MODULE 2: The Prehistory of Cognitive Science

MODULE OVERVIEW

The concept of mind has historical origins that predate all of the scientific disciplines that study the mind. Cognitive Science inherits its concept of mind from philosophical work dating all the way back to ancient Greece. In this module, we will look at Plato's theory of the mind, and his theory of cognitive ontology. We will then examine a competing theory of mind from his student, Aristotle. Lastly, we will examine the work of René Descartes, a 17th century mathematician, mechanical scientist, and philosopher.

LEARNING OUTCOMES

By the end of this unit, you should be able to:

- Explain what we mean by "cognitive ontology".
- Start to recognize the difference between questions about mental activity and mental objects.
- Be able to critically assess Plato's Imperfection Argument as an argument for what we now call "concept innatism" in Cognitive Science.
- Explain the benefits of Aristotle's biopsychological framework, and how it might anticipate current research in cognitive science.
- Make connections between Descartes' representational theory of the mind and the Computational-Representational Theory of Mind (CRTM).

MATERIALS

A. READINGS
Aristotle, excerpt from *De Anima*
Descartes, Meditation II from *Meditations on First Philosophy*
Plato, excerpt from *The Phaedo*

LESSONS

Introduction: Origins of the Concept of Mind
Plato's Cognitive Ontology
Aristotle Naturalizes the Mind
Descartes and the "Way of Ideas"

STUDY QUESTIONS

1. What is Plato's Imperfection Argument? Can you think of a criticism of the argument?
2. While Aristotle thinks that forms exist, how does he disagree with Plato on this topic?

3. Why does Descartes think we cannot know the wax remains the same piece of wax using sense-perception or imagination?
4. Do you agree more with Aristotle's theory that all living things have minds, or Descartes theory that only rational human beings have minds?

KEY TERMS (SEE GLOSSARY FOR DEFINITIONS)

Analytic geometry; anatomy; animal soul (perceptual soul); arguments; biological taxonomy; bio-psychology; Cambridge Platonists; Cartesian coordinate system; causation, Aristotle (material, formal, efficient, final); cognitive ontology; Cognitive Revolution; compound substance; concepts; concept innatism; concept nativism; conclusion; corpuscles (corpuscularian mechanics); counter-examples; deductive soundness; deductive validity; dialectic; dialogue; Dream Argument; epistemic foundations; the Forms; Euclid's axiomatization of geometry; hylomorphism (hylomorphic union); idea (the Way of Ideas); imagination; Imperfection Argument; inconsistency; indirect representations; information theory; intellectual soul; Language Faculty; matter; methodological scepticism; mind/body distinction; motion; Ockham's Razor; ontology; physiology of perception; phenomenology; Platonic dualism; posits/positing; premise; Ptolemaic World System; rationalism; rhetoric; Scientific Revolution; sense/sensation; sense-perception; substance dualism; substance/mode distinction; vegetative soul (nutritive soul); Wax Argument

MODULE 2, LESSON A: ORIGINS OF THE CONCEPT OF MIND

INTRODUCTION

This module will look closely at two important historical predecessors of our modern conception of the mind. The first has its moment in 4th century BCE Greece. We will be especially concerned with the philosophical work of Plato and Aristotle. Plato provides us with our first theory of the mind as soul, and with a theory of cognitive ontology: those mental objects or mental faculties that must exist if we are to explain our wide-ranging cognitive abilities. For Plato, the mind is closely related to the soul; when the body dies, this soul, which is eternal, returns to a heavenly realm of pure Forms, to which it has direct cognitive access. While this story about migrating souls and a heavenly realm of pure concepts (forms) sounds bizarre, the picture of the mind Plato gives us has many analogues in current Cognitive Science. In fact, there are more than a few self-described Platonists in Cognitive Science—to the surprise of most students just entering the field.

Plato's student Aristotle gives us a competing conception of the mind. Aristotle cared much less about what sort of thing the mind was, though he also thought of the mind as constituting at least part of our soul. However, his view of the soul is very different from Plato's. For Aristotle, you are not a soul stuck in a body waiting to be free to return back to heaven upon your death. You are an essential mixture of material and soul—soul giving form to the material stuff out of which your body is made. When the body dies, the soul does not persist. We call this "hylomorphism" from the Greek word "hylas" (meaning "matter"), and "morphē" (meaning form). The mind is more a principle of organization than a thing, and Aristotle sees it as a set of abilities—only some of which are intellectual in nature. This offers Aristotle a way of naturalizing the mind within a proto-biological theory—something that has once again become popular in the last 50 years or so in the sciences.

The second moment in our admittedly selective pre-history of Cognitive Science finds us visiting the 17th century CE: ground-zero for the Scientific Revolution. We will pay especially close attention to the philosopher René Descartes' theory of the mind. Modern Cognitive Science inherits a great deal of its concept of the mind from Descartes and his contemporaries. In fact, Noam Chomsky has remarked that what we have been calling the "Cognitive Revolution" of the 1950s and 60s should really be dubbed the "Second Cognitive Revolution". The "First Cognitive Revolution" occurred as a part of the Scientific Revolution. Descartes and other scientists from that period contributed as much to a re-thinking of the mind as they did to the re-thinking of the material world.

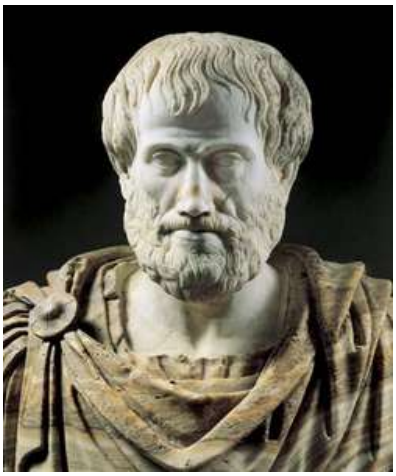
In the philosophical ideas of Plato, Aristotle, and Descartes we find analogues for much of contemporary Cognitive Science. This is only surprising if one is under a misconception regarding the nature of philosophy. We tend to think of philosophy as a discipline quite distinct from the sciences. In actuality, Plato, Aristotle, and

Descartes would have thought their forms of inquiry paradigmatically scientific. And, as we shall see, some of their ideas translate into the modern scientific conception of the mind. In this lesson, we will examine their ideas in very broad outline, and leave a more thorough exploration of their arguments for their positions for the other lessons in this module.

One point of this module is to show you that philosophical modes of inquiry often lead to important scientific ideas. Another point is to show how some of these modes of inquiry can still play a role within science itself—so that philosophy is seen as contiguous with (and part of) Cognitive Science. (We have already seen an argument regarding the indispensability of philosophy for Cognitive Science in the Thagard piece from Module 1.) But a further significant point will be made in this module: that philosophical and scientific ideas are often hard to parse, especially when we are dealing with general matters of a theoretical sort. Related to this final point is a historical truth: that many of those we take to be *mere philosophers* have actually made a number of scientific contributions. In fact, Cognitive Science is built on some of these contributions.

PLATO AND ARISTOTLE—ANCIENT SCIENCE AND THE MIND

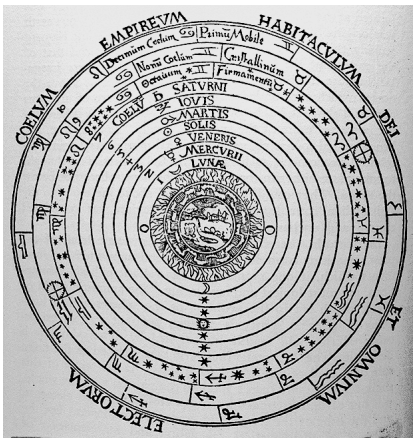
The ancient world was a complicated place, filled with trade (by sea and by ground) from Asia minor (and beyond) in the East, to the shores of Southern Europe and North Africa in the West. This meant not only that goods moved relatively freely between places. Ideas also moved just as freely. And Ancient Greece, especially the city-state of Athens, was a key meeting place for ancient science and philosophy. It should come as no surprise, then, that Plato wrote in dialogue format. The image of Socrates meeting with visiting luminaries (not just the people of Athens) is one that would have been familiar to his pupil Plato. In a way, we can see Plato trying to offer a curated record of the intellectual congress that was popular at the time.



What kinds of scientific advancements were made by Plato and Aristotle? Let's start with Aristotle, and then work back to Plato.

Most (if not all) historians of science regard Aristotle's taxonomical system in biology as the first such system, initiating a scientific study of all forms of living things. This system would be modified by many working within a broadly Aristotelian framework, and not

entirely replaced until Darwin's work in the 19th century. Aristotle also gives us a working physical theory that was advanced and applied by the most impressive scientific minds of the Greek, Roman, and Islamic worlds. The astronomer Ptolemy even turned Aristotle's geocentric conception of the world system into a mathematical model capable of making very accurate predictions, and allowing for stellar navigation. This picture of the natural world survived until it was replaced by new astronomical and physical theories in the 16th and 17th centuries. We call this the Ptolemaic World System, but we could even more aptly refer to it as the Aristotelian system. Here is a picture of the Ptolemaic World System



Arisotle's value to the sciences is fairly clear, even if we have come to significantly modify or reject many of his key ideas. His influence on Western intellectual thought is indelible. Plato is much harder to pin down. He rejected empirical science as a kind of confusion, instead focussing his attention to our conceptual knowledge. However, this does not mean he was anti-science. He just thought that all science was ultimately formal science. His contributions to the history of science come mostly by way of the role he played in propagating a mathematical conception of nature, and how we think of the use of idealizations in science. (Aristotle also made contributions to formal science; his codification of logic as part of his theory of argumentation and rhetoric survived as the only viable system of logic until the 19th century.) Plato has long been highly regarded by some mathematicians—even up to this day. Plato's ideas about our knowledge of a perfect formal reality lying behind the imperfect material world was inspirational for Euclid's axiomatization of geometry around 300 BCE, but also very influential on the development of mathematical physics in the 17th century. Historians of science often point to the intellectual influence of Cambridge Platonists like Ralph Cudworth and Henry More on a younger Isaac Newton at Cambridge.

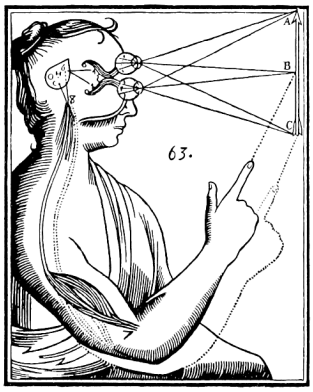
Plato's focus on the formal aspects of our cognitive abilities also makes him the grandfather of a certain school of thought regarding concept acquisition and concept application. Contemporary concept innatists and concept nativists draw much on

Plato's account of our conceptual knowledge. Plato's position is still integral to contemporary concept nativism and concept innatism in debates about concepts, as we shall see in later modules in this course; we will have much to say about how Platonic ideas are still alive and well in the interdisciplinary study of mind.

DESCARTES AND THE SCIENTIFIC REVOLUTION

When we try to place Descartes within the Scientific Revolution of the 17th century, things get rather complicated. Descartes was an ardent defender of corpuscularian mechanics—which was the first recognizably modern form of physical atomism—and he was responsible for much groundbreaking work in anatomy (especially as regards the nervous system) and the physiology of perception (especially vision). He was also responsible for many important advances in mathematics, not least of which is the Cartesian coordinate system. In this system, we can measure the position of any point using two numbers: one corresponding to the particle's position on the x-axis, and one corresponding to the particle's position on the y-axis of the Euclidean plain. This might seem like a simple contrivance, but it is the basis for analytic geometry. Using this system, one can take any possible construct on the Euclidean plain, say a triangle, and represent it using an algebraic formula.

So why is it difficult to fix Descartes place within the pantheon of great revolutionary scientists? It actually has much to do with his theory of mind in relation to his theory of he physical realm. As far as his physics was concerned, Descartes was a strict mechanist. 17th century mechanists thought that all descriptions (including law-like descriptions) and explanations of natural phenomena could be spelled out in terms of matter and motion. With these two concepts, we can talk about a world of material bits aggregating in various ways to form the things we can see, touch, hear, smell, and taste. Even complicated processes, like visual perception, could be explained this way. Tiny bits of matter (i.e. the corpuscles) aggregate to form material objects. In the picture below (from Descartes 1644 book, *Principles of Philosophy*), the representative object is an arrow, but any material object will do. We may not yet possess the exact laws regarding how these objects form, but Descartes and other mechanists, like Galileo Galilei, Thomas Hobbes, and Robert Boyle were committed to the existence of such laws, and optimistic about their discovery.



When we look at material objects like the arrow, tiny particles of light reflecting off the object take straight paths to the eye, where they excite the matter in the eye.

This in turn starts a mechanical interaction of tiny vibrations through the nervous system. Ultimately, these tiny motions cause a mechanical interaction in the brain, leading to a sensation.

So far, so good; the picture looks not just scientific, but very much like the sort of account that we would provide using modern theories about the physiology of perception. This is because we inherited our picture largely from Descartes and his contemporaries!

But the problem for Descartes comes when we think of how these vibrations lead to an idea in the mind. The term "idea" is a technical one for Descartes and many other philosophers in the 17th and 18th centuries. It was actually introduced into philosophical parlance by Galileo. We don't use the word "idea" in this technical sense any more; we now call contents of this sort "representations", which are either percepts or concepts. How can physical events in the world (including the physical events in my perceptual apparatus) ever give rise to ideas before the mind? As we shall see, Descartes thinks minds and bodies are different kinds of things—in fact, very different kinds of things. Bodies are defined by their extension in space—by the fact that they can be located on, and measured by, a Cartesian co-ordinate system. Material objects differ only in their constitution, their shape, and their solidity. Minds, on the other hand, are defined by their activity. They are thinking things. Descartes took this to be a substantial difference. Body and Mind are different kinds of thing altogether, different substances!

For Descartes, substance is a metaphysical category. Anything that doesn't rely on something else for its existence is a substance. The other Cartesian metaphysical category is mode. We wouldn't use that term anymore; we would say "property" or "quality" or "attribute". Put together, the picture is fairly intuitive. My shirt is a substance (an extended substance). It relies on no other substance for its existence—it is self-subsistent. It is also red. Redness is a *mode*. Redness can't exist on its own. It needs to be the property of a material thing—i.e., an extended substance—if it is going to exist at all.

The keen amongst you might be thinking, "Then mind is a mode of material substance, since minds can't exist separable from bodies." Descartes disagrees. We will see how he argues for his substance dualism: the theory that mind (or soul) is a different substance from the body, and that it is separable from the body (at least in principle). For now, we need merely note that Descartes *does indeed* think the mind (soul) is separable from the body. And, because it is not a material substance (extended in space-time), it is not something amenable to scientific study. (Recall that Descartes thinks that the only real material science is mechanics, and it will only countenance matter and motion—not mental stuff.)

So Descartes was an eminent scientist, and he gave us the modern theory of the mind as a representational medium. The representational theory of mind we are exploring in this course can be traced back to Descartes for just this reason. But he

thought there could be no science of the mind (as we think of science) because for him there could be no mechanics of the mind. As a practicing Catholic who wished to do scientific work under the watchful eye of the Inquisition, which had already condemned Galileo to house-arrest for professing similar ideas, Descartes was more than happy to have hit upon a metaphysics that would allow for the material world to be studied using the new mechanical science and free from church authority. Since mechanics just studied mindless matter, the Church had nothing to fear about its growing prominence in European intellectual circles. The Church was left with dominion over the soul—to which science had no claim, because it was not an extended substance.

The picture looks nice and tidy, and no doubt it helped keep Descartes safe from the Inquisition; but the side effect of this move in his metaphysics is that the mind is not amenable to scientific study. It is only available to us through introspection. While each of us has important access to one mind (namely one's own mind), mind as such cannot be an object of intersubjective, empirical study. So what we want to do is see how Descartes thought of the mind as a representational medium, but divorce this useful theory of the mind from a troubling metaphysical dualism. But first, we need to see what the theory of mind is in more detail. We will do that in Lesson D of this module. Before we get there, however, it will be useful to spend some quality time with Plato and Aristotle.

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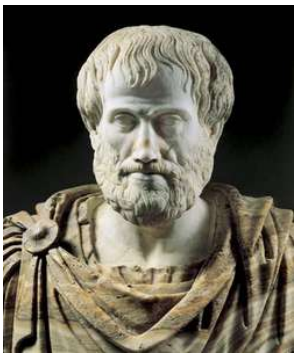

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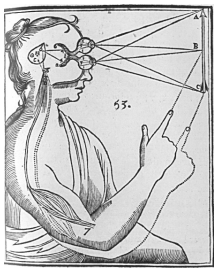

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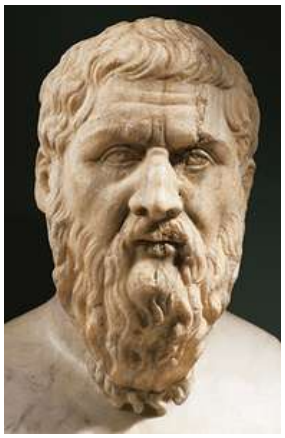
MODULE 2, LESSON B: PLATO'S COGNITIVE ONTOLOGY

INTRODUCTION—SOME REMARKS ON PLATO AND ONTOLOGY

As we saw in Lesson A of this module, the concept of mind finds its origins in the ancient Greek world. Much scholarship from that period has been lost. Fortunately, the work of key figures was sufficiently copied and interpreted at various schools of learning and libraries throughout the ancient and medieval world. In the case of Plato and Aristotle (whose work we will address in Lesson C), much of the copying, editing, and interpreting of these ideas was done by medieval Islamic scholars during the Islamic Golden Age (8th century to 14th century), only to be "re-discovered" by the West when some of these documents were brought back as a result of the crusades and, after the crusades, expanded trade with the Middle East and Asia.



Why is Plato's work so important? At least part of its importance comes from the fact that we take Plato as the first authoritative voice on several issues. For our purposes, he was the first to talk about the mind in a systematic way—hoping to explain our surprising ability to make judgments (statements or thoughts that can be true or false) about the world around us. He gives us the first concept of mind outside of a purely religious context. This isn't to say that Plato isn't under the sway of religious ideas when he talks about the mind. For him, the notion is so intimately attached to that of the soul that the religious affiliations are obvious to even the most casual reader. But Plato was trying to give a philosophical argument for his position, and was positing the mind (or soul) to make sense of certain of our cognitive abilities. That is what makes it the first really scientific account of the mind.

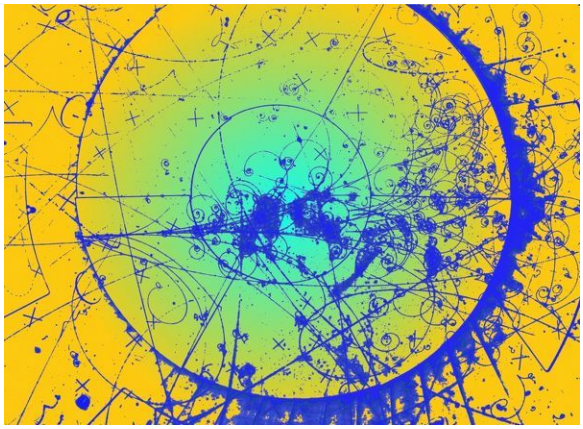
Plato is also important for contemporary Cognitive Science because he lays out a particular kind of methodology that still gets employed by philosophers and others whenever we want to discuss hidden or theoretical entities. Because so much mental function is opaque to the usual forms of scientific inquiry, we are often in much the same methodological waters as was Plato. How do we study something that we cannot easily observe? As in all theoretical domains, we must be careful to produce consistent theories about the mind, and then apply them based on their explanatory power. When engaging in this kind of theorizing, we should always be guided by two methodological principles, here expressed as questions.

1. Do our theoretical posits succeed in explaining what we *can* experience?
2. Are they necessary to generate these explanations, or have we gone a step too far with unnecessary positing?

For example, we have lots of observations of linguistic and bodily behaviour. We also have at least some access to our own minds and mental processes. If we can explain all of these behavioural and auto-psychological phenomena by inferring the existence of certain unobservable entities, then we have reason to believe that these unobservable entities exist. Of course, lots of posits could help us explain the phenomena, so we should be careful not to accept just any explanatory framework. In theoretical discussions, a "posit" is a process or entity that is taken to exist on the basis of its ability to explain observed phenomena, despite not being directly

observable itself. The verb "to posit" means to stipulate or assume such processes or entities in a given theoretical context. We should, at the very least, follow the medieval philosopher William of Ockham's dictum of simplicity, often called "Ockham's Razor": to prefer theories that involve fewer, rather than more, assumptions and theoretical posits in explaining the phenomena one is setting out to explain.

On first blush, inferring the existence of theoretical entities might seem unscientific, but there is precedence for such posits in the history of science and even contemporary scientific practice. For example, even though we can't observe subatomic particles, we can still infer their existence given what we *can* observe. When I see a streak in bubble or a cloud chamber (a.k.a. a Wilson Chamber), I infer the existence of an electrically charged particle—a theoretical entity that is part of my atomic theory. The particle is something I cannot see, but my theory offers a unified explanatory framework for what I can see; this framework is (1) indispensible for such explanations, and (2) the simplest framework that is consistent with other theories explaining other phenomena we take to be systematically related to atomic phenomena. Since both of our conditions have been met, the theoretical positing of subatomic particles is wholly scientific. If we think of mental entities and mental processes in the same way, then we shouldn't be too embarrassed by the fact that we cannot observe these things.



Philosophers use the term **ontology** to describe what exists—usually with an eye to what is most fundamental. For example, when you adopt atomic theory in physics and chemistry, you adopt atoms (and sub-atomic particles) as part of your ontology. Current physics adopts what is called "the Standard Model" as its fundamental ontology—a model that describes all of the known elementary particles. Every science will have its own ontology, or it will borrow from the ontology of a closely related field. Does Cognitive Science have its own ontology, or borrow from the ontology of those disciplines that comprise it? Well, that's hard to say. We will address some of these issues later in the term. But, ever since the Cognitive Revolution, neuroscientists, computer scientists, linguists, and philosophers have posited theoretical entities in order to better describe and explain the world. When we posit mental faculties (e.g., capacities for mental functioning, such as the capacity for computation), or the existence of mental entities (e.g., representations, or the elements out of which they are constructed), we engage in what is called "**cognitive ontology**". Given the Computational-Representational Theory of Mind we are studying in close detail, this includes whatever mechanisms realize cognition, the mental faculties associated with cognition, and the representational states central to CRTM. So, even though we cannot measure them with some special instrument, cognitive scientists tend to agree that in order to explain, for example, our linguistic or problem solving abilities, we must posit certain structures and entities in the mind—which itself is a kind of theoretical posit.

We already saw one instance of how one might do cognitive ontology in linguistics in Module 1. We saw how Noam Chomsky posited an innate **Language Faculty** in order to explain surprising phenomena about how we acquire and use language. In this, Chomsky was following a long tradition in the study of mind going back to Plato.

PLATONIC DIALOGUE: DIALECTIC VS. RHETORIC

Plato was an ancient Athenian philosopher. He was born in either 428 or 424 BCE, and died in either 348 or 347 BCE. (Athenian record-keeping, even for aristocrats like Plato, was a bit spotty. Hence the imprecision of the dates.) He was a student of Socrates, and teacher of Aristotle and many others. He started his own school: the Academy. You can still visit the spot where Plato's Academy once stood if you go to Athens. It is now mostly park area, with some ancient ruins of the old Academy structures.

We still refer to higher-education as "the Academy" or "academia" as a result of how important this school was in Western intellectual history. This school was a busy centre for philosophical ideas from 387 BCE to 83 BCE. When we come to talk about Aristotle's important work in the study of the mind in Lesson C of this module, we should remember that his ideas were formed while he was a student at Plato's Academy for 20 years.

Plato writes in a **dialogue** format. Two or more interlocutors come in and out of conversation, addressing whatever issue seems to be on their minds. It is usually Socrates, though, who initiates the conversation. Each Platonic dialogue has a central topic. In the *Symposium*, the interlocutors are concerned with the nature of love, and the various kinds of love that might exist. In the *Meno*, the topic starts off about the nature of virtue, but quickly turns to issues regarding how we know concepts. (The *Meno* could have easily been a reading for this class!) In the *Republic,* the interlocutors discuss the nature of justice, and how to set up an ideal city-state—who should rule, how people should be educated, and how the state should defend itself. All of the dialogues have a similar structure: two or more people talking about an important concept, and how it ought to be defined. Various attempts at definition are offered and examined. They are rejected if they are susceptible to **counter-examples** (examples that fit with a proposed definition, but which nevertheless seems not to be a proper instances of the concept for which the definition is proposed), or if they lead to an **inconsistency** (by implying two or more propositions that conflict logically), or if they clearly don't apply to something to which they ought to intuitively apply. For example, I offer a definition of beauty as "proportional and symmetrical in bodily features"; you counter by saying that this definition fails to capture sunsets, abstract art, or double-plays in baseball. I remember that these things can also be beautiful, so that my definition was far too narrow. We have to go back to the drawing board with an expanded and refined proposal for what beauty is.

It should be noted that Plato's dialogues often look like arguments, with various people defending their preferred positions. However, Platonic dialogue is not aimed at *winning the argument.* It is not mere persuasion. It is dialogue aimed at truth. Plato calls this **dialectic.** Only

when all interlocutors desire to work collectively, using the machinery of argument, for the truth—for the correct or apt definition of a thing—can we say we are engaged in a philosophical enterprise like dialectic. Not all uses of argument are dialectical. The machinery of argument can be used to get you to vote for someone in politics, or to get you to buy something via advertisement, or to get a client cleared of charges in a court of law. But here, the standard is not truth, but mere persuasion. The art of persuasive speaking or writing is called **rhetoric**. Although his student Aristotle would do much to turn rhetoric into a disciplinary study, Plato was not fond of rhetoric. In another of his dialogues called *Gorgias*, Plato describes rhetoric as a "kind of flattery"—something that merely makes people feel good. In fact, in a rather dismissive moment, Plato compares rhetoric to baking!

PLATO'S *PHAEDO*

The *Phaedo* is the final dialogue Plato devoted to narrating the trial and death of his friend and teacher Socrates—the other three being the *Euthyphro, Apology,* and *Crito*. In this dialogue, Socrates dies by his own hand—carrying out the death sentence prescribed by the Athenian courts. Socrates was condemned to death for corrupting the youth of Athens, and disparaging the gods. He is given a chance to leave the city, but he rejects this opportunity. It would be wrong to turn his back on the Athenian courts and the city that raised him, protected his family, and educated his children. For Socrates (or at least Plato's *version* of Socrates) to leave and disrespect the Athenain courts and political order would be hypocritical, inconsistent, and vicious (i.e. lacking in virtue).

Phaedo (the titular character of the dialogue) was a student of Socrates' who was with Socrates when he took his own life by drinking poisonous hemlock. Also present with Socrates at his death are two Theban philosophers, Cebes and Simmias—with whom Socrates is having a conversation about death, the immortality of the soul, and the fundamental nature of reality. The *Phaedo* is actually Phaedo's recounting of these conversations to a Pythagorean philosopher named Echecrates.

The *Phaedo* contains Socrates' argument for why a true philosopher ought to welcome death, not fear it. If one reasons properly, one will see that the soul must be immortal, and death must mark the return of the soul to its heavenly home—an afterlife in which the disembodied soul enjoys true knowledge based on direct contact with the **Forms**: objects which exist outside of space and time, and also independent of any human mind, corresponding to conceptual categories of various type. These are the objects we grasp when we perceive and think correctly about the world. They are analogues to the modern notion of a **concept** in cognitive psychology and philosophy—though few psychologists or philosophers would think they exist independently of the mind in a heavenly realm!

Phaedo is relaying Socrates' arguments as to the separability of the soul from the body (a position known as **Platonic dualism**), the immortality of the soul, and the perfection of the soul and the knowledge it possesses. The soul, as Plato describes it in the dialogue, isn't identical with our concept of mind, but it is an early precursor—and Plato would likely have thought that our modern conception of the mind is at least a partial echo of his own view of the soul. In Plato's terms, whatever cognitive abilities we have are associated with the intellectual part of the soul.

Plato's position does not merely posit the existence of mental entities and transcendental objects

like the forms. What makes Plato's position interesting is that he *argues* for these posits. He is aware that others might be suspicious of the existence of the Forms and the disembodied souls that grasp them, and, as a result, he wants to offer rational support for his position. We owe much to Plato not just because of the specific arguments he musters in defense of his view of the mind, but because he did much to usher in the intellectual significance of *argument* as a tool for establishing what sorts of beliefs we should adopt. If a proposition is true, but not self-evidently so (thus differing from things like logical laws, or perhaps some elementary propositions of mathematics), then we ought to be able to offer reasons why another rational person would accept the proposition. **Arguments** are just structured bits of reasoning; our reasons for believing some proposition are offered as **premises**, and, when taken together, they support the proposition under question—i.e., they support the **conclusion** of the argument. If you produce an argument, and someone does not like the conclusion of the argument, they have only two ways of criticizing your position. They can (a) show that at least one of the essential premises of the argument is untrue or conceptually confused or incoherent, or (b) show that there is some flaw in the reasoning, so that the conclusion does not follow from the premises (even if the premises are true). Simply denying the conclusion will win you nothing.

So how does Plato argue for his positions? Here is an argument that Plato appeals to in trying to show that the soul must live on after physical death in this world. It is part, but *only* part, of his larger argument for the dualist position that the soul is separable from the body. It is called the

Argument from Opposites:

1. All things come to be from their opposites.
2. Between every pair of opposite states, there are opposite processes.
3. These processes balance each other.
4. Being alive and being dead are opposite states; coming to life and dying are opposite processes.
5. THEREFORE: Everything that dies must come back to life.

This argument can be better understood if we take a simpler example. You heat up a pot of soup. The soup moves from being cold to being hot. (It becomes hot as you heat it.) Things become hot from the opposite of hot, namely cold, and become cold from the opposite of cold, namely hot. Now, if something is hot and it becomes cold, we might say that heat has left the object, but not that heat has been annihilated. It just went somewhere else, i.e. it is no longer in the object, but it (heat) nonetheless still exists. Plato is making a similar point. If the soul is by its very definition that which brings life to the object, and the object is no longer living, then the soul has merely left the body—but it is still alive.

If you are not convinced by this argument, then that's great! It is problematic (to say the least). First of all, Plato treats all properties (states) and processes as amenable to discussion in terms of opposition. It is unclear if this is the case. Are life and death really *opposites*? Conventional wisdom has it that the opposite of down is up; the opposite of black is white. But is the opposite of life really death? How you might systematize a logic of opposition is quite unclear. (I mean, is the opposite of black really white? Shouldn't the opposite of black be some colour, since black is the privation of colour? Or, better yet, something that isn't a colour? Isn't a ham sandwich more opposite to black than is white, with which black has much in common? Alas.) You might agree intuitively with Plato, but it is hard to even offer a definition of "opposites" that will capture that

intuition. In absence of such a definition, premises 1, 2, and 4 don't have a definite meaning, and they certainly don't support the conclusion. Also, in absence of some science of life and death, we cannot judge the truth of the conservation principles from premise 3: that processes of living and dying balance each other out. Conservation principles are useful in science, but only when you know exactly what is being conserved, and only when this magnitude can be measured, e.g. energy, mass, momentum. It is true that if I am measuring the number of living things in a system, then I can't get +1 on "things that are dead" without getting -1 on "things that are living", but we regularly speak intuitively about entities coming to life without talk of them "coming out of death". We tend to think that human beings and other living things are thrust into existence from inexistence, not death; perhaps Plato just means to say that death is just inexistence, or a kind of inexistence, but this argument needs to be made clearer—and this premise needs to be added to the argument.

Is the argument sound? We don't know enough yet about how to repair the vague notions at play in the premises, principally the claim that life and death are opposites. The argument might not even be valid. Recall that an argument is **deductively valid** if the truth of the premises guarantees the truth of the conclusion. In other words, *if* the premises are true, *then* the conclusion must be true. An argument is **deductively sound** if it is valid and has true premises. Until we know what Plato means by "opposites", we cannot know if the argument is sound. It seems to be valid, so long as the term "opposites", whatever its content, is being used the same way in each premise. This, however, might not be the case. It might be that "opposite" as a modifier of "process" is different from "opposite" as a modifier for "state". Again: Plato doesn't give us enough to go on.

But this argument is important irrespective of its soundness. Methodologically, it is important simply by virtue of the fact that it is an *argument*. Plato takes up the task of laying out his reasoning in a structured way, so that others can understand it and know exactly how they will criticize it. There is something intellectually honest and, dare we say, scientific about such a practice. Plato is saying, "Here is my theory of the soul as the essence of life. Argue against me, if you wish."

A much stronger argument also comes from the *Phaedo*. This one is important for contemporary Cognitive Science because it is still utilized by concept innatists and nativists, in some form or other, to this day. We call it the **Imperfection Argument**:

1. We perceive sensible objects to be *X* (where *X* denotes some property, say "being a triangle").
2. Every sensible object is only imperfectly *X*, i.e. No sensible object is perfectly *X*. (You have never seen a perfect triangle.)
3. We are fully aware that objects only imperfectly instantiate concepts (i.e. Forms, or Ideas, as Plato called them).
4. We thus perceive objects to be imperfectly *X*.
5. But, to make judgments about objects being imperfectly *X*, we must know what it would mean for an object to be *perfectly* X. (That is, we must have some idea of *perfect triangularity* in mind if we are in to be in any position to judge that the triangles we've come across in our experience [e.g. in drawings] are only imperfectly triangular.)
6. So we have in mind something that is perfectly *X*.

7. Thus, there is something that is perfectly *X* (e.g., the Form of Triangle) that allows us to make sense of our knowledge that objects of perception are only imperfectly *X*.
8. THEREFORE: There is such a thing as *X* itself, the Form, and it is distinct from any sensible object which exemplifies or instantiates it.

Using the Imperfection Argument, Plato has established that we have some non-empirical, innate knowledge—knowledge of the Forms themselves. This knowledge is tokened every time we try to make sense of an imperfectly *X* object placed before us. Every triangle you have seen, whether constructed by your own hand, the hand of another, or a computer program, is imperfect. The interior angle sum does not equal 180 degrees; the sides are not perfectly straight; the lines drawn, even if fairly straight, have some dimension (some thickness) that Euclidean lines do not have. In fact, all of the triangles you have seen were constructed in a physical space whose geometry is determined by mass-energy distribution. In other words, none of the triangles you have seen are even Euclidean objects! Even though this is true, we still recognize all of these imperfect things as triangles—even though none of them fit the Euclidean definition. Plato thinks this is because we grasp, via our intellect, the perfect Form of Triangle when we see and make judgements about these imperfect instantiations. Real perception, and the judgments we make about what is perceived, actually require a great deal of insight from our conceptual faculties.

This idea of active conceptualization in perception is still one of the most hotly debated issues in cognitive and perceptual psychology, and we are only now coming to understand the neuroscience behind it. Still, Plato was able to see the importance of this issue nearly two and a half thousand years ago! We have universal concepts in mind, and these concepts get applied in individual acts of perception. The concepts are what give form to the chaos of sensory data that would otherwise be too inchoate to track. Plato was among the first to think about these issues in this way, and he was undeniably the first to offer systematic argument for viewing the mind as an entity capable of grasping and applying concepts to make sense of empirical phenomena. He was also the first to argue that empirical phenomena could only be understood once processed through some kind of conceptual filter. These ideas are still very much alive in Cognitive Science—as we shall see in later modules when we talk about the importance of concepts in our mental lives.

MODULE 2, LESSON C: ARISTOTLE NATURALIZES THE MIND

INTRODUCTION

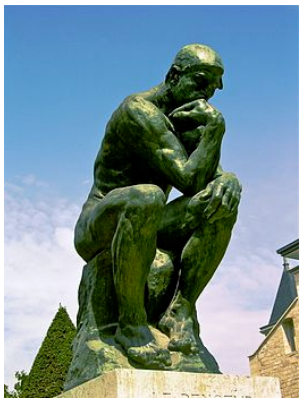
Aristotle (384-322 BCE) was a Macedonian who lived in Athens, and a student at Plato's Academy. He spent 20 years at the Academy, from 367-347 BCE, before opening his own school, the Lyceum. His principal work in psychology is *De Anima* (or *On the Soul*—from which this module's reading comes). We're not exactly sure when he wrote it, but because of its content, many historians of science and philosophy maintain that Aristotle probably wrote it sometime after he opened the Lyceum in 334 BCE. This is because we know he worked on biology after leaving Plato's Academy, and *De Anima* is written using a bio-psychological framework. Aristotle's primary question in the book concerns how we can think about the soul or mind as a kind of vital principle, or as that which brings form and life to otherwise lifeless matter. Here, the affinities with his teacher Plato should be obvious. But there are also very important differences. While Aristotle agrees with many of his predecessors, including Plato, that the soul brings life and form to an organism, he disagrees that the soul is some separable thing, merely inhabiting a body for a short period of time before it returns to its true disembodied state. For Aristotle, there is no form without matter. Soul and material substance work as one. They form a **hylomorphic union**. (Recall our brief discussion of hylomorphism in Lesson A of this module.)

For Aristotle, the soul is important because it explains the stability of the self through changes in material body. When you were born, you had a very different body than the one you have when you are 20, and then 40, and then 60, etc. In fact, there are small differences in the material constitution of the body even on much smaller timescales. However, when I look at a picture of me in my baby book, or a my high school graduation, or my first trip to Europe, my wedding day, or the day of my eldest daughter's birth, those are pictures of *me*—in spite of the many alterations of my body (most of them unfortunate). *Same soul, same person*. But as with Plato in Lesson B and Descartes in Lesson D of this module, Aristotle has a difficult set of questions to answer once souls become part of our discourse. These questions have to do with the nature of the soul, but also with how we can know the soul at all. For Aristotle, the soul is part of the hylomorphic unity that makes an individual human being. Body and soul come together as to constitute this unity. But given that they *do* come together, how can we then disentangle that which is supposed to be so pervasively intertwined, so that we can theorize about the soul/mind specifically?

STUDY OF THE SOUL

Aristotle thinks of the soul as a vital principle—"the first actuality of a natural organic body" (*De Anima* ii 1, 412b5–6). He also refers to the soul as the form of a natural body that has at least the potential for life. (*De Anima* ii 1, 412a20–1) Without a soul, nothing is living—there can be only lifeless matter in the absence of a soul. This matter will still

have a form, but not a form that bestows life. The distinction here between form and matter is an important one. Like Plato, Aristotle thinks we cannot really understand the essence of anything without grasping its form. However, unlike Plato, he does not believe in a special kind of thing called "**the Forms**"—since, for Aristotle, form implies that *something* (some material thing) is *being* formed. Rodin's famous sculpture, The Thinker, is a hylomorphic union of bronze and the form (in the sense of *shape*) of the thinking man. If I melt the bronze, that particular form no longer exists. Wherever you have form, you need to have matter; and all matter has to have some kind of form. Even a rock has a form—i.e., that of a rock, rather than a pebble, or a boulder, or a sculpture—even though these may all be made of the same material stuff. But some things, namely living things, have a soul—a formal principle that is *also* a vital principle. This means not only that intelligent beings have a soul, but that all living beings do—from plants, to lower animals, to human beings.



This means that psychology is, if not a branch of biology, then certainly closely related to biology. Aristotle's work in **biological taxonomy** (classifying biological entities based on their differences and similarities), which was mostly done in the time between his studies at the Academy and his opening of the Lyceum, is alive in his study of the mind. Especially in Book II of *De Anima*, we see an analogue of our contemporary notion of the mind as something that grades back into the animal kingdom. Also, since the early 2000s, many researchers in biology have been examining the rather complicated behaviour of plants, some even arguing that plants have minds (though probably not conscious minds). In this respect, then, Aristotle was something of a pioneer! His general framework of doing psychology from the standpoint of biological systems is also echoed in contemporary theorizing, which is one of the reasons we should probably consider including biology among disciplines that study the mind within Cognitive Science, as we spoke of briefly in Module 1.

This more biological perspective on the mind means that Aristotle might have a leg up on Plato when it comes to answering some basic questions of methodology. When it comes to some of the big questions—such as "How do we know anything about the soul or the mind?" or "What sorts of properties does the soul or mind have?"—Aristotle can point to biological facts about the organism instead of abstract and immaterial entities like Plato's forms. In fact, Aristotle, unlike Plato in Lesson A or Descartes in Lesson D, tends not to think about the soul as a specific kind of *thing*. He disagrees with Plato and Descartes that it is separable from the body, and he usually doesn't talk about it as a substance. In fact, he considers it as forming, at most, *part* of a substance—that is, part of a hylomorphic compound. Instead, he is much more interested in thinking of the mind as a set of *abilities*. We will come back to discuss these abilities after we understand the theory of causal explanation Aristotle employs to study the mind scientifically.

ARISTOTLE AND THE FOUR CAUSES

Aristotle's science of nature is based on grasping the essence of things. We do this through an examination of a thing's properties (or attributes), and sometimes, as with Plato, reasoning backwards from these attributes to other properties the thing must have if we are to make sense of it, to get to the essence of it. For Aristotle, questions about a thing's essence amount to questions about how it is caused, but we must be careful here: Aristotle's notion of a cause was not the simple notion it is today in our scientific view of the world. For us, causation is a necessary relation that holds between events of two types, call them A and B. If A is the cause of B, then A must happen before B, and there must be a general causal law according to which A-type events always give rise to B-type events. A law of this sort reflects the fact that we take a causal relation to involve more than mere correlation. Beyond mere correlation, we take it that the cause gives rise to its effect invariably, and by necessity. When I say that the cue ball caused the 8 ball to go into the pocket of the billiards table, I am saying that *any* such hitting of cue ball-like entities will cause the same kind of effect in 8 ball-like entities. The universal quantifier "any" should be taken as denoting a general law—here one of mechanics.

Aristotle's account of cause doesn't come from *De Anima*. Because it is fundamental to all of science, not just psychology, it is found in Aristotle's more general works: the *Physics* (in Book II) and *Metaphysics* (Book V). As a point of interest, Aristotle's account of causation draws much from remarks Plato made in the *Phaedo* before going on to make the more particular arguments about the soul we surveyed in Lesson A.

Aristotle's theory of causation has many more moving parts than this simple account of of our modern notion of a cause. Where we see a cause simply as one thing giving rise to another by a kind of law-like necessity, Aristotle distinguished *four different kinds of causation,* each one covering a different aspect of a thing's overall causal profile.

1. **Material Cause**: the way that an object is constituted, or what it is made out of. For example, Michelangelo's David is unique, even though there are many replicas. What makes it unique is that it is made out of a specific bit of marble. Replicas made from other pieces of marble, or some other kind of stone, or clay, or plastic, might be shaped in the right way, but they can never be the original. To identify what a thing is made of—i.e., its material cause—is to identify one specific aspect of what that thing is.

2. **Formal Cause**: the way that an object is arranged, shaped, or made to appear before us. For example, Michelangelo's David might be made out of the same sort of material as my kitchen counter-top, but it is not formed in the same manner as my kitchen counter-top. They have a different design. The formal cause of a thing is its specific design, or in the case of natural things, the specific way in which the material is arranged so as to make it the kind of thing that it is.

3. **Efficient Cause**: the external influence by which the thing in question was given its specific form. For example, Michelanelo's skilled hand with his chisel was the efficient cause of the statue coming to be from the marble block from which it was hewn.

4. **Final Cause**: the end or purpose or function of the thing. You often hear philosophers use the Greek term *telos*, which just means "end" or "purpose" or "goal". For example, my kitchen countertop and Michelangelo's David not only differ in their form (their design), but also in how they are likely to be *used*. It is doubtful that my countertop will ever be on display as an object of delectation or contemplation at the Galleria dell-Accademia in Florence, and the folks at the Galleria get rather upset if you try to chop tomatoes on David's feet. For Aristotle, even natural things like animals, plants and naturally occurring material objects can be said to have a final cause, some purpose or other in the overall scheme of nature.

With these four causes in mind, Aristotle thinks you can answer any "why" question about an object—even a complicated object like a human being! But, sticking with a much simpler example, take my kitchen countertop (again): If you know what it was made out of (material cause), its design (formal cause), the manner in which it was constructed (efficient cause), and its principal purposes (final cause), then you know pretty much everything you need to know about the thing. Aristotle is giving us a general framework for **naturalistic explanations** of empirical phenomena. By "naturalistic" we mean explanations that refer only to natural, not supernatural, entities. Nowhere did we make reference to the will of the gods, for instance, when talking about the statue of David or my counter-top.

Aristotle's appeals to his various notions of causation not only to explain the nature of things, but also to explain our ways of coming to know them. For example, the notion of a formal cause is deeply involved in Aristotle's account of how we perceive objects in our immediate perceptual environment. For Aristotle, to perceive something is to grasp its form—it is to bring the form of the thing into the mind, thus mentally abstracting it from the matter of the perceived object. To perceive, then, is for the mind to take on a thing's sensible form without its matter. So when we perceive, we mentally take on a part of our environment—namely the formal part.

KINDS OF MINDS

Even we human beings have an essence that can be grasped using Aristotle's four causes. Our formal cause is a vital principle, since we are alive. But we are alive in ways similar to other living things (plants and non-human animals), but also in ways that differ from them. To understand our soul—i.e., human souls, specifically—is to understand those

formal differences. For Aristotle, all souls, even purely vegetative souls, have certain abilities. Let us start with plants, and work our way up to humans. (The language of "working up" makes sense within Aristotle's biology, since there is a hierarchy based on function, as we shall soon see!)

1. Plants have the functions of nutrition, reproduction, regulation of their vital systems, and growth. In light of such functions, we can call the soul of a plant the **vegetative soul** or the **nutritive soul**.

2. Animals have all of the abilities of plants, but also perception and mobility. We can call this the **animal soul** or **perceptual soul**. Modern animal psychologists might want to add that animals, at least those with mammalian brains, have some empathic abilities, some social abilities, and the capacity to engage in rudimentary problem solving and communication. Aristotle, however, did not associate these abilities with animals.

3. Humans have what non-human animals have, but they also have intellect: the ability of thought and reflection. We can call this the **intellectual soul**. Again: modern psychological theories of intelligence might want to get more precise regarding the kinds of faculties we typically possess, arguing that human beings have, for example, interpersonal and intrapersonal intelligence which helps explain social interactions. (On this, Aristotle might have agreed! He argued in his ethical and socio-political writings that human beings are, by their nature, social and political animals.)

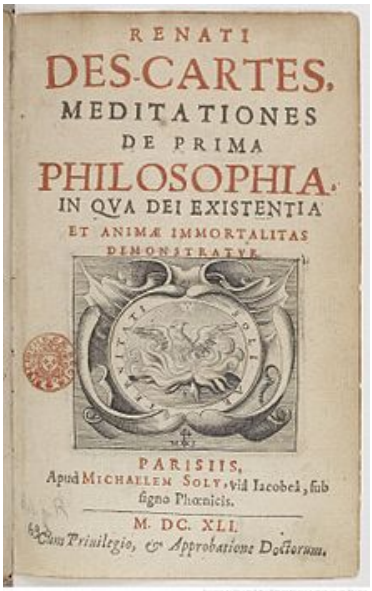
So the human mind is an animal mind plus certain kinds of intellectual abilities. We might look at this psychological division, based as it is on biological taxonomy, as a purely descriptive enterprise. For Aristotle, however, this is more than just descriptive science. Recall that for Aristotle, we fully understand things only when we grasp all of their causal dimensions, including their purpose—their final cause or *telos.* For Aristotle, this has ethical implications, and so there is a normative dimension to this psychology. Unlike plants and animals, human beings have intellectual abilities, the abilities for rational thought and contemplation being foremost among them. For Aristotle, it is, in fact, our *purpose* to engage in contemplation—i.e. to engage in thought for thought's sake, over and above any material benefits that the exercise of thought may give rise to. This is, according to Aristotle, the highest good for human beings, and it is central to his ethics and his socio-political writings.

Nowadays we usually try to keep descriptive and normative practices separate from one another. Scientists study natural phenomena, and some of these phenomena may well be related to important political and ethical questions. But scientists don't do ethics or politics, or, at the very least, they do ethics or politics while wearing different hats, as it

were. With Aristotle, the whole world picture seems to come at once, with biology informing psychology, and bio-psychology informing ethics. He was, in a sense, the first interdisciplinary scholar to focus on the mind from a scientific point of view, but he did so from within a normative framework, one that included ethics and politics. For that reason alone, it is probably worth our time to know a bit about Aristotle. But, as we progress in this course, Aristotle will also inform our understanding of the mind in more specific ways. Particularly important is his view of the mind as a set of abilities. When we come to discussions about Artificial Intelligence, for example, a position like this will be integral to the project of creating synthetic minds, integral to even starting in on such a project. Every other position on the nature of mind leads directly to a kind of pessimism about AI. If the mind just is the soul (or part of the soul), and if the soul is always housed in some kind of biological being—like a biological human being—then something that isn't biological can't have a mind. Plato, Aristotle, and Descartes (who we'll come to next) could probably all agree on this point. However, by defining minds in terms of their abilities, Aristotle leaves the door open, just a crack. What if something synthetic (as opposed to organic) could realize the same sorts of abilities, especially the ones we regard as intellectual in nature? We will have a good deal to say about this question later on in the course.

MODULE 2, LESSON D: DESCARTES AND THE WAY OF IDEAS

INTRODUCTION



The Descartes reading for this module comes from his book *Meditations on First Philosophy* (1641, cover pictured to the right). It may surprise you to know that Descartes thought of this book as something that might be used by universities as a textbook. Along with a book he wrote four years earlier called *Discourse on Method* (1637), and one to be published three years later called *Principles of Philosophy* (1644), the *Meditations* lays out Descartes' theory of nature, his dedication to the mechanistic science *en vogue* in the middle of the 17th century, cosmological and ontological arguments for the e xistence of God, and his **substance dualism**: the theory that the mind exists as a separate substance from the body. This dualism has some affinities with Plato's dualism, though Descartes argues for his position in distinct ways, and it rests on a distinct theory about the nature of physical reality with which Plato would not have agreed. Still, both Plato and Descartes are what philosophers refer to as rationalists**. Rationalism**, as a philosophical doctrine, holds that there are sources of genuine knowledge beyond what we learn from sensation. Depending on the kind of rationalism in question, the extra-sensory source of knowledge might be reason, intellect, or some form of rational intuition. But no matter what internecine battles rationalists engage in, they all argue that at least some of our knowledge must have an origin beyond our five senses; this is because the senses seem inadequate as a source for knowledge of formal mathematics and general concepts (as well as other more theological concerns, like our knowledge of God).

As we saw in Lesson B of this module, Plato's **Imperfection Argument** sought to show how we can have formal and general knowledge of mathematical entities like triangles. This kind of knowledge would seem to exceed our grasp of empirical facts learned through sensation. Descartes follows Plato at least this far, though he would abhor Plato's anti-scientific view that the senses cannot ever be trusted, and that formal knowledge is all there really is. For Descartes, the senses acquaint us with the material world we study in mechanics. But he agreed with Plato that our formal knowledge had to have a non-sensory source, and also with Plato's idea that perception was more than just sensation—it required some conceptual filters if we were to make sense of a world of objects outside of us. Descartes was a scientist who wanted to trust his senses. He really just wanted some rational guarantee that the senses were worthy of that trust.

This is not an epistemology course, so why are we talking so much about Descartes' theory of knowledge? This is because it is only within the context of Descartes' epistemological and metaphysical writings that we can make sense of his theory of mind. This lesson will explore the tension we introduced in Lesson A between Descartes' rather

scientific account of bodies (i.e., as extended substances) in accordance with the mechanical science of his day, and his rather non-scientific view of the mind (i.e., as thinking substance), incapable of intersubjective scientific inquiry. Why did Descartes think the mind couldn't be studied scientifically? How did he (perhaps inadvertently) end up giving us the basic elements of the representational account of the mind that gets employed in much of Cognitive Science as it is currently practiced? We will tease out answers to these questions as we explore Descartes' rather intricate theory of the mind and its many functions.

DESCARTES AND METHODOLOGICAL SCEPTICISM

The *Meditations* (short for *Meditations on First Philosophy*) are Descartes' most explicit formulation of his form of rationalism. They attempt to provide the **epistemic foundations** (those unshakeable and self-evident propositions) on which the edifice of knowledge is built. The key to understanding Descartes' rationalism is in following his very novel methodology—what he calls "**methodological scepticism**". For Descartes, only after we have doubted everything that it is possible to doubt—including some of our most fundamental beliefs about experience, mathematical knowledge, and views of the self—can we begin to uncover the truly unshakeable foundations of knowledge.

Our reading for this lecture is Descartes' Meditation II, but I will begin with some background from Meditation I, since Meditation I gives so much context for Meditation II.

Descartes starts the *Meditations* by asking, "What can be called into doubt?" What beliefs do we currently accept as true that could possibly be false? For Descartes, a belief that might possibly be false can have no place in the foundation upon which we build our knowledge of the world, so identifying and rejecting beliefs that are susceptible to doubt is a first step in securing our system of knowledge. In Descartes' own words, "I realized that it was necessary, once in the course of my life, to demolish everything completely and start again right from the foundations if I wanted to establish anything at all in the sciences that was stable and likely to last." But what bits of knowledge are demolished by such scepticism? Firstly, those beliefs that we know to be patently false must be jettisoned. But also, those beliefs that may be wrong, even in the weakest sense of "may". If we can find at least *some* reason for doubting a belief, no matter how fantastical the doubt may be and how commonsensical the belief may be, we must get rid of that belief.

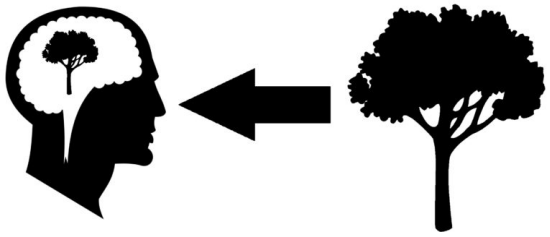
Perceptual beliefs are all susceptible to this kind of radical doubt. This is for two reasons. Firstly, I have been deceived by my senses before. For example, I have seen what looks like a smooth wall from a distance, only to find upon my approach that it is made of jagged brick. The wall both looked smooth, and did not look smooth. The senses are a possible source of inconsistent information, so they ought to be rejected, at least until we can make sure whether, and under what circumstances, they can be trusted.

Secondly, it is possible to have experiences in dreams that are indiscernible from those experiences one has in waking life. Let us more closely explore Descartes' "**Dream Argument**", for it tells us much about Descartes' new conception of the mind as a representational medium. Here is the argument:

1. I have experiences of the world while awake, such as walking about, talking to people, etc.—call them *E*—which are true of the real world. (Of course, they may be illusions, but let's suppose for the sake of argument that they are veridical.)
2. I have experiences while dreaming, such as walking about, talking to people, etc.—call them *E** –which are not true (since while I have such experiences I am not walking about, not talking to anybody, etc.— I am just laying down in my bed).
3. There is no way to be sure via experience alone that I am awake and not just dreaming, i.e. there is no indication in *E* or *E** of which is the real and which the illusory experience.
4. THEREFORE: My experiences cannot be trusted since they may be the product of a dream state, not a veridical representation of the real world.

Strictly speaking, the Dream Argument only calls into question our experiential knowledge about particular things, such as the existence of this set of hands and this computer keyboard I am looking at, or this coffee I am drinking; it doesn't call into question (give us any reason to doubt) the existence of general concepts, like colours, tastes, etc., since these concepts seem to be instantiated even in my dream experiences. That said, all of our common sense knowledge about objects, not to mention our physics and other empirical sciences, are called into question by the argument. This is the upshot of Descartes' methodological commitment to doubt all that can be doubted.

Remember, though, that we are less concerned with the epistemological message of the Dream Argument, and much more concerned with what it tells us about Descartes' theory of the mind. So what is Descartes' underlying theory of the mind and mental representation? For Descartes, the mind is a representational medium, and the objects before the mind are **indirect representations**. Cognition takes as its object a representational state, which (in cases of veridical perception) are like their external causes.



Phenomenologically identical representational states play the same role within cognition, even though they might be very different in terms of their reference relations—e.g., the mind can undergo the same representational content in a dream as it does in waking life, but such contents' relations to what's going on in the outer world are entirely different in the dream state. ("**Phenomenology**" is just a word philosophers and psychologists use to describe subjective experience—how the world appears to a subject, or what it is like to undergo a certain set of experiences from the point of view of the subject.) In the case of

veridical experiences, the representational content in some way "matches" the actual world—the thing being represented. But non-veridical representations such as dreams don't match the actual world in the same way, even though the kinds of contents they they present seem to be indistinguishable from the representations we undergo in our waking experience.

Recall from Lesson C that Aristotle thought that the form of external objects was transferred to the mind when we engage in perception. All mental objects are thus objective in the sense that they borrow the same form as the objects they are about. It is an objective feature we take from the environment in every act of perception. Descartes rejects this idea. What is before the mind is nothing but a representation; nothing of the original object, its form or matter, is taken into the mind. To use an analogy from modern electronics, information coming from the senses must be transduced into representational information in order for the cognitive system to do anything with it.

So the theory of mind Descartes is defending isn't concerned with the ultimate source of the representation. This will, of course, matter to his epistemology; we only have knowledge when our ideas accurately represent reality. But the representational theory of mind leaves open the possibility that our inner representations bear little, if any, resemblance to what exists in the world outside of our minds. On this view, cognition is about how we process these representations using whatever mental faculties there may turn out to be.

Descartes used the term "**ideas**" to refer to indirect representations before the mind. As we indicated in Lesson A, we no longer use this terminology—preferring the general term "representation", and then more precise terms like "percept" or "concept" to refer to different kinds of representation. But our account of representation is, in spite of this change in nomenclature, basically Descartes'. The word "Representational" in "Computational-Representational Theory of Mind" owes much to Cartesian philosophy of mind and its uptake in psychology in the 19th century. It gets a more precise definition from later philosophers and psychologists, and, as we shall see, from Alan Turing at the dawn of the Cognitive Revolution—but the basic picture, and many of the details, come from Descartes' work more than three centuries before Turing.

DESCARTES AND PERCEPTION—THE SECOND MEDITATION

Meditation I leaves us with nothing we know for certain. The quest for a foundational belief on which all other knowledge rests is thus far elusive. None of our scientific knowledge, none of our common sense knowledge about external things (even our own bodies), and none of our mathematical knowledge (or even knowledge of universal concepts immediately present to the mind in sense perception and imagination, like colours, tastes, shapes, etc.) has survived methodological doubt. Descartes seems pessimistic at this point. It may be the case that the only thing we know with certainty is that we know *nothing* with certainty!

Descartes then turns his attention to his own inner thoughts. He has thoughts. Did perhaps God or an evil deceiver put them there? Is he the author of such thoughts, perhaps via the imagination? For Descartes, the **imagination** is the faculty that allows us to picture a state of affairs to ourselves, as a kind of inner image. Unlike veridical experience, imaginative representations carry no pretense of "matching" the world. Like sensation,

imagination is an operation of the mind that produces picture-like representations, but unlike sense perception, it doesn't rely on any external source.

However, Descartes has hit upon a certain truth: even if these representations are false or fabricated, even if he is being deceived about the nature of the world and the self, even if he doubts all of his ideas, there must be something (call it "I") that exists—*something* being deceived, *something* engaged in thought, *something* doubting, etc. After all, there must be some "I" that's doing the thinking, even if all my thoughts are devoted to generating doubts about what I previously thought was true. Therefore, "I exist, I am" is a necessary and certain truth, one that is affirmed by any judgement I make (no matter how sceptical) and any process of thought I undertake. You may be more familiar with another formulation of this argument, "I think, therefore I am" (*cogito ergo sum*). While many think it comes from the *Meditations*, it actually comes from Descartes' *Discourse on Method*. The idea is the same, however; if I am thinking (doubting, assenting, etc.), then I must exist as the thing that is thinking (at least for as long as I am thinking).

Descartes wants us to be careful though. We know simply that something exists, and I have called it "I". We still don't have an adequately clear idea of what this something is. Is the "I" my common sense understanding of me? No: My commonsense understanding of me includes the idea that I have a body, but I can actually *doubt* that I have a body! Since my only basis for judging that I have a body is through sensory experience, and since I can't tell veridical experience from the kind of illusory experience I have in dreams, then even my "knowledge" of my body is open to question! By contrast, my knowledge of the "I" cannot be doubted, since it is affirmed by any thoughts I may have, even by the doubts I entertain about other things. So the existence of the body can be doubted but the existence of the I cannot be doubted. For Descartes, this proves that the mind and the body must be two distinct things, for they fail to share at least one essential property. (For two things to be identical to one another, they must share all of the same properties.)

In a roundabout way, then, this is the main conclusion Descartes draws in the Meditation II: that the mind and body must be distinct kinds of thing (distinct "substances"), and that the mind is, in fact, more easily known than the body (since its existence is less susceptible to doubt). Given that mind and body are, for Descartes, distinct kinds of thing, how are their differences reflected in their respective definitions? Descartes ultimately settles on definitions of body and mind that go along the following lines:

Body: whatever has a determinate shape and definable location and can occupy space in such a way as to exclude all other bodies. It is defined by extension in space-time.

Soul/Mind: that part of us which is in congress with the body, but which differs from the body in that it is not extended in space, and has no definite location. It is defined by its activity, namely thinking.

Is the mind definable as sense perception? No. Sense perception, while requiring mental faculties, also relies on the sense organs (body), and the body is extended (and doubtable). Is it definable as *thinking*? Yes! I am a thing that thinks: an intellect, a mind, a soul, an intelligence, etc. Even though I spent all of my life thinking I was embodied, there is no necessary connection between my being the mind that I am and my having a body; I am essentially a soul/mind—a thinking thing, and nothing else. Later on in the

Meditations, Descartes argues this soul/mind is co-ordinated with a body by God—it thus becomes what Descartes calls a "**compound substance**". But as a matter of principle, Descartes maintains that minds and bodies are separable.

Because this thinking thing is a totally different substance from body (body being defined as a substance that is spatially extended, mind being defined as a substance that is not spatially extended/located), Descartes is what we now call a **substance dualist**. He believes there are two different kinds of things, bodies and souls/minds. Plato thought this too. The mind is different, and separable from, the body. The mind, in many ways, is the opposite of the body. It is immortal, i.e. it cannot be destroyed (except by whim of God, for Descartes), its essence is thought, and indeed, some of its faculties of thought require no body at all (e.g., rational intellect, imagination).

Even though Descartes' doubts about the existence of body are somewhat temporary—in Meditation VI (not in your readings), he finally gets around to proving that material things, including bodies, exist—he also follows Plato in arguing that successful perception of the outer world requires active input from the mind. We will see how Descartes argues for this in what has come to be called the "**Wax Argument**". Descartes starts the argument by getting us to think about a piece of bee's wax. It has certain properties: if you lick it, it still tastes of honey; it smells of flowers; it is hard, and of a certain shape; it has a certain white-ish colour.

But then Descartes puts the wax up to a flame. Quickly, it loses its honey taste and floral aroma; it turns soft and loses its shape and solidity. Its colour darkens. In short, it has none of the sensory qualities it used to have. How do we know it is still the wax we were looking at before we held it to the flame?

Descartes thinks there are three possible answers, each corresponding to a mental faculty; two of these answers are inadequate as explanations of our true belief that the wax persists through the wholesale transformation of its sensible qualities. So how do we know the wax is the same wax, persisting through these transformations? Here are the three possibilities:

1. **The senses**. We know the wax is the same because we sense the wax before and after the transformations it undergoes. But this makes little sense. We have said that every sensory quality has changed. How could we possibly know it is the *self same* bit of wax by appealing sensory qualities that have changed entirely? If anything, the senses are telling me there are two distinct pieces of wax, sharing none of the same properties (except that they are extended, though, even here, very differently shaped).

2. **The imagination**. This seems more plausible. After all, the imagination can picture anything it likes (so long as such a thing is not a logical contradiction). If I grasped the wax via my imagination, then there are no troubles. I can imagine how a bit of wax might change its shape. But, I can grasp that the wax is capable of countless changes in shape, yet, since my imagination is finite, I cannot

imagine countless (i.e. infinite) shapes of the wax. I am grasping something here about the wax that I cannot imagine, so finite imagination cannot capture my knowledge of the wax—since I cannot imagine the possibly infinite number of shapes it could take.

3. **The mind itself**. Descartes thinks this is the answer, but in speaking of "the mind itself" it is important to recognize that Descartes is not talking about those aspects of the mind that are involved in sensation and imagination. He means something like "the intellect", or the purely rational part of the mind. The wax is perceived by the mind directly, not via the senses or the imagination. I know it is the same wax because my mind understands how the wax endures as one and the same object even through the unimaginably many changes it is capable of undergoing. As Descartes puts it: "The perception I have of it is a case not of vision or touch or imagination—nor has it ever been, despite previous appearances—but of purely mental scrutiny; and this can be imperfect and confused, as it was before, or clear and distinct as it is now, depending on how carefully I concentrate on what the wax consists in."

Again, we are not concerned with the epistemological aims of the wax argument. We are interested in what it tells us about the underlying theory of mind. Descartes is here arguing that there are distinct mental faculties. Each has a role to play in cognition. Sensation allows us to track the sensible qualities of objects, but the senses do not give us knowledge of the essence of material objects—i.e., knowledge of them as extended things in which the sensible qualities inhere. Put another way, the senses can give us knowledge of the **modes** of the thing, but not substantial knowledge of the thing itself—not knowledge its its essence.

Imagination allows us to generate new ideas, perhaps using some of the basic elements we have become acquainted with through sensation. It allows us to represent to ourselves states of affair that we may never have come across in experience. It might even let us represent to ourselves certain physically impossible, but logically possible, states of affairs, like when we imagine time-travel, or going faster than the speed of light. My imagination can provide me with hum-drum representations of how my day might go when I plan a to-do list, or more fanciful representations of what it would be like to ride a unicorn to the edge of a rainbow. But it is also insufficient if I want to grasp onto the essence (the defining quality) of ordinary material objects. To do this, the mind needs some intellectual faculty—one that can grasp the definitional essence of the wax.

Much as we saw with Plato's Imperfection Argument, the Cartesian mind, the rational intellect, has a grasp of these essences—so we'd like to know just how the mind does it! For Descartes, part of the mind's representational capacity is innate, and goes beyond mere sensory representations or imaginings. When we know the triangle, when we grasp its geometrical essence (as distinct from other objects one can construct on the plane), we are exercising this conceptual faculty. You know this is the case because every time you see or imagine a triangle, it has to be a specific triangle. It is isosceles, scalene, or equilateral. It has a specific size, or colour in the visual (or imaginative) field. Yet you seem to be able to grasp the general concept of a triangle without having any specific representation of a particular triangle in mind at all. Therefore, your grasp of the general concept cannot consist in either a sensory or an imaginative representation of a triangle.

Descartes is not only arguing for the existence of this purely conceptual faculty. He is using the Wax Argument to make the point (in even clearer terms than Plato) that this conceptual faculty is implicated in successful perception of the world. We cannot accurately perceive the world, and act on those perceptions, if they do not come already conceptualized. The mind organizes the influx of sensory data using this special faculty. While modern Cognitive Science disagrees with some of the rest of the story that Plato and Descartes tell us, much work is still being done on this very topic. We will address that work as the term progresses, but now we can see its interesting historical roots.

As we go, we will also see that Descartes' conception of the mind has been developed and honed, often using the tools of empirical science. Even though he thought the mind incapable of being an object of scientific study—perhaps because he judged minds, at least our own minds, to be sufficiently transparent to us *without the need* for scientific study—this in no way stopped Descartes from laying the foundations for our modern view of the mind as a representational medium that engages in mental processes (attributable to distinct mental faculties) when it receives certain kinds of inputs.