Descartes' Model of Mind

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Rene Descartes (1596–1650) is considered the founder of modern philosophy. Profoundly influenced by the new physics and astronomy of Kepler and Galileo, Descartes was a scientist and mathematician whose most long-lasting contributions in science were the invention of Cartesian coordinates, the application of algebra to geometry, and the discovery of the law of refraction, what we now call Snell's law. His most important books on philosophy were *The discourse on method* (1637) and *The meditations* (1642). Descartes' writings display an exemplary degree of clarity and an aversion to pedantry.

For more than a thousand years, thinkers had been dominated by the thought of Aristotle (384BC–322BC). Although Descartes was a promoter of the new physics, which undermined the Aristotelian approach to nature, he was also under the influence of Aristotle. It is customary to emphasize how Descartes broke with the Aristotelian tradition, but Descartes and Aristotle had common ground.

Rene Descartes was an advocate of a particular form of dualist interactionism, in which the influential materialism of his day played a large role. Descartes argued that there was both mind and body and that these interacted with one another. Materialism, which had received a boost in the seventeenth century with the rise of Galilean science, is the doctrine that everything is composed of matter or body and that this fills parts or perhaps the whole of space. Different parts of the world interact by one body pushing another body, making the whole world a clockwork mechanism in which all explanation is based on action by contact and push. Descartes' model of mind was an answer to the question "how does the mind fit into such a machinelike world?" His answer was to suggest that the human body was also a machine, but that the mind, composed of a fundamentally different substance, spirit, resides in the machine and controls the body by an interaction centered at the pineal gland of the brain. Like most other philosophers before him, Descartes was a dualist interactionist on the relationship between mind and body. What was new with Descartes was his elaborate attempt to combine dualist interactionism with the determinist clockwork world of Galileo. The problems that Descartes met in doing this stimulated a plethora of alternative views, both dualist and monist, such as epiphenomenalism, parallelism, eliminativist materialism, idealism, functionalism and other pluralistic interactionist accounts.

Essence, Ultimate Explanation and The Method of Intuition

To understand Descartes' model of mind it is helpful to know what he had inherited from Aristotle.

The three most important things that Descartes inherited from Aristotle were the doctrines:

- essential substances;
- ultimate explanations;
- the method of intuiting the essence of things.

These doctrines were part of Aristotle's way of answering the ubiquitous ancient question of how to explain change in the world. This in turn was based on the distinction—common among ancient Greek philosophers—between appearance and a hidden reality behind the appearance.

The hidden reality for Aristotle consisted of substances. Substances have essential and accidental properties. An essential property is one that is necessary to the type of thing something is. These are contrasted with accidental properties, which are those properties of a thing

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that can change while the essential substance remains the same. Essences were thought of as lying behind and serving to explain the appearances of things. For example, for an Aristotelian, if he knew modern chemistry, the essence of water would be H_2O; its accidental properties would be, among others, its liquid, solid or gaseous states. The Aristotelian would also regard H_2O as the ultimate explanation of all the accidental properties of water. For an Aristotelian, finding the essence of something is the final word in its explanation. Descartes shared this view.

Of course, the example is anachronistic because the composition of water was discovered, not by intuition, as in Aristotle's method, but by the hypothetico-deductive method. Aristotle taught that, after being prepared by many observations of nature, the mind could unerringly intuit the essence of a thing. In contrast, the hypothetico-deductive method consists in the proposal of imaginative hypotheses that are then subject to experimental test. Moreover, the modern theory of the composition of water is conjectural, and has abandoned the concept of essence. In describing the modern theory as conjectural, this is not to deny that it is a discovery that water is H_2O. Rather, it is to make clear that for the modern scientist, there is no unerring method to attain truth and there is always the possibility of digging deeper into the structure of the world, by conjecturing more general and precise laws. These deeper laws still explain the appearances (and more), but they are no longer regarded as final stopping points.

Starting with Galileo's approach, it became increasingly clear that there was no need for the intuition of essences. For example, as Osler (1973) argues, in Galileo's theory of free fall, nothing can be inferred about the essential natures of individual kinds of object from the fact that they all accelerate at the same rate under gravity. From this point of view there is no essential difference between a cannonball and a Siamese cat. Galileo's law of free fall is not about inner unobservable essences, but is rather about the relationship between velocity and time: the velocity of a falling body is proportional to the time spent in falling, increasing by equal increments in equal times. Similarly, Galileo's law of inertia did not involve essences within bodies, but referred only to relations between bodies: relative to a frame of reference (that is, other bodies, such as the Earth), a body will continue in its state of rest or uniform motion unless disturbed by some outside force. It took time for essentialism to die; both Newton and even later, Maxwell, showed the dwindling relics of essentialistic thinking. For example, Newton toyed with the idea that inertia was an essential property of matter. However, Galileo had sounded its death knell.

Despite the massive success of the increasingly nonessentialist new science of the seventeenth century, Descartes made ample use of these defunct doctrines and methods, adding his own modifications. Descartes still wanted to say that at least we could discern the essential nature of all bodies. Descartes felt, like Aristotle, that the fundamental laws could be arrived at by reflection, by intuition, but, unlike Aristotle, accepted that the rest of the laws would need experimental investigation. However, regarding the fundamental methods and assumptions of science, there was no compromise. These could be established, Descartes insisted, by a purely intellectual reflection. This reflection would be a process of systematic doubt to eliminate all but the indubitable axioms, upon which all of science could be reestablished as a unified, certain system.

Pre-Cartesian Materialism

Descartes developed a particular sort of materialism, called corpuscular atomism. In interesting respects it agrees with both Aristotle and Democritus (460–370BC), who are normally placed in contention on this issue. Before Descartes, materialism had a long history, going back to antiquity, displaying a number of variants. Attempts at a mechanistic materialism can first be seen in Leucippus (fifth century BC) and Democritus, who held that

matter consists of indestructible, unchanging atoms. The observable characteristics and behavior of matter were explained as the movement, collision and pushing of different invisible atoms in a vacuum. In the possibly apocryphal anecdote, Democritus smelled bread from a nearby bakery and conjectured that small invisible bits (atoms) of bread had floated through the air to affect his nose. Democritus held that there had to be empty space because otherwise there would be no movement, because there would be no place for the moving atoms to move into. Pull, which might have been thought necessary to explain how atoms combine or clump together, was reduced to push in these systems by having atoms with hooks that would allow atoms to become entangled and push one another in subtle ways.

Aristotle rejected atomism, insisting that the basic elements, fire, air, water and earth, were not atomistic but continuous and filled the whole of space. Empty space was not necessary for movement: all that was required was for one part of matter to exchange places with another part of matter by a continuous process. After Aristotle's attack on atomism, with a few exceptions, its popularity lapsed during the Middle Ages until it was revived by Bruno, Gassendi, Galilieo, and Descartes.

Descartes' view broke with Democritus, arguing that matter is essentially extension in space and nonatomistic, but rather like a fluid filling the whole of space, crowding out any vacuum. Space, Descartes argued, cannot be a vacuum because space itself is essentially extension and therefore matter. Matter cannot be atomistic because geometric space is infinitely divisible. The behavior of matter is then explained as due to the movement of matter in vortices, like the movement of tea leaves in a cup of tea. In this Descartes agreed with Aristotle. He broke with Aristotle in arguing that, nevertheless, matter is composed of bits or corpuscles that are tightly packed, filling up all space. Also in contrast to Aristotle, Descartes asserted, all movement occurs according to his law of the conservation of motion, that is, that the total amount of motion in the universe is constant.

Man as Machine

Aristotle thought that everything in the cosmos was striving to achieve ends. Even rocks falling to earth were animated by a goal, or "final cause." When asked why a rock accelerates as it falls, Aristotle answered because it becomes more jubilant as it approaches home, the Earth, its natural place. Man was regarded by Aristotle as a rational animal at the peak of a hierarchy of plants and animals leading step by step from inanimate matter to man. In contrast, Descartes' world was a lifeless clockwork world, apart from the soul within man himself.

An important part of the intellectual context in which Descartes was thinking was the success of Galileo's universal and quantitative laws governing the behavior of, if not all, then a staggering generality of bodies, the clockwork model of the world. Through his three laws of planetary motion, Kepler had captured accurately the orbits of the planets, while Galileo, with his quantitative experimental approach, had accurately propounded the law of falling bodies and supplied the powerful method for understanding the joint effect of many forces acting simultaneously. Admittedly, the achievement of complete generality of the laws of matter (where laws explain *all* of the behavior of *all* bodies) had to wait for Newton. As Einstein points out in his foreword to Galileo Galilei's *Dialogue concerning the two chief world systems: Ptolemaic and Copernican* (Galileo, trans. 2001, p. xxv), Galileo had not seen the full significance and universality of his law of inertia and confined it to bodies close to the Earth. However, it already seemed, at least to Descartes, that eventually, nothing, from the simple to the complex, from the microscopic to the astronomical, would escape the governance of universal physical laws. Aristotle's world of animated, goal directed matter was in irreversible retreat.

Descartes' contemporary, Hobbes (1588–1679) had accepted the implication that not only all beasts but also humans were just machines, although special because of their complexity. Both Hobbes and Descartes were emboldened in this approach by William Harvey's discovery in 1628 of the circulation of the blood, whose vastly more detailed mechanistic explanation undermined Galen's vitalism, which required a nonmaterialistic "spark of life" to animate organisms. Harvey inspired Descartes' model of the nervous system as hollow tubes filled with animal spirits. Beasts were subcogwheels in a clockwork world, like the automatic water-driven puppets fashionable at the time.

This line of thought led later to increasingly sophisticated accounts of people as robots and computers. Only a hundred years after Descartes' death, the first clear and bold formulation that humans are robots was stated by La Mettrie in his *Man a machine* (1747). Homer (about the seventh or eighth centuries BC) had played with a rudimentary idea of robots, but the elaborate and detailed mechanistic analyses springing forth from scientists in the seventeenth century gave a moral boost to its extension to human beings. Descartes, a sincere Christian who accepted the reality of the soul, was prepared to accept that beasts were simply machines, but he was trapped between his admiration as a scientist for Galileo's revolutionary view and his own conflicting view that humans are not just machines, but persons with a soul. Somehow, he felt, he had to combine these views.

The Two Substances

At the heart of Descartes' view of the mind-body problem is the distinction between two fundamentally different substances: body and spirit. Like Aristotle, Descartes assumed that the existence of each substance was completely independent of every other substance. Body obeys the laws of mechanics and is essentially extension in space. Any particular object can undergo superficial changes in its accidental properties but the essential substance and its properties remains the same. Consider another example. A piece of wax at room temperature appears to us as having definite properties: white, malleable, and with a certain tactile texture. However, if we heat the wax, these accidental properties disappear when the wax melts. But the substance of the wax remains. This permanence in the face of superficial change also characterizes spirit. A mind may have different thoughts or feelings at different times, but the self-identity of consciousness remains the same.

It has sometimes been implied, for example by Ryle (1949/1963), that Descartes was the first to distinguish between body and mind and to suggest that they were related by an interaction. However, it has also been argued, for example by Popper and Eccles (1977), that the ancient Greeks already had this distinction as the very old and popular fairy tale of the magical transformation of the body (demas) while the mind (nous) remains the same. For example, in the tenth book of the *Odyssey,* Homer describes how Circe smote some of the companions of Odysseus with her wand: "They had the head, and voice, and bristles, and the body [demas] of swine; but their mind [nous] remained unchanged as before. So they were penned there, weeping . . ."

They were aware of their horrific condition, as people trapped inside pigs' bodies, and remained conscious of their self-identity.

Like Descartes, Aristotle and his school thought of the mind as incorporeal and immortal, and he clearly distinguished between mind (or soul) and body and assumed that there was a two-way interaction between them.

> Soul and body, I suggest, react sympathetically upon each other; a change in the state of the soul produces a change in the shape of the body, and conversely: a change in the shape of the body produces a change in the state of the soul. (*Physiognomics*, Chapter IV)

(Notice that in this quotation, Aristotle confines the adjective of "shape" to the body; the

mind only has states.) Most thinkers of this time held a dualist interactionist position on the problem of the relationship between the mind and body, and accepted tacitly that this interaction was non-mechanical. The atomists were the exception here because they believed in universal mechanical interaction.

What is new with Descartes is his particular theory of causation in physics and his elaborate epistemological argument to connect our consciousness to the external material world.

The Quest for Truth through Certainty

Before Descartes, the systematic doubting of the possibility of knowledge in the sense of certain truth, called skepticism, can be traced back to Socrates and even earlier, to Xenophanes and Heraclitus, to the very beginning of philosophical musings about knowledge. Socrates famously said, "I know that I do not know." In contrast, for Descartes, skepticism was just a starting point: he wanted to use it as a method to get to certain truth, to ultimately undermine skepticism.

Descartes wanted to establish the whole of science on indubitable axioms. To arrive at this goal Descartes proposed his method of doubt. According to Bernard Williams, Descartes' chief modern commentator, he did not confuse truth and certainty. Rather, he regarded the search for certainty the only sure way to find the truth: certainty, identified with the impossibility of doubt, was a criterion of truth. In this quest, he hoped to find other criteria of truth.

The method of doubt required a resolution to doubt everything that he could manage to doubt. He begins this long process with skepticism regarding the senses. For example, can he doubt that he is sitting here by the fire in a dressing gown? He concludes that he can because sometimes he had dreamt that he was there when in fact he was in bed asleep. Moreover, madmen sometimes have hallucinations, so it is possible that he is in a similar state of mind.

Dreams, however, are like painters: they present us with copies of real things—at least of the elements that make them up. For example, you may dream of a winged horse, but only because you have seen wings and horses. Further thought makes clear, Descartes argues, that there are several abstract elements of all experience that are less dubitable than particular things that are made of complexes of these elements. Corporeal matters involving such aspects as extension, magnitude, number, are equally true in dreams as in wakeful experience, and hence are less sensitive to doubt than particular objects. Descartes concludes that astronomy and physics, being about particular objects, are less certain than geometry and arithmetic (abstract mathematics).

Descartes next raises the level of skepticism by granting that there may be an evil demon, unlimited in both deceit and power. Perhaps this demon sets about to cause him to doubt even that 2 plus 2 equals 4, and to make all sorts of mistakes in abstract mathematics.

However, Descartes continues, there is one thing that even such a powerful demon cannot make him doubt. He cannot deceive him if he did not exist. He may have no body. It is conceivable that he is under the illusion that he has a body. However, thought is fundamentally different. A demon could not make him doubt that he thinks, because this very doubting would be an instance of his thinking. It would amount to doubting that he doubts. Descartes concludes that despite his attempt to doubt everything, it must necessarily be that this truth, that the I who thinks must be something that exists. Hence, *I think, therefore, I am*. Also stated in Latin as *cogito ergo sum*. This became Descartes' first axiomatic principle.

Descartes argues that the *cogito* means that I am essentially something that thinks, because there is evidence that I exist if and only if I am thinking. If I am not thinking then there can be no evidence that I exist. Descartes concludes that mind exists if and only if thinking does. We can imagine thinking without body and body without thinking. However what can be imagined to be missing from something must

only be an "accidental" property of the thing. Therefore, thinking is essentially different from body. Thinking was understood by Descartes in a wide sense, as covering feeling, imagining, affirming, denying, willing, and so forth. Persistence of personal identity is maintained by the mind thinking at all times, even in sleep.

This is how Descartes arrives at his distinction between the two fundamental substances: *res cogitans* (thinking substance) and *res extensa* (extended substance).

But why, Descartes asks, is the *cogito* so evident? Descartes suggests that it is evident because it is clear and distinct. This commended itself to Descartes as a second axiomatic principle: all things that we can conceive clearly and distinctly are true. His argument for adopting this in turn was that God would not maliciously deceive us by making false ideas seem clear and distinct.

Not all of Descartes' contemporaries thought the cogito evident. Hobbes points out that the inference "I think, therefore, I am thinking substance" is uncomfortably like the inference "I walk, therefore, I am walking substance."

Bertrand Russell (1946/2005, p. 517) points out that St. Augustine (AD354–430) had invented Descartes' *cogito* argument, but had used it for other purposes and it did not figure prominently in his thoughts. Descartes, in contrast, uses it to establish a difference in the essential nature of thought as distinct from matter. This is interesting as he is using a theory of knowledge to make an ontological point: an argument from how we know to what kinds of things there are.

Mind to Body Influence

Descartes confined the mind "mainly" to a small region of the brain, the pineal gland. The mind acted on the body first through the pineal gland, which in turn acted on the "animal spirits," rare fluids, which connect the brain mechanically to the sense organs and the brain.

From our review of the intellectual context of Descartes' thinking, it will be clear why this immediately led to two grave problems. The most serious was that the animal spirits (essentially extended, matter) move the body by push. However, they in turn were moved by push, as a necessary consequence of Descartes' theory of causation, because all physical action had to be by push. How could an unextended soul push the extended animal spirits? This was an inconsistency.

This inconsistency was eventually removed by Leibniz (1646–1716) who was partly anticipated by Hobbes. Hobbes and then Leibniz pointed out that Descartes' purely geometric extension could not explain an important feature of matter: its resistance to penetration and division. As a consequence, the cohesion of bodies also becomes inexplicable in terms of the hooks on atoms, because, in order to work, these hooks must also be rigid. Force, Hobbes and Leibniz asserted, must be more fundamental than extension. As a corollary, Descartes needed force to account for his corpuscles: without such a force resisting division, they are infinitely fluid and therefore unable to push each other around. Instead, they suggested, one must postulate mutually resisting instantaneous point forces. Hobbes called these forces *conatuses* or *endeavors*.

Leibniz, the coinventor of the differential calculus, took literally Descartes' definition of mind as essentially unextended and matter as essentially extended. He reasoned that a mind must be a single unextended point in space. Descartes did not say precisely this, but it seems to be implied by the mind being unextended *and* having a specific position (in the pineal gland). On the other hand, extended matter must consist of an infinity of points. But not merely geometric points: otherwise, you would have Descartes' vacuous matter. Leibniz conjectured that the unextended points must be localized intensities, like forces at a point. Leibniz was encouraged later by the fact that such intensities were required in his differential calculus. Combining this thought with the Cartesian dichotomy (*mind = unextended and matter = extended*), forces, Leibniz argued, must be *mental.* In this way,

Descartes' difficulty in accounting for how the essentially different mind interacts with matter is avoided, because Leibniz postulates that the world—mind and matter—consists of indivisible mental monads, an infinity of point intensities or forces. On this view a person consists of an aggregate of monads, some more or less dominant than others. The person's soul is the most dominant of these monads. This was Leibniz' monodalogy.

However, there was another problem. Descartes had advanced a law of motion, to the effect that the total motion in the universe must be conserved. The quantity of motion of a body was the size of the body multiplied by its speed. Descartes did not distinguish between size (or bulk) and mass; and neither did he distinguish between speed and velocity. In the modern view, the mass of an object is measured by its resistance to acceleration, a view that refers to force, a concept that, as we have seen, was alien to Descartes' system. Speed is distance covered in a specific amount of time (e.g., 20 miles in one hour), but velocity is a vector concept—it always contains a direction—20 mph due north.

Because of his law of the conservation of motion, Descartes felt competent to say that although the mind could not move matter as such, the mind could change its direction, steer it, and thereby have an influence on the material world. However, this attempted solution was upset by Leibniz, who discovered the law of the conservation of momentum. This is quite different from Descartes' view on motion, because momentum is mass times velocity and velocity has a direction. Roughly expressed, the conservation of momentum is a resistance to any change of motion (speed or direction). Whereas Descartes' law referred only to the total quantity of matter multiplied by the speed, the new law of the conservation of momentum meant that even a change of direction had to be accounted for by push from other bodies (not minds). This immediately ruled out the possibility of the mind steering or deflecting the animal spirits and therefore in turn abolished the possibility of the mind controlling the direction of action of the body.

Descartes' assumption of an interaction between mind and body in Descartes' was later abandoned by his Dutch acolyte, Geulincx, and also by Malebranche and Spinoza. Wishing to retain the fundamental distinction between mind and body, Geulincx devised the theory of the "two clocks." Imagine you have two clocks that operate independently but are set up so that whenever one clock points to the hour the other one rings. To a naive observer, it would appear that the first caused the second to ring. So it is with the mind and the body: They are causally separate but coordinated. For example, whenever I will my arm to rise, my arm dutifully does so, but only because this coincidence has been prearranged. Called psychophysical parallelism, it was thought that this theory had the virtue of conforming to the principle that fundamentally different substances cannot interact.

However, since the work of Faraday and Maxwell, it is hard to maintain such principles. With the advent of Maxwell's theory of electric and magnetic fields, it is now implausible to maintain that mind cannot affect body because it is of a different substance. Bodies produce these fields, but they themselves are not bodies in the sense that we have seen stretching back through Newton, Descartes, and Galileo and to the ancient Greek materialists. Furthermore, these fields can act back on the material that gave rise to them: they interact. Therefore, one of the main arguments for the theory of the "two clocks" no longer stands. However, Descartes' idea of interaction between the very different mind and body, if shorn of much of its peculiar mechanism, still has a fighting chance.

Perhaps some of the most exciting recent attempts at a dualistic interactionist account are those of Popper and Libet. Both thinkers propose that mind may be a field of force that is produced by neural activity, but which also acts back on this brain activity. Popper's variant, partly inspired by Hobbes' and Leibniz's idea that mind can be thought of as intensities, stresses that mind and force fields share

a counterintuitive combination of properties: localized, point intensities, unextended, incorporeal, dependent on bodies, capable of affecting bodies, capable of being affected by bodies, having temporal duration.

SEE ALSO: Empiricism versus Rationalism; Epistemology; Essentialism versus Nominalism; Laws of Nature; Natural Kinds; Popper, Karl (1902–94); Scientific Metaphysics and Ontology; Truth —Theories of; Unity of Science

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ABSTRACT

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KEYWORDS

Aristotle; Galileo; history of science; materialism; self and identity; dualism; hallucinations; interactionism; methodology; mind