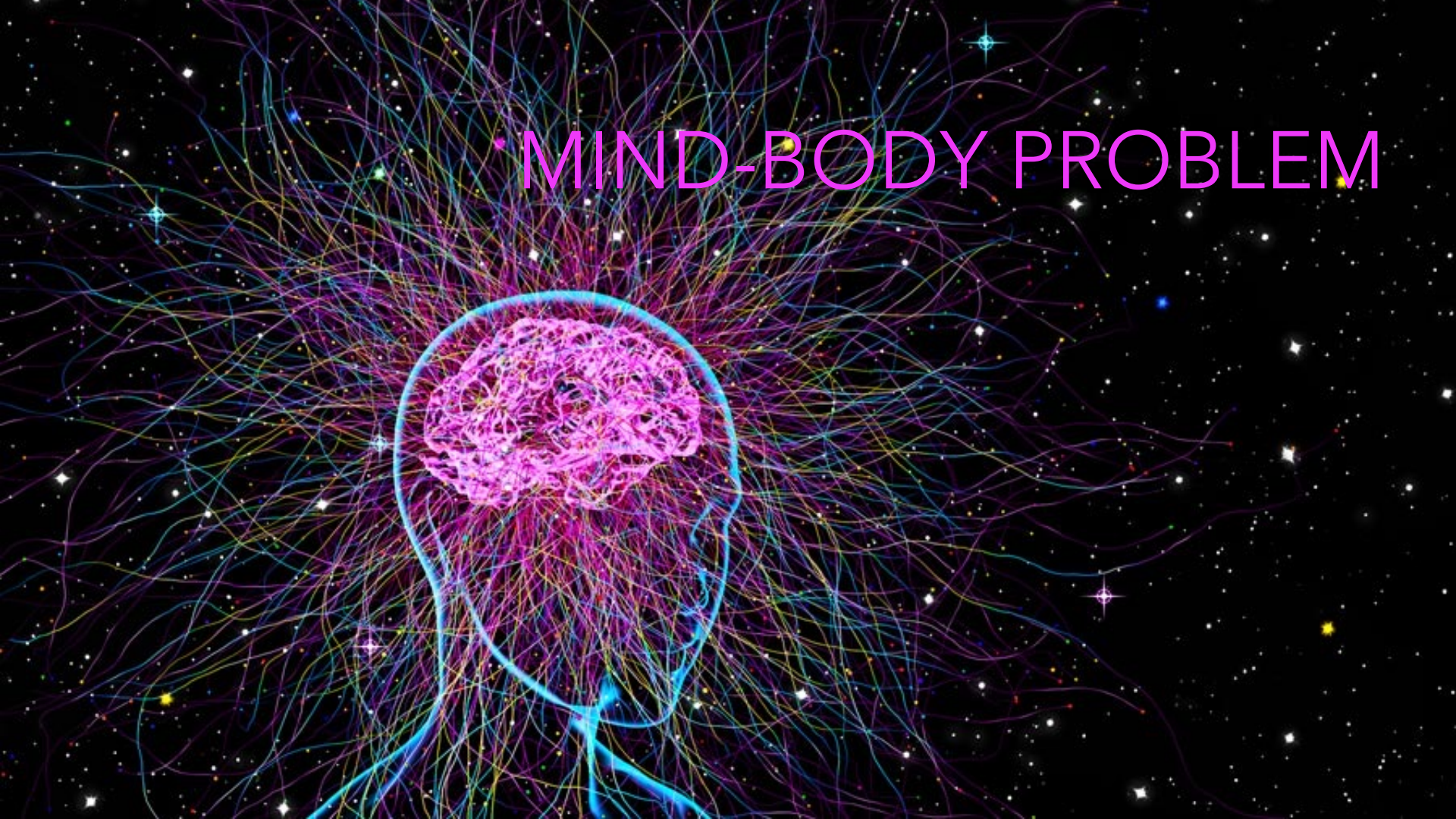
Introduction to Cognitive Science



Dr. Mark Miller

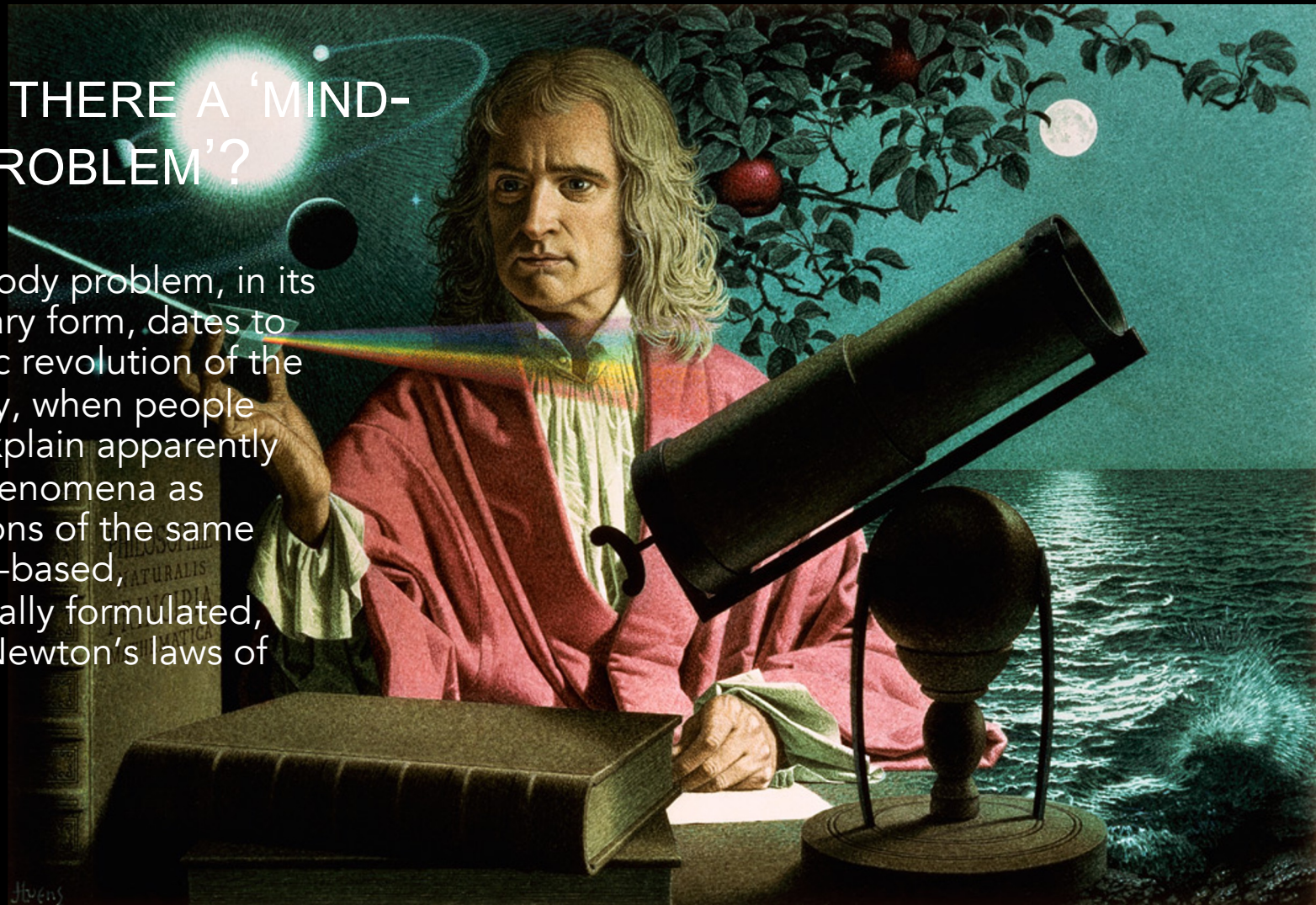
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MIND-BODY PROBLEM



Why is there a 'mind-body problem'?

The mind-body problem, in its contemporary form, dates to the scientific revolution of the 17th century, when people began to explain apparently different phenomena as manifestations of the same observation-based, mathematically formulated, laws (e.g., Newton's laws of mechanics).





René Descartes (1596–1650)

René Descartes was a French philosopher, mathematician, and scientist who is often referred to as the "Father of Modern Philosophy." Descartes is best known for his philosophical statement "Cogito, ergo sum" ("I think, therefore I am") and for his development of Cartesian dualism, which fundamentally shaped Western philosophy's approach to the mind-body problem.



Substance dualism divides the world into two kinds of thing: *material substance* and *mental substance*.

…What is a 'substance'?

For Descartes and his predecessors, substances are individual, 'self-standing' objects; they are *particulars*.

Distinguish from:

properties (blueness, roundness)

abstract entities (numbers, sets)



Substance

Descartes distinguished substances into *kinds* according to an *attribute*: an attribute is what makes a substance the kind of substance that it is.

According to Descartes, substances possess *one* and only one attribute.

Kind of Substance	*Attribute*
Material	Extension
Mental	Thought



Substance

Material things cannot exist without physical extension: location in space.

Mental things are of a different kind, typified by thought:

"…thought: this alone is inseparable from me. I am, I exist—that is certain."

"But what then am I? A thing that thinks. What is that? A thing that doubts, understands, affirms, denies, is willing, is unwilling, and also imagines and has sensory perceptions" (Med. II, p. 11)



Notice that Descartes uses ‘thought’ in a very broad sense. Among ‘thoughts’, he includes not only beliefs and inferences, but also: desires, choices, sensations, perceptions, pains, emotions, acts of imagination and memory .... anything that is or involves a mental state.



Substance

In Med. VI, Descartes summarizes his position as follows:

"But nevertheless, on the one hand I have a clear and distinct idea of myself, in so far as I am simply a thinking, non-extended thing; and on the other hand I have a distinct idea of body, in so far as this is simply an extended, non-thinking thing."

These are the fundamentals of substance ('Cartesian') dualism: minds fall on the side of the mental or spiritual and bodies on the side of the material or mechanical.



Some attractions of dualism

Dualism vindicates intuitions that we (our minds or souls) are separable from our bodies: that it is at least possible that we could persist—as minds, as persons—beyond the destruction or loss of our physical body.

Accordingly, dualism is consistent with theistic commitments about the possibility of an afterlife.



Some attractions of dualism

In addition to delivering hope in an afterlife, substance dualism is consistent with maintaining a *thoroughly mechanistic* science of the material world.

Even if the mental is not explained by such science, having disentangled the mental and the physical, the material world is now open to empirical investigation.



What are Descartes' arguments?

He has many … here we will only consider a few of the more influential ones.

All attempt to reach the same conclusion: that mind and body are fundamentally different kinds of substance:

Mind is a mental (spiritual) substance.
Body is a material substance.

Descartes' Arguments: Qualitative Distinctness

One of Descartes' arguments appeals to the Second Law of Identity (*a.k.a.*, the 'Indiscernibility of Identicals' or 'Leibniz's Law').

The laws of identity:

First law: for all x, x = x (Everything that exists is identical to itself)

Second law: for all x and all y, if x = y then, for all properties F, x is F if and only if y is F. ('The Indiscernibility of Identicals' or 'Leibniz's Law').

From Leibniz's Law, it follows that if two objects, *a* and *b*, do *not* share all the same properties in common, then they are non-identical (i.e., distinct).



What is all this talk of ‘mental phenomena’ about?

We are all familiar with a great diversity of ‘mental states’. Some key examples include:

- We hold *beliefs* and, more broadly, we can think, know, entertain, or suspect all sorts of things about the world outside us.
- We *reason*, i.e., form thoughts that are logically connected to other thoughts, and hold those thoughts true *because* of their logical connections. (More on this shortly)
- We *want* things, and consider some things better than others, and this influences how we act.
- We can be *pleased* or *displeased*; we can enjoy things or find them unpleasant.
- We make *choices*, and we can identify *reasons* why a choice makes sense.
- We experience *sensations*, both bodily sensations and sensations related to the ‘five senses’.
- By means of (at least some) sensations we *perceive* objects outside us, and perceive them as being various ways (e.g., as having various features and as standing in various relations to one another).
- We can recreate those sensory perceptions in *imagination*.
- We can *remember* past events and mental states, recalling them to mind or just recognizing when present mental states resemble them.

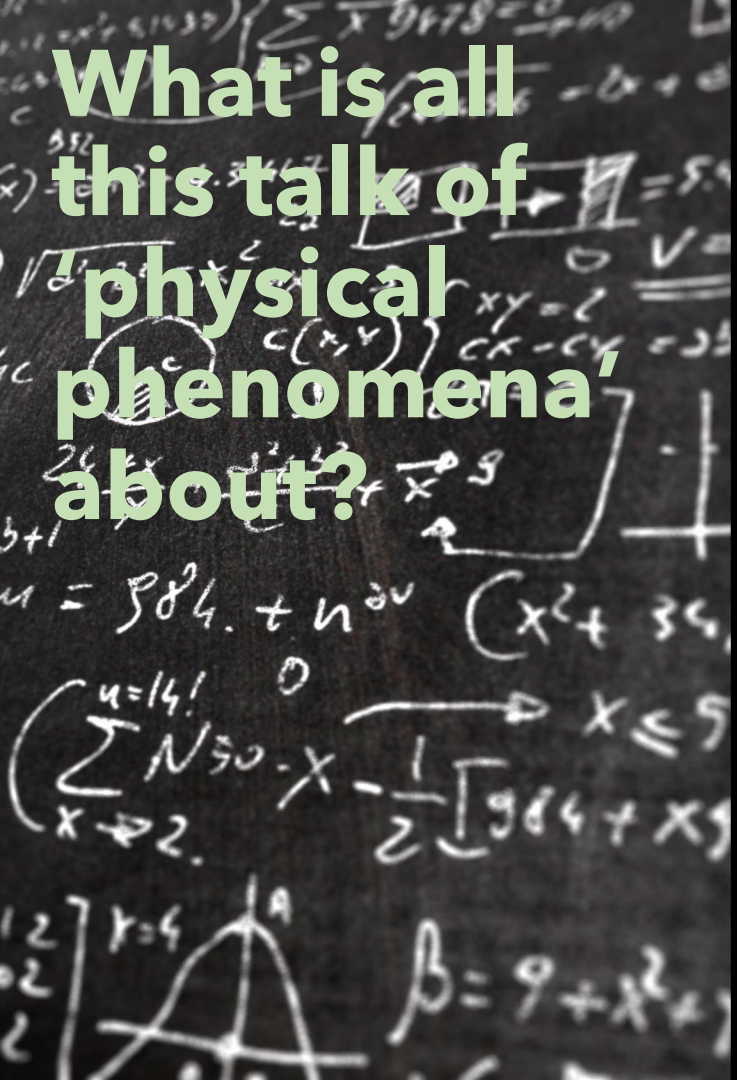


What is all this talk of ‘mental phenomena’ about?

Note some of key features from these examples:

1. Many mental states are ‘representational’: they are *about* or *of* something other than themselves, and can be true or false, accurate or inaccurate, satisfied or unsatisfied. (They possess ‘intentionality’).
2. Many mental states have a distinctive ‘quality’: something about them that we can feel and recognise but cannot put into words.
3. Many mental states are ‘conscious’: they are ‘present’ to the subject in a special way that makes one directly aware of them.
4. Mental states are ‘private’: they belong to a particular subject, and that subject knows them directly in a way that others don’t.
5. Many mental states reflect – or at least seem to reflect – a form of agency, freedom, or decision.

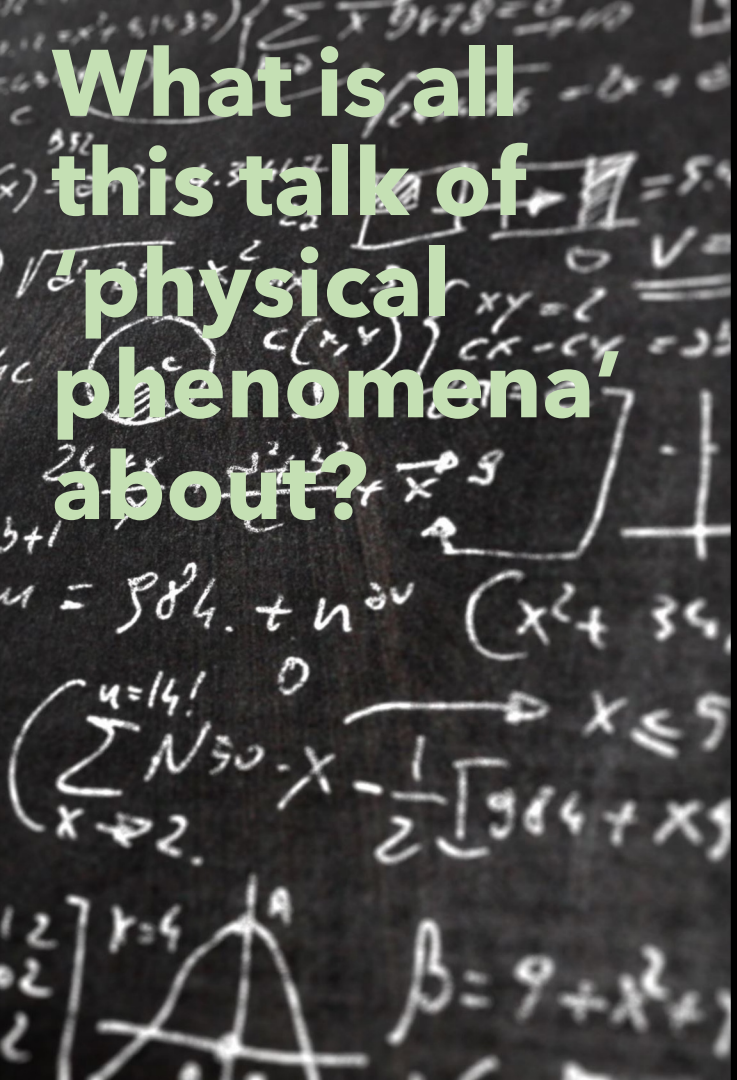
Questions to consider: Are some of these features more central to your concept of the mental than others? Might some (or all) of these feature be connected? Might some be more amenable to physical-mechanical explanation than others?



What is all this talk of 'physical phenomena' about?

There are a number of ways to define 'physical':

- By appeal to the senses: what's physical is whatever can be seen, heard, smelt, tasted, or touched (or detected by instruments which can be perceived in these ways).
- By appeal to scientific theory: what's physical is whatever conforms to the best theories *physicists* come up with.
- By pointing to paradigm cases: what's physical is whatever these things (paper, tables, water, stones, etc.) are all made of.



What is all this talk of 'physical phenomena' about?

In most cases, these three definitions seem to identify the same things as physical but they may not in all cases. However defined, physical things typically seem to have some noteworthy features:

1. They exist in *space* and occupy some smaller or larger portion of it.
2. Their features are *quantitative* and representable as mathematical quantities.
3. They exert *causal influence* on each other, and this influence is either deterministic or random . (It does not involve room for 'choice' or 'will'.)
4. They are 'public': however it is that we know about them, *anyone* can in principle know them equally well.

Descartes' Arguments: Qualitative Distinctness

Now consider the many (profound!) differences between material body and mind:

Bodies	*Minds*
Spatial	Non-spatial
Mathematically quantifiable properties	Non-quantifiable 'qualitative' properties (e.g., a certain feel)
Epistemically public (i.e., objective)	Epistemically private (i.e., subjective)
Purposeless and normatively 'inert'	Purposeful and normatively *evaluable* (e.g., in terms of truth)

These differences may motivate a simple argument for dualism:

(1) If x and y have different properties, then x and y are not identical (by 'Leibniz's law').

(2) Minds and bodies differ in their properties. (see above)

(3) So, mind is distinct from body.

Descartes' Arguments: Conceivability-Possibility Principle

Descartes (and many of the early modern philosophers) give arguments that appeal to a putative link between what is *conceivable* and what is *possible*.

Most simply: what is conceivable (for Descartes: 'clear and distinct' to the understanding) is possible, and what is inconceivable is impossible

Descartes justifies his use of this principle by appeal to God and clear and distinct perception:

Descartes' Arguments: Conceivability-Possibility Principle

"Firstly, because I know that all which I clearly and distinctly conceive can be produced by God exactly as I conceive it, it is sufficient that I am able clearly and distinctly to conceive one thing apart from another, in order to be certain that the one is different from the other, seeing they may at least be made to exist separately, by the omnipotence of God; and it matters not by what power this separation is made, in order to be compelled to judge them different; and, therefore, merely because I know with certitude that I exist, and because, in the meantime, I do not observe that anything necessarily belongs to my nature or essence beyond my being a thinking thing, I rightly conclude that my essence consists only in my being a thinking thing [or a substance whose whole essence or nature is merely thinking]. And although I may, or rather, as I will shortly say, although I certainly do possess a body with which I am very closely conjoined; nevertheless, because, on the one hand, I have a clear and distinct idea of myself, in as far as I am only a thinking and unextended thing, and as, on the other hand, I possess a distinct idea of body, in as far as it is only an extended and unthinking thing, it is certain that I, [that is, my mind, by which I am what I am], is entirely and truly distinct from my body, and may exist without it."

Descartes' Arguments: Conceivability of Disembodied Existence

(1) I can form a clear and distinct conception* of a situation where my mind exists just as it actually does but my body does not exist.

(2) Whatever I can clearly and distinctly conceive, God could have created.

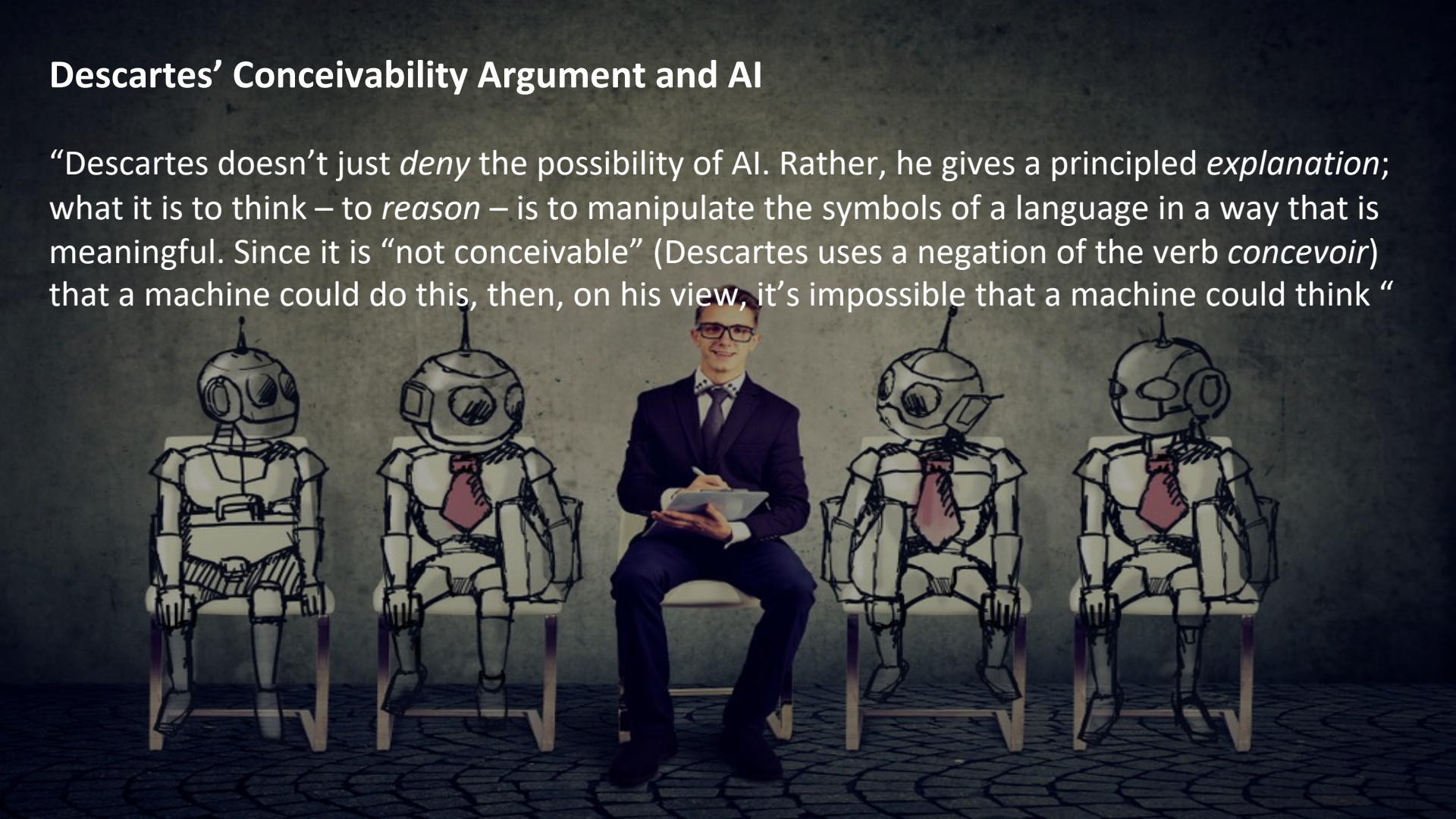
(3) If my mind could have existed just as it actually does without my body, then my mind is not the same thing as my body.

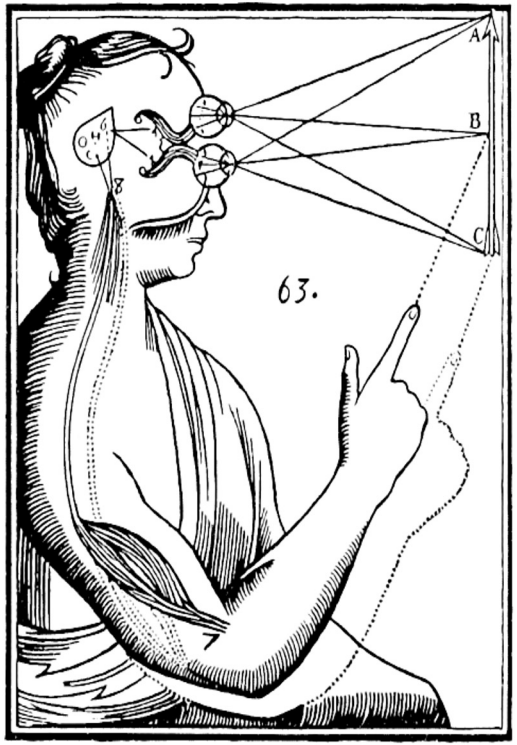
(4) So, my mind is not the same thing as my body.

*by a 'clear and distinct conception', Descartes means, roughly, an idea that (i) makes us vividly aware of what it represents, and (ii) allows us to distinguish everything that is and is not contained in that idea.

Descartes' Conceivability Argument and AI

"Descartes doesn't just *deny* the possibility of AI. Rather, he gives a principled *explanation*; what it is to think – to *reason* – is to manipulate the symbols of a language in a way that is meaningful. Since it is "not conceivable" (Descartes uses a negation of the verb *concevoir*) that a machine could do this, then, on his view, it's impossible that a machine could think "



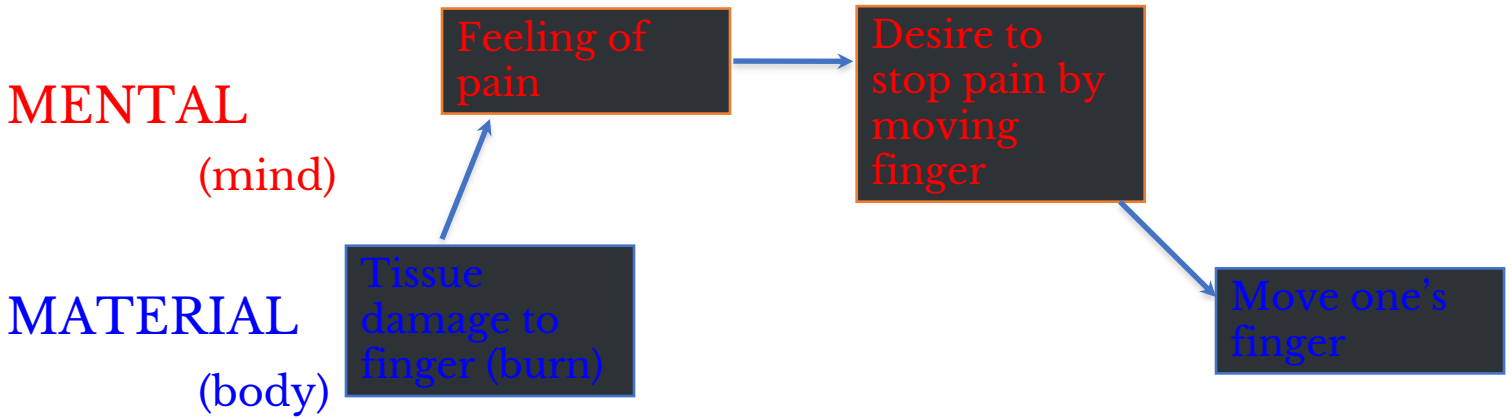


Descartes and mind/body **interactionism**



Interactionism

According to interactionism, mental substance (i.e., mind) and material substance (i.e., body) causally interact:





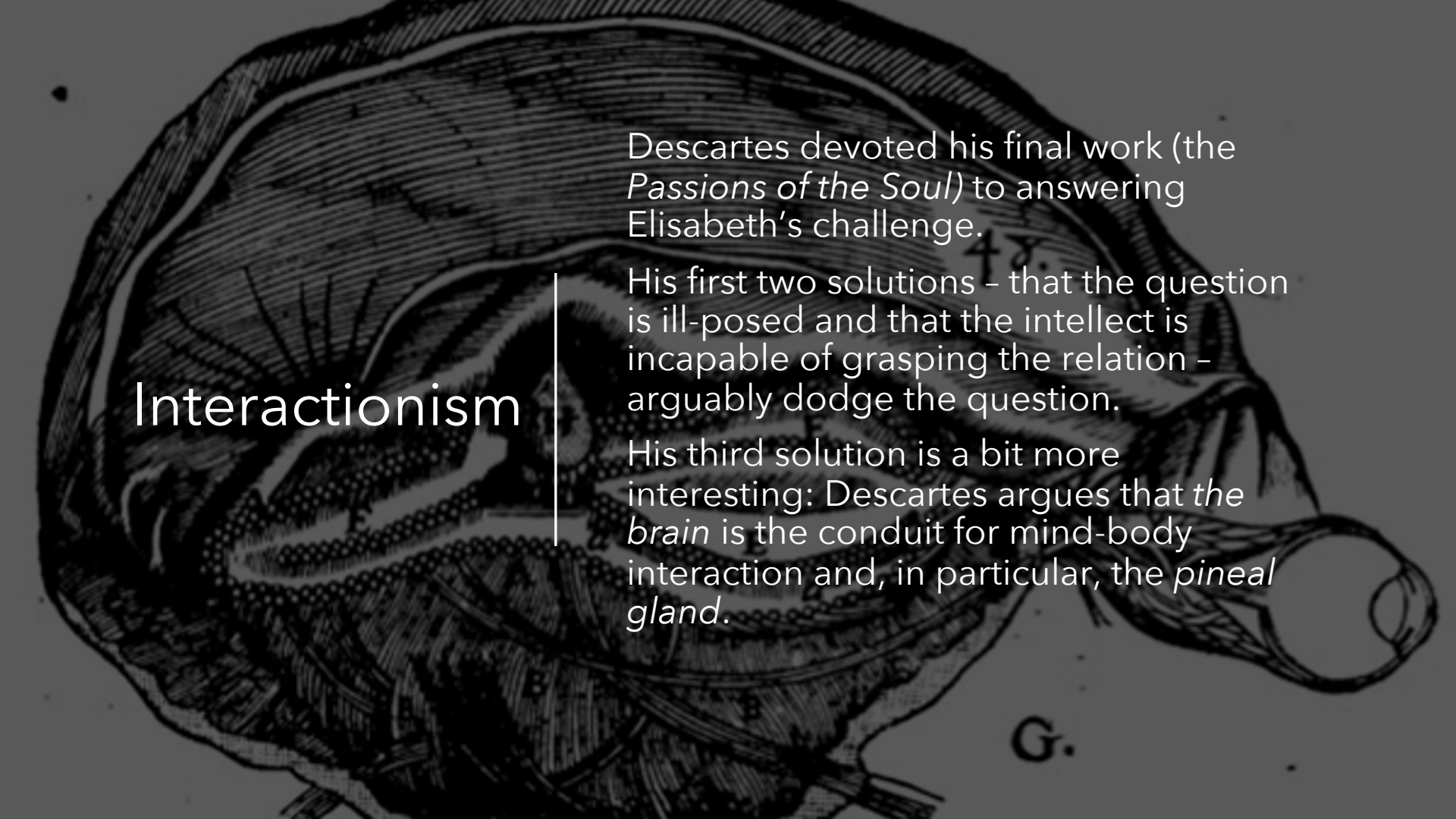
Princess Elisabeth of Bohemia (a.k.a., Princess Palatine)

- Descartes wrote to Elisabeth: "You are the only person I have found so far who has completely understood all my previously published works" (Descartes, Philosophical Writings, 2: 192).
- In a letter to Descartes, Elisabeth objected that it isn't enough for Descartes to assert that mind and body causally interact. Given the substantial differences between mind and body on Descartes' account, we are also owed an explanation of *how* they do so – i.e., of a purely spiritual, nonextended substance is able to *cause* material events in the body, and vice versa.



Princess Elisabeth of Bohemia (a.k.a., Princess Palatine)

"I beseech you tell me how the soul of man (since it is but a thinking substance) can determine the spirits of the body to produce voluntary actions. For it seems every determination of movement happens from an impulsion of the thing moved, according to the manner in which it is pushed by that which moves it, or else, depends on the qualification and figure of the superficies of the latter. Contact is required for the first two conditions, and extension for the third. You entirely exclude extension from your notion of the soul, and contact seems to me incompatible with an immaterial thing. That is why I ask of you a definition of the soul more particular than in your Metaphysic – that is to say, for a definition of the substance separate from its action, thought."

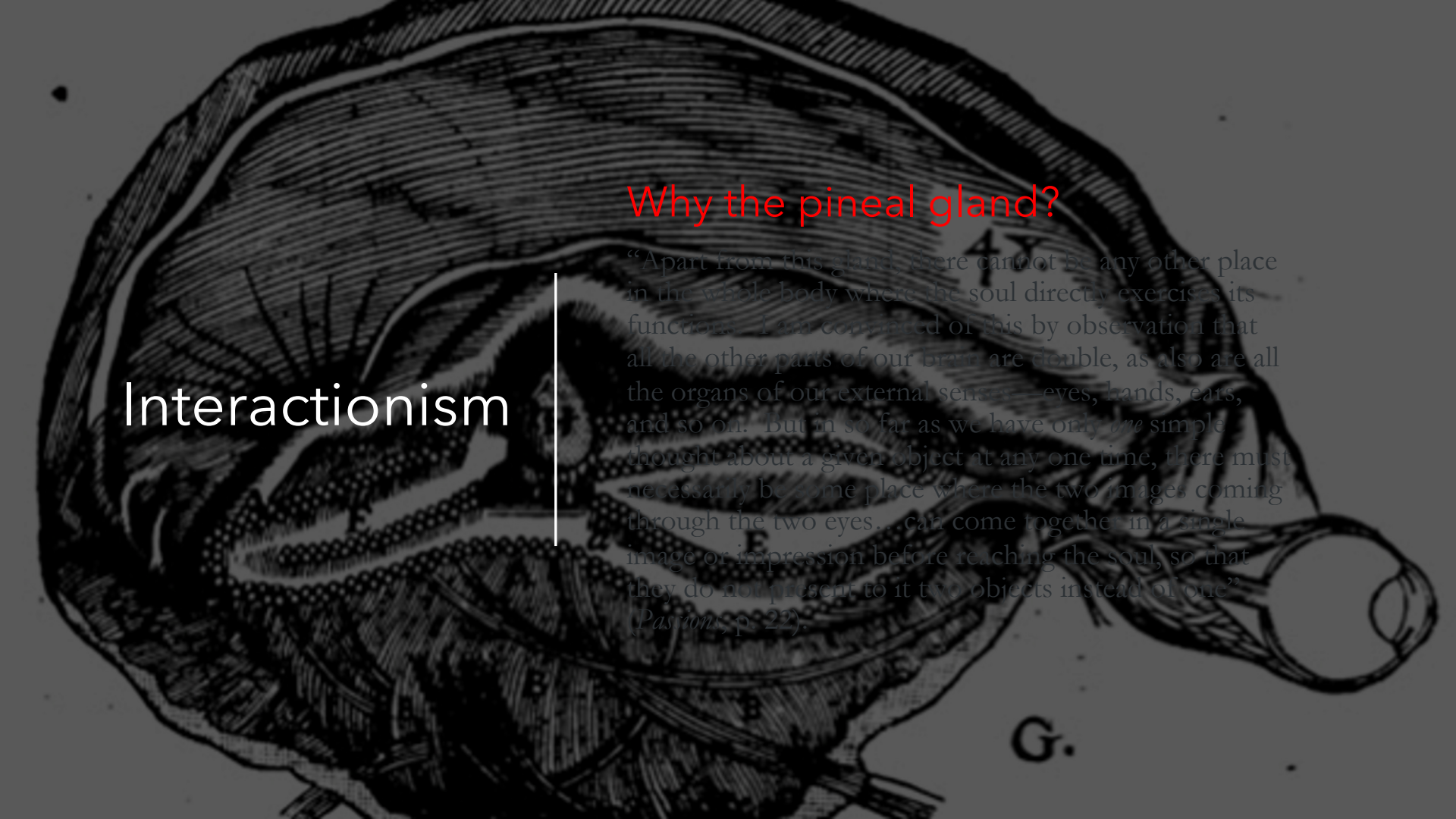


Interactionism

Descartes devoted his final work (the *Passions of the Soul)* to answering Elisabeth's challenge.

His first two solutions – that the question is ill-posed and that the intellect is incapable of grasping the relation – arguably dodge the question.

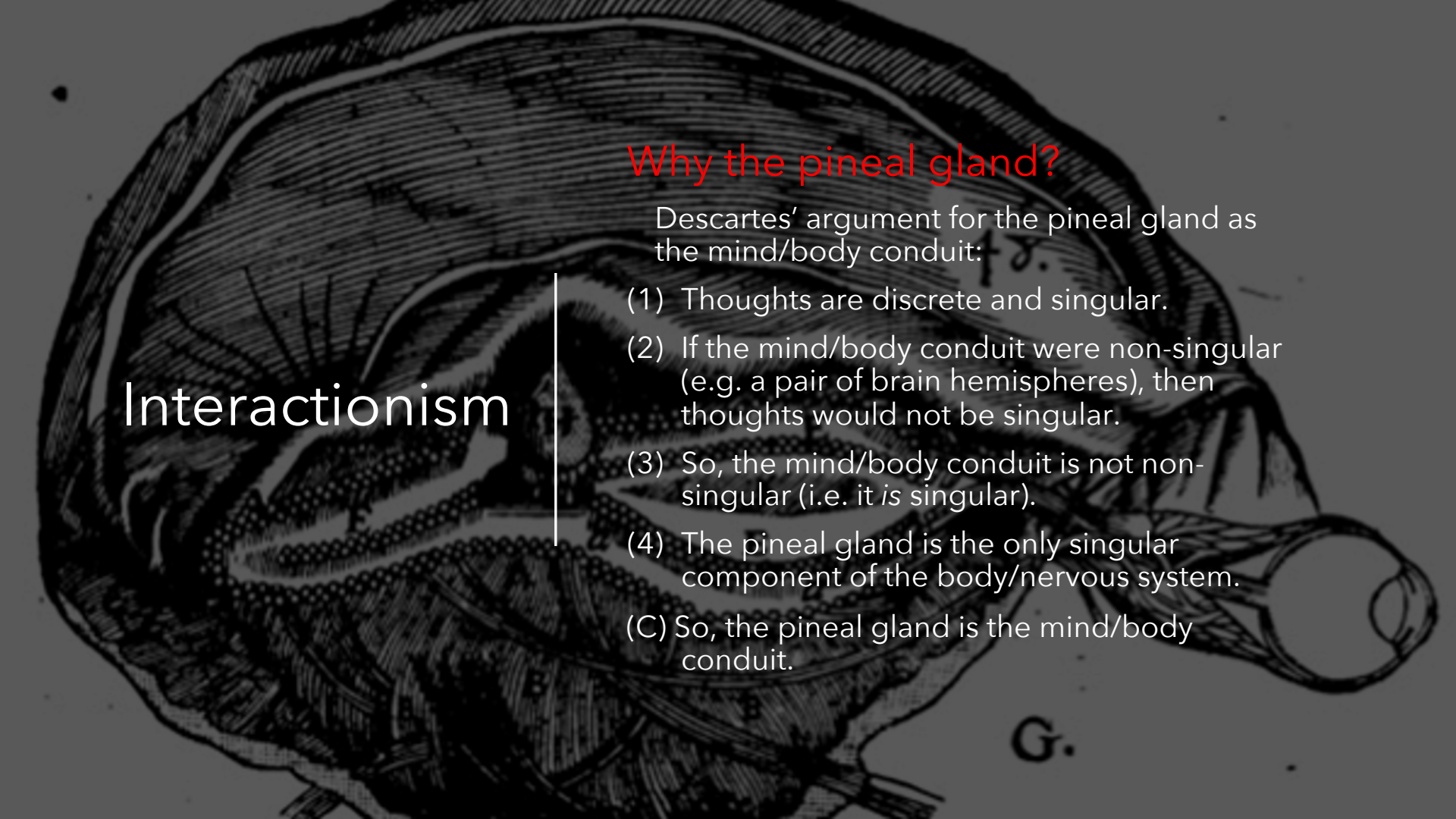
His third solution is a bit more interesting: Descartes argues that *the brain* is the conduit for mind-body interaction and, in particular, the *pineal gland*.



Interactionism

Why the pineal gland?

"Apart from this gland, there cannot be any other place in the whole body where the soul directly exercises its functions. I am convinced of this by observation that all the other parts of our brain are double, as also are all the organs of our external senses – eyes, hands, ears, and so on. But in so far as we have only *one* simple thought about a given object at any one time, there must necessarily be some place where the two images coming through the two eyes ... can come together in a single image or impression before reaching the soul, so that they do not present to it two objects instead of one." (*Passions*, p. 22).



Interactionism

Why the pineal gland?

Descartes' argument for the pineal gland as the mind/body conduit:

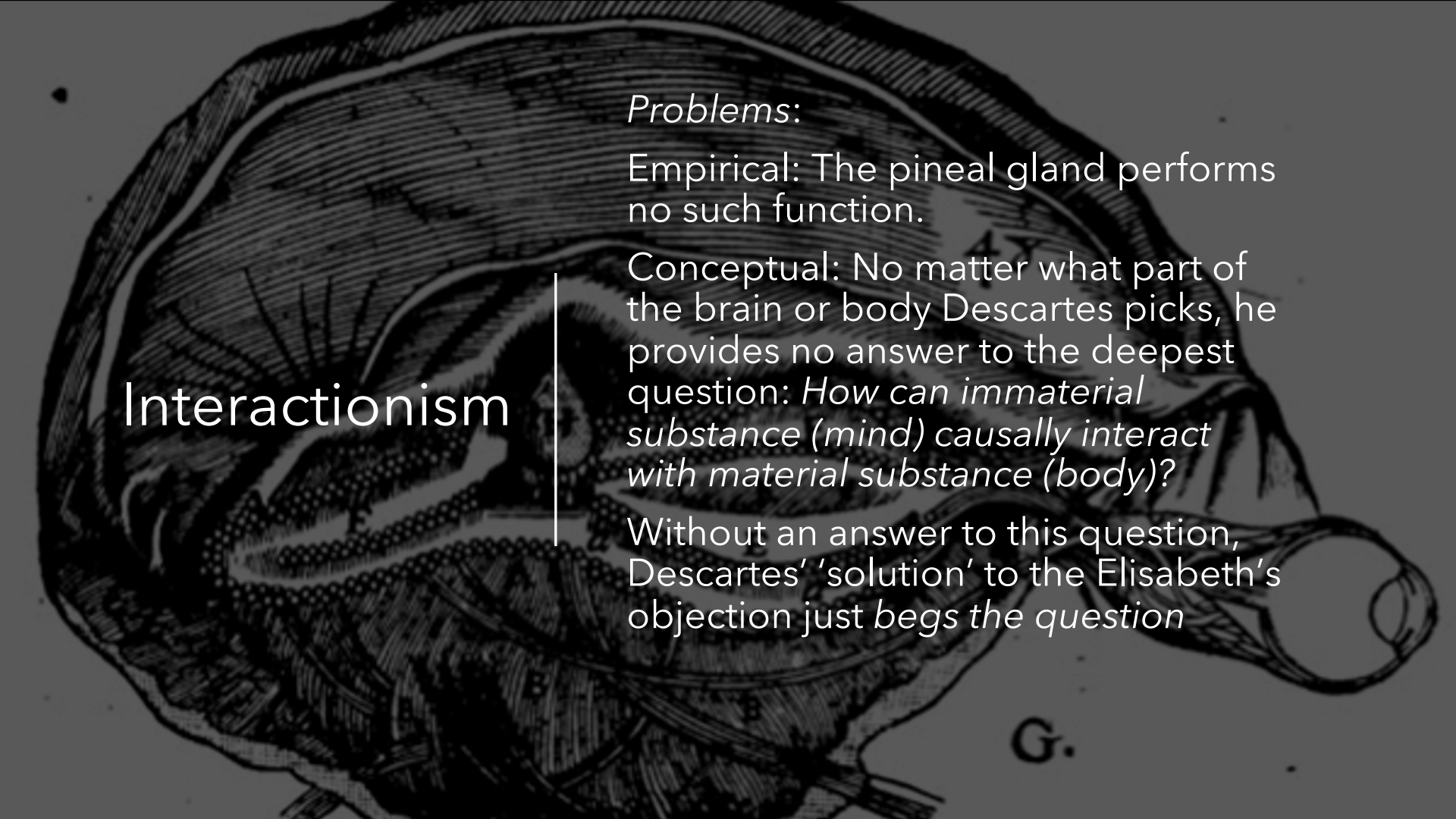
(1) Thoughts are discrete and singular.

(2) If the mind/body conduit were non-singular (e.g. a pair of brain hemispheres), then thoughts would not be singular.

(3) So, the mind/body conduit is not non-singular (i.e. it *is* singular).

(4) The pineal gland is the only singular component of the body/nervous system.

(C) So, the pineal gland is the mind/body conduit.



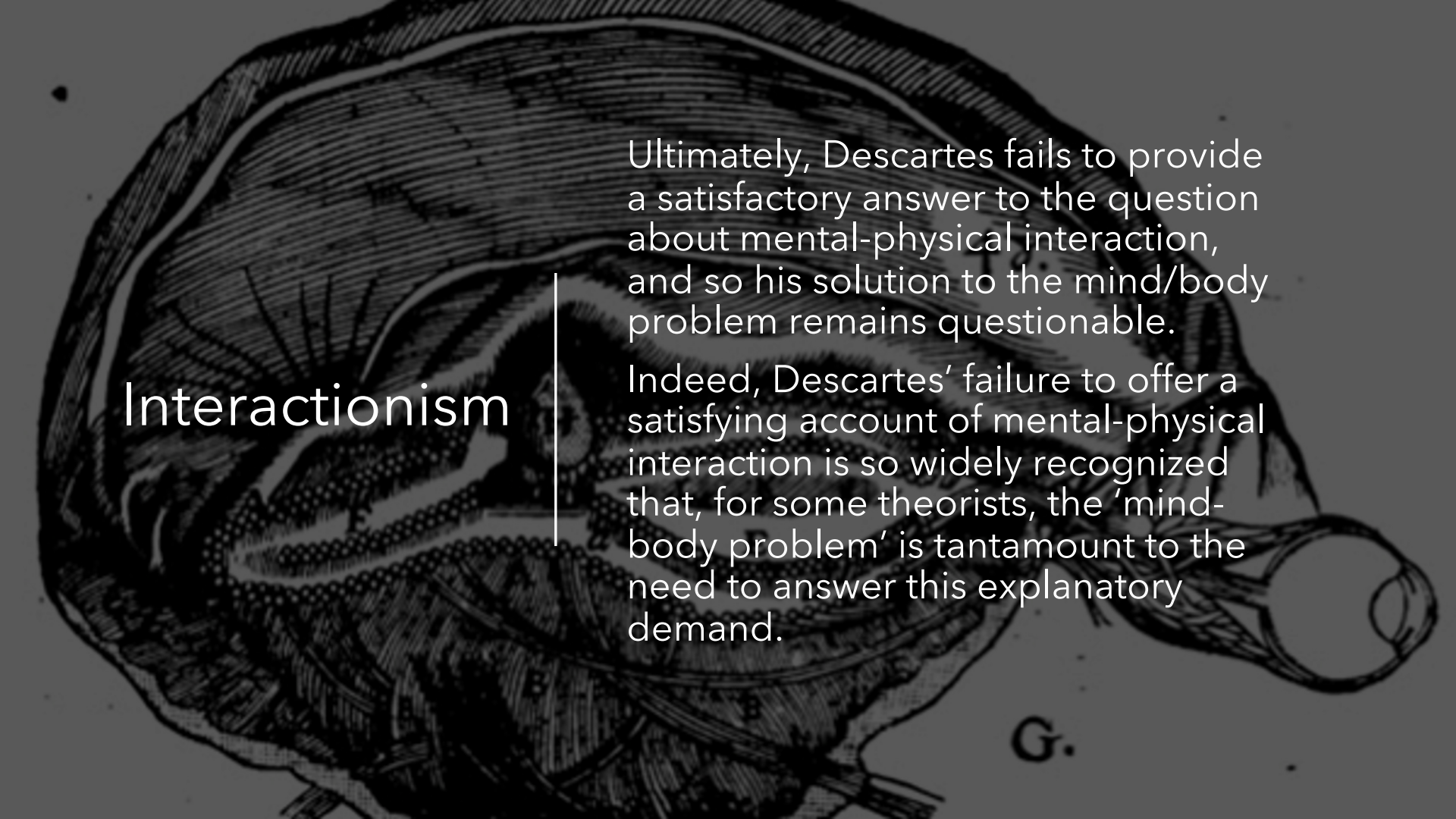
Interactionism

Problems:

Empirical: The pineal gland performs no such function.

Conceptual: No matter what part of the brain or body Descartes picks, he provides no answer to the deepest question: *How can immaterial substance (mind) causally interact with material substance (body)?*

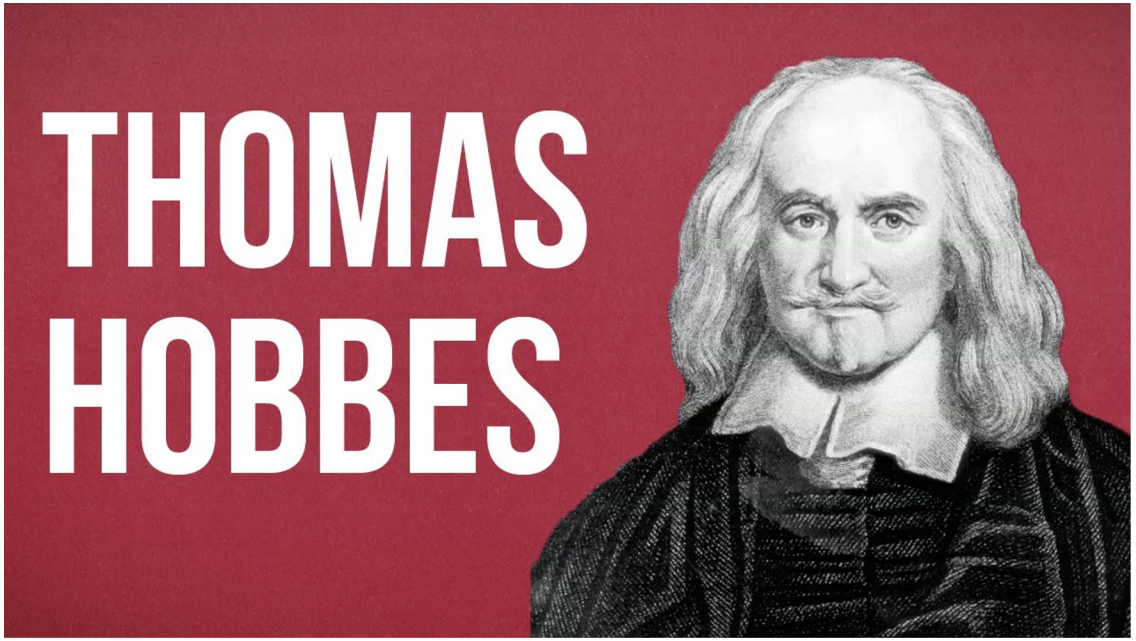
Without an answer to this question, Descartes' 'solution' to the Elisabeth's objection just *begs the question*



Interactionism

Ultimately, Descartes fails to provide a satisfactory answer to the question about mental-physical interaction, and so his solution to the mind/body problem remains questionable.

Indeed, Descartes' failure to offer a satisfying account of mental-physical interaction is so widely recognized that, for some theorists, the 'mind-body problem' is tantamount to the need to answer this explanatory demand.

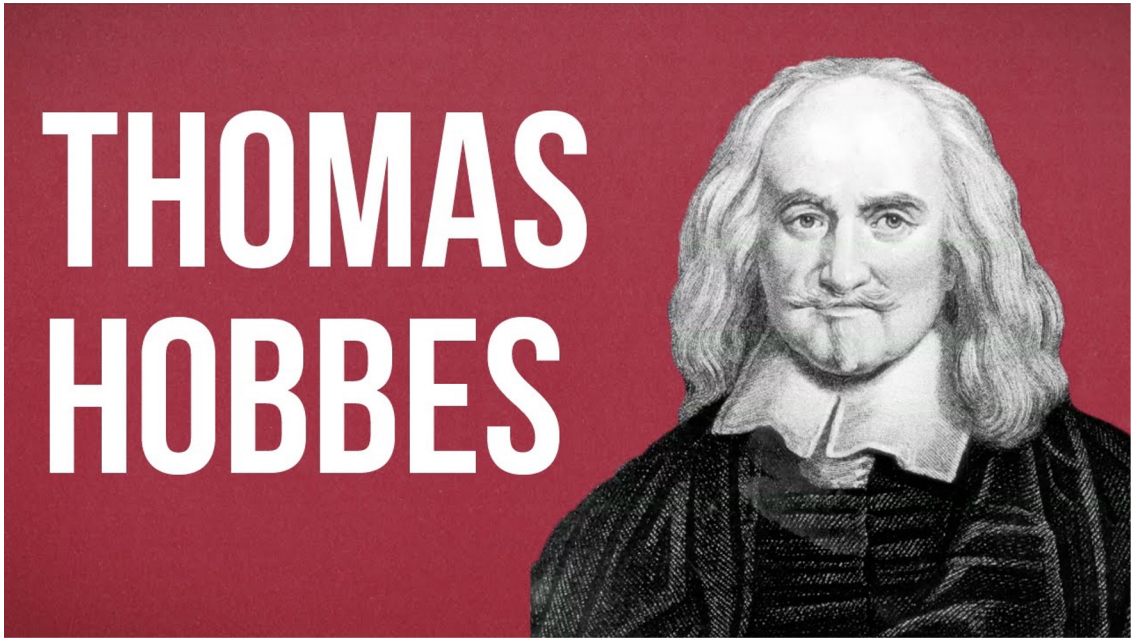


Thomas Hobbes (1588–1679)

Thomas Hobbes was an English philosopher best known for his work in political philosophy, particularly his book "Leviathan" (1651)

Hobbes was a **materialist (a.k.a. physicalist)**, meaning he believed that everything that exists is physical in nature. He argued that all phenomena, including mental phenomena, could be explained in terms of matter and motion.

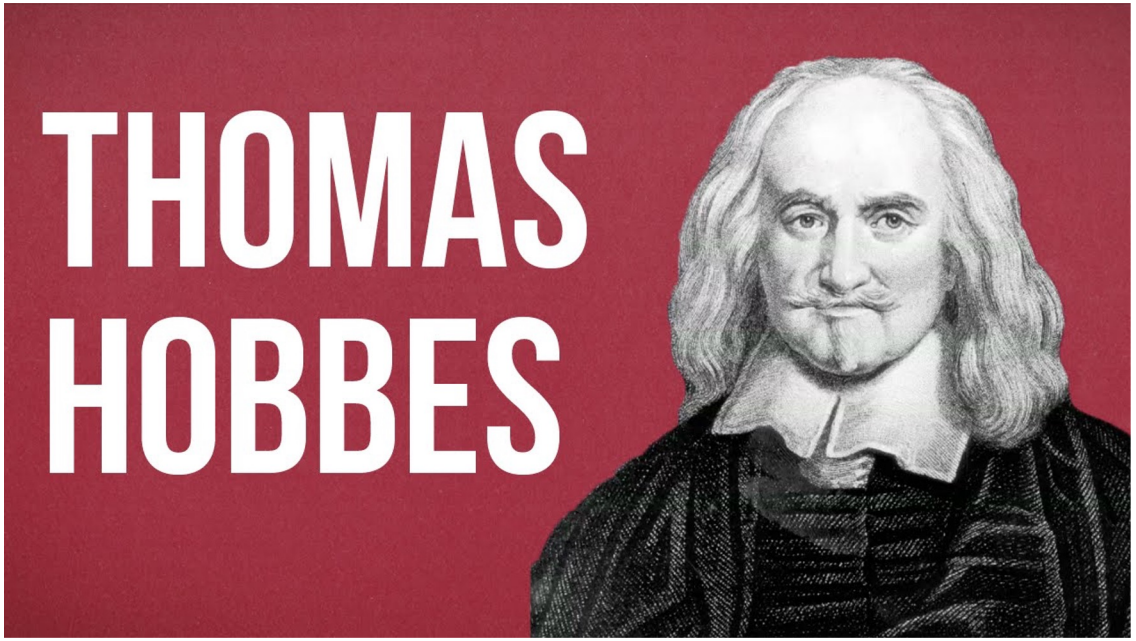
Hobbes' materialist view laid the groundwork for later scientific approaches to the mind, influencing the development of fields like psychology, neuroscience, and cognitive science.



"In the first chapter of his (1655) *Elements of Philosophy*, Thomas Hobbes declares "By ratiocination, I mean ***computation***" and thus comes to be described (e.g., by Haugeland, 1985) as the **"Grandfather of AI".**

Hobbes goes on to explain that all reasoning – thinking – can be considered along the same lines as the standard mathematical operations of addition, subtraction, multiplication and division".

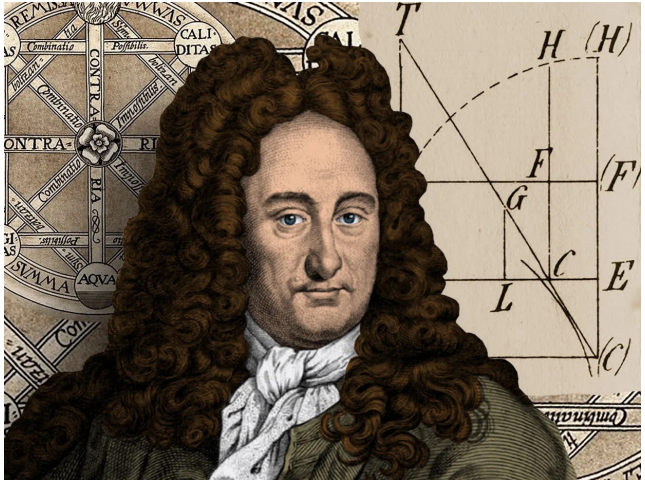
Ratiocination: "the process of making judgments about something based on sensible thinking or logic"

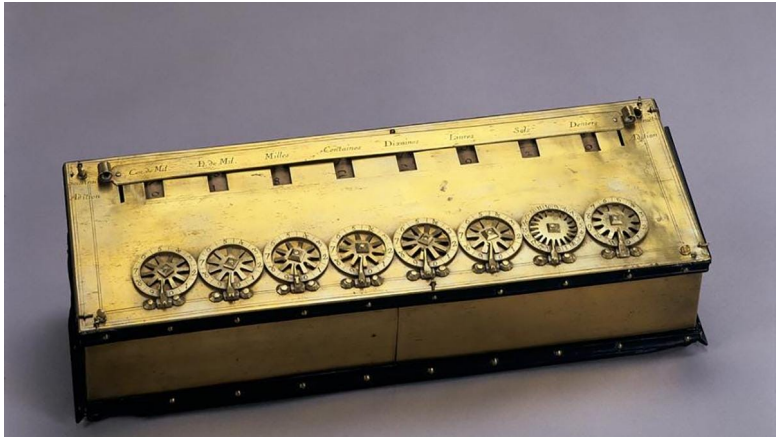


"In sum, in what matter soever there is place for *addition* and *subtraction*, there also is place for *reason*; and where these have no place, there *reason* has nothing at all to do [...] For reason, in this sense is nothing but *reckoning* – that is, adding and subtracting – of the consequences of general names agreed upon for the *marking* and *signifying* of our thoughts; I say *marking* them when we reckon by ourselves, and *signifying*, when we demonstrate or approve our reckonings to other men. (*Leviathan*, Part I, chapter 5)"

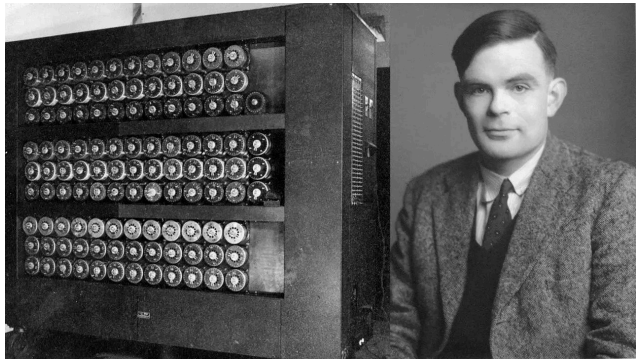
HISTORY OF COMPUTER
LEIBNIZ CALCULATOR











Taxonomy of positions on the mind-body relation

Dualism: The view that there are two fundamental aspects of reality. Minds and bodies really are as different as they seem.

- **Substance dualism**: Minds and bodies are two different things, which can in principle exist independently of each other.

- **Property dualism**: The same underlying stuff that bears physical properties (mass, location, etc.) also bears a distinct set of mental properties (qualitative feel, intentionality, etc.). Thus the mind cannot exist apart from the body.

    - *Emergentist* property dualism: Most physical stuff has no mental properties, but when combined in certain specific structures, mental properties appear.
    - *Panpsychist* property dualism: Physical stuff in general has both mental and physical properties, with the complex mentality of human beings matching the physical complexity of their brains.



Taxonomy of positions on the mind-body relation

Monism: There is only one fundamental type of stuff in the world, and both 'minds' and 'bodies' are versions of this stuff.

- **Idealism**: Everything is mental, and matter exists only as perceptions in different minds.
  - **'Berkeleyan' idealism**: The only minds are human minds (and perhaps God's mind); nonhuman things exist only as perceived by humans (and God).
  - **Panpsychist idealism**: *Everything* has a mind of some sort, both human and nonhuman.
- **Physicalism** (*a.k.a.,* materialism): Everything is physical, and minds are nothing over and above a particular type of physical thing.
  - **Behaviourism**: Each mental state is a disposition to behave in certain ways under certain circumstances
  - **Identity theory** (*a.k.a.*, brain state theory): Each mental state is identical to a certain brain state.
  - **Functionalism**: Each mental state is a particular structure of causes and effects.
    - **Computational (or 'machine') functionalism**
- **Neutral monism**: The basic stuff of reality is somehow 'in between' mental and physical, and can appear as one or the other in different contexts.



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