electricity and that electromagnetic forces extend beyond the physical conductor. His contemporaries reject much of his work, in part because he lacks the mathematical knowledge to express his theories mathematically. [4-6] Finally, Maxwell publishes his [Treatise on Electricity and Magnetism](#) that includes four laws. These laws together form the basis of classical electrodynamical theory. One of the laws expresses Faraday's results on electromagnetic induction. Maxwell's work unifies electric, magnetic, and light phenomena as resulting from the same entity, electromagnetic fields that travel through space as waves moving at the speed of light.[1]

In summary, ontological frameworks provide structure and constraints upon inquiry by forwarding a hypothesis regarding number and nature of the fundamental categories for some domain. Fundamental categories serve in an ontological framework as the essential and ineliminable elements in any adequate account of the phenomena in some domain. They also constrain the sorts of attributions and dynamical interactions theorists can utilize to explain phenomena. As the example of forces in physics illustrates, some of the elements of an ontological framework prove less central, even dependent upon, other elements. Likewise, the nature and number of elements of an ontological framework can change as inquiry progresses.

Early General Metaphysical Speculation: Philosophical Materialisms and Dualisms

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 slow accumulation of properties and processes associated with three different distinctions living vs non-living, animate vs inanimate, and mental vs non-mental. **Second**, thinkers from Thales through the British Empiricists with the exception of Descartes tend to 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 framework. I refer to this ambiguity regarding the exact position of the mind within the various ontological frameworks as **tenuous dualism**. The tenuous dualist seems to treat the

mind (or soul) differently than other elements of any of the categories in their ontological framework. For instance, Aristotle seems to adopt a monistic physicalist ontological framework in which physical objects are a union of matter and form. However, he seems to violate that framework when discussing the soul (see below).

In addition, two main ontological frameworks emerge early on in Greek thought; monistic physicalism and what I call oppositional dualism. **Monistic physicalism** holds that all objects, properties, processes, etc., including those associated with the mind and life, belong to a single kind of substance, physical substance. As a result, theories about all phenomena should categorize their target phenomena using physicalistic categories construct dynamic and attributional models from for phenomena from those physicalistic categories. For instance, Thales proposes that water is the basic element and seeks to explain how all other objects, properties, processes, etc. result from water and its properties. **Dualism** (or more generically, **pluralism**) asserts that there are two (or more) fundamental kinds of substance. Each substance has its own characteristic properties. For instance, [Anaxagoras](#) (500 BC – 428 BC) of Clazomenae (an area in Turkey in Asia Minor) appears as the ultimate pluralist, holding that all types of materials—from milk to gold—constitute distinct eternally existing substances with their respective characteristic. [7] [Empedocles](#) (490-430 BCE) of Agrigentum (now known as the city of Agrigento in Sicily) appears likewise to have adopted a pluralism of the basic four elements (earth, air, fire, and water) together with two forces, love for combining and strife for separating these elements to create other materials. [7]

Dualists assert the existence of only two distinct kinds of substance. Each kind of substance has an ineliminable role in explaining some class or classes of objects, properties, processes, etc.. I use the term **oppositional substance dualism** to refer to those dualisms that assign opposite or fundamentally different properties to each kind of substance. For instance, the Greek philosopher Plato articulates an oppositional dualism of forms and sensible objects. Plato supposes that forms do not change and admit of no parts. Sensible objects, in contrast, change and can have parts. The most famous oppositional dualism, often called **substance dualism** or **mind-body dualism** supposes that to understand and explain minds, their properties, processes, etc. requires the supposition of a mental substance having only mental properties. Likewise, that to understand and explain physical objects, properties, processes, etc. requires the supposition of a physical substance having only physical properties.

Additionally, the development of the Greek notion of the soul illustrates a common dilemma that theorists have faced throughout the historical development of theories of mind: **(D1)** Monistic physicalist theories face the difficulty of formulating physical mechanisms that plausibly explain various mental properties and processes. In contemporary times many researchers allege that, qualitative consciousness, viz., conscious experiences of red, represents

such a mental process. For instance, David Chalmers argues that qualitative conscious experiences resist explanation by known physical mechanisms. [8-10] He tells readers that, [8]

The really hard problem of consciousness is the problem of *experience*. When we think and perceive, there is a whirl of information-processing, but there is also a subjective aspect. ... It is undeniable that some organisms are subjects of experience. But the question of how it is that these systems are subjects of experience is perplexing. Why is it that when our cognitive systems engage in visual and auditory information-processing, we have visual or auditory experience: the quality of deep blue, the sensation of middle C? How can we explain why there is something it is like to entertain a mental image, or to experience an emotion? It is widely agreed that experience arises from a physical basis, but we have no good explanation of why and how it so arises. Why should physical processing give rise to a rich inner life at all? It seems objectively unreasonable that it should, and yet it does. (§ 8 & 9)

In contrast, (D2) dualist oppositional theories like substance dualism 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. Substance dualist theories generally face difficulties in explaining mental functioning in that, by their very nature, mental substances do not obviously have any mechanistic or causal elements. Indeed, many of the marks by which we identify causation are absent in mental substances. Mental substances lack spatial dimensions (thus spatial proximity) and have no parts on most accounts (having no spatial dimensions). Hence, one cannot explain the actions of minds by the interaction of the component elements of their mental substances. Even temporal coordination can seem sketchy: Did one's desire for that candy bar cause one's going to the store, or did the two events have a common cause, say the candy bar. Perhaps the two phenomena merely prove temporally coextensive, without any direct causal interaction at all, just as the times on people's watches remain coordinated without causally interacting with one another.

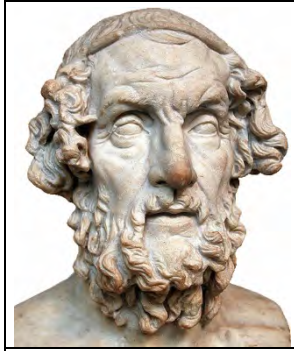
The Greek Notion of the Soul

The outline of the narrative regarding the Greek notion of the soul goes as follows: The idea of a single unified thing—the mind—emerges over time from the notion of the soul. To have a notion of the mind theorists must come to a general consensus regarding two issues: (1) Theorists must come to suppose that the diverse set of phenomena scientists now consider mental processes and properties form a common, interrelated set of phenomena—a domain. Call this the **domain hypothesis**. (2) Theorists must come to suppose that those interrelated processes and properties have a common locus—that there is a single thing that has mental properties and where mental processes occur. Call this supposition the **common locus hypothesis**. This chapter chronicles the evolution of a consensus with regard to the **domain** and **common locus** hypotheses. People often express surprise upon discovering the relative

recency and lack of ubiquity of the notion of a single entity responsible for all the phenomena we associate with mentality. However, the mind is, in fact, a relatively recent invention. For example, Fyodor Dostoyevsky's underground man gives a common alternative explanation for his temperament—a mental property—in the opening passage of *Notes From the Underground*: “I AM A SICK MAN.... I am a spiteful man. I am an unattractive man. I believe my liver is diseased.” [11] The underground man's explanation of his spitefulness by reference to liver disease was not uncommon at the time. Likewise, the early Greek philosophers often did not associate processes and properties now commonly considered mental with the mind, nor did they offer particularly mental explanations for these processes and properties.

In short, the soul does not begin in Greek thought as a single entity having mental properties and where mental processes occur. The soul begins as the locus of the distinction between living and non-living things. Living things have a soul, whereas non-living things are bereft of souls. As Greek thinkers continue to reflect upon the nature of the soul one sees these thinkers start to associate the soul with the distinction between animate and inanimate things. That is, possession of a soul comes to differentiate those things capable of exhibiting self-generated movements from those things incapable of such movements. Early Greeks distinguish animate from inanimate things in that animate things generate movement whereas inanimate things move only as a result of the transmission of motion, e.x., when a moving ball transmits its motion to another ball with which it collides. Eventually, Greek thinkers come to envision the soul as the common locus of mental processes and properties. By the time Plato and Aristotle pen their works, the core processes of the contemporary notion of the mind—reasoning, sensation, perception, ambivalence, and emotion—all plausibly reside within the human soul. However, the Platonic and Aristotelian souls still form the basis for the distinctions between living and non-living as well as the more basic Greek notion of animate and inanimate. Thinkers in the Hellenistic period, like Epicurus and the Stoics, move towards conceiving of the soul as the locus of mentality, differentiating mentality from other aspects of life and alternative causes of motion. However, the association between mentality and mortality—or often immortality—persists even today. Thus, the development of the notion of a mind involves the association of various properties and processes as having a common nature (the **domain hypothesis**) as well as the association of those properties and processes with a single entity (the **common locus hypothesis**). Additionally, theorist must also disentangle other properties and processes from that entity as well. Call this the **mental distillation hypothesis**.

Perhaps the earliest mention of a soul in Greek literature occurs in the epic poems of the Greek poet [Homer](#). [12, 13] These poems, the *Iliad* and the *Odyssey*, 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 *Iliad* and the *Odyssey* Homer refers to the soul as an entity unique to humans that gives life with its



Idealized bust of the Greek poet Homer in the British Museum.
From:
http://en.wikipedia.org/wiki/File:Homer_British_Museum.jpg

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* (ψυχή) translate as alive, breath, and spirit.[12-15]

No doubt, many ordinary Greeks and religious thinkers of the time likely believe in immortal souls, just as people today. Indeed, a 2009 Harris online poll found that 71% of the survey subjects indicate belief in a soul that continues to exist after death. Only 10% profess disbelief in such a soul. In contrast, only 45% express belief in evolution.[16]

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.

Discussion of the soul continues in early Greek philosophy, though few Greek philosophical texts exist today. Most of what contemporary scholars know about the early Greek philosophers comes from surviving 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. Scholarly knowledge of Thales comes from doxographic evidence, i.e., discussions of his views in other writers. The primary source of information about Thales comes from the Greek philosopher Aristotle.[7, 14, 17-19]

Early Greek philosophy tends not to distinguish strongly between different areas of inquiry. For instance, early Greek philosophers do not distinguish philosophy from most of what one now thinks of as science and mathematics. 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 585BCE, an accomplishment that moves many researchers to identify Thales's work as marking the beginning of western science in addition to philosophy.[14, 17]

Thales, like many of the earliest (Presocratic) Greek philosophers, adopts a monistic physicalistic ontological framework. Thales provides a model for other early Greek philosophers in that he articulates a general theoretic framework for understanding all phenomena within monistic physicalism. Specifically, this early Greek theoretic framework seeks to understand and explain all phenomena—objects, properties, processes, etc.—by positing one or more basic elements and explaining all phenomena as manifestations of that

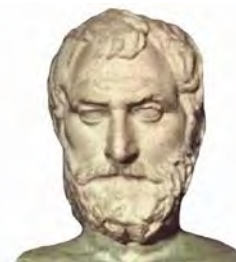
(those) element(s). Thales forwards the hypothesis that water is the basic element and seeks to explain how all other objects, properties, processes, etc. result from water. Thus, one can understand Thales and the other early Greek philosophical thinkers as attempting to develop a general monistic ontological framework for understanding the world. Thales and most of the early Greek philosophers are physicalists (materialists), holding that all that exists is matter and the void. As a result, Presocratic theories about the soul presuppose its physical nature. For



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 (624-546 BCE) from <http://www.davidarling.info/encyclopedia/T/Thales.html>

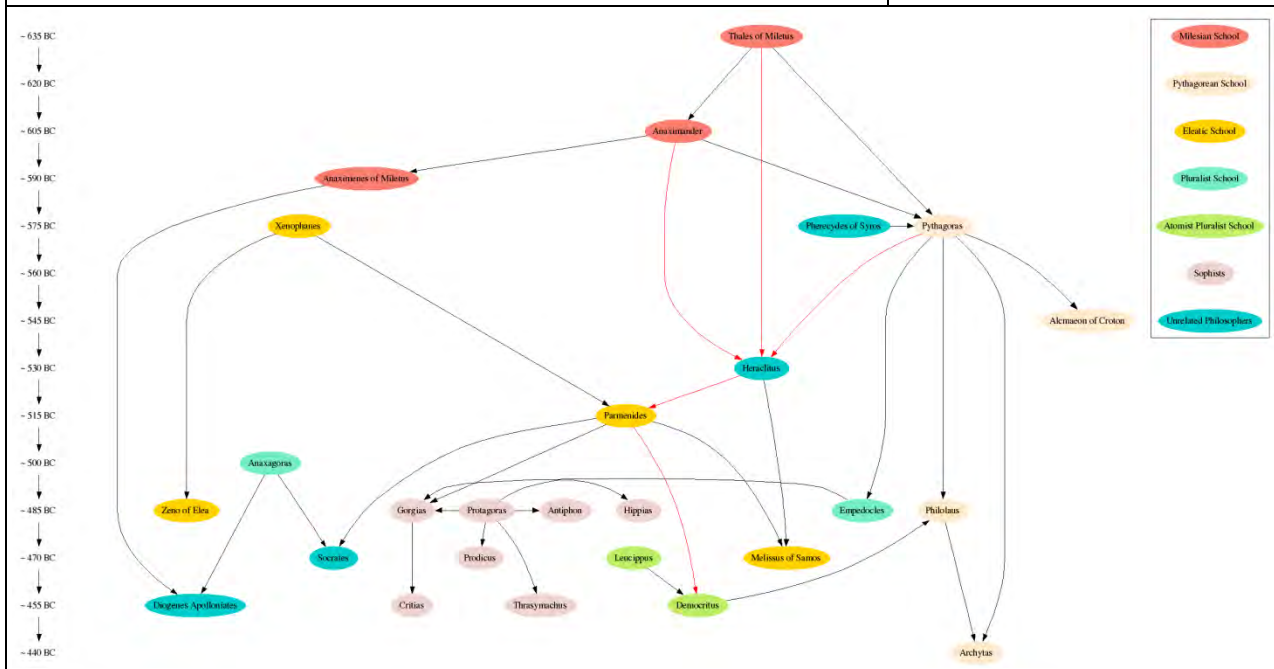


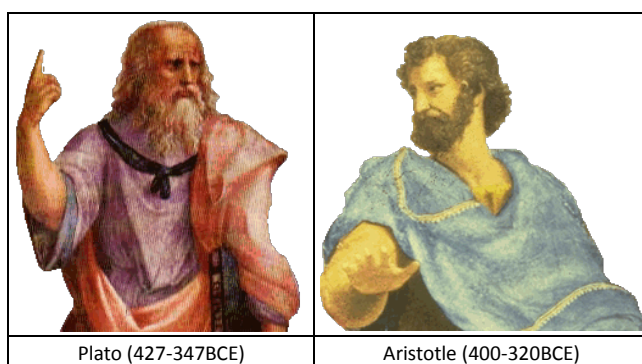
Diagram depicting the timeline as well as the interrelationships between the various pre-Socratic Greek philosophers and their schools. From: http://upload.wikimedia.org/wikipedia/en/e/e2/Presocratic_graph.png

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)[20] 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 entities. However, one must distinguish animation from ambulation and other sorts of motor movements in early Greek thought. Animation applies to all self-generated movements. For instance, the Greeks think of the planets as animate objects. In contrast, ambulation refers to self-generated movements resulting from motor skills and intent—like walking. Thales does not seem to suppose that magnets have the ability to ambulate, though they do count as animated.

Similarly, [Heraclitus](#) (535 to 475 BCE) of Ephesus proposes fire as the most basic element, speculating that the soul consists of fire or air. Heraclitus also suggests that control of motor functions emanates from the soul and follows [Pythagoras](#) (570 to 490 BCE) in linking wisdom to the soul. Thus, for Heraclitus the fiery nature of the soul means that mental and motor functions deteriorate 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)[21] [Pythagoras](#) (570 to 490 BCE)[21, 22], [Anaxagoras](#) (500 to 428 BCE)[23, 24], [Empedocles](#) (490 to 430 BCE)[25], and [Democritus](#) (460 to 370 BCE)[26, 27] 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, albeit 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.

Specialized Greek Philosophy Tracts Emerge and Dualism Becomes Less Tenuous

Around 400 BCE philosophers who have grown up within the general Presocratic 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](#) [28] and later the [Theatetus](#) [29], 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 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, one can 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 sources of various kinds of knowledge about the mind--as seeking to understand and/or clarify how one might come to know of the existence and nature of mental functioning. Answers to these questions provide a framework through which theorists attempt to gather evidence in order to better understand the nature of the mind and its functioning.

On the other hand, one can ask questions about the nature of knowledge and what distinguishes knowing from other states. One can think of these questions as concerned primarily with the nature and function of knowledge in cognition. Plato primarily seeks answers to the most central of this second class 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 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 [*Theaetetus*](#) 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 diverse and seemingly inconsistent 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 allows the sensible wine to seem both bitter and sweet to different people or to the same person at different times.

Beginning as early as the [Phaedo](#) [30], 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 entities of the latter realm prove imperceptible, changeless, and indestructible unities. (§77-81)[30] 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) [30] 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—an **oppositional dualism**. 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](#) [31], 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. Thus, Plato also exhibits a version of **tenuous dualism** with regard to the soul.

Aristotle

In [De Anima](#) [20], 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 denies that the form of an object constitutes a distinct entity. Rather the form “blends” with matter to create an individual entity having those characteristic properties

and capacities resulting from the blending of form and matter. However, in *De Anima* Aristotle appears to make an exception for the soul within his overall theory of form and matter.[20]

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)

Aristotle describes the soul, not as informed, but as “the place of forms,” making the soul unlike other individual entities, e.x., the body. This designation seems to qualify Aristotle as a **tenuous dualist** in that the soul seems to fall outside the framework of his monistic physicalism. That is, Aristotle treats the soul in a way that makes it the one thing within his ontological framework that is neither matter, form, nor informed matter. Aristotle’s tenuous dualism results from a difficulty that emerges again and again for monistic physicalist theories of the mind and its function, namely the difficulty in formulating a monistic physical theory that seems to explain mental functioning. As with many of the Presocratic philosophers, 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

Euclid of Alexandria (325-265 BCE) stands out as one of the most underappreciated figures in shaping the western notions of mathematics, philosophy, science, rationality and mentality. Euclid is a Greek mathematician, who likely receives his training in geometry in Athens from students of Plato before moving to Alexandria. In [The Elements](#) [32](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 of 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, where it comes to serve as the dominant model for rational thought and knowledge for many, many thinkers.

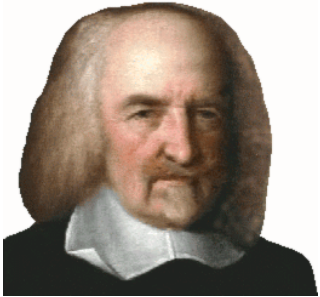
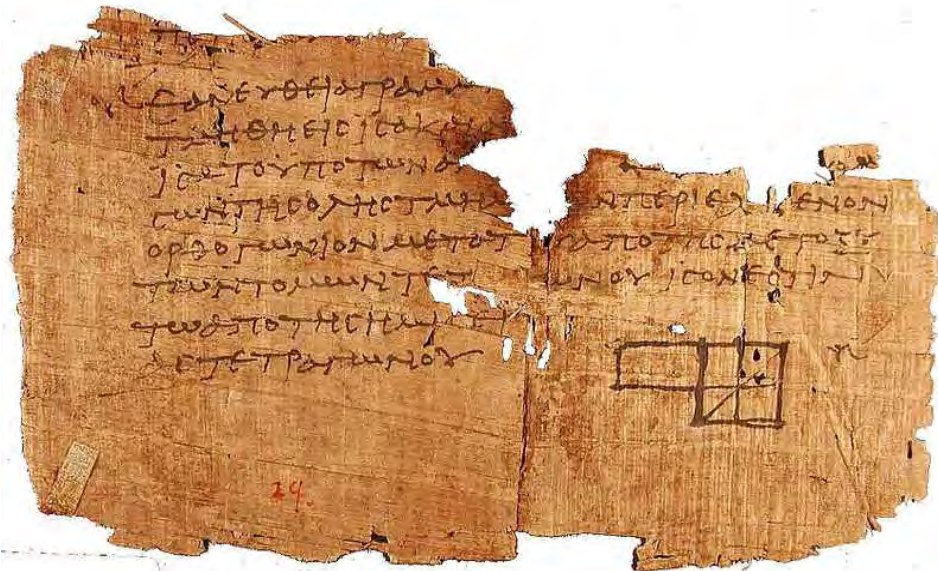
Indeed, Euclid's geometry proves so impactful that it influences great thinkers holding very different theories about the nature of the mind. For instance, Thomas Hobbes (1588–1679) advocates a hard-bitten mechanistic physicalism. Hobbes views all things, including politics and the mind, in terms of mechanistic operations upon physical matter. Hobbes speculates in his [*Elements of Philosophy*](#) [33] 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*)[34] 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 synthesis and accomplishment. Euclid's work serves as a model for the nature and structure of knowledge, for reasoning, and for the nature and operations of the mind. In this Euclidian-inspired 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, knowledge, and mentality upon our theoretical musings upon rational inquiry, reason, and the mind.

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| Euclid of Alexandria (325BCE-265BCE) | Thomas Hobbes (1588–1679) | Baruch de Spinoza (1632–1677) | René Descartes (1596-1650) |
| <p>Euclid's Axioms</p> <ol style="list-style-type: none"> 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. | | | |
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| <p>One of the oldest surviving fragments of Euclid's <i>Elements</i>, found at Oxyrhynchus and dated to circa AD 100. The diagram accompanies Book II, Proposition 5. From Wikipedia http://en.wikipedia.org/wiki/Euclid</p> | | | |

Descartes and Substance Dualism

Descartes life and work provide a microcosm of the changes and challenges wrought by the important intellectual, social, and economic developments that characterize the European Renaissance and the Scientific Revolution. 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 increased scientific activity that eventually lead to what historians call the Scientific Revolution. Historians 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 [35]. 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 [36]. 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 of mechanistic determinism increasingly moves scientists to seek to understand all phenomena in terms of universal physical laws discovered through controlled empirical experimentation--even those phenomena definitive of 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*) [37] in 1641. Descartes' work represents perhaps the first and clearest systematic presentation of what we now understand as **mind-body substance dualism**. Like all thinkers of the time, the French philosopher, physicist, mathematician, and anatomist is a mind-body dualist. Indeed, Descartes' meditations 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 *Meditations* and Their Impact

The *Meditations on First Philosophy*, proves important in the development of the philosophy of mind for many reasons. For instance, Descartes' view proves important, in part, because it and Descartes himself become very influential in the intellectual circles of Europe. However, the discussion in this chapter focuses upon two ideological reasons: First, Descartes brings his scientific and mathematical interests to philosophical speculation regarding the mind. More precisely, Descartes brings the goal of scientific explanation and an emphasis on rigorous methodology to philosophical ruminations regarding the mind. One ought not to suppose that these features are exclusive to Descartes's works. Rather, he exemplifies a growing movement. Importantly, his emphasis on rigorous methodology in the development of theories and explanations leads Descartes to seek an explanation for why only some kinds of physical entities appear to have minds or the potential for mentality. Though a dualist, Descartes makes some of the first steps towards a materialistic, scientific psychology and neuroscience. Descartes maintains a very strong long-term interest in the workings of the physical body, and spends a great deal of time dissecting cadavers. In 1637 Descartes publishes *La Dioptrique* as one of three appendices to his *Discourse on Method*. [38] 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 theoretical speculation from a work he began long before, *Traite de l'homme* [39] (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). [39] 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'." [39](p.19) Ironically, though Descartes advocates 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.

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| <p>A diagrammatic section of human brain from René Descartes' <i>Treatise on Man</i> (left) and Descartes' diagram depicting visual processing from <i>La Dioptrique</i> (right).</p> | <p>Descartes' diagrams depicting the pineal gland facilitating visual-motor function (left) and the communication of pain (right) in <i>Meditations Métaphysiques</i>.</p> |
| | <p>Pituitary and Pineal Glands</p> |
| <p>Annotated picture indicating the position of the ventricles in a cross-section of a human brain. From: http://msdl.physiol.ox.ac.uk:8081/medlearn/1bm2t2005/Neuroanatomy/The-Skull-etc/Choroid-Plexus.html</p> | <p>Illustration of the Pineal Gland (top) From Wikipedia: http://en.wikipedia.org/wiki/Pineal_gland Diagram indicating the position of the pineal gland in a cross-section of a human brain.</p> |
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| <p>Computer generated graphic showing the relative position of the ventricles in the human brain (left) and a computer generated graphic depicting the shape of the overall ventricle system. Both diagrams from: http://neuroanimations.com/TBI/VentricSyst.html</p> | |

So, the *Meditations* has importance in the development of science and the evolution of philosophical theories of mind because of its basis in physiology. Though Descartes is mistaken on numerous points regarding the pineal gland, etc., he articulates and argues for a view of the

body as a machine capable of autonomous action--thereby indirectly furthering physical explanations of the mind. Indeed, Descartes notes that,[39]

...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 [37]

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 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, ¶18) [37] In other words, Descartes proposes mental substance, an ontological kind characterized exclusively by mental

properties, as the true explanation for both the mental itself and for the seeming differences between the mental and the physical. 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 minds 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.


So, Descartes' *Meditations* proves influential in that it brings his scientific and mathematical interests to philosophical speculation regarding the mind. Ironically, the second reason for the influence of Descartes' *Meditations* lies in its failure to offer an adequate scientific explanation of the relationship between the mind and the body. Descartes' oppositional substance dualism paints mental and physical substance as so unlike one another that it illustrates the daunting challenges of trying to understand how these two opposite ontological kinds could possibly interact in the seemingly fluid and highly integrated way one observes in one's 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) [40] and *Traite de l'homme* (Treatise on Man) [39] lay the groundwork for a switch in emphasis in the philosophy of mind. Whereas philosophic speculation regarding the mind has a strong epistemic and functional emphasis before Descartes, the emphasis turns somewhat away from epistemology and towards ontology. That is, philosophers become increasingly interested in one of two theoretic projects: (1) Some thinkers seek to understand if/how the mind could be physical in nature and explained through science. (2) Other thinkers seek to explain the apparent seamless integration of the mental and the physical within an oppositional dualist framework. These interests, at least the former, continue today and lead 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 tenuous dualistic posit—the idea. John Locke (1632-1704) writes his [*An Essay Concerning Human Understanding*](#) [41] (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](#) [42] (1739-40) and [An Enquiry concerning Human Understanding](#) [43] (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

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

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. 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.](#) [44] 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) [45] and [*Three Dialogues Between Hylas and Philonous*](#) (1713) [46], 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 (reductive materialism or monistic physicalism)** posits only one type of substance, material substance. The mind and all mental properties result from modifications of the same substance--physical substance, i.e., the mind = the body. Second, **dualism (substance dualism or mind-body 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 (monistic mentalism)** 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.

Similarly, the line of development outlined in this text does not exhaust the rich theoretic permutations in the historical record. 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*](#) [47](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.

Substance Dualism in the Twentieth Century

Despite Kant's skepticism, scientific psychology eventually begins 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 holds 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 causally interact with one another?" For that matter, given that the mind is non-spatial, where could they possibly causally interact? Experience renders mind-body interaction indubitable, 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 of these purely physical laws—violating them.

One possible solution to this last worry involves denying causal interactionism—at least in one direction. **Epiphenomenalism** asserts that changes in physical substances can cause changes in mental substances and properties, but that changes in mental substances cannot cause changes in physical substances or their properties. Thus, one still retains causal connections between

the mental and the physical, without mental causation violating 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, it must explain why causation only runs from the physical to the mental, and not vice versa. The

| Possible Substance Dualisms | | | |
|-----------------------------|------------------------------|------------------------------|----------------------|
| Name of Position | Mental to Physical Causation | Physical to Mental Causation | Illustrative Diagram |
| Interactionism | Yes | Yes | |
| Epiphenomenalism (mental) | No | Yes | |
| Epiphenomenalism (physical) | Yes | No | |
| Parallelism | No | No | |

Table of the possible substance dualisms with diagrams depicting each variety. Substance dualisms posit two fundamental types of substances, physical and mental. Each substance has distinct properties. Here conveniently yet inaccurately modeled by bubbles.

second dualist solution to the problem of interaction also denies interactions. Parallelism asserts 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 correlate 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 above table.

Each of the modern substance dualist positions illustrates the tensions inherent in the position. Recall that early in the chapter I noted that 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 that plausibly explain various mental functions. 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 obviously have any mechanistic or causal elements.

Arguments for Mind-Body Dualism

At the beginning of the chapter and at various points throughout I suggest motivations and challenges for the various ontological frameworks. For oppositional dualists--dualists who assert a fundamental and irreconcilable difference between the kinds posited in their ontological frameworks (e.x., mental and physical substance) the most salient challenge lies in explaining (or explaining away) the seeming seamless and perpetual integration of mind and body. Thus, one might well ask, "Why would someone advocate dualism?" Descartes and other theorists have presented three mainlines of argumentation for their ontological framework; (1) Arguments based upon the apparent inimical differences between mental and physical phenomena, (2) Arguments based upon knowledge claims linked to mentality, and (3) Arguments alleging the physicalist cannot explain various mental phenomena.

The Argument From Leibniz's Law/Identity of Indiscernibles (Descartes)

Descartes gives readers a version of the first kind of argument in the *Meditations* VI:[37]

... I here remark, in the first place, that there is a vast difference between mind and body, in respect that body, from its nature, is always divisible, and that mind is entirely indivisible. For in truth, when I consider the mind, that is, when I consider myself in so far only as I am a thinking thing, I can distinguish in myself no parts, but I very clearly

discern that I am somewhat absolutely one and entire; and although the whole mind seems to be united to the whole body, yet, when a foot, an arm, or any other part is cut off, I am conscious that nothing has been taken from my mind; nor can the faculties of willing, perceiving, conceiving, etc., properly be called its parts, for it is the same mind that is exercised [all entire] in willing, in perceiving, and in conceiving, etc. But quite the opposite holds in corporeal or extended things; for I cannot imagine any one of them [how small soever it may be], which I cannot easily sunder in thought, and which, therefore, I do not know to be divisible. This would be sufficient to teach me that the mind or soul of man is entirely different from the body, if I had not already been apprised of it on other grounds. (M VI, ¶19)

Contemporary writers often update Descartes argument it as follows:

Modern Argument From Leibniz's Law/Identity of Indiscernibles (Descartes)

(L1) I can easily imagine my body being chopped-up, placed into garbage bags, and scattered about town. Hence, my body is divisible.

(L2) I cannot imagine my mind being chopped-up. Hence, my mind is not divisible.

(L3) If my mind was just my body, by Leibniz's Law, I should be able to imagine my mind being chopped-up. That is, identical things must have all and only the same properties. [i.e., if $(x)(y)((x=y) \text{ then } (P)(Px \text{ if and only if } Py))$]

(L4) Hence, my mind is not my body.

Theorists criticize such Leibniz law arguments on the basis that the seeming differences between the properties associated with the mind or mental substance and the properties associated with the body of physical substance might well only appear to differ because of referential opacity. Theorists assert the referential opacity of two categories, concepts, or terms whenever the exact nature of their reference (or possibly co-reference) remains indeterminate. For instance, suppose that you have no experience of ice whatsoever, but you do know and have experience with water. In this context, ice and water will likely prove referentially opaque to you. That is, if someone holds up a piece of ice and announces that they are holding water you will likely deny the truth of their assertion. On the other hand, if they hold up a glass of water you will likely agree with their assertion. Thus, your context--your knowledge and your situation—prevents you from clearly determining the reference of the two categories, concepts, or terms. As a result, those terms, concepts, or categories are referentially opaque to you. In the case of the above Leibniz Law argument, the arguer asserts that mental and physical substance are distinct because one, physical substance, can be divided while the other, mental substance, cannot. But the premise does not provide direct evidence

that the two substances differ. Instead, the argument relies upon one's ability to imagine division of each substance. However, logicians have long known that in context like imagining, knowing and believing one cannot necessarily substitute co-referential, but opaque terms *salva veritate* (i.e. without changing the truth value of the statement). Thus, it may be true that Bob believes that Richard Bachman wrote *Thinner*, and yet deny that Stephen King wrote *Thinner* (despite the fact that King did write *Thinner* under the pen name Richard Bachman). In short, seeming differences in properties may result for non-identity or they may result from referential opacity.

Argument from Introspection

In the case of arguments from introspection, the arguer infers the differences between mental and physical substance on the basis of differences between their sensory experiences of their body and their introspective perceptions of their mental states and processes. One can also find something like an argument from introspection in Descartes' *Mediation VI*: [37]

...because I know with certitude that I exist, and because, in the meantime, I do not observe that aught necessarily belongs to my nature or essence beyond my being a thinking thing, I rightly conclude that my essence consists only in my being a thinking thing [or a substance whose whole essence or nature is merely thinking]. And although I may, or rather, as I will shortly say, although I certainly do possess a body with which I am very closely conjoined; nevertheless, because, on the one hand, I have a clear and distinct idea of myself, in as far as I am only a thinking and unextended thing, and as, on the other hand, I possess a distinct idea of body, in as far as it is only an extended and unthinking thing, it is certain that I, [that is, my mind, by which I am what I am], is entirely and truly distinct from my body, and may exist without it. (M VI, ¶19)

Putting this argument in a more generic and contemporary format gives one something like this:

The contemporary Argument from Introspection

(I1) Introspection reveals mental states and properties to the introspector in much the same way that vision reveals objects in the visual world.

(I2) Introspection reveals that mental states have none of the properties of brains or brains states.

(I3) Thus, direct observation seems to belie the claim that mental states and processes are simply physical states and properties.

Writers like Paul Churchland [48-50] as well as psychological researchers [51-60] note the pitfalls of introspection as a means for accurately accessing mental states and processes. The lectures later in the course will discuss these in more detail.

The Argument From Special Abilities/Inabilities (Descartes):

Logicians often refer to form of this last class of argument as appeals to ignorance in that they argue from a lack of current ability and or knowledge to an in principle claim that such abilities can never exist or that their underlying principles can never be known. These arguments also rely upon our tendency to see mental creatures as fundamentally different from other entities. Specifically these arguments focus upon the limited extent of mental properties in the world. Not everything acts in a manner people recognize as, for example, intelligent. Arguments from special abilities infer from the fact that theorists do not fully understand some mental property or ability to the claim that such a property or ability can never be fully understood or realized in purely physical entities. Such arguments lose their efficacy insofar as viable physicalist explanations emerge for various aspects of mentality. For instance, in part five of his *Discourse on Method* Descartes suggests such an argument from disability:

The second test is, that although such machines might execute many things with equal or perhaps greater perfection than any of us, they would, without doubt, fail in certain others from which it could be discovered that they did not act from knowledge, but solely from the disposition of their organs: for while reason is an universal instrument that is alike available on every occasion, these organs, on the contrary, need a particular arrangement for each particular action; whence it must be morally impossible that there should exist in any machine a diversity of organs sufficient to enable it to act in all the occurrences of life, in the way in which our reason enables us to act. Again, by means of these two tests we may likewise know the difference between men and brutes. For it is highly deserving of remark, that there are no men so dull and stupid, not even idiots, as to be incapable of joining together different words, and thereby constructing a declaration by which to make their thoughts understood; and that on the other hand, there is no other animal, however perfect or happily circumstanced, which can do the like. Nor does this inability arise from want of organs: for we observe that magpies and parrots can utter words like ourselves, and are yet unable to speak as we do, that is, so as to show that they understand what they say; in place of which men born deaf and dumb, and thus not less, but rather more than the brutes, destitute of the organs which others use in speaking, are in the habit of spontaneously inventing certain signs by which they discover their thoughts to those who, being usually in their company, have leisure to learn their language. (Part 5, ¶17)

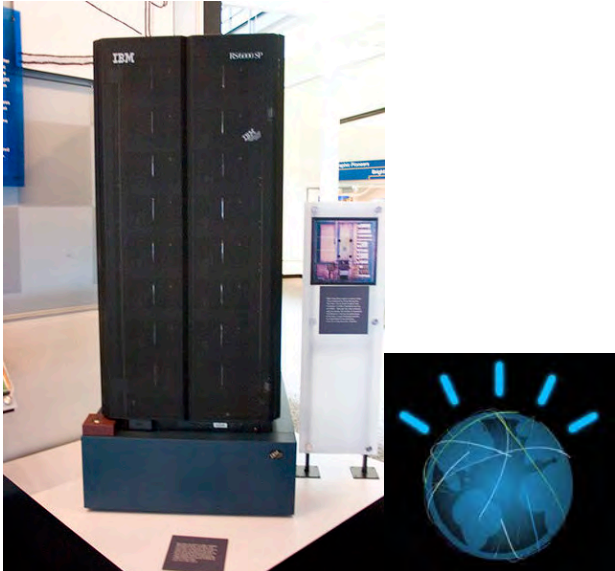

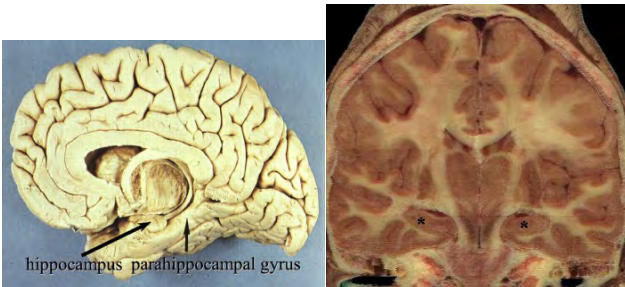

The Contemporary Schema of the Argument From Special Abilities/Inabilities

(SA1) Only humans can _____.

(SA2) If mental properties and abilities were just physical properties and abilities, then one would expect to find or to be able to create other physical systems with that can _____.

(SA3) Since we do not, humans must be mental in virtue of some other, nonphysical substance having some other, nonphysical properties.

Over time the greatest difficulty with the argument from special abilities/inabilities lies in the slow march of human understanding and ingenuity. For instance, in the case of computers, many abilities once claimed as beyond the possibility of computers have been realized in computers. Computers have beaten the best chess players in the world.[61] In similarly spectacular fashion, computers have controlled vehicles in urban and off-road races without the intervention of human drivers.[62] Most recently a computer beat all of the best past contestants in the game Jeopardy.[63] Similar problems emerge for the inability argument in light of the discoveries of scientists that tie various mental abilities very strongly to specific neuronal structures. For instance, psychologists have long known that extensive bilateral (both sides) damage to a structure of the brain called the hippocampus results in the inability to form long term declarative memories. Declarative memories are memories of facts and events. Specifically, declarative memory systems share a common functional characterization and a significantly overlapping neural substrate. At the functional level, researchers consider declarative memory systems to be representational and to encode factual information (i.e., people, places, things, and times) as well as the significance of such information. Though not necessarily propositionally encoded, normal subjects can express information stored in declarative memory through linguistic and/or graphic mediums with sufficient precision to warrant its evaluation for veridicality--most often truth-functionality. Insight into the crucial role of the hippocampus in long-term declarative memory has been dramatically advanced by the selfless contributions made by [Henry Gustav Molaison](#), known as HM in the literature and a musicologist and conductor, [Clive Wearing](#). Each man suffered drastic bilateral (both sides) damage to their hippocampus. This damage resulted Mr. Molaison and Mr. Wearing losing their ability to create long-term declarative memories. Each man had to function exclusively through their previously stored memories and their working memories after their brain damage. Their working memory limited their ability to consciously attend to activities and environments to continuous periods ranging between seven seconds and about one and one-half minutes. Nevertheless, both men volunteered for countless psychological studies and upon his death in 2008 Mr. Molaison donated his brain to science.

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| <p>Picture of deep blue (left). Picture of Jeopardy Champion computer Watson's avatar. From Wikipedia: http://en.wikipedia.org/wiki/File:Deep_Blue.jpg and http://en.wikipedia.org/wiki/File:Watson%27s_avatar.jpg respectively.</p> | <p>Two videos of memory patient Clive Wearing. After massive bilateral (both sides) damage to his hippocampus Mr. Wearing lost the ability to form long-term memories or to function for more than between 7-90 seconds without exhausting his working memory and "rebooting." Both videos are from utube. Click on the images to play the videos.</p> |
|  |  |
| <p>A sagittal cut (left) of the right hemisphere of the human brain revealing the hippocampus labeled in the picture. A coronal bisection of a human brain (right) revealing the hippocampal structures in each hemisphere. Pictures from these sites respectively: http://www.pnas.org/content/99/7/4135/F1.expansion.html http://krasnow1.gmu.edu/cn3/real.html</p> | <p>Picture of the late Henry Gustav Molaison (1926 – 2008) who furthered research into long-term declarative memory after an epilepsy operation resulted in bilateral hippocampal damage. Mr. Molaison also donated his brain to science. Picture from Wikipedia: http://en.wikipedia.org/wiki/File:Henry_Gustav_1.jpg</p> |

Arguments Against Dualism

Most theorists rely upon two kinds of arguments against an oppositional mind-body dualistic framework. On the one hand, theorists note that dualism by its very nature posits entities and

properties that provide no obvious means of causal interaction. How does the pin-prick you get (a physical event caused by physical entities and processes), cause the pain that you feel (a mental event supposedly caused by mental entities and processes)? How does something with no location in space provide one with a perspective from a location in space? Such problems regarding the interaction of mental and physical substances seem insurmountable to most theorists. This line of argumentation usually goes under the moniker of the **problem of interaction**.

More recently Paul Churchland [48, 64] argues that oppositional mind-body dualistic frameworks do not actually provide plausible explanations for seemingly mental phenomena. For instance, why do humans sleep? Why do humans dream when they sleep? Why do humans develop mental disorders like schizophrenia? Substance dualism tends merely to posit a substance together with a set of properties corresponding to mental attributes such as fear, belief, desire, etc.. However, the nothing about such entities or their proposed properties provides one with any dynamical mechanisms to explain how mental phenomena occur or lead one to the next. For this reason, substance dualisms seem to suffer from the same difficulties faced by physicalistic theories. As noted in the beginning of this chapter, (D1) Physicalist theories face the difficulty of formulating physical mechanisms that plausibly explain various mental functions and properties. Churchland argues forcefully that substance dualisms face the same difficulties in explaining various mental functions and properties. Thus, in contemporary times many researchers allege that, qualitative consciousness, viz., conscious experiences of red, represent a mental function that seems to resist explanation by known physical mechanisms. Churchland suggests that dualist theories likewise face the difficulty of formulating dualistic mechanisms that plausibly explain various mental functions like sleep, dreaming, etc..

The 20th Century and the Semantic Twist

Logical Behaviorism

If mind-body oppositional dualists have problems both in explaining the seeming interaction between the mental and the physical and in positing explanatory mechanisms even for mental phenomena, how do monistic physicalists fair? Physicalist theories face the difficulty of formulating physical mechanisms that plausibly explain various mental functions. However, with the rise of scientific psychology and later cognitive science, philosophers spend less time formulating and defending theories of mind and more time trying to understand the relationship between scientific theories of the mind and ordinary conceptions of the mind. It is during the early 20th century that the emphasis in philosophy of mind—though still focused almost exclusively upon ontological issues—turns towards the developments in science for

inspiration. Within philosophy itself a number of scientifically inspired general strategies emerge in the 20th century for trying to flesh-out a monistic physicalist framework. This movement towards closer integration between philosophy and science also marks a shift in methodological emphasis. During this period philosophers begin increasingly to think of theories not simply in terms of theoretical posits, but in terms of the relationships between the terms and categories of scientific theories and those of ordinary language. As a result, during this time philosophical theorists become increasingly interested in semantic reduction. For instance, whereas earlier philosophers focus upon ontological frameworks, most 20th century strategies for offering monistic physicalist explanations involve directly identifying mental terms with physical terms. The underlying inference driving such identifications lies in the notion that by directly equating mental and physical terms one indirectly identifies the referents of those terms—mental phenomena and physical phenomena. In other words, 20th century philosophers locate the explanatory problem for the monistic physicalist in an inability to recognize or gather sufficient evidence for the co-referential nature of mental and physical terms. Thus, two general strategies emerge within philosophy during the first half of the 20th century. On the one hand, theorists try to identify the meaning of mental terms with sets of behaviors definitive of those terms. On the other hand, theorists seek to identify the reference of mental properties, processes, and entities with the reference of physical properties, processes, and entities through something akin to analytical reduction.

Theorists call the first systematic attempt to flush-out this strategy for asserting that mental properties are just physical properties **logical behaviorism**. Logical behaviorism (also called **analytical behaviorism** and **philosophic behaviorism**) represents the first attempt to systematically address the difficulties for physicalism within the scientific framework of the time. It is important to note that philosophers of starkly different methodological orientations follow this line of theoretical speculation. Indeed, historians identify Gilbert Ryle and Carl Hempel as the two most prominent figures in logical and/or analytic behaviorism. Ryle is a philosopher of language, particularly of ordinary language. Ryle holds that researchers can dissolve many philosophical problems through the correct analysis of the ordinary language terms that theorists employ the formulation of those problems. In his classic book, *The Concept of Mind*, Ryle argues extensively that mind-body oppositional dualism results from a category mistake—an incorrect use of language:[65]

My destructive purpose is to show that a family of radical category-mistakes is the source of the double-life theory. The representation of a person as a ghost mysteriously ensconced in a machine derives from this argument. Because, as is true, a person's thinking, feeling, and purposive doing cannot be described solely in the idioms of physics, chemistry, and physiology, therefore they must be described in counterpart idioms. As the human body is a complex organized unit, so the human mind must be

another complex organized unit, though one made of a different sort of stuff and with a different sort of structure. (p.18)

In contrast, Carl Hempel is a philosopher of science and a logical positivist/empiricist. Logical positivists and empiricists believe that terms get their meaning through their conditions for verification and that science provides one with the most rigorous and explicit methodological definitions of terms through operationalizations—the procedures that scientists use to detect and measure theoretical entities, properties, etc.. Logical positivists and empiricists also tend to hold a doctrine called the unity of the sciences. The unity of the sciences asserts that one can ultimately reduce all sciences to the most basic science, physics. That is, one can reduce the terms of sciences like elemental chemistry to the terms of atomic physics. Moreover, logical empiricists see a further benefit from such semantic reductions—the terminological reduction demonstrates that the laws in the reduced science follow from or merely represent special instances of more fundamental laws in the fundamental science.

Most historians cite Gilbert Ryle's book, *The Concept of Mind* (1949)[65] as the first tract in logical behaviorism and assign Hempel's "[The Logical Analysis of Psychology](#)" (1935,1949) [66] to the second position. However, Hempel published his article, though in French, over 14 years earlier than Ryle's book. Both works have historical significance because they share a common shift of emphasis that continues to shape thinking about the mind in philosophy. Both Ryle and Hempel seek to defuse the seeming difficulties in understanding how mental properties arise from or are identical to physical properties by arguing that the meanings of mental terms are exhausted by behavioral terms. In other words, establishing monistic physicalism involves escaping referential opacity. Hempel tells readers,[66]

All psychological statements which are meaningful, that is to say, which are in principle verifiable, are translatable into statements that do not involve psychological concepts, but only the concepts of physics. The statements of psychology are consequently physicalistic statements. (p.18)

Similarly, Ryle asserts,[65]

In this chapter I try to show that when we describe people as exercising qualities of mind, we are not referring to occult episodes of which their overt acts and utterances are effects; we are referring to those overt acts and utterances themselves. (p.25)

While Hempel aims primarily to address scientific and ontological issues, Ryle sees his work in a different light. Ryle tries to provide an analysis of the concepts of ordinary language. Both philosophers, however, trace the seeming difficulties associated with the equation of mental

processes and properties with physical properties and processes to an improper understanding of the true meanings of mental terms. Ryle asserts that,[65]

This book offers what may with reservations be described as theory of mind. But it does not give new information about minds. We possess already a wealth of information about minds, information which is neither derived from, nor upset by, the arguments of philosophers. The philosophical arguments which constitute this book are intended not to increase what we know about minds, but to rectify the logical geography of the knowledge which we already possess. (p.7)

Additionally, Ryle's emphasis on intelligent behavior marks a differentiation between mental properties and non-mental properties which has come to serve as an important standard in the philosophy of mind, and which latter allows for the initial explanatory focus of cognitive science on cognition. Specifically, philosophers differentiate between mental properties and states that are strongly (or even definitively) phenomenal in nature, called **qualia or qualitative mental states**, and mental properties or states that are primarily (or even definitively) intentional, called **intentional states or propositional attitudes**. Examples of the former (qualia) include pains, itches, seeing red, anger etc.. Examples of the latter (intentional states) include beliefs and desires. Intentional states may have some phenomenal aspects, but intentional states are importantly, even fundamentally representational. That is, intentional states represent objects, properties, relations and/or events in the world.

Logical behaviorists like Hempel who embrace logical empiricism seek to build upon real progress by experimentalists like Pavlov, Watson, Tolman, and Skinner as well as by scientists across a wide swath of the sciences. They view the explosion of scientific progress from the beginnings of the scientific revolution to the middle twentieth century as deriving primarily from tying theories and theoretical terms to rigorous empirical measurement and experimentation. The overall picture many logical empiricists embrace, at least early on, portrays science as a hierarchical set of axiomatic systems. Specifically, as a set of universal, exceptionless laws together with operational or bridge laws that serve to tie theoretic terms to the particular domain (see illustrative diagrams below). Logical empiricists ultimately hold that the sciences are unified, and that higher, less basic sciences like psychology or sociology will ultimately be reduced to lower level sciences and finally to the laws of physics. The theoretical terms of physics will ultimately find their meaning through bridge laws that link the theoretical terms of physics to the experimental operations used to detect and/or measure the presence or amount of the referents of those terms. As a result, experimental operations thereby define the referents of the theoretical terms of physics an ontologically neutral observation language.

Logical empiricists refer to this conception of the nature of scientific theories and their interrelationships as the unity of science.[67] The logical empiricists, especially those in Vienna, are deeply influenced by Ernst Mach as well as by the works of Max Planck. Indeed, the Vienna philosophers originally call their group Verein Ernst Mach (the Ernst Mach Society) in 1928. The group publish their manifesto, *Wissenschaftliche Weltauffassung. Der Wiener Kreis* (*The Scientific Conception of the World. The Vienna Circle*) in 1929.[68] A kindred school with common members exists in Berlin. This group includes such luminaries as Paul Oppenheim and Hans Reichenbach.[69] Both groups are strongly influenced by their common belief that human knowledge and especially science are part of a long evolutionary process creating a hierarchical set of sciences all of which ultimately reduce to physics. For instance, Rudolph Carnap's classic work, *Der Logische Aufbau der Welt* (*The Logical Structure of the World Pseudoproblems in Philosophy*),[70] provides readers with the most sophisticated and systematic attempt to reconstruct science as a series of hierarchical axiom systems that reduce to one another and ultimately to observations framed in an ontologically neutral observation language. Similarly, Otto Neurath edits multiple volumes of *Foundations of the Unity of Sciences*[71] and *International Encyclopedia of Unified Science*[72]. The goal of these works is the organization and presentation of science as a unified body of knowledge.

An integral part of their reductionist program in science and their rejection of metaphysical speculation is their doctrine regarding the meaning of theoretic terms. The earliest version of the positivist doctrine of meaning is now called the **verifiability theory of meaning** or the **verificationist theory of meaning**. This doctrine holds that the meaning of a proposition or theoretic term consists solely in the method of its verification. This doctrine along with the moniker of positivism traces back to [Auguste Comte](#) (1798-1857). The doctrine strikes out against metaphysical speculation in that it implies that all seeming statements that one cannot cash-out in terms of their conditions of verification are meaningless. The early positivist writings often invoke this principle to critique philosophic problems as pseudo-problems.

The logical empiricists share a common disdain for metaphysical speculation and a desire to further human understanding through rigorous epistemological doctrines addressing methodological issues and minimizing ontological issues. In many ways they turn the focus of philosophy of mind towards philosophy of science and issues of scientific methodology. Likewise, they follow the methodological lead of behaviorists in reexamining the proper understanding of mental properties and processes.

Thus, one can see that logical behaviorists—both the ordinary language variety and the logical empiricist variety--as seeking to understand the meaning and hence the reference of psychological terms like belief and desire in terms of the behaviors of intelligent creatures. Nevertheless, philosophers often misrepresent logical behaviorism as a unitary movement with

a strongly shared set of background theoretical commitments. Logical behaviorists do share a commitment to science, and specifically to the promise of behaviorism in psychology. They also share a desire to capture the meanings of mental terms in behavioristic terms thereby identifying the referents of mental terms with the referents of physical terms.

However, logical behaviorism marks a significant point of divergence in the philosophy of mind. On the one hand, the logical empiricists give rise to an orientation in the philosophy of mind that seeks to understand the new and rapidly advancing sciences in terms of the theoretic posits, explanatory schemas, and methodological practices of those sciences. These theorists likely now identify themselves as philosophers of psychology or cognitive science. On the other hand, Ryle and other philosophers of language devote their efforts primarily to understanding the ascription conditions of ordinary language terms describing the mind, mental properties, and mental processes. These theorists, like Ryle himself, seek to understand the world by clarifying the ontological posits and theories implicit in ordinary language as used in everyday life. Ryle describes himself, for example, as philosophical cartographer.[73, 74] Ryle likewise begins his discussion in *The Concept of Mind* by telling his readers that, "The philosophical arguments which constitute this book are intended not to increase what we know about minds but to rectify the logical geography of the knowledge we already possess."(p.1) [65]

No matter what motivations lead logical behaviorists to advocate their doctrine, logical behaviorism faces three significant difficulties. **First**, the meanings of many mental terms seem essentially or importantly tied to qualitative subjective experience as opposed to overt behaviors. Thus, many people find the awfulness of pain essential to being in pain, but few find verbal demonstrations essential to being in pain. A person paralyzed by curare will not exhibit the normal behavioral effects of pain when stabbed in the arm. However, it seems improbable to suppose that such a person feels no pain. Likewise, actors really do suffer for their art according to logical behaviorists in that these actors actually suffer when overtly behaving as if they were suffering. **Second**, many mental properties such as aibohphobia (a fear of palindromes), ankylophobia (fear of stiff or immobile joints) and malaise (a vague feeling of discomfort, one cannot precisely identify, but which is often described as a sense that things are "just not right.") seem to lack any definitive set of behavioral effects. These terms do not seem meaningless or less meaningful than other mental terms, yet they do not exhibit a small group of overt behaviors that one might consider criterial of the state. **Third**, mental terms do not operate, for the most part, in isolation from one another. Rather, the connections between the typical behavioral causes and typical behavioral effects--even for those mental terms that appear to have more or less criterial overt behavioral causes and effects--are mediated by the interactions mental states with other mental states. This last point finds emphasis in the work of Roderick Chisholm and Hilary Putnam.[75-80] For instance, one cannot determine the

causes and effects of your belief that this text is remarkably dry in isolation from your interest in the subject, your desire to do well in the class, etc.. If you love dry and boring texts, you may read all night. If you are hungry, your belief may result in your getting a chocolate bar. The seeming interconnection between mental terms leads Putnam and others to formulate a new approach to theorizing called functionalism discussed later in this chapter. As Chisholm tells his readers:[77]



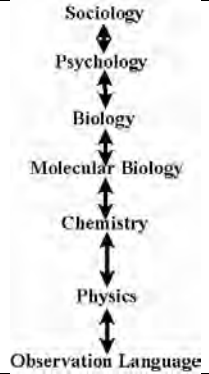


Nevertheless, difficulties in principle seem to be involved when we attempt to extend the preparatory-stimulus theory to human behavior. [Logical behavioristic reductions of mental terms to collections of stimuli and responses]

These difficulties concern the specification of the occasions upon which the appropriate fulfillments or disruptions must occur. According to our paradigm, these must be caused by the occurrence, or nonoccurrence, of the referent. But it is easy to think of elementary human sign situations where the appropriate events do not occur in the manner required. And to accommodate our definition to such cases, we seem required to make qualifications which reintroduce the intentional concepts we are trying to eliminate. [Other mental terms] (p.61)

Likewise, Chisholm later asserts that:[76]

...when we wish to describe anyone's believing, seeing, knowing, wanting, and the like, either (a) we must use language which is intentional or (b) we must use a vocabulary we don't need when we talk about non-psychological facts. (p.132)

Theorists explore the general difficulties facing approaches like Ryle's and Hempel's in the technical literature even before Ryle publishes *The Concept of Mind*. The verification theory of meaning and the difficulties involved in the inter-theoretic reduction that the logical empiricists initially advocate begins to attract the great minds of philosophy and science long before the 1950s. However, Putnam's "[Psychological Concepts, Explication, and Ordinary Language](#)"[78] (1957) and Chisholm's "[Intentionality and the Theory of Signs](#)" [77] (1952) serve to make explicit and popularize the implications of these technical problems for logical behaviorism. These challenges together with the limitations and difficulties emerging in **methodological behaviorism** or simply **behaviorist psychology** combine to lead theorists to reject the behavior gambit. Monistic physicalist ontological frameworks for understanding the mind, mental properties, and mental processes must include more than mere overt behaviors and their probabilistic associations. By the later 1950s and early 1960s theorists actively seek to develop alternative monistic physicalistic ontological frameworks for philosophy and psychology.

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| <p>Gillbert Ryle (1900-1976)</p> | <p>Carl Gustav Hempel (1905-1997)</p> |
| <p style="text-align: center;">The Basic Reductionist Picture of The Logical Empiricists</p> <p style="text-align: center;">Exceptionless Universal Law Formulated in a Reduced Science</p> $ \begin{array}{ccc} S_1 & \xrightarrow{\quad} & S_2 \\ \updownarrow & & \updownarrow \\ P_1 & \xrightarrow{\quad} & P_2 \\ \text{Exceptionless Universal Law Formulated in a Reducing Science} \end{array} $ |  |
| <p>Diagram depicting the general picture of inter-theoretic reduction imagined by the logical empiricists. Terms in the theory at the higher level are reduced (ideally) analytically to terms in the reducing theory. Exceptionless universal laws in the higher reduced theory thereby become subsumed by the laws in the lower reducing theory.</p> | <p>Diagram depicting the sort of inter-theoretic structure proposed by the logical empiricists. Higher, less basic sciences like sociology eventually reduce to successively lower sciences until all sciences ultimately find reduction into physics, which itself then cashes out the meanings of its terms in an ontologically neutral observation language.</p> |
|  |  |
| <p>Roderick Chisholm (1916-1999)</p> | <p>Hilary Putnam (1926-)</p> |

Identity Theories: Type-Type Identity

Theorists often call the successor to logical behaviorism **type-type reductionism** or **type-type identity theory**. Type-type reductionism proposes to identify types of mental entities, mental properties, and mental processes, e.x., pain, with specific types of physical entities, physical properties, and physical processes, e.x., stimulated c-fibers. Historians generally credit the British philosopher and psychologist U.T. Place (1924-2000) and the Austrian philosopher Herbert Feigl (1902-1988) as the source of the modern identity version of type-type physicalism. Place's colleague, J.J.C. Smart (1920-) also adopts this position. The identity theorists' motivations stem in large part from (and build upon) the difficulties with logical behaviorism. For instance, Place tells readers,[81]

The view that there exists a separate class of events, mental events, which cannot be described in terms of the concepts employed by the physical sciences no longer, commands the universal and unquestioning acceptance amongst philosophers and psychologists which it once did. Modern physicalism, however, unlike the materialism of the seventeenth and eighteenth centuries, is behaviouristic. Consciousness on this view is either a special type of behaviour, 'sampling' or 'running-back-and-forth' behaviour as Tolman (1932, p. 206) has it, or a disposition to behave in a certain way, an itch for example being a temporary propensity to scratch. In the case of cognitive concepts like 'knowing', 'believing', 'understanding', 'remembering' and volitional concepts like 'wanting' and 'intending', there can be little doubt, I think, that an analysis in terms of dispositions to behave (Wittgenstein, 1953; Ryle, 1949) is fundamentally sound. On the other hand, there would seem to be an intractable residue of concepts clustering around the notions of consciousness, experience, sensation and mental imagery, where some sort of inner process story is unavoidable (Place, 1954). It is possible, of course, that a satisfactory behaviouristic account of this conceptual residuum will ultimately be found. For our present purposes, however, I shall assume that this cannot be done and that statements about pains and twinges, about how things look, sound and feel, about things dreamed of or pictured in the mind's eye, are statements referring to events and processes which are in some sense private or internal to the individual of whom they are predicated. (p.44)

Two central ideas define type-type identity: **First**, Place and Feigl hold that behavioristic and identity analyses of mental terms do not exhaust the meaning of mental terms in ordinary language. That is, the new definitions of mental terms are not analytic--they do not capture the individually necessary and jointly sufficient conditions thought to dictate the meanings of ordinary terms. Place and Feigl hold that mental and physical terms pick out classes or kinds of things in virtue of their meanings, and that a significant part of the meaning of ordinary mental terms (as well as of the identity theorists' new analyses of those terms) is synthetic--i.e., going beyond the definitional meaning, usually as a result of experience. Specifically, type-type reductionists hold that the various behavioral associations between mental terms and physical/bodily terms serve to provide an initial description of a physical (brain) state. One can modify the initial behavioral descriptions, to the extent necessary, as a result of experience. Such descriptions ultimately determine the physical state that corresponds to the mental state. The identification of the physical state with the mental state constitutes a synthetic discovery. **Synthetic truths** or discoveries differ from analytical truths or discoveries in that analytical truths follow from the meaning of the terms involved. **Analytic truths** are statements that are true in virtue of the meaning of the constitutive terms and/or logical structure. Denying an analytic statement therefore results in a contradiction. For example, "All triangles are three-sided

planar figures," is an analytic statement, so is "A square is a four-sided, regular planar figure." Likewise, "It's false that all unmarried human males are bachelors" is a contradiction, since by definition bachelors are unmarried men. Analytic statements are said to be true by definition and/or their logical structure. In contrast, synthetic truths do not follow merely from the meaning of the terms involved. Someone can negate a synthetic statement without a contradiction. For example, one can assert the negation of the statement that "Long Beach has a population of 360,000 people," without a contradiction. "It's false that Long Beach has a population of 360,000 people." is not a contradiction. For this reason, discovering the population of Long Beach is a synthetic discovery.

The synthetic nature of the discovery that brain states and processes prove identical to mental states and processes allows type-type theorists to side-step many of the objections raised by dualists. Place tells readers,

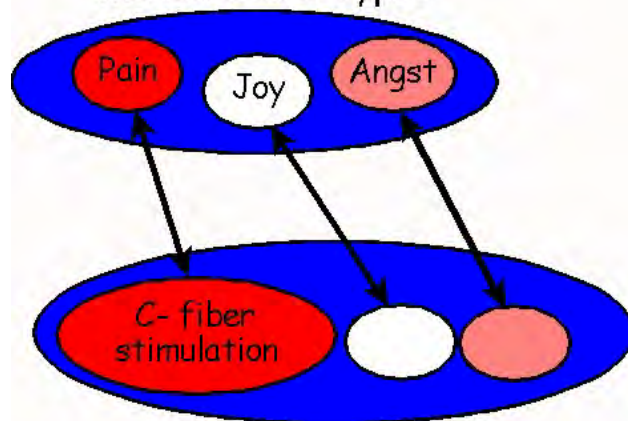
To say that statements about consciousness are statements about brain processes is manifestly false. This is shown (a) by the fact that you can describe your sensations and mental imagery without knowing anything about your brain processes or even that such things exist, (b) by the fact that statements about one's consciousness and statements about one's brain processes are verified in entirely different ways and (c) by the fact that there is nothing self-contradictory about the statement, X has a pain but there is nothing going on in his brain'. (p.45)

In other words, mental terms and physical terms share the same referent, but not the same meaning. Philosophers refer to terms that have the same referent, but which do not have the same meaning as referentially opaque. Recall, two terms are referentially opaque if they refer to the same object or property, but they cannot be substituted *salva veritate* (i.e. without changing the truth value of the statement). For example, people in northern latitudes can watch the northern lights (aurora borealis) regularly. They may proclaim that they see the northern lights or that the northern lights are beautiful. However, most would not say that they are watching the photonic discharge resulting from ionized nitrogen atoms regaining an electron and nitrogen and oxygen atoms returning to a grounded state from an excited state after collisions with charged particles (solar winds) traveling along the magnetic field lines of the Earth's magnetosphere. Nor would most observers likely say that the photonic discharge is beautiful. The difference, according to Place, between saying that the northern lights are photonic discharge and saying that the northern lights are beautiful is a logical feature:[81]

This logical feature may be described by saying that in both cases both the grammatical subject and the grammatical predicate are expressions which provide an adequate characterization of the state of affairs to which they both refer. (p.45)

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|  |  |  |
| Herbert Feigl (1902-1988) | U.T. Place (1924-2000) | John Jamieson Carswell "Jack" Smart (1920-) |

Mental State Types



Physical State Types

Diagram depicting Type-Type Identity Theory. Type-type theorists claim that there is only physical substance. Mental properties exist, but are type-identical to types of physical properties. Theorists discover the identity using the physical and behavioral associations between mental and physical terms to identify the physical state type corresponding to the mental state type.



(Right) Several pictures depicting the beautiful photonic discharge resulting from ionized nitrogen regaining atoms electron and nitrogen and oxygen atoms returning to a grounded state from an excited state resulting from their collisions with charged particles (solar winds) traveling along the magnetic field lines of the Earth's magnetosphere. Er, the beauty of the northern lights (aurora borealis). From: http://en.wikipedia.org/wiki/File:Aurora_Borealis_Poster.jpg

(Below) A movie of the sudden large-scale discharge of electrons between bodies of suspended liquid and frozen crystals measuring no more than a few tens of microns and having a negligible fall velocity, i.e., a lightning discharge between clouds. Click to play.



Feigl expresses a similar point by telling readers that:[82]

The identity thesis which I wish to clarify and to defend asserts that the states of direct experience which conscious human beings "live through," and those which we confidently ascribe to some of the higher animals, are identical with certain (presumably configurational) aspects of the neural processes in those organisms. ...we may say, what is *had-in-experience*, and (in the case of human beings) knowable by acquaintance, is identical with the object of knowledge by description provided first by molar behavior theory and this is in turn identical with what the science of neurophysiology describes (or, rather, will describe when sufficient progress has been achieved) as processes in the central nervous system, perhaps especially in the cerebral cortex. In its basic core this is the "double knowledge" theory held by many modern monistic critical realists. ... The "mental" states or events (in the sense of raw feels) are the referents (the denotata) of the phenomenal terms of the language of introspection, as well as of certain terms of the neuro-physiological language. For this reason I have in previous publications called my view a "double-language theory." But, as I have explained above, this way of phrasing it is possibly misleading in that it suggests a purely analytic (logical) translatability between the statements in the two languages. It may therefore be wiser to speak instead of *twofold access* or *double knowledge*. The identification, I have emphasized, is to be empirically justified, and hence there can be no logical equivalence between the concepts (or statements) in the two languages. (Section E ¶4 and 5)

Place and Feigl, then, have two lines of argument for their identity theory. On the one hand, they argue that traditional dualist arguments like the argument from Leibniz's Law and the argument from introspection do not apply to the identities they advocate. Call these the **inapplicability arguments**. On the other hand, they present an argument from analogy with other historical examples of scientific reduction. Call these the **reductive analogy arguments**. Object color is really surface reflectance. Heat is mean kinetic energy. Sound is compression waves traveling through the atmosphere and pitch is just the oscillatory frequency of those waves. Lightening is just the sudden large-scale discharge of electrons between clouds. Feigl tells readers that:[82]

...the advance of scientific theories consists essentially in the reduction of a variety of originally heterogeneous observable facts and regularities to a unitary set of explanatory concepts and postulates. Customarily it is said, for example, that visible light is electromagnetic radiation (within a certain interval of wave lengths); that table salt is NaCl; that magnetized iron is an aggregate of iron atoms with a characteristic spin of certain of their electrons; that the transmitters of hereditary traits are the genes in the chromosomes of the germ cells; that (at least) short range memory traces are reverberating circuits in cerebral cell assemblies, etc. The "is" and the "are" in these sentences represent identities. But these identities differ in their mode of certification from the analytic identities of pure logic and mathematics.the identities

established in the factual sciences are confirmed on the basis of empirical evidence. ...
...there are also such empirically ascertainable identities as those of Tully and Cicero, of William Thompson and Lord Kelvin, or of the evening star and the morning star. In the examples just given we have (extensional) identities of individuals labeled or uniquely described in two or more ways. (Section D, ¶2 &3)

Identity Theories: Token-Token Identity

In 1970, Donald Davidson (1917-2003) proposes a new version of identity physicalism. Davidson starts his chapter, "[Mental Events](#),"[83, 84] by stating his motivation for the view,

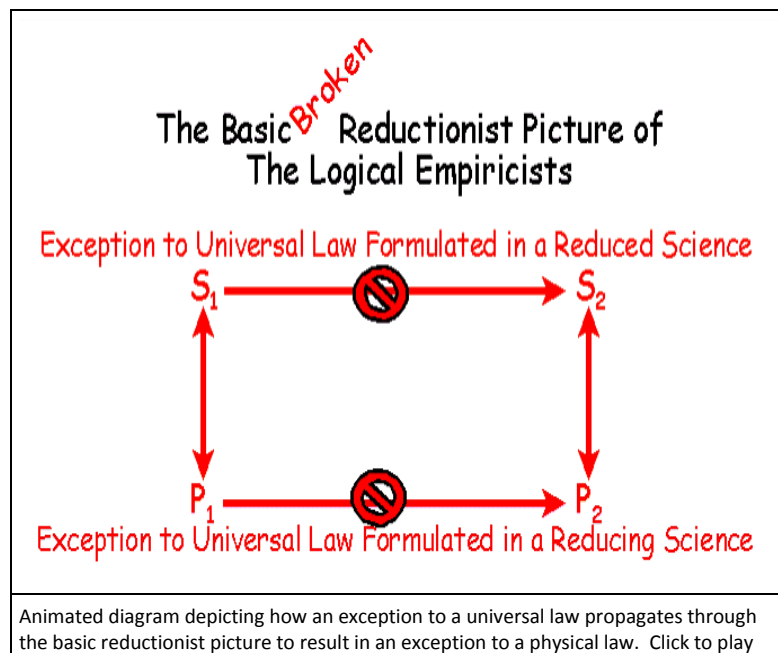
Mental events such as perceivings, rememberings, decisions, and actions resist capture in the nomological net of physical theory. I start from the assumption that both the causal dependence and the anomalousness of mental events are undeniable facts. My aim is therefore to explain, in the face of apparent difficulties, how this can be. (p.138)

By **nomological** Davidson simply means law-like, and by **anomalousness** Davidson means not falling under exceptionless universal laws. Davidson thinks that the failure to find the simple type-type identifications theorists like Smart, Place, and Fiegl suggest and the failure of psychology and sociology to generate universal exceptionless laws warrants a reconsideration of the type-type identity theory. In the quote above, Davidson tells readers that he takes the anomalousness of the mental as an undeniable fact.

The anomalousness of the mental presents a problem for Davidson because he accepts both the monistic physicalistic framework and the basic logical empiricist picture of laws and reduction in science. That is, Davidson holds that the dramatic success of sciences like physics proves the mechanistic and deterministic nature of the physical world as one describes it using the physical conceptual scheme. Specifically, scientists formulate laws using exclusively physicalistic descriptions. These physicalistic descriptions represent a conceptual scheme for describing the world. This conceptual scheme has proven itself capable of describing the world so that the sciences produce finite, exceptionless universal laws. Indeed, the collection of such laws forms a closed, complete deductive system. That is, given a complete physicalistic description of some state of the world, called a physical event, scientists can, at least in principle, deduce how the world will unfold by deducing the resulting physical event, i.e., the exclusively physicalistic description of the world resulting from the prior event.

This view of physical laws looks like the bottom of the diagram (below, left) for the reductionist view of science. However, what happens to the picture if the mental has exceptions to its laws? If one supposes that physical laws and bridge laws between the mental terms and the

physical terms are exceptionless and universal, then an exception to a psychological law between S_1 and S_2 is an exception to the physical law between P_1 and P_2 . That is, all members of S_1 are members of P_1 and all members of S_2 are members of P_2 . Thus, the exception to the



psychological law between a token (member) of S_1 and token (member) of S_2 is also an exception to the physical law. The exceptionless bridge laws mean that the token (member) of S_1 is also a token (member) of P_1 and token (member) of S_2 is also a token member of P_2 . Thus, P_1 and P_2 violate the physical law just as S_1 and S_2 violate the psychological law.

Davidson's paper is famous for arguing that the anomalousness of

the mental proves consistent with a certain sort of physicalism. However, many people think that Davidson offers no reason to accept the anomalousness of the mental. In fact, Davidson does offer a reason for the anomalousness of the mental. Mental terms, like physical terms, form a conceptual scheme. Unfortunately, the conceptual scheme for the mental differs from the conceptual scheme for the physical. Davidson holds that the physical conceptual scheme has as its exclusive purpose conceptualization of the physical world for the purpose of formulating and testing physical laws. In contrast, the primary purpose of the mental conceptual scheme consists in making attributions of mental terms so as to provide one with an understanding of other people. Specifically, Davidson argues that in order to understand the actions, beliefs, desires, etc. of a person one must understand the person as a rational agent. In other words, in so far as one cannot see the actions, thoughts, etc. of an individual as rational one cannot understand them. That is, the actions of the individual make no sense in the mental conceptual scheme if one cannot understand that person as acting in accordance with one's own standards of reasonableness. This emphasis on rational understanding can, and Davidson suggests does, often trump ascriptions that would support universal and exceptionless laws in psychology. Davidson feels that one can use psychological generalizations to explain and predict by relating mental events, i.e., descriptions of some state of the world using exclusively mentalistic terms. However, mental events, events one describes using mental terms, do not

lend themselves to the expression of exceptionless universal mental laws because the mental conceptual scheme works to maximize one's ability to understand others, even if such understanding violates psychological laws. Hence, psychological laws, as mere heuristic generalizations, do not form a closed, complete deductive system.

But how can one avoid the seeming dire consequences of an anomalous mental realm? Specifically, Davidson wants to preserve three principles:[83]


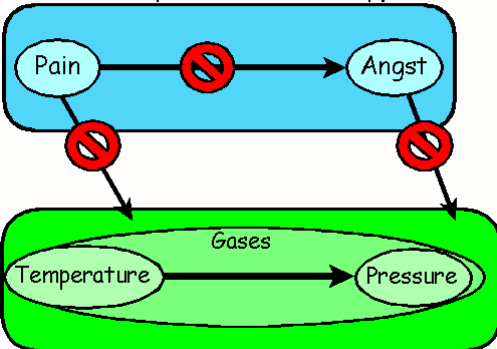
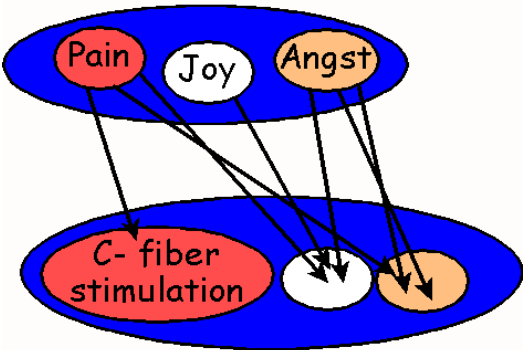
- (1) Causal interaction occurs between the mental and the physical. (pp.137-138)
- (2) If causal interaction occurs, then strict deterministic laws (universal and exceptionless) govern that interaction. Davidson refers to this property as "the Principle of the Nomological Character of Causality." (p.138)
- (3) "The third principle is that there are no strict deterministic laws on the basis of which mental events can be predicted and explained (the Anomalism of the Mental)." (p.138)

How does Davidson solve his difficulty of rendering these principles consistent? The answer lies in his notion of the two conceptual schemes. Davidson holds that since the mental and physical conceptual schemes differ in their goals, no possible reduction of mental terms to physical terms exists. In other words, Davidson denies the possibility of exceptionless universal "bridge-laws"--laws relating mental descriptions of states of the world (mental events) to physical descriptions of states of the world (physical events). Though the argument seems complex, it's actually pretty straightforward. Physical laws are universal and exceptionless. Mental laws are neither universal nor exceptionless. But, if there were universal and exceptionless laws linking mental and physical events, then they would provide a basis for universal exceptionless mental laws. Hence, there can be no universal and exceptionless bridge laws.

What about the causation between the mental and the physical (principle 1) and the strict deterministic nature of all such causation (principle 2)? Easy, says Davidson; mental events are just descriptions of the world using the mental conceptual scheme. Every mental event is just an event described using mental terms. But one can also describe that event using physical terms from the physical conceptual scheme. Thus, every token of a mental event is also a token of a physical event. The physical and mental descriptions might only hold for that token event, or the descriptions may prove more general. However, mental types do not reduce to physical types. So, some tokens of a particular type of mental event, call it M_1 , will have token physical descriptions from different physical types than other tokens of mental events from that type, .i.e. M_1 . Thus, despite the lack of mental-type to physical-

type reduction, one can understand how token mental events are identical to token physical events—they are just different descriptions of the same event.

Moreover, since every token of a mental event has a physical event description, token mental events can causally interact with token physical events in a strict deterministic manner—the manner dictated by the strict deterministic law relating their physical event descriptions. Since physical event descriptions yield finite, exceptionless universal laws that combine to form a closed deductive system, all tokens of mental causal interaction with the physical fall under strict deterministic laws—just not laws using mental terms.

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|  | <p>(Below) Two diagrams of the relationships in Davidson's anomalous monism or token-token identity theory. Individual mental event tokens are identical to some or other particular physical event token. However, under their mental and physical conceptual scheme type descriptions the association might seem somewhat random. (Bottom right). However, anomalous monists deny that mental event types (kinds) are identical to physical event types (kinds). Instead, any individual token mental event—an event one describes using the mental conceptual scheme—is also a token physical event—an event one describes using the physical conceptual scheme. The physical conceptual scheme of science describes all events and specifies the universal exceptionless laws of science's closed, deductive system. However, the mental conceptual scheme does not describe events in manner conducive to the formulation of universal exceptionless psychological laws. As a result one finds no exceptionless universal bridge laws relating mental terms to physical terms. (Bottom left)</p> |
| <p>Donald Herbert Davidson (1917–2003)</p> | <div style="display: flex; justify-content: space-around;"> <div data-bbox="181 993 695 1472"> <p>Mental Events: Descriptions Using Exclusively Mental State Types</p>  <p>Physical Events: Descriptions Using Exclusively Physical State Types</p> </div> <div data-bbox="699 993 1451 1472"> <p>Mental State Types</p>  <p>Physical State Types</p> </div> </div> |

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