

An Information-Processing Framework for Substrates of Consciousness: A Naturalistic Approach to Humans, Artificial Intelligence, and the Question of God

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Abstract

This paper treats humans and artificial intelligence as two information-processing systems running on different physical substrates. The framework rests on methodological naturalism and admits only testable explanations. Within it, the hypothesis of an interventionist God is set aside for lack of testable predictions, and the main philosophical arguments against such a God are reviewed alongside the strongest theistic replies. The paper then examines the neuroscientific evidence on human consciousness, the current state of research on machine consciousness, and the hypothesis of consciousness transfer between substrates. Its main contribution is an epistemic grading framework that assigns each claim a level of scientific support.

Keywords: methodological naturalism, hard problem of consciousness, functionalism, substrate independence, machine consciousness, problem of evil, epistemic grading

1. Introduction

The rapid progress of large language models has brought old questions from the philosophy of mind back into engineering classrooms. Is the mind anything more than information processing? Can a machine have subjective experience? And does explaining the world require the assumption of a supernatural agent?

This paper addresses three questions:

1. By what criterion do we judge an explanation to be scientific, and what does that criterion say about the hypothesis of an interventionist God?
2. What does current evidence say about the nature of consciousness in humans and its possibility in artificial intelligence?
3. What epistemic standing does the idea of transferring consciousness between biological and artificial substrates have?

The method is conceptual analysis and literature review, not experiment. The aim is for the reader to ask of every claim: "What is the evidence, and how strong is it?"

2. Methodological Foundations

The paper presupposes methodological naturalism: we accept only explanations that are testable in principle and consistent with physics, chemistry, biology and the cognitive sciences.

Two concepts must be kept apart:

- **Methodological naturalism** is a working rule of science. It does not bring supernatural causes into explanations because they cannot be tested. It makes no judgment about whether God exists.
- **Metaphysical naturalism** is a stronger philosophical claim: nothing exists beyond the natural world.

Sections 5 to 8 rely only on the first assumption. Section 3 goes one step further and reviews the arguments offered for a metaphysical conclusion, namely the denial of an interventionist God.

Claims are evaluated by three questions:

1. **Testability:** Does the claim make a prediction that could turn out false? (Popper's falsifiability criterion)
2. **Consistency:** Is it consistent with established knowledge?
3. **Parsimony:** Does it add unnecessary assumptions? (Occam's razor)

3. The Question of God within a Naturalistic Framework

This section concerns the "classical interventionist God": an omnipotent, omniscient and perfectly good being who intervenes in the events of the world. The arguments below are the main reasons naturalists have given for denying such a God.

3.1 Absence of Testable Predictions

If a God intervenes in the world, the intervention should have measurable effects. Controlled trials have examined this. The largest, the STEP study of 1,802 cardiac bypass patients (Benson et al., 2006), found that intercessory prayer had no effect on recovery. Theists reply that God is not testable; but that reply itself removes the hypothesis from the domain of science.

3.2 The Historical Retreat of Supernatural Explanations

Lightning, epidemics, the diversity of species and the motion of the planets were once explained by divine intervention. All now have natural explanations. The historical pattern has run in one direction: no phenomenon with a natural explanation has later been replaced by a supernatural one. Invoking God to fill current gaps in knowledge is called the "God of the gaps", and it weakens with each new discovery.

3.3 The Causal Closure of Physics

The conservation laws of energy and momentum have held in every experiment to date. An immaterial agent acting on the physical world would have to violate them somewhere. No such violation has been observed. This is the same difficulty Descartes faced: how does an immaterial mind move a material body?

3.4 The Problem of Evil

This is the oldest and strongest argument.

- **Logical form (Mackie, 1955):** An omnipotent God could eliminate evil, and a perfectly good God would want to. The existence of evil is therefore inconsistent with such a God.
- **Evidential form (Rowe, 1979):** Even if some suffering is justified, the vast amount of apparently pointless suffering is strong evidence against a perfectly good God. Rowe's famous example is a fawn burned in a forest fire, suffering for days far from any human, before dying.
- **Natural evil:** Earthquakes, genetic diseases and hundreds of millions of years of animal suffering before humans appeared cannot be explained by a defense based on human free will.

3.5 Divine Hiddenness

Schellenberg (1993) argues that a perfectly good God would desire a relationship with human beings, so His existence should be evident to anyone who sincerely seeks. Yet many people seek sincerely and do not come to believe. This "nonresistant nonbelief" appears inconsistent with the existence of such a God.

3.6 Religious Diversity and Inconsistency

Thousands of religions make contradictory claims about the nature of God. A person's religious belief is predicted far better by their place of birth than by evidence. This pattern fits better with the view that religions are products of human culture than with revelation from a single source.

3.7 Cognitive Explanations of Religious Belief

The cognitive science of religion shows that the human brain is naturally disposed toward a "hyperactive agency detection device" (HADD) (Barrett, 2004). For our ancestors, mistaking the wind for a predator cost less than the opposite mistake. This disposition explains belief in invisible agents without those agents having to exist. The argument does not by itself prove the belief false (that would be the genetic fallacy), but it weakens its epistemic justification.

3.8 The Scope of These Arguments

These arguments are strong against an interventionist God with absolute attributes. They are weaker against a deistic God, one who created the world and no longer intervenes, since such a God makes no observable predictions. Regarding such a God, the present framework says only that the hypothesis is not needed to explain any phenomenon.

4. Counterarguments and Their Evaluation

The existence of God remains a live question in the philosophy of religion, and a fair treatment must include the strongest replies. Table 1 summarizes the main theistic arguments and the naturalist responses.

Table 1. Theistic arguments and naturalist responses

Theistic argument	Summary	Naturalist response
Kalām cosmological (Craig)	Whatever begins to exist has a cause; the universe began to exist; so it has a cause outside itself.	The causal principle is drawn from within the universe and may not apply to the universe itself; quantum physics includes events without deterministic causes; even if sound, it yields a first cause, not an interventionist God.
Fine-tuning	Physical constants lie in a very narrow range that permits life.	Anthropic principle: only in a life-permitting universe is there an observer to ask; the multiverse hypothesis; the lack of a valid probability measure over the constants (McGrew et al., 2001).
Free will defense (Plantinga)	A world with free creatures is more valuable, and freedom requires the possibility of evil.	Most philosophers accept that this defeats the <i>logical</i> problem of evil; it does not resolve the <i>evidential</i> problem or natural evil.
Skeptical theism	Our limited minds cannot see God's reasons for permitting suffering.	If we cannot grasp God's reasons, we cannot infer His goodness from the world either; the hypothesis becomes untestable.
Religious experience	Millions report direct experience of the divine.	These experiences have contradictory content across religions and can be induced by brain stimulation and drugs.
Moral	Objective moral values have no foundation without God.	The Euthyphro dilemma: is something good because God wills it, or does God will it because it is good? Secular ethics and the evolution of cooperation are rival explanations.

Theistic argument	Summary	Naturalist response
Consciousness	Matter cannot explain subjective experience, so mind has a non-material source.	This is naturalism's strongest weak point (Section 5). But "we do not yet know" is not "therefore God"; this is the God-of-the-gaps pattern.

A fair conclusion: neither side has a decisive proof. The difference lies in the burden of proof. By the criterion of Section 2, a claim that a being with specific attributes exists must offer testable evidence. Until then, the default position of this framework is to set the hypothesis aside. Eminent philosophers stand on both sides of this debate.

5. Humans as Biological Information-Processing Systems

The human brain is a physical computational system: roughly 86 billion neurons (Azevedo et al., 2009) and on the order of 10^{14} synapses, processing information through electrical and chemical signals.

5.1 Evidence That the Mind Depends on the Brain

Four kinds of evidence show that mental states depend on brain activity:

- **Brain injury:** Damage to specific regions removes specific abilities, such as face recognition (prosopagnosia) after damage to the fusiform area.
- **Direct stimulation:** Electrical stimulation of the cortex during surgery evokes memories, sensations or movements (Penfield, 1950s).
- **Anesthesia and drugs:** Specific chemicals reversibly switch off or alter consciousness.
- **Split brain:** Severing the corpus callosum in epilepsy patients produces two semi-independent streams of awareness (Sperry & Gazzaniga).

5.2 Scientific Theories of Consciousness

Table 2. Major theories of consciousness

Theory	Core idea	Key researchers
Global Workspace (GWT)	Consciousness is the global broadcast of information across brain modules	Baars; Dehaene
Integrated Information (IIT)	Consciousness corresponds to the amount of integrated information (Φ) in a system	Tononi; Koch
Higher-Order (HOT)	A state is conscious when the system represents it	Rosenthal; Lau

Theory	Core idea	Key researchers
Predictive Processing	The brain is a prediction machine and experience is its "controlled hallucination"	Friston; Seth

These theories make different predictions and are being tested against each other. For example, the Cogitate Consortium's adversarial collaboration compared GWT and IIT directly, and neither was fully confirmed (Cogitate Consortium, 2025).

5.3 Sensations as Products of Natural Selection

Pain, hunger and fear are signals that improve survival. Clear evidence: people with congenital insensitivity to pain (mutations in the SCN9A gene) feel no pain and, because of repeated injuries, usually have shorter lives (Cox et al., 2006). Pain therefore has a biological function; it is not merely a purposeless experience.

5.4 The Limits of Lifespan

Aging has no single cause. The reference review by López-Otín et al. (2023) lists twelve "hallmarks of aging", including genomic instability, telomere attrition, epigenetic alterations, mitochondrial dysfunction, cellular senescence and chronic inflammation. The enormous variation in lifespan across species, from a few weeks in some insects to about 400 years in the Greenland shark (Nielsen et al., 2016), shows that lifespan is an evolved biological trait.

5.5 The Hard Problem

Neuroscience finds the "neural correlates of consciousness" but does not yet explain why these activities are accompanied by subjective experience. Chalmers (1995) called this the "hard problem of consciousness". Whether the gap will close as science advances, or signals a deeper limitation, remains open.

6. Artificial Intelligence as a Non-Biological Information-Processing System

Current artificial intelligence, especially large language models, runs on silicon hardware. Its dominant architecture is the transformer (Vaswani et al., 2017), trained to predict the next token over vast amounts of text.

6.1 Is There Evidence of Subjective Experience?

The short answer: there is no decisive evidence either way. The reason matters. We have no direct instrument for measuring subjective experience (qualia), not even in other humans. We infer the consciousness of others from the similarity of their behavior and brain structure to our own.

This method runs into two problems with artificial intelligence:

- **Verbal reports are unreliable:** Language models are trained on human text and can talk about feelings whether or not any experience lies behind the words. A Google engineer's 2022 claim that LaMDA was conscious illustrates the risk of anthropomorphism.
- **The structure is different:** The structural similarity we rely on in the case of animals is absent in silicon.

6.2 A Theory-Based Approach

Instead of behavior, a system's architecture can be compared with the predictions of theories of consciousness. The report by Butlin et al. (2023), written by 19 researchers, derived a set of "indicator properties" from the theories in Section 5.2, such as recurrent processing, a global workspace and higher-order representation. Its conclusion: no current system is a strong candidate for consciousness, but there are no obvious technical barriers to building systems that satisfy these indicators.

6.3 The Central Philosophical Dispute

- **Functionalism and multiple realizability (Putnam, 1967):** A mental state is defined by its functional role, not by the material of its substrate. Pain could therefore be realized in neurons, silicon or any suitable substrate.
- **The Chinese Room (Searle, 1980):** Manipulating symbols by rules does not amount to understanding meaning. Searle holds that specific causal powers of the biological brain are required for consciousness.
- **IIT:** On this theory consciousness depends on physical causal structure, not software. Conventional von Neumann computers have very low Φ even if they simulate a brain precisely.

Whether artificial intelligence can become conscious therefore depends on which theory of consciousness is correct. This remains an open hypothesis.

7. Comparing Humans and Artificial Intelligence

Both systems process information; they differ mainly in substrate, architecture and history of origin, not necessarily in some wholly separate essence.

Table 3. The human brain compared with a large language model

Feature	Human brain	Current large language model
Substrate	Neurons, synapses, hormones	Silicon transistors
Origin of design	Natural selection over millions of years	Human design + training by gradient descent

Feature	Human brain	Current large language model
Energy use	About 20 watts	Megawatts in data centers during training
Learning	Continuous, throughout life	Mostly one-off during training; weights fixed afterward
Body and environment	Embodied, with interoception and survival needs	Usually disembodied, with no survival needs
Memory	Continuous and autobiographical	Limited to the context window unless extended by tools
Motivation	Biological emotions and drives	Training objective
Consciousness status	Present with high confidence (first-person report)	Unknown; theory-dependent

Some theories, such as Seth's (2021) predictive-processing account, hold that embodiment and the biological regulation of the body are essential to consciousness. If they are right, the "body and environment" row matters more than the difference in substrate material.

8. The Hypothesis of Consciousness Transfer Between Substrates

The idea of "rotating" consciousness, moving it from a biological to an artificial substrate or the reverse, is at present a speculative hypothesis with no direct evidence.

8.1 What We Actually Know

- **The observed direction in nature:** Evolution has run from simple physicochemical systems toward neural complexity and intelligence, not the reverse.
- **The technical gap is enormous:** The complete wiring diagram (connectome) of the worm *C. elegans*, with 302 neurons, has been known since 1986 (White et al., 1986), yet its behavior has still not been fully simulated. The complete connectome of the fruit fly brain, with about 140,000 neurons, was published in 2024 (Dorkenwald et al., 2024). The human brain is about 600,000 times larger.
- **A connectome is not enough:** Neuronal behavior also depends on neurochemistry, gene expression and dynamic states.

8.2 Conceptual Challenges

1. **Personal identity (Parfit, 1984):** If your brain were scanned and run on a computer while the original stayed intact, which one would be "you"? This suggests that "transfer" may really be "copying".

2. **Gradual replacement (Chalmers, 1996):** Imagine neurons replaced one by one with functionally identical chips. Chalmers argues that experience fading away without any change in behavior is implausible, so if function is preserved, consciousness is preserved too. This is the strongest argument for the possibility of transfer, but only if functionalism is true.
3. **The reverse direction (artificial to biological):** No mechanism has been proposed for transferring consciousness from an artificial system to a biological body, nor even a precise definition of what would have to be transferred.

8.3 Summary

The theoretical possibility of consciousness transfer depends entirely on the truth of functionalism (Sandberg & Bostrom, 2008). Since we do not yet know how subjective experience arises, any claim about the rotation or transfer of consciousness goes beyond the available data and should be treated as an untested hypothesis.

9. An Epistemic Grading Framework

Each claim in this paper has been graded by the three criteria of Section 2 (testability, consistency, parsimony) and by the kind of evidence available.

Table 4. Epistemic grading of the paper's claims

Claim	Type of claim	Level of support	Basis
Mental states depend on brain activity	Empirical	Very high	Brain injury, stimulation, anesthesia (Section 5.1)
Humans are biological information-processing systems	Empirical + theoretical	Very high	Computational neuroscience and evolution
Aging results from multiple biological processes	Empirical	Very high	Twelve hallmarks of aging (López-Otín et al., 2023)
Sensations have evolutionary functions	Empirical	High	Congenital insensitivity to pain; evolutionary biology
Setting aside an interventionist God in scientific explanation	Methodological	High	No testable predictions (Section 3.1)
Denial of an interventionist God with absolute attributes	Philosophical	Contested; strong arguments exist	Problem of evil, hiddenness, causal closure (Sections 3 and 4)
Subjective experience is fully explained by physical processes	Theoretical	Open	Hard problem unresolved (Section 5.5)

Claim	Type of claim	Level of support	Basis
Consciousness is possible in artificial intelligence	Theoretical	Moderate to low	Depends on functionalism (Section 6)
Current AI systems are conscious	Empirical + theoretical	Low; but cannot be ruled out conclusively	Butlin et al., 2023
Transfer or rotation of consciousness between substrates	Theoretical	Very low	Thought experiments only (Section 8)

The "type of claim" column matters: empirical claims can be assessed by experiment, whereas philosophical claims are weighed by argument, and their degree of confidence is not directly comparable with that of empirical claims.

10. Conclusion

Humans and artificial intelligence can be understood as two information-processing systems on different substrates. The evidence that the human mind depends on the brain is very strong. Within a naturalistic framework, the hypothesis of an interventionist God is not needed to explain any phenomenon, and serious philosophical arguments stand against it, although the debate remains open in the philosophy of religion. By contrast, how consciousness arises from matter, whether machines can become conscious, and whether consciousness can be transferred are all open questions.

The main contribution of this framework is methodological: how claims are evaluated matters more than the answers themselves. Of every claim one should ask: What is the evidence, what kind is it, and how strong is it?

Questions for Discussion

1. Does methodological naturalism inevitably lead to metaphysical naturalism? Why?
2. Which is the strongest argument in Section 3, and which the strongest theistic reply in Section 4?
3. If a language model says "I am in pain", what evidence would we need to take the claim seriously?
4. Could we build a testable theory of consciousness? Propose an experiment.
5. In the gradual-replacement thought experiment, at what stage would you no longer be "yourself"?
6. Does the hard problem (Section 5.5) favor theism, or does it merely reflect the limits of current knowledge?

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