

On the Possibility of a Unified Science of The Mind

Abstract:

A unified science of the mind aims to explain the full range of mental phenomena, from perception and cognition to consciousness, within a single theoretical framework. Yet this project faces a fundamental difficulty if it is to include all mental phenomena. Consciousness is not merely an object of investigation but also the condition under which any investigation of the mind is conducted. As a result, attempts to explain consciousness appear to presuppose the very phenomenon researchers seek to explain. We call this difficulty the reflexivity problem: the problem of how consciousness can become an object of explanation when it is simultaneously a condition of the explanation. This paper investigates the conditions under which a solution to the reflexivity problem would be possible. It argues that the reflexivity problem is logically prior to familiar debates in consciousness studies, including the explanatory gap and the naturalization of phenomenology. A scientific account of the mind presupposes a domain of determinate mental phenomena, yet consciousness participates in the very constitution of this determinacy. From this starting point, we can derive a set of constraints that any successful solution must satisfy. The central constraint is that conscious determinacy must be intelligible from two sides at once. From the first-person perspective, it must be recoverable as something given within experience itself. From the third-person perspective, it must be describable as a structure or process open to scientific explanation. The reflexivity problem can be solved only if these two descriptions can be described in the language of the other. We therefore ask what form mental determinacy must have in order to be accessible both phenomenologically and scientifically, while also remaining general enough to encompass the full domain of the sciences of mind. In doing so, we specify the epistemological and structural conditions under which a unified science of mind could become possible.

Introduction

A unified science of the mind has been a long-standing goal of the cognitive sciences (K. Friston, 2010; Newell, 1994). Such a theory would encompass all the different productions of the mind and their causes, ranging from the simplest sensory perceptions and neural correlates all the way to higher-level cognitive functions and consciousness (Marr, 2010). It must also possess counterfactual explanatory power and account for the space of possible variations of the productions of the mind, all within a unified framework. Despite its status as the goal of cognitive science, this objective faces methodological difficulties which question its very possibility.

Yet certain mental phenomena are considered to fall outside such a unifying framework, which undermines the very possibility of such an account. Most notable amongst these are conscious phenomena, namely the domain of subjective, first-person experience. (Chalmers, 1995b; Levine, 1983). Integrating consciousness within such a unified theory of the mind is an active area of

research, yet faces considerable methodological difficulties the moment it attempts to offer more than correlations and advance a complete explanation.

The core difficulty is epistemological: consciousness is presupposed in the very act of its investigation. (Husserl, 1983; Gallagher, 2012; Zahavi, 2004, 2013). For a domain to be scientifically investigated, it must be identifiable independently of the investigation itself, which first-person experience resists precisely because it is a condition of the very methods used. If by first person experience we indicate the set of conscious experience, it is prior to any method that could be applied to it, prior to the language used to describe it, and prior to the mathematical or computational frameworks in which it might be formalized. Such scientific investigation of consciousness thereby presupposes the very task it investigates. It provides observational but no clear causal or counterfactual explanations, given that consciousness itself is a confounder. Phenomenological approaches, which start with consciousness, also face the same problem; the very existence of consciousness is presupposed, and any attempt to go beyond consciousness fails. As a result, any attempt to fully step outside consciousness in order to explain or ground it encounters the same limit (Nagel, 1989; McGinn, 1991). This has led a number of researchers to question whether a common foundation between consciousness and the rest of the cognitive sciences is available at all. (Kastrup, 2017; Koch, 2019; Kuhn, 2024; Nagel, 2012).

As long as consciousness remains both the object of investigation and a condition for investigation itself, the paradox remains unresolved and constitutes a central methodological difficulty for cognitive science (Bermúdez, 2000). We will, in this paper, call this the *reflexivity problem*: the very possibility for consciousness to reliably study itself. The possibility of a solution to the reflexivity problem is thereby foundational for a unified theory of the mind and a precondition for solving the explanatory gap [22]. A solution would require consciousness to become transparent to scientific investigation, such that the act of investigation itself could be reintegrated within the domain it investigates, with as few additional conceptual commitments as possible.

The task, then, is to specify the conditions under which such a unified theory could become possible. This paper, therefore, begins by examining the structure of the reflexivity problem and the reasons for its persistence. On this basis, it identifies the conditions under which first-person and third-person accounts of mental phenomena could converge within a single explanatory framework.

SECTION I. The Reflexivity Problem

The methodological issue we identified above can only be understood once the domain of a unified science of the mind has been scoped. It is only within this initial framing that the above problem arises, as well as any potential solution. A unified theory of the mind will here comprise the set of the productions of the mind, which includes its mental phenomena from sensations to cognitive processes, all the way to consciousness.

A unified science of the mind presupposes that its objects are determinate. For a phenomenon to be scientifically explained, it must first be identifiable as the particular phenomenon it is and not

another. A given sensation, for instance, must be distinguishable from other sensations, just as a cognitive process must not only be determinate, but also operate upon determinate contents rather than indeterminate ones. The possibility of a unified explanation therefore depends upon the existence of an identifiable domain of mental phenomena; any other option would foreclose explanation and thereby a unified explanatory framework.

The task of a unified science of the mind is therefore to account for the determinate structure through which mental phenomena emerge and become identifiable as the particular states they are. Such an account must provide a generative explanation of how these structures arise and transform across different levels of mental organization, from elementary processes to higher-order mental faculties. The set of all production of the mind thereby depends on the identifiable determinate elements scoped by its limits.

The question then becomes what it means for a mental state to be determinate at all. A state acquires determinacy through contrast: an experience, perception, or cognitive process can only be identified as this particular state rather than another insofar as it stands in relation to alternative possible states. Within the domains already studied by cognitive science, such determinacy can often be identified externally through measurable or distinguishable configurations. A cognitive state becomes identifiable because it can be differentiated from other possible states within a given explanatory framework. The central difficulty emerges when this requirement of determinacy is extended to first-person experience itself.

At first glance, first-person experience seems to clearly partake in the domain we have identified. It must involve a degree of determinacy for the investigation of consciousness to become possible at all. The very way we treat consciousness involves a degree of determinacy: there is something *it is like to be* in a given state, a first-person, phenomenal character that distinguishes conscious from non-conscious processing. A conscious state must in some sense be present to the subject as the particular state that it is, and not as another (Nagel, 1974). For the study of consciousness to have a subject matter at all, conscious states must be identifiable as *something and not something else* (Chalmers, 1995b; Sellars et al., 1997; Siewert, 1998). It is the condition under which consciousness becomes a domain. Notably, this does not prejudice the boundaries of phenomenal consciousness: some states may exceed or precede full phenomenal accessibility, yet retroactively acquire determinacy as they become available for report or reflection (Block, 1995). The determinacy is here given for someone; it belongs to a first-person space of experience. The domain of consciousness, which must be integrated in a unified science of the mind, is this set of determinates first person experience

The difficulty emerges from the fact that determinacy is itself given within consciousness. Consciousness appears not merely as one determinate phenomenon among others, *but as the condition through which determinacy becomes available in the first place*. This is valid not only for the domain of consciousness itself, but also for the domain of cognitive processes, which are themselves determined by consciousness. Every attempt to explain why a given experience is determined in one way rather than another, therefore, requires an investigation into the conditions under which such determinacy appears at all. Yet this investigation must itself occur from within

consciousness, that is, while already situated within the very structure it seeks to explain. And given that determinacy is given in the first-person, the exact nature of this determinacy and its construction remains undecided.

This is the core tension of the reflexivity problem. Any attempt to ground consciousness already presupposes the conscious operations through which such determinate grounding becomes possible. Every attempt to explain why a given experience appears as this determinate experience rather than another. Therefore, it risks either circularity or infinite regress, unless consciousness is treated as primitive from the outset. This difficulty is structural. The domain of the production of the mind cannot be fully explained unless it can account for the very process through which the determinacy in this domain is constituted. The observer cannot simply stand outside the explanatory framework, because the observer is already implicated within the structure under investigation. The reflexivity problem, consequently, takes the form of a self-referential constraint upon any unified science of the mind (McGinn, 1991; Battaglia et al., 2025). The very act is bound with paradox of the self-investigating mind.

The only full solution would be to integrate consciousness in the explanation, in such a way that the emergence of determinacy could itself be investigated without relying on a further constitution of the determinacy. In this case, the origin of determinacy would become an object of study without leading to further regression. This would imply investigating the emergence of consciousness itself: the conditions under which specific determinate experience become possible at all; in other terms, why this specific determinate experience and not another. Such a solution would require a bridge between the determinate spaces of the first-person and third-person perspectives and the identification of a mapping between them. Under this condition, a first-person understanding and a third-person explanation would converge upon the same underlying process. The constitution of conscious determinacy could be reconstructed from within experience as a subjective experience and from outside experience as an object of scientific explanation. We call this requirement *a dual solution to the reflexivity problem*. In such a case, the production of determinacy and the experience of that determinacy would belong to the same explanatory domain

This framing preserves the standard explanatory structure of the sciences while extending it to the conditions under which a larger set of determinacy is constituted. Scientific frameworks already rely upon specifically scoped forms of determinacy, a requirement fully compatible with our inquiry. Cognitive science, neuroscience, Bayesian approaches to cognition, and approximation-based models each presuppose particular ways of individuating states, processes, and explanatory domains (Griffiths et al., 2010, 2024; Knill & Pouget, 2004; Tenenbaum et al., 2011). In this sense, they are not merely explanatory frameworks, but specific procedures for constituting determinate scientific objects. The notion of determinate elements is already presupposed within the formal foundations of scientific reasoning itself and must now find a bridge to first-person experience.

SECTION II. Conditions and Difficulties

We now examine the main approaches that have attempted to integrate consciousness into a unified scientific framework, and the reasons why the reflexivity problem remains open. A full solution would require the first-person determinacies to be translated into the third person, yet all major strategies fail to achieve this objective. This is not a contingent issue, but one which results from the very nature of the approaches taken; all do so in a way which structurally prevents this realizability.

Given the framing of the problem, one must begin either from the first-person perspective or from the third-person perspective and then construct a bridge to the other. For the third person, we can identify a simple taxonomy in the space of determinate cognitive processes. These processes may be characterized either in computational terms (Clark, 1996; Signorelli et al., 2021) or in terms of the contents they take as inputs and generate as outputs.

Computational approaches pursued fall into several broad families (Signorelli et al., 2021). Neural and biological approaches aim to identify the neural correlates and underlying mechanisms of consciousness (Koch et al., 2016; Tononi & Koch, 2008). Functional and computational frameworks attempt to explain consciousness in terms of information processing (Baars, 1993; Dehaene, 2014; K. J. Friston et al., 2020; Seth et al., 2006; Seth & Tsakiris, 2018; Whyte et al., 2025). The mapping goes from underlying processes to states of consciousness.

However, these approaches encounter a structural limitation with respect to the reflexivity problem itself. Where does the space of contrast emerge to give determinacy in consciousness? Where is it generated for a first-person perspective? Within such a computational framework, the determinacy can only be found in the underlying process. Therefore, the space of contrast needed for determination is always in the background; the space of contrast is never presented to from a first-person perspective. To create a determinate experience for consciousness, the underlying cognitive processes would need an interface through which this determinacy is given, which is far from clear. These approaches explain correlations, functions, or access relations, but fail to explain how determinate conscious differentiation becomes representable within the same domain as cognition itself. It is impossible to verify the mapping from a first-person perspective and to assess the validity of the approach. The first-person perspective remains methodologically relied upon, yet its own conditions of emergence are not themselves constituted within the explanation. By their very structure, such approaches cannot fully resolve the reflexivity problem so long as the conditions of conscious determinacy remain external to the explanatory process itself.

Content-based approaches attempt to identify a specific structure within a representation or a presentation. It is not so much the computation as before, but how the rest is given or constructed to computation (Dretske, 1997). Yet a problem surfaces. It becomes difficult to explain what makes a given conscious experience determinate, or even to explain its difference from something that has the same content yet is unconscious. Several approaches attempt to preserve a representational framework while distinguishing conscious from unconscious states by appealing to higher-order properties or access relations (Carruthers & Gennaro, 2023). Conscious states are thereby characterized as representations possessing a distinctive higher-order feature. Yet consciousness remains explained in terms of additional representational structure, which itself would warrant an explanation, and remains in need of a third-person explanation. In this case, the space of contrast is

simply given along with consciousness. Such approaches fail to explain the determinacy of experience, and the precise conditions under which conscious experience becomes identifiable as this determinate experience rather than another.

In response to these shortcomings, another strategy would be to start from the other end of the circle; with the first-person perspective. Yet within this perspective consciousness fails to investigate itself using a language other than itself. A first line of argument takes consciousness and qualia as primitives, in which case the investigation is fully closed. (Levine, 1983; Chalmers, 1995a; Strawson, 2006; Henry, 2008). In such views, the determinacy of conscious experience is taken as given from the outset.

In all of the approaches considered above, the reflexivity problem persists. The difficulty is not merely empirical but structural. Each approach identifies a form of determinacy from which it starts but fails to explain how the determinacy of one domain becomes the determinacy of another. The required bridge between first-person and third-person forms of determinacy is therefore not unaccounted for. Third-person approaches explain the determinacy of physical or cognitive processes, but this determinacy is not itself available within experience. The source of conscious determinacy, therefore, remains external to the domain it seeks to explain. As a result, the process cannot be reconstructed from a first-person perspective, nor can the relation between physical and experiential determinacy be directly verified. Conversely, approaches that begin from consciousness treat experiential determinacy as primitive, thereby closing off the possibility of explaining how it emerges within a broader scientific framework. The two domains remain related only through an assumed mapping that we have to assume but cannot verify.

As previously stated, the challenge is therefore to identify a bridge between first-person and third-person forms of determinacy. The process through which conscious experience becomes determinate must be constructible both as an object of scientific explanation and as a structure available within experience itself. This requirement constrains the form that any solution can take. If the source of conscious determinacy remains entirely external to experience, then the first-person perspective cannot recover the conditions under which its own determinacy is constituted. The reflexivity problem, therefore, remains unresolved. A solution requires that the conditions generating conscious determinacy be representable within the domain of experience itself.

At the same time, these conditions cannot simply be presupposed. For the inquiry to remain scientific, the determinacy of experience must arise from an identifiable cognitive process rather than from another unexplained primitive. The source of determinacy must therefore be both generated and represented: generated by a cognitive process and represented within experience as the outcome of that process. Only under this condition can consciousness recover the determinants of its own experience and reconstruct them as the result of cognitive operations directly in consciousness. This requirement applies across all levels of mental life, from sensory perception and mental imagery to memory and abstract thought. In each case, a mental state becomes

determinate only through its differentiation from alternative possibilities. The remaining question is, therefore, what conditions would make this possible, if at all.

SECTION III. Structural Conditions

The approaches described above reveal a limitation: the lack of a bridge between first-person and third-person forms of determinacy. The challenge is therefore to identify a structure capable of supporting both forms of reconstruction.

Let us recall the minimal division introduced above between cognitive processes and the contents of mental events. Underlying cognitive processes are not directly available to consciousness and therefore cannot, by themselves, satisfy the requirements of a dual solution. The content of cognitive processes remains the only plausible candidate for a solution. It is both the space in which things can become conscious and the level at which the outputs of cognitive processes can be identified.

If cognitive processes play a role in the constitution of consciousness, and if this role is to be recoverable from within consciousness itself, then the relevant structure must be found at the level of presentation. Presentation is the only place where a space of contrast can be both generated by cognitive processes and given within experience. Reflexivity therefore requires that the source of determinacy, or at least the contrastive structure through which determinacy emerges, become available at the level of presentation.

Let us recall the minimal division of cognitive processes we crafted above between the processes and the contents of mental events. Underlying cognitive processes are not directly available to consciousness and therefore fail to meet the requirements for a dual solution. The content of cognitive processes itself remains the only option. It is both a space where things can be conscious and where the output of cognitive processes can be identified. If cognitive processes play any role in the constitution of consciousness, and if they can be identified within consciousness itself, they must be found at the level of the presentation, as this is the only place where a space of contrast can be both given in experience and produced by cognitive processes. If reflexivity requires access to the source of determinacy, so that the space of contrast in which this determinacy emerges can be given. Yet if the source of conscious determinacy is nevertheless to be recoverable from within experience, then the relevant differentiating structure must be represented at the level of presentation. Any alternative would fail to satisfy the requirement of dual reconstruction. Cognitive processes must generate a contrastive field in which a given presentation can be experienced as this determinate experience rather than another. This space determines the specific what-it-is-like of experience and makes it possible, at least in principle, to identify the causes of a given subjective state.

A fundamental question then arises: how does the determinacy generated by cognitive processes become available within experience itself? Since presentation is given directly, the space of

contrasts that makes a determinate experience possible must also be given within presentation. An adequate account must accommodate the diversity of mental content. The question, then, concerns the kind of mental content compatible with this possibility, and the constraints this imposes on the processes by which such content is generated.

Let us begin with the basic case of perception, before turning to more complex forms of mental content. A first-person perceptual experience is determinate only against a space of possible perceptual contrasts. To experience this perception as this perception rather than another, it must be situated within a field of alternative possible perceptions. The relevant contrasts must therefore be of the same general type as the perception itself. If the contrastive elements belonged to an entirely different domain, they would fail to determine the specificity of the perceptual experience.

This is where imagination, memory, anticipation, and dreaming become significant. In such cases, cognitive processes generate content that appears within presentation itself. They do not operate as background cognitive processes; they produce presentation-like contents that can enter the same space as perceptual experience. This suggests a possible bridge between cognitive process and first-person determinacy. Cognitive processes can generate contents of the same type as the perceptual input, thereby enlarging the space of presentation within which a specific experience becomes determinate. This generation is different from the prediction of perception. In order for the requirement to hold, the perception has to be generated, within the same space, not as background prediction for further decision making (Seth & Tsakiris, 2018).

The exact mechanism of this generation lies beyond the present inquiry. What matters here is the structural condition it reveals. For perceptual experience to be determinately given, the space of contrast must be available within presentation itself. Cognitive processes must therefore be capable of generating contents that belong to the same contrastive space as what is currently perceived. In this sense, perceptual determinacy depends on an enlarged field of possible presentation: what is given is experienced not in isolation, but against a background of possible variations, alternatives, and counterfactual presentations.

The same requirement holds for higher-level forms of mental content. Perceptual determinacy depends on a space of possible perceptual contrasts; conceptual, affective, and imaginative determinacy depend on more complex spaces of possible meanings, situations, and developments. In each case, the content becomes determinate only insofar as it is situated within a structured field of alternatives.

The mind therefore generates not merely isolated contents, but complex spaces of determination. These spaces contain counterfactual possibilities: not only what is actually perceived, but what could be perceived, imagined, expected, remembered, or conceptually grasped. The relevant contrastive field is therefore not exhausted by immediate sensory input. It is enlarged by cognitive processes that generate possible contents within presentation itself.

This allows the same primitive structure to apply at different levels. A perception is determinate against possible perceptual variations. A concept is determinate against possible conceptual

variations. A situation is determinate against possible ways in which it could be interpreted, developed, or related to other contents. Higher-level mental contents can thus be understood as patterns of presentation structured across a richer space of possible contrasts.

Considered as such, cognitive processes generate the space in which determinacy becomes available to experience. The process itself may remain third-personally describable, but its effect is first-personally manifest: it changes the space of contrasts within which a content is experienced. This explains how the same perceptual input can give rise to different subjective experiences. The input is embedded in a higher-dimensional field of possible meanings, expectations, and counterfactual presentations, and its determinacy depends on that field.

This provides the condition of possibility for a bridge between third-person process and first-person experience. A cognitive process can be scientifically identified insofar as it generates or modulates a space of possible contents. It can also be phenomenologically identified insofar as this modulation changes the structure of experience itself. The bridge is therefore not between a hidden process and a private quale, but between a generative cognitive process and the contrastive field through which experience becomes determinate.

IV. Foundations of a Unified Theory of the Mind

It remains to ask whether the conditions outlined above are sufficient to ground a unified theory of mind. More precisely, the account must be assessed against the requirements of a dual solution: it must make consciousness intelligible from both the first-person and third-person perspectives. If this requirement can be met, the reflexivity problem can be addressed by reintegrating consciousness into the domain of scientific explanation without reducing it to something merely external to experience.

From the third-person perspective, the relevant task is to identify the cognitive processes through which elements are generated within presentation. Imagination, memory, anticipation, and perceptual completion already show that cognitive processes can introduce contents into experience rather than merely operate behind it. These processes modify the space of contrast within which a given experience becomes determinate. A specific conscious experience can therefore be reconstructed as a presentation together with the contrastive field in which it appears. What is given is not experienced in isolation. It is experienced as this content rather than another because it is situated within a space of possible alternatives, variations, and counterfactual presentations. The changing determinacy of experience can then be understood as a change in this space of contrast.

From the first-person perspective, consciousness can investigate this determinacy by attending to the way in which an experience is structured. It can modify the field through acts such as attention, imagination, comparison, reflection, and conceptualization. In this sense, consciousness can

partially investigate the nature of its own position: it can examine not only what is given, but the contrasts through which what is given becomes determinate. Consciousness can alter its own determinacy while still making visible the structure through which this alteration takes place. Given the possibility of cognitive processes to generate this field, consciousness can then map back to the third-person perspective.

The first-person validation of the account, therefore, shows the specific character of subjective experience is always given within some field of possible contrasts. The third-person validation consists in showing how cognitive processes generate or transform this field of experience. A specific experience must be traceable back to the contrastive field in which it becomes determinate, and this field must in turn be traceable back to the cognitive processes that generate or modify it. The possibility of a unified theory therefore depends on a reversible form of reconstruction: from cognitive process to conscious presentation, and from conscious presentation back to the generative conditions that make it possible.

This does not require that the entire mechanism be *immediately* transparent to consciousness. The construction of a determinate experience may be highly complex and may exceed our capacity. *What matters is that such a mapping is possible.* The condition of possibility for a unified theory is thus continuity. The elements generated by cognitive processes and the elements given in consciousness must belong to the same general space of presentation. If they were of an entirely different nature, no bridge between first-person experience and third-person explanation would be possible. The possibility of an algorithmic or scientific account of consciousness depends on whether this field can be identified and reconstructed. The bridge allows a first-person process to be approximated, at least in principle, by a third-party computational process, in the same way that reasoning is modelled as a sequence or structure.

CONCLUSION

This paper has proposed a possible foundation for a unified theory of mind by addressing the reflexivity problem at the level of conscious determinacy. The central claim has been that consciousness can be reintegrated into scientific explanation only if the structure through which experience becomes determinate can be reconstructed from both sides: as a structure given within first-person experience and as the effect of third-personally describable cognitive processes.

This clarifies both the necessity and the limits of the present claim. Our argument does not offer a complete theory of consciousness, nor does it specify the full mechanism by which mental phenomena are generated. It identifies a necessary condition for any such theory: a unified science of mind is possible only if conscious determinacy can be reconstructed from both sides: as a structure given in experience and as the effect of cognitive processes. Otherwise, consciousness either remains outside scientific explanation or is explained only by being reduced to something no longer recognizable as experience. This condition narrows the theoretical search space for the

scientific practice by offering a minimal foundation for a unified theory of mind: one in which consciousness is neither excluded from naturalistic explanation nor dissolved into a purely third-person description.

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