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Journal of Philosophy

Published by the Department of Philosophy, University of Abuja

Volume 1 (2025), Article 1, <https://doi.org/10.70118/SSJP0001>

A Contemporary Justification of Cartesian Interactionism

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Abstract

Cartesian interactionism, the position that the mind and body are distinct yet capable of causal interaction, has historically faced persistent criticism, particularly for its perceived violation of physical causal closure and its lack of mechanistic clarity. This paper argues that such critiques, while historically significant, are not conclusive, and that developments in modern science offer conceptual frameworks that revitalise the plausibility of interactionism. Drawing on interdisciplinary analogies from fields such as thermodynamics, electromagnetic mediation in transformers, information transmission in telecommunications, and the mathematical concept of continuity, the paper demonstrates that interaction across ontologically distinct domains can be both coherent and intelligible. These analogies illustrate how systems with distinct properties may interact without collapsing into each other or violating physical laws. By reframing mental causation in terms of informational modulation, field influence, and systemic continuity, the study challenges the dominant view that dualism is incompatible with scientific understanding. Instead, it proposes a scientifically informed reinterpretation of Cartesian interactionism that is conceptually robust and philosophically credible. This paper thus positions Cartesian interactionism not as an obsolete metaphysical relic, but as a viable and contemporary philosophical account of consciousness and agency.

Keywords: Cartesian Dualism, Mind–Body Problem, Scientific Analogies, Causal Closure, Neo-Cartesian Interactionism

Introduction

In this paper, I argue that Descartes' theory of interactionism is not only philosophically plausible but is also relevant when viewed in the light of modern scientific advancements. René Descartes is known to have articulated a metaphysical distinction between two different types of substances: *res cogitans*, or the thinking substance (mind), and *res extensa*, or the extended substance (body). This doctrine, commonly referred to as substance dualism, asserts that the mind and body possess entirely different natures and that their essential attributes —thought and extension, respectively —can exist independently [Descartes 1996]. Moreover, Descartes went beyond merely stating that the mind and body are distinct substances, to argue that they can affect each other. Specifically, physical changes in the body, particularly in the brain, can lead to mental experiences like sensations; conversely, decisions or intentions in the mind can result in physical actions by the body. This perspective, later known as Cartesian interactionism, holds a unique position within the dualist tradition because it asserts that mental

experiences cannot be reduced to physical processes, yet, they can still induce changes in the physical world.

Descartes's interactionism faced criticism from both his contemporaries and later philosophers. One of the key concerns has been whether such interaction is feasible in mechanistic terms, given that mind and body are said to be entirely different and share no common properties. As such, critics argue that Descartes' theory lacks a clear and coherent explanation of how something non-physical, such as a thought or intention, could produce physical effects without contradicting established laws of physics. Following this line of reasoning, Jaegwon Kim contends that introducing non-physical causes into the physical realm undermines the principle of causal closure. He states, "If physical effects have sufficient physical causes, then there is no need and no room for non-physical causes" (Kim, 2005, 15). From this perspective, Kim believes that Descartes' interactionism introduces causal contradiction, rendering it incompatible with a scientifically grounded understanding of physical causality.

This seeming difficulty gave rise to several deeper questions that have been widely debated in several literature. Among them are concerns about whether Cartesian interactionism is consistent with the causal principles outlined in Descartes' Meditations, and what role, if any, is played by the so-called "occasional causes"—physical states or objects that appear to act as signs for the mind rather than as efficient causes [Sepetyi 2021]. In more recent times, Cartesian interactionism has also faced criticism from the standpoint of modern science, particularly about the principle of causal closure in the physical domain. This principle, widely accepted in contemporary philosophy of science, holds that all physical events must have fully physical causes. From this standpoint, the notion that an immaterial mind could influence the physical body appears not only implausible, but incompatible with the very framework of physical explanation. As a result, interactionist dualism is often dismissed as a relic of pre-scientific metaphysics, lacking both empirical support and explanatory power. This paper, however, demonstrates that recent developments in science provide conceptual models that enhance the intelligibility of Cartesian interactionism. It contends that some scientific analogies not only resonate with Descartes' core insight—that the mind and body can affect each other despite their ontological distinctness—but also help to clarify and strengthen the philosophical credibility of interactionism in a contemporary context. These analogies are presented here as empirical support of dualism, and as conceptual frameworks, or tools, to help clarify how interaction across distinct domains is possible without contradiction.

Cartesian Interactionism and the Mind–Body Problem

It is already established that Cartesian Interactionism holds that although separate, the mind and body can have a real causal connection. Put technically, Shaffer (1997) avers that in Cartesian interactionism, "states of consciousness can be causally affected by states of body and states of body can be causally affected by states of consciousness." This implies that the mind and body are not only different substances but also capable of influencing each other in such a way that physical conditions in the body, such as brain activity or damage, can cause mental experiences, like pain or emotions; likewise, mental states, such as thoughts, intentions, or decisions, can bring about physical actions, like moving a hand or speaking. Descartes argues this point of view by contending that although God is the only independent and absolute substance, the mind (*res cogitans*) and the body (*res extensa*) as formed, are dependent substances. Each has essentially different qualities; the body is extended and defined by spatial dimensions; the mind is unextended and defined by thought (Descartes, 1664/1996). While the body is passive, under control by mechanical rules, the mind is active, able to think and will. Descartes understood it is difficult to imagine how these two substances might interact without conflict since their natures are opposed. He then insisted that, despite this challenge, some features of human experience point to a close and personal unity between thought and body. He spoke of appetites (hunger, thirst), emotions, and passions—none of which can be fully understood as purely mental or purely physical. That is, these states cannot be satisfactorily explained by reference to either alone; they seem to arise from the interaction between the two

substances. Such encounters, Descartes thought, show proof that the human person is a cohesive entity created by their interaction rather than only a mix of two separate elements (Descartes, 1664/1996). Descartes suggested the pineal gland as the location of the mind-body communication to explain this interaction. He thought that this little structure in the brain was specifically positioned to operate as the point of mediation between mental volitions and physical acts, even though it is anatomically incorrect by modern criteria.

After holding such views, Descartes faced criticism; these critiques led to several efforts to propose alternatives to Cartesian Interactionism or, rather, a more reasonable theory for the connection between the mind and body. Baruch Spinoza, for example, provided another dualist perspective. Although he rejected Descartes's dualism (substance dualism) completely, he rather suggested a type of substance monism—that which he termed God or Nature—arguing that mind and body were just two properties of a single substance (Spinoza, 1677/2002). This concept influenced the development of the notion of parallelism as it was known later on. This perspective holds that although the mind and body do not directly affect one another, their actions occur in perfect time since they both reflect the same underlying reality. Though Spinoza never used the word "parallelism" personally, his notion that the mind and body follow the same pattern and order closely reflects the fundamental idea behind the theory we now call psychophysical parallelism. On the other hand, Nicolas Malebranche, while appreciating Descartes' dualist separation of mind from body, disagreed with the notion that these two entities could interact directly. Rather, he posited the doctrine of occasionalism, which views God to be the actual driver of all events. Malebranche argues that the intellect does not control the body when one decides to move one's arm. God instead intervenes at that precise instant to generate the physical action [Malebranche 1997]. God thereby operates on every occurrence of apparent mind-body contact. To better understand Malebranche's view, imagine someone grabbing a glass of water. From daily experience, we believe that reaching out comes from the mind and moves the arm. But Malebranche claims that the movement is not driven by the mind's choice. Rather, the choice just gives God more chances to intervene. Not the mind, but God drives the arm to move. The mind and body remain separate and apart; only God closes the distance between them. The thought does not move the body unless God works to provide the motion, much as turning a light switch does not light the bulb until electricity flows through the circuit.

In the eighteenth century, Thomas Reid argued that dualism and mind-body contact were both reasonable. He opposed the growing scepticism of his time, especially the materialist claim that mental states are reducible to physical processes, and the idealistic view that physical reality is merely a construct of the mind, even while he freely acknowledged that the exact mechanism by which the mind and body influence one another remains a mystery. Reid contended, therefore, that the interplay of mind and body is a fundamental truth of human experience, something to be acknowledged as self-evident rather than justified by abstract speculation (Reid, 1785/2002). Reid's thesis for interactionism was *not* undermined by the inability to offer a mechanical justification for how mental causes generate physical outcomes. He likened this to our knowledge of gravity: even if we cannot completely comprehend how it operates, we do not question its existence just because it remains very enigmatic. In the same sense, our firsthand experience of desiring an action, such as choosing to speak and then really speaking, serves as instantaneous proof of the mind's causal power over the body. Reid thus reinterpreted interactionism as a stance anchored not in metaphysical theory but in phenomenological and ordinary perception. For him, there is no theoretical explanation for the basic relationship between mental intention and physical action in our daily life. Conscious experience itself, he thought, provides all the evidence required that the mind and body interact in a significant and causal manner.

Karl Popper and John Eccles further gave interactionism fresh philosophical backing. Popper had proposed what he termed the three worlds theory, in which World 1 comprises physical objects and events, World 2 of mental states, and World 3 of objective contents of thought (such as theories, propositions, and arguments). Popper thought that interactions between World 1 (physical events) and World 2 (mental states) might preserve the dualist intuition inside a scientifically orientated framework (Popper & Eccles 1977). In the same vein, Eccles

defended a type of dualistic interactionism grounded in neuroscience by maintaining that although brain processes can affect mental states, the reverse is also true: conscious intentions can affect the probability of synaptic events in the brain. As such, Popper and Eccles proposed that the mind interacts with the brain by influencing quantum uncertainties in neural microstructures, so providing a mechanistic hypothesis for mind–body interaction. Though divisive and not generally accepted in mainstream science, their efforts marked a major attempt to reconcile dualism with new scientific knowledge, thus renewing interest in interactionism as a philosophically and scientifically viable position.

Contemporary Criticisms and Objections to Cartesian Interactionism

Besides efforts to provide more reasonable explanations to Cartesian Interactionism, some scholars, on the other hand, dismissed the idea of mind-body interactions, thereby challenging its plausibility. Gilbert Ryle offered one of the most influential critiques in this regard. He accused Descartes of committing a "category mistake". According to Ryle, Descartes mistakenly treated the mind as if it were a kind of thing, like the body, but existing in a separate realm. Ryle argued that mental concepts such as belief, desire, and intention are not references to hidden, non-physical substances but describe patterns of behaviour and dispositions to act. He thus states that "The dogma of the Ghost in the Machine is entirely false. It represents a category mistake of a most fundamental kind" [Ryle 1949]. In this view, the mind is not an independent entity interacting with the body; rather, it is expressed through observable behaviour. Ryle's critique led to the rise of logical behaviourism, which sought to explain mental states without reference to any inner, non-physical realm. However, Ryle was later criticised for oversimplifying the nature of consciousness and for failing to adequately account for the subjective, first-person experience that characterises mental life [Robinson 2020].

Patricia Churchland further presented one line of criticism against Cartesian interactionism. She argues that the assumption of an immaterial mind interacting with a physical brain is increasingly implausible in light of modern neuroscience. According to her, as we uncover more about the neural basis of consciousness, thought, and behaviour, the need to posit a non-physical mind becomes both unnecessary and scientifically irresponsible. In her view, "the weight of evidence favours the hypothesis that mental phenomena are deeply dependent on neural phenomena, and that positing a non-physical mind to account for consciousness is a desperate and scientifically unhelpful move" [Churchland 2002]. Churchland, therefore, argues that interactionism fails because it cannot provide any mechanistic account of how an immaterial entity could causally affect neurons, synapses, or bodily actions—a gap that physicalist models of mind are increasingly able to fill. Similarly, David Papineau has criticised interactionist dualism through the lens of causal argumentation. He maintains that if mental causes were genuinely distinct from physical causes, then they would have observable effects that could not be explained by physical science. However, no such effects have been detected. As Papineau (2002) puts it, "the success of the physical sciences in accounting for behaviour leaves no explanatory gaps for non-physical minds to fill" (p. 17). Thus, the ongoing success of neuroscience and physics in explaining bodily movement and behaviour without reference to immaterial minds poses a severe problem for the plausibility of interactionism.

Another recent criticism comes from Daniel Dennett, who critiques Cartesian dualism not only for being scientifically implausible but also for being conceptually confused. In **Consciousness Explained** (1991), Dennett describes the "Cartesian Theater" model—the idea that there is a central place in the brain where "mental events" are experienced—as a misguided leftover of dualist thinking. He argues that consciousness is better understood as a distributed, non-centralised process without the need for an internal observer or immaterial mind. While his work primarily targets residual dualist assumptions within cognitive science, Dennett's broader argument strikes directly at the plausibility of Cartesian interactionism by denying the coherence of a unified, immaterial experienter altogether [Dennett 1991].

One thing worthy of note is that these contemporary critiques are rooted in the empirical success of the sciences, the conceptual evolution of theories of consciousness, and the lack of evidence for non-physical causation. However, while these criticisms raise serious challenges, they do not decisively eliminate the possibility of mind–body interaction. Rather, they highlight the need for a reinterpreted model of interactionism—one that moves beyond outdated metaphysical assumptions and engages with contemporary scientific frameworks. The thesis of this study maintains that Cartesian interactionism, when viewed through the lens of modern science, becomes more conceptually plausible. Developments in fields such as systems theory, information science, and energy transformation show that interaction between distinct domains, without full ontological reduction, is both possible and observable. The lack of direct mechanistic evidence for mental causation is not, in itself, a conclusive refutation, just as the lack of a complete mechanistic explanation for gravity or quantum entanglement does not undermine their acceptance. Thus, while recognising the force of contemporary critiques, this study contends that a scientifically informed, neo-Cartesian interactionism remains a credible and philosophically rich approach to understanding the mind–body relationship. This is treated in the next section.

A Contemporary Justification of Cartesian Interactionism

Recent scientific paradigms suggest new ways to justify Cartesian interactionism without relying only on metaphysical assumptions. Although Descartes' original model of mind–body dualism has long been criticised for lacking scientific plausibility, however, modern developments in physics, systems theory, and information science open up conceptual space where interaction between distinct domains appears both coherent and possible. The first law of thermodynamics, a fundamental principle of physics, states that energy can neither be created nor destroyed, but only transformed from one form to another [Tipler & Mosca 2008]. While this law operates strictly within the physical sciences, its philosophical and metaphysical implications can be inferred. It suggests that even seemingly radical changes, such as the shift from kinetic energy (motion) to thermal energy (heat), do not involve annihilation or ontological rupture, but rather a reorganisation or redescription of energy's state. This idea challenges the assumption that causal interaction between different domains must entail the violation or destruction of one domain. An everyday example makes this more vivid: consider the boiling of water. As heat is applied, water molecules increase their kinetic energy, eventually transitioning the liquid into vapour. The substance is not destroyed but simply reorganised in response to environmental conditions. Similarly, in condensation, vapour molecules lose kinetic energy and reform as liquid. These natural transitions illustrate how one form of existence can influence and reshape another without elimination or brute mechanical causation.

This principle can serve as a metaphor for mental causation of mind–body interaction. If mind and body are seen not as isolated substances needing direct mechanical impact to affect each other, but as systems capable of transformative modulation, much like phase transitions in thermodynamics, then interactionism becomes more philosophically credible. Ellis's view is relevant here, where he explains, higher-level organisational states often exert top-down causation in complex systems: the pattern or form of organisation can constrain and direct lower-level processes without reducing to them (2005). Similarly, mental intentions could act as top-down informational constraints on bodily behaviour, guiding physical outcomes without needing to directly "push" or "move" matter in a Newtonian sense. Thus, understanding energy conservation and transformation provides a naturalistic model for reimagining mind–body interaction: not as the collision of alien entities, but as a structured, dynamic modulation across different energetic levels.

This understanding offers a fresh way to defend Cartesian interactionism in the context of modern science. Recall that critics of Descartes argued that if the mind and body are completely different—one being immaterial and the other material—then any kind of real interaction between them would be impossible. As such, they insisted that causal influence

must involve similar types of entities or require direct physical contact. However, the principle of energy conservation and transformation shows that interaction does not have to involve destruction, replacement, or even direct contact. Transformation across states can happen within a continuous system without violating the distinct properties of each form. When we apply this idea to the mind–body relationship, we can think of the mind and body not as radically isolated entities locked out of mutual influence, but as distinct systems that can modulate each other across different levels of organisation, much like energy modulates matter without changing its essential existence. Just as thermal energy reorganises the molecular behaviour of water without becoming a molecule itself, mental intentions could reorganise or modulate bodily actions without needing to become part of the physical structure of the body. In simple terms, the mind does not have to "push" the body mechanically to cause action. Instead, it can guide or constrain bodily processes through informational or energetic influence—a type of causality that fits naturally within the way we now understand complex systems in science. For example, deciding to raise your hand does not mean your immaterial mind physically moves atoms in your muscles. Rather, it could mean that your mental intention modulates the biological systems already in place, steering neural and muscular activity through lawful but non-reductive processes. Thus, by seeing mind–body interaction as a type of structured modulation across energetic fields, rather than brute mechanical force, we can defend a neo-Cartesian view that is fully compatible with scientific principles like energy conservation. Rather than being an outdated relic, Cartesian interactionism, when reinterpreted through the dynamics of modern physical science, becomes a credible and conceptually sophisticated model for explaining how two distinct realities—the mental and the physical—might interact without collapsing into one another or violating the laws of nature. In this way, energy conservation and ontological continuity provide an important contemporary justification for the plausibility of mind–body interaction, rescuing Descartes' core intuition from historical criticisms and aligning it with the best insights of modern science.

Another analogy that could serve as a contemporary justification of mind–body interaction comes from electrical engineering, specifically the operation of a step-down transformer. In simple terms, a transformer allows electrical energy to pass between two separate circuits—one operating at a high voltage and the other at a lower voltage—without any direct physical contact between them [Neidhöfer 2008]. Instead, the energy transfer occurs through a shared electromagnetic field that mediates the relationship invisibly but effectively. To grasp this intuitively, consider the everyday example of charging a laptop. When a charger is plugged into a wall socket, it connects to a high-voltage power grid, far too powerful for the delicate components of a laptop to handle directly. The charger contains a transformer that steps down the voltage to a much safer level. Crucially, the primary coil (connected to the wall) and the secondary coil (connected to the laptop) never physically touch; the transfer of energy is accomplished through induction, mediated entirely by the electromagnetic field. This allows for a real causal relationship between isolated systems without requiring direct material interaction. As such, if we think of the mind as a kind of high-frequency informational or energetic system, and the body as a lower-frequency physical structure, it becomes conceivable that interaction could occur not by mechanical pushing or pulling, but through field-like mediation.

In this analogy, mental intentions (such as deciding to speak or to move a hand) are not imagined as brute forces acting upon matter. Instead, they can be seen as informational modulations transmitted through complex biological systems—such as the nervous system or the endocrine system—which serve the role of biological transformers, translating mental activity into coordinated physical responses. Importantly, this model avoids the classical objection that dualism requires “ghostly” interactions or metaphysical violations of natural laws. Just as electromagnetic induction is a fully lawful, measurable, and scientifically understood phenomenon, so too might mind–body interaction be lawful and natural, operating according to patterns of field-based influence rather than direct mechanical causation. As Esfeld (2017) observes, modern physics increasingly recognises fields and relational structures as fundamental, sometimes more so than traditional particle models. Phenomena such as electromagnetic fields, gravitational fields, and even quantum fields show that real causal effects do not always require the contact of physical objects. Relationships mediated through fields are now standard in science, and the idea of interaction at a distance no longer carries the

mystery or implausibility it once did. Therefore, by drawing from the step-down transformer analogy, we find a powerful way to justify Cartesian interactionism in contemporary terms. Mind and body, though ontologically distinct, can be seen as connected through structured, lawful processes that preserve their distinctiveness while enabling real causal influence. Rather than viewing interactionism as a metaphysical relic, this model presents it as a coherent and scientifically plausible account of how mental events can have real, physical effects, without violating the autonomy or integrity of either domain.

Another analogy that sheds light on the possibility of mind–body interaction comes from the field of telecommunications. In technologies like mobile phones, computers, and the internet, non-material information—such as voice signals, text messages, images, or videos—is encoded into electromagnetic signals, transmitted wirelessly across distances, and then decoded back into tangible outputs [Holzmann & Pehrson 1995]. At no point is the actual material substance of a person’s voice or image physically transported from one location to another. Instead, it is the patterned information content that travels invisibly, carried by electromagnetic fields, and reconstructed at the receiving device. A simple example makes this clear: when you speak into your mobile phone, the sound of your voice is captured by a microphone, converted into electrical signals, and then transformed into electromagnetic waves that travel through the air to reach the recipient’s phone. The receiving device decodes the waves back into sound, allowing the other person to hear your voice almost instantaneously, despite the absence of any physical transfer of air molecules or vocal cords between you. This technological process provides an instructive metaphor for how mental states could causally affect physical bodily actions without requiring direct material influence. In this model, mental intentions—such as the desire to raise a hand or speak a sentence—can be understood as informational packets, structured within the neural architecture of the brain, transmitted through biological processes, and finally decoded into physical behaviour such as moving muscles, producing speech, or expressing emotions.

Crucially, this shows that causal efficacy does not have to depend on physical transport or material transfer. Information, though immaterial in itself, can produce real and observable physical effects when encoded, transmitted, and appropriately interpreted. This insight directly addresses a traditional objection to Cartesian dualism: that an immaterial mind could not meaningfully influence a material body. By analogy with telecommunications, mental causation does not have to operate like a physical force pushing matter. Instead, it can be conceived as informational influence operating through lawful translation and transmission processes—processes that are already familiar and well-accepted in modern science and technology. As Floridi (2011) has argued, information is increasingly recognised as a fundamental ontological category. It is neither purely material nor entirely abstract, but occupies a unique position where it can bridge the gap between different types of reality. Viewing the mind as an informational system opens up new conceptual possibilities for explaining its interaction with the body. Information flows are structured, dynamic, and capable of real-world causal power without themselves being material objects in the classical sense. Thus, reframing the mind in terms of informational dynamics allows us to defend a form of interactionism that is scientifically intelligible, conceptually robust, and free from the outdated metaphysical assumptions often used to criticise Descartes. Instead of imagining the mind as a "ghost in the machine," we can understand it as an informational agent operating within and upon biological systems, much like the signals that drive global telecommunications networks today. In this light, Cartesian interactionism, properly reinterpreted, gains renewed credibility. Rather than being dismissed as an incoherent relic of pre-modern metaphysics, it can be seen as a philosophically fertile model that aligns with contemporary insights into information theory, systems science, and the nature of causality.

A more abstract but philosophical analogy comes from mathematics, specifically the concept of the continuum. As Dedekind (1901) demonstrated, what appears to be discrete and separate, such as the numbers 3 and 4, is connected by an infinite continuum of decimal values. In mathematics, we often think of numbers as separate and distinct: for example, the number 2 and the number 3. At first glance, these seem completely different—2 is not 3, and 3 is not 2. However, if we look more closely, we see that between 2 and 3, there is no space or void.

Instead, a smooth, infinite series of numbers connects them: 2.1, 2.2, 2.3, 2.4, 2.5, and so on, getting finer and finer without ever leaving a real gap. Thus, what looks like two discrete, separate points is, in reality, connected by an endless continuum of intermediary states. There is no sudden jump from 2 to 3; it is a gradual flow. The apparent separation is something we impose for convenience, not something truly built into the structure of reality itself [Dedekind 1901]. This mathematical idea gives us a powerful analogy for thinking about mind and body. We often treat them as if they are totally separate: mental events on one side (thoughts, feelings, desires) and physical events on the other (movements, brain activity, chemical processes). Cartesian dualism described them as different "substances" with no direct overlap. But if we think using the continuum model, mind and body may not be radically different things. Instead, they could be different points or expressions along a continuous ontological spectrum, just as 2 and 3 are connected by countless numbers like 2.1, 2.2, 2.3, and so on.

Another way to picture this is to imagine the electromagnetic spectrum in physics. We label different parts as infrared, visible light, or ultraviolet, but these are not different kinds of substances. They are simply different frequencies along one continuous field. Similarly, mental states and physical states might be seen not as independent realms, but as different frequencies, patterns, or modes within a larger, unified field of existence. For instance, just as the number 2.5 is halfway between 2 and 3, we might imagine certain phenomena—like conscious brain activity—as occupying an intermediate space between purely mental intentions and purely physical actions. Conscious awareness, emotions, and bodily sensations could be the "decimal numbers" filling the space between mind and matter, linking the two not by a sudden jump but by gradual modulation. This approach aligns with contemporary philosophical views such as panpsychism and neutral monism, where mind and matter are seen as different aspects or properties of a deeper, shared reality [Chalmers 1996]. Instead of picturing mind and body as locked in a mysterious struggle to interact across a metaphysical void, we can see them as neighbouring territories on a continuous spectrum, naturally influencing each other through their proximity and relation. Thus, by thinking in terms of mathematical continuity, rainbows, coastlines, and number lines, we can reframe Cartesian interactionism. No longer is it the problematic interaction of two alien substances; it becomes the dynamic interplay of different but connected aspects of a single, layered reality. This vision is far more consistent with modern scientific understandings of complex systems, continuity, and gradual change, offering a fresh and plausible justification for the idea that mind and body can interact meaningfully without needing to be identical.

Contemporary Cartesian Interactionism: Implications for the Mind–Body Problem

Our reinterpretation of Cartesian interactionism through contemporary scientific models brings new perspectives to the mind–body problem. We have shown that scientific developments in fields such as physics, engineering, telecommunications, and systems theory now show that distinct systems can, and often do, interact across domains without material contact or ontological collapse. These developments suggest that the traditional criticisms of dualism may rest on outdated or overly narrow conceptions of causality and interaction. One of the implications of this shift is that our understanding of causality must be widened beyond the old mechanical models of "push and pull." In everyday experience, causation is often indirect, mediated, or structured through fields and informational flows. For example, when one person speaks to another through a phone call, the voice is not physically transferred across the distance. Instead, the information carried by electromagnetic waves reaches the receiver, where it is reconstructed into sound. Similarly, the mind's influence on the body need not be imagined as a mechanical force physically shoving neurons or muscles; it can be thought of as an informational modulation that lawfully affects biological systems—perhaps through neural fields, synaptic patterns, or complex emergent structures that science is only beginning to understand.

Another important implication is the rejection of the assumption that distinctness means isolation. Just as the numbers 2 and 3 appear separate but are connected by an infinite

continuum of decimals—2.1, 2.11, 2.111, and so on—mind and body may be distinct in character but continuously related in their existence. This view dissolves the supposed "gap" between mental and physical realities. Instead of seeing the mind as an alien visitor to the body, it can be seen as an expression on a higher organisational level, closely tied to but not reducible to physical processes. This mirrors the way colours in a rainbow blend into each other without sharp divisions: while we can name "red" and "orange," nature provides no hard line where one stops and the other begins. In this framework, mental phenomena like intentions, desires, and choices are not explained away as mere by-products of physical processes, nor dismissed as illusions. Instead, they are recognised as real, causally effective aspects of human existence, integrated into the physical world through structured, lawful relationships. For instance, the decision to write a sentence does not happen randomly or mechanically; it emerges from a structured informational intention that translates into motor activity, typing, and producing a physical text—an effect that is measurable and observable.

This reframing also undermines the old accusation that Cartesian dualism involves "spooky" or "miraculous" interactions. In fact, the examples from science—electromagnetic fields influencing objects at a distance, telecommunication networks transmitting voices through empty space, transformers transferring energy without physical contact—show that non-mechanical causal connections are part of everyday reality. The mind–body relationship can be seen similarly: not mystical, but structured, operating through lawful but non-material interactions, perhaps via fields or information systems yet to be fully uncovered. Moreover, adopting this broader view aligns Cartesian interactionism with recent philosophical movements. For example, David Chalmers' naturalistic dualism acknowledges that consciousness is a fundamental feature of reality, not reducible to brain processes, while neutral monism suggests that both mind and matter may be expressions of a deeper, underlying reality. In both cases, the relationship between mind and body is one of complex interaction across a continuum, not violent collision between incompatible substances.

Finally, the implications for human identity and free will are significant. If mental causation is real and lawful, then consciousness retains an active role in shaping our lives and choices. We are not merely passive machines determined by blind physical forces. Instead, our thoughts, decisions, and intentions matter—they have genuine causal power in the unfolding of our physical lives. Cartesian interactionism, updated with modern insights, preserves this vital truth about the human condition. Thus, when reinterpreted through the models provided by contemporary science, Cartesian interactionism does not crumble under philosophical criticism but rather evolves into a more robust, scientifically informed view of how mind and body coexist and interact. It shows that the mind–body problem is not solved by eliminating the mind or reducing it to matter, but by recognising the complex, layered nature of causality and the richness of reality. The mind–body problem remains a profound topic, but through this lens, it can now move from the realm of mystery to become a matter that is dynamic, structured, and deeply connected to the fabric of the natural world.

Conclusion

This study has shown how Cartesian interactionism—long criticised for its alleged incoherence—can find renewed philosophical support when reinterpreted through the bases provided by contemporary science. We have shown from the foregoing that interaction between ontologically distinct domains is not only conceptually possible but observable within the natural world. These challenge the traditional view that causality must always occur through material contact, suggesting instead that influence can be lawful, structured, and non-mechanical. Moreover, reframing the mind–body relationship through the logic of fields, spectra, and systemic modulation moves the debate beyond the old metaphysical binaries of substance dualism and reductive physicalism. It opens up a vision of reality where mind and body, though different in nature, participate in a continuous ontological structure, allowing for real and meaningful interaction without violating scientific principles. Thus, Cartesian interactionism, properly modernised, is not a relic to be discarded, but a dynamic framework

that invites new ways of thinking about consciousness, agency, and the layered complexity of existence. In a world increasingly understood through systems, networks, and invisible forces, Descartes' intuition—that mind and body, though distinct, can truly meet—remains more relevant than ever.

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