

Cognitive science: The mind–body problem

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Cognitive science is the science of the mind. It views the human mind as a highly complex information-processing system. This paper attempts to introduce the basic issues of cognitive science – the debate between the antagonistic philosophies of dualism and materialism.

A few decades ago, a new branch of science was born out of the efforts of researchers in linguistics, computer science, psychology and neuroscience. This branch of science is referred to as *cognitive science* – the science of the mind. It is concerned with mental phenomena like perception, thought, learning, understanding and remembering. Its scope is very wide, ranging from observing learning processes in children to programming computers to solve problems which were hitherto thought to be possible only with human intelligence.

Cognitive science views the human mind as a highly complex information-processing system – that is, a system which receives, stores, retrieves, transforms and transmits information. At the very start, cognitive science encounters a deeply philosophical issue, the mind–body problem, which has been plaguing the minds of philosophers for several centuries – the ontological and the epistemological riddles.

In philosophical language, the ontological question is:

1. What things really *exist* ?
2. What is their essential nature?

This is the mind–body problem. There are two theories which attempt to answer these questions:

I. The *materialist theory* holds that only the brain exists and what we call mental states and mental processes are merely sophisticated states and processes of a complex physical system called the brain.

II. The *dualist theory*, on the other hand, claims that mental processes constitute a distinct kind of phenomenon that is essentially non-physical in nature.

The mind–body problem cannot be discussed without looking into other compelling problems with which it is thoroughly intertwined:

1. *The semantical problem.* Where do commonsense terms for mental states like ‘pain’ or ‘sensation of warmth’ get their meaning. One possible answer is by one’s own experience which has taught us what relevant term to attach to the relevant mental state. But this again

raises a problem. How can I be sure that the inner sensation which my friend has attached to the term ‘pain’ is qualitatively the same as the inner sensation which I have attached to that term? This semantic worry is impossible to settle because it appears entirely impossible that anyone should ever have *direct* experience of someone else’s mental states and nothing less than such experience would settle the issue. This conclusion is very odd and violates our intuition. After all, the very purpose of language is public communication within a shared network of understanding. So now we turn to another theory of meaning.

To learn the meaning of pain is to learn that ‘pain’ is a state that is caused by bodily damage, a state that in turn causes other inner states such as mild unhappiness or panic and characteristic behaviours such as wincing or moaning. According to this theory, the essential feature of pain is a network of causal relations that connects any pain to a variety of publicly observable things.

Philosophy also raises another important issue.

2. *The epistemological problem.* Epistemology is the study of what knowledge is and where it comes from. Here also the *problem of others’ minds* is perplexing. On what grounds can I assume that my friend has any mental state at all? Or, for that matter, animals like the great ape and domestic dogs – do they have genuine consciousness like we think we have? Recent advances in computer technology have added computers also to this list. Can we say that a complex physical system like the computer, which can mimic successfully many of our so-called intelligent tasks, cannot for all that be called a conscious being? Each of us is self-conscious. Why is it that your own mental life is so transparent to you, when the mental life of others is so opaque? How is it that you feel, think and desire without looking at your behaviour? That is the capacity for introspection.

Let us return to the *ontological problem* or the *mind–body problem* and consider some of the questions and the current views on the subject.

The questions that can be posed are:

- 1) What is the real nature of mental states and mental processes?
- 2) In what medium do they take place?
- 3) How are they related to the physical world?
- 4) Will my consciousness survive the disintegration of my physical body?

- 5) Or will it disappear forever as my brain ceases to function?
- 6) Is it possible that a purely physical system such as a computer could be constructed so as to enjoy real conscious intelligence?
- 7) Where do minds come from, what are they?

The stand of dualism

The essential nature of conscious intelligence resides in something non-physical, called the mind, which is beyond the scope of scientific enquiry or understanding. Dualism is deeply entrenched in most of the world's religions, although it is more or less rejected by most scientific philosophers.

There are at least four radically different versions of dualism. Similarly, there are different versions of anti-dualism or the materialistic theory. The essence of the materialistic theory lies in the denial of the non-physical mind.

Substance dualism holds that each mind is a distinct package of non-physical substance, a thing whose identity is independent of any physical body to which it may be temporarily attached. René Descartes (1596–1650) is the father of substance dualistic theory. He theorized that reality divides into two basic kinds of substance.

As Descartes saw it, the real you is not your material body, but rather a non-spatial thinking substance which is in causal interaction with your body. Your non-physical mind causes visual/auditory/tactile experiences in your mind. And the desires and decisions of your non-physical mind cause your body to behave in purposeful ways. Its causal connections to your mind are what make your body yours and not someone else's.

But the difficulty with substance dualism theory is: How can a non-physical 'thinking substance' influence ponderous matter like the brain.

To overcome such doubts about cartesian dualism, some people have come up with the explanation of 'a ghost in a machine'. Mind is made up of a ghost – a spiritual substance, quite unlike a physical substance but in intimate contact with the brain. The mind-body interaction involves exchanging of energy in a form that our science has not yet recognized or understood. As ordinary matter by itself is a form of energy, perhaps the mind stuff is also energy of a form which we have not yet unravelled. This view is more of wishful thinking and there is no evidence as yet to support it, such as the survival of the ghost substance after the death of the brain stuff.

In another form of dualistic theory, the brain has a set of special properties possessed by no other kind of physical object. It is these special properties that are non-physical. This theory is called *property dualism*. The properties are, for example, having pain, having a

sensation of red, desiring a certain thing. These are the properties we associate with consciousness. They are held to be non-physical in the sense that they cannot ever be reduced to or explained by concepts of familiar physical sciences (irreducibility). One version of property dualism is epiphenomenalism, which says that mental phenomena ride over and above brain's physical state and emerge only when brain structure attains a certain level of complexity. This theory also holds that mental phenomena are incapable of influencing the brain's physical state. This viewpoint is somewhat strange because it denies that humans have volition, beliefs and desires which are in some ways connected to their behaviour. It demotes mental properties to causally impotent by-products of brain activity.

Interactionist property dualism asserts that mental properties do indeed have causal effects on the brain and thereby on behaviour. The brain's mental and physical properties are an integral whole and have systematic interaction with each other. One's actions are influenced by one's desires and volitions. Again, mental properties are held to be emergent properties and do not manifest at all until ordinary physical matter has managed to organize itself to a system of sufficient complexity.

Arguments for dualism

Dualism's major advocate is religion. Most of the religions of the world are committed to the notion of an immortal soul and therefore religious beliefs are naturally attracted to substance dualism. This we can call as an argument from religion.

The argument from introspection goes as follows: when you centre your attention on the contents of your consciousness, you do not think of a neural network pulsing with electrochemical activity. You apprehend a flux of thoughts, sensations, desires and emotions. Introspection, therefore, seems strongly on the side of some form of dualism.

The argument from irreducibility is that a variety of mental phenomena, like seeing the colour or smelling the fragrance of a rose cannot be accounted by purely physical explanation. A physicist might know everything about the molecular structure of the rose and of the human brain but that knowledge will not enable him to predict the human experience like smelling the rose. The final argument in support of dualism is the existence of so-called parapsychological phenomena such as telepathy and telekinesis, which, the dualist claims, are beyond purely physical explanation.

Arguments against dualism

Consider first the explanatory resources available to the materialist from neuroscience. We know much of brain's microstructure: how the neurons are organized into

systems and their interconnections, how sensory nerves come in from the sense organs and how motor nerves go to the muscles. We know much about their micro-chemistry. We know a great deal about the correlations between behavioural and cognitive deficits and brain damage. As opposed to this impressive list of explanatory achievements, there is no significant or trustworthy evidence for non-physical mental phenomena such as parapsychology in spite of endless pronouncements in the popular press. There is not a single parapsychological effect that can be repeatedly or reliably produced in any laboratory suitably equipped to perform and control the experiment. Not one. Honest researchers have been repeatedly hoodwinked by 'psychic' charlatans with skills derived from the magician's trade. Against this record of achievements of materialist scientists, the dualist may argue that these successes concern only the meditative functions of the brain and not the central or higher-level capacities such as reason, emotion and consciousness. Concerning the latter functions, both dualism and materialism draw a blank.

So far as the capacity for reasoning is concerned, machines already exist that execute sophisticated deductive and mathematical calculations in a matter of minutes that would take the human a lifetime. If these high-level capacities take place by a distinct mental stuff, then these faculties must be invulnerable to direct control of pathology by manipulation or damage to the brain. But, in fact, the exact opposite is true. Alcohol, narcotics or senile degeneration of nerve tissue will impair, cripple or even destroy one's capacity for rational thought.

Lastly, the arguments from evolutionary history, the evidence from fossil record, comparative anatomy and biochemistry of proteins and nucleic acids leave no room to doubt that the human brain is the end product of billions of years of evolution from very simple organism to the present highly complex organism.

To sum up, it appears as though we have to give up the view that we are distinct from our animal ancestors, much hard though it is to reconcile to the fact that we are also creatures of matter.

The goals of cognitive science

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In this paper cognitive science is defined as the study of intelligence as a computational process. The several disciplines which contribute to the study of cognitive science are briefly described so as to glean a birds-eye view of the subject of cognitive science.

COGNITIVE science is the study of intelligence and intelligent systems, with particular reference to intelligent behaviour in terms of computational processes.

It is difficult to propose a really satisfactory intentional definition of intelligence. However, in everyday life we are willing to judge when intelligence is being exhibited.

We say that people are behaving intelligently when they choose courses of action that are relevant to achieving their goals, when they reply coherently and appropriately to questions that are put to them, when they solve problems of lesser or greater difficulty or when they create or design something useful or beautiful or novel.

We apply a single term 'intelligence' to this diverse set of activities because we expect that a common set of underlying processes is implicated in performing all of them.

Today it is quite common to attribute intelligence to both human and non-human systems and, in particular, to programmed computers. Not everyone accepts this usage, but we call programs intelligent if they exhibit behaviours that would be regarded as intelligent if they were exhibited by human beings.

Intelligence is to be judged by the ability to perform intellectual tasks, independent of the nature of the physical system that exhibits this ability.

Cognitive science defined as the study of intelligence and its computational processes has several different approaches. For example:

- We can undertake to construct an abstract theory of intelligent processes, without regard to specific physical or biological implementations (formal logic).
- We can study human or animal intelligence seeking to abstract a theory of intelligence processes from the behaviour of intelligent organisms (experimental psychology).
- We can study computer intelligence, trying to learn the computational principles that underlie the organization and behaviour of intelligent programs (artificial intelligence).