The Past, Present and Future of Time-Consciousness: From Husserl to Varela and Beyond

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> Context • In developing an enactivist phenomenology the analysis of time-consciousness needs to be pushed toward a fully enactivist account. **> Problem** • Varela proposed a neurophenomenology of time-consciousness. I attempt to push this analysis towards a more complete enactivist phenomenology of time-consciousness. **> Method** • I review Varela's account of time-consciousness, which brings Husserl's phenomenological analysis of the intrinsic temporal structure of experience into contact with contemporary neuroscience and dynamical systems theory, and pushes it towards a more enactivist conception of consciousness. I argue that Varela's analysis motivates a closer examination of the phenomenological aspects of the intrinsic temporal structure of experience, understanding it in terms of an action-oriented embodied phenomenology in its most basic manifestation. **> Results** • This fully enactivist phenomenology of time-consciousness continues the analysis initiated by Varela and remains consistent with but also goes beyond Husserl's later writings on time-consciousness. **> Implications** • This analysis shows that the enactive character of intentionality in general, goes all the way down; it is embedded in the micro-structure of time-consciousness, and this has implications for understanding perception and action. **> Constructivist content** • This account is consistent with Varela's constructivist approach to cognition. **> Key words** • **Time-consciousness, enactivism, Husserl, Varela.**

Introduction

« 1 » My first encounter with Francisco Varela was in 1996 when we communicated about one of my articles he reviewed for the *Journal of Consciousness Studies* (Gallagher 1997). At that time we exchanged manuscripts that we were in the process of writing. He was writing an article on the neurophenomenology of time-consciousness (Varela 1999a, 1999b), and I was just putting the finishing touches on a book manuscript on the same topic (Gallagher 1998). Neither of these subsequently published works, however, went far enough towards an interpretation of time-consciousness that would fit with a fully enactivist view. In this target article I propose to review what I take to be an important development of Edmund Husserl's analysis of time-consciousness in Varela's work, and to push it forward to a full-fledged enactivist conception, informed by dynamical systems theory and a more action-oriented embodied view of experience.

The past: Husserl's analysis

« 2 » How is it possible to be conscious of objects such as melodies, which cannot appear all at once, but only unfold themselves over time? This is the kind of question that Husserl (1966a) seeks to answer in his lectures on time-consciousness. Husserl's view is that perceiving succession and change would be impossible if consciousness gave us merely a pure momentary time slice or if the stream of consciousness were a series of unconnected experiential points. If consciousness were restricted to what exists right now, it would be impossible to perceive anything with a temporal extension and duration. A succession of isolated, punctual, conscious states does not add up to a consciousness of succession and duration. Consciousness must in some way grasp more than the punctual now; it must be conscious of that which has just been and is just about to be. How this is possible or how a subject can be aware of that which is no longer or not yet present – this is what Husserl attempts to answer. To be clear, Husserl offers a phenomenology of the intrinsic temporality of experience, bracketing or setting aside assumptions about time as objective or measurable by the clock.

« 3 » Husserl reject's Franz Brentano's answer, that re-presenting (*vergegenwärtigende*) acts of imagining, remembering or expecting allow us to grasp more than the now point, since that would imply that we are not able to *perceive* objects with temporal duration (Husserl 1966a: 10–19). Rather, in agreement with William James (1890), Husserl argues that the basic unit of time-consciousness is not a "knife-edge" present, but a "duration-block," i.e., a temporal field, or what Robert Kelly, the author of *The Alternative: A Study in Psychology*, writing under the name of E. R. Clay, had called a "specious present" (see Andersen & Grush 2009). The specious present or thick duration block, which is not equivalent to a momentary or strict present, somehow contains all three temporal modes, present, past and future. Husserl offers a phenomenological account of this temporality.

http://constructivist.info/13/1/091.gallagher

« 4 » Assume that you are hearing a tonal sequence A, B, and C. If you attend to your perception the instant tone B sounds, you will not find a consciousness of this tone exclusively alone, but rather a consciousness of the broader sequence A, B, and C. When you hear the tone B, you are still perceptually conscious of the just-past tone A and, if it is a familiar melody, you are anticipating the just-about-to-be-sounded tone C. You are not simply perceiving B, and then remembering A and combining that with an act of imagination about C. Rather, in some way you are *hearing* these tones as in succession, as part of an on-going sequence. Importantly, however, there is a difference between your consciousness of the present tone B and your consciousness of the tones A and C, since they are not heard as simultaneous; A is heard as just past, and C as just about to be. For this reason, we can say that we *hear* the melody in its temporal succession and not merely as isolated or unconnected tones.

« 5 » In his analysis, Husserl describes the structure of this temporal experience using three technical terms:

- *Primal impression*, the component of consciousness narrowly directed toward the now-phase of the object. According to Husserl, the primal impression cannot be thought independently of its temporal horizon (Husserl 1966b: 315, 337f). It never appears in isolation, and as such, in the analysis, it is treated as an abstract component of a larger structure.
- *Retention*, the component that provides us with a consciousness of the just-elapsed phase of the object. Retention provides an awareness of the object or event as it sinks into the past.
- *Protention*, the component that, in a more-or-less indefinite way, anticipates the phase of the object just about to occur. Protention is an implicit and unreflective anticipation of what is just about to happen as experience progresses.

« 6 » According to Husserl's analysis, not only perception, but also memory, imagination, and experience of any kind, has this common temporal structure: at any moment of experience a retentional reference to past moments of experience is coupled to a current openness (primal impression) to what is happening now, and a protentional anticipation of the moments of experience that are just about to happen. The concrete and full structure of temporal experience is determined by the *protention/primal-impression/retention structure of consciousness*. Within this structure *what* we experience – the experiential content – changes from moment to moment, but how we experience it – the temporal form – at any given moment reflects this threefold unified structure.

> "In this way, it becomes evident that concrete perception as original consciousness (original givenness) of a temporally extended object is structured internally as itself a streaming system of momentary perceptions (so-called primal impressions). But each such momentary perception is the nuclear phase of a continuity, a continuity of momentary gradated retentions on the one side, and a horizon of what is coming on the other side: a horizon of 'protention,' which is disclosed to be characterized as a constantly gradated coming." (Husserl 1962: 202)

« 7 » Thus, on Husserl's account perceptual presence is not punctual, it is a field in which now, no-longer-now and not-yet-now are given in a gestalt pattern. This structure is what allows for the possibility of our perception of succession and duration.

« 8 » In contrast to Brentano, retention and protention are distinguished from the proper cognitive acts of recollection and expectation. Clearly there is a difference between hearing a melody as it is occurring, and recollecting the party you attended last New Year, or looking forward to the beach next summer. The latter are full-fledged and explicit intentional acts, which themselves presuppose the operations of retention and protention as structural components or implicit moments of such acts of consciousness. Moreover, retention and protention are said to occur passively, in contrast to explicit recollection or expectation, which are usually under our voluntary control. In contrast to recollection (memory proper), which is a bringing to presence (or "re-presenting" [*Vergegenwärtigung*]) of a past, no-longer-present event, retention is a keeping in presence of what has just been present (Husserl 1966a: 41, 118, 330).

« 9 » To be clear, for Husserl temporal experience is not itself an object occurring *in* time, but neither is it merely a consciousness *of* objective time; rather it is itself a form of temporality. This means that even if we ascribe some kind of temporality to the stream of consciousness due to its dynamic and self-differentiating character, this intrinsic temporality is not the same temporality that pertains to the objects of consciousness. Husserl rejects an isomorphism between the stream of consciousness and the temporal objects and events of which it is conscious. The relations between protention, primal impression and retention are not relations of past-present-future in a way that matches up with a perceived object such as a melody. My retentional awareness of the just-past note is not itself just past; it is part of the present structure of consciousness. Husserl thus distinguishes the objects that are constituted as temporal objects in an experience structured by protention, retention and primal impression, from the relations that exist between the constituting structures of consciousness itself. There are two different temporal domains here. Just as my experience of a red circle is neither circular nor red, the temporal givenness of the intentional object (as past-present-future) is not the same as the intrinsic temporality of the experience itself (Husserl 1966a: 75, 333, 375f).

« 10 » In Husserl's analysis of this intrinsic temporality of consciousness, each element, if taken in isolation, is an abstraction and theoretical limit-case. Primal impression is never given alone; nor is retention or protention. The concrete and full structure of the lived presence, according to Husserl, is protention/primal impression/retention (Husserl 1966b: 317, 378). I note that much of Husserl's original analysis focuses on retention, and on getting that aspect right. His discussion of protention is less developed, and most of this suggests that protention is something like the reverse of retention.

« 11 » This is a brief survey of Husserl's standard depiction of the tripartite structure of the intrinsic temporality of experience as found in his lectures and notes from around 1904 to 1917. Some of Husserl's later texts on time-consciousness, especially the *Bernau Manuscripts*, which were written around 1917–1918, introduce a reframing of the original tripartite account. In this later account, primal impression, rather than be-

ing portrayed as an experiential origin, "the primal source of all further consciousness and being" (Husserl 1966a: 67), is considered the result of an interplay between retention and protention. Thus, in the *Bernau Manuscripts*, Husserl defines primal impression as "the boundary between […] the retentions and protentions" (Husserl 2001: 4). Whereas retentions and protentions in the early lectures were defined as retaining the primal impression, or projecting a new primal impression, respectively, in Husserl's later research manuscripts, the primal impression is considered the line of intersection between retentional and protentional tendencies that make up every present phase of consciousness. Even in his earlier account Husserl had claimed that primal presentation is not self-sufficient, rather it operates only in connection with retentions and protentions. In the *Bernau Manuscripts*, however, Husserl seems to suggest that the complicated interlacing of retentions and protentions is constitutive of primal impression. Not only is primal impression not self-sufficient, it is a constituted product rather than something that makes a constitutive contribution of its own.

« 12 » This more radical claim is expressed in Husserl's idea that the initial event of experience is the empty anticipation.

> "First there is an empty expectation, and then there is the point of the primary perception, itself an intentional experience. But the primary presentation [or impression] comes to be in the flow only by occurring as the fulfillment of contents relative to the preceding empty intentions, thereby changing itself into primal presenting perception." (Husserl 2001: 4; translated in Gallagher & Zahavi 2014)

The primal impression comes on the scene as the fulfilment of an empty protention; the now, as the present phase of consciousness, is constituted by way of a protentional fulfilment (Husserl 2001: 4, 14).

> "Each constituting full phase is the retention of a fulfilled protention, which is the horizonal boundary of an unfulfilled and for its part continuously mediated protention." (Husserl 2001: 8)

« 13 » In shifting the emphasis from primal impression to protentional fulfillment, Husserl is moving from a static phenomenology to a more genetic view. I want to argue that this shift sets the stage for a more dynamical, enactivist conception of time-consciousness. To start working towards this conception, I will suggest that Varela's neurophenomenological analysis of time-consciousness makes some important headway.

The present: The neurophenomenology of temporal experience in Varela

« 14 » Whereas Husserl proposed a purely phenomenological account of the intrinsic temporality of consciousness, Varela proposes a naturalized account that integrates phenomenological and neurophysiological elements. Varela sees in Husserl's account, however, a "dynamical bent," a leaning towards a dynamical account that Varela takes as opening towards a neural dynamics, and thereby, a naturalization. He thus wants to work out a neurophenomenology of time-consciousness.

> "In brief, I approach temporality by following a general research direction I have called neurophenomenology, in which lived experience and its natural biological basis are linked by mutual constraints provided by their respective descriptions (Varela 1996) […] Given the importance of the topic of the experience of temporality, let it be clear that I consider this an acid test of the entire neurophenomenological enterprise." (Varela 1999a: 267)

« 15 » Varela focuses on the "texture" or the three-part structure of time-consciousness, and he describes it as follows. First, there is a central "now moment with a focused intentional content" – that which is given by the primal impression. This central moment is "bounded by a horizon or fringe that is already past" – but a past that is held in retention. It also "projects toward an intended next moment." As these horizons move, they flow into the past that I can retain to some limit, and then they disappear out of view. Varela's description is consistent with Husserl's original phenomenology. It is by way of a complaint, however, that Varela is able to shift the account closer to a neurophenomenology. The complaint is about Husserl's primary example of listening to a melody. As numerous commentators have remarked, Husserl treats listening to music as a very abstract experience (see, e.g., Gallagher 1998); Varela, likewise, criticizes the example and proposes to shift to a more concrete, but perhaps uncommon example: multistable visual perception. One can think here of the Necker cube or the duck-rabbit figure, and the shifting perspectives we experience as we view them. Varela offers the following image (Figure 1).

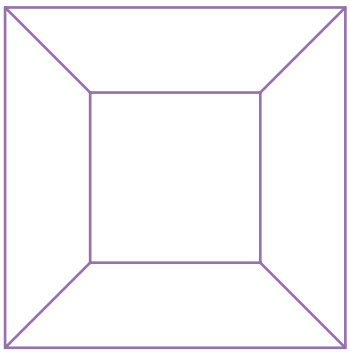


Figure 1 • Pyramid-Hallway (from Varela 1999a).

« 16 » We can see this in a first instance as from the top, where the center square is the top of a pyramid; our perspective can shift so that we see that same center square as the back wall of a hall. The image is perceptually unstable; it can flip back and forth, but we can also learn to control this shift of perspective. This example offers an important difference from Husserl's example of listening to the melody. Specifically, when we learn to control the shift of perspective, we become active perceivers rather than passive listeners. Indeed, Varela wants to emphasize, as enactivists generally want to do, the idea that there is a connection between perception and active movement. Here he admits that there is minimal movement involved in perceiving this unstable image. He suggests "head adjustment, frowning and blinking, and surely, in eye movements of various kinds" (Varela 1999a: 272). He offers another example that serves the same analysis, but would be less amenable to experimentation. I open a door and walk across the thresh-

old only to bump into a friend whose face I immediately recognize. I offer my hand in greeting. There is more obvious movement involved, and there is a certain adjustment required to bring my friend's face into focus. For Varela, and enactivists, the key is the link between perception and action. "It is this active side of perception that gives temporality its roots in living itself" (ibid).

« 17 » It will be helpful to clarify the concept of enactivism. Enactivism is a specific theory of embodied cognition. It argues that perception and much of cognition is action-oriented, and that the meaningful world is not independent from the experiencing agent. Enactivism can be characterized by the following propositions (see Gallagher 2017 for further discussion).

a Cognition is not simply a brain event. It emerges from processes distributed across brain-body-environment.
b The world (meaning, intentionality) is not pre-given or predefined, but is structured by cognition and action.
c Cognitive processes acquire meaning in part by their role in the context of action, rather than through a representational mapping or replicated internal model of the world.
d The enactivist approach has strong links to dynamical systems theory, emphasizing the relevance of dynamical coupling and coordination across brain-body-environment.
e In contrast to classic cognitive science, which is often characterized by methodological individualism with a focus on internal mechanisms, the enactivist approach emphasizes the extended, intersubjective and socially situated nature of cognitive systems.
f Enactivism aims to ground higher and more complex cognitive functions not only in sensorimotor coordination, but also in affective and autonomic aspects of the full body.

« 18 » Higher-order cognitive functions, such as reflective thinking or deliberation are exercises of skillful know-how and are usually coupled with situated and embodied actions.Varela draws the connection between Husserl's analysis of intrinsic temporality and enactivism by means of this emphasis on movement, which reflects the enactivist emphasis on embodied cognition and dynamical systems theory to characterize both the dynamical coupling between body and environment, and the dynamical processes of the brain.

> "From an enactive viewpoint, any mental act is characterized by the concurrent participation of several functionally distinct and topographically distributed regions of the brain and their sensorimotor embodiment. From the point of view of the neuroscientist, it is the complex task of relating and integrating these different components that is at the root of temporality. A central idea pursued here is that these various components require a frame or window of simultaneity that corresponds to the duration of lived present." (Varela 1999a: 271)

« 19 » Somewhat like the shifting Necker perspectives (pyramid/hallway, duck/rabbit), Varela shifts the perspective on temporality, moving from the phenomenological perspective to a neuroscientific point of view. Here he introduces a second threefold distinction between three scales of duration, to make clear how we can open the window onto the lived present.

- The elementary timescale (measured in milliseconds)
- The integration timescale (measured in seconds, approximating the specious present)
- The narrative timescale (measured in durations greater than the specious present).

Within the elementary timescale (of 10–100 msecs), which characterizes neurophysiological events,[1] two stimuli are not perceived as successive but are fused and treated as simultaneous. This facilitates the variations across sense modalities, where visual, auditory, tactile, etc. have different processing times. At the ballet, my experience of the ballerina's movement is not out of sync with the music, for example, because this syncing between different temporally processed modalities happens within a window where there is no experienced succession. This timescale approaches the limit of the momentary perceptual event or the reaction time for a basic action. Apparent motion, such as the psy-phenomenon, Varela notes, requires 100 msecs.

« 20 » At the integration scale these subpersonal events are integrated into a cognitive operation or basic action at a personal, phenomenological level. This correlates with neuronal, "long-range" reciprocal connections or cell assemblies across "vast [relatively speaking] and geographically separated regions of the brain" organized in dynamical networks "where sequentiality is replaced by reciprocal determination and relaxation time" (Varela 1999a: 274). An experiential event arises, flourishes, and subsides in the flow of consciousness in a structure that integrates experiential phases into and across cognitive acts and basic actions. This is precisely where the retention/primal-impression/protention process does its work and forms an incompressible specious present. This process is underpinned by transient phase locking of cell assemblies in neural synchronization (Varela 1995). This intrinsic temporality arises in these dynamical processes, not on the basis of an objective time tied to an external or internally ticking clock or a fixed integration period, but is contingent on the integration of variable numbers of dispersed cell assemblies.

« 21 » One could think of this as a purely processual or formal integration, and therefore as presemantic, independent of the particular intentional content of the experience. Varela sees this as consistent with Husserl's contention that the coherence of temporal experience does not depend on a recollection or act of expectation. For purposes of understanding the intrinsic temporality of consciousness we need not consider the narrative timescale, which would involve memory, etc.

« 22 » Varela's analysis of the phenomenology of our temporal experience then follows Husserl. He employs the multistable image in Figure 1 to provide a description of the retentional aspect of experience.

> "What is preserved is also modified. If when I see a pyramid, I could still hold unchanged the nowness of when I saw the hallway, all temporal

1 | "These thresholds can be grounded in the intrinsic cellular rhythms of neuronal discharges, and in the temporal summation capacities of synaptic integration. These events fall within a range of 10 msec (e.g., the rhythms of bursting interneurons) to 100 msec (e.g., the duration of an EPSP/IPSP sequence in a cortical pyramidal neuron)" (Varela 1999a: 273).

structure would disappear. The relation of the now to the just-past is one of slippage organized by very strict principles." (Varela 1999a: 278)

In effect, the retentional aspect of consciousness presents, within the now of perception, what is just past, not as present, but precisely as just past – as a modified present. He also presents neurocognitive evidence for the distinction between memory proper and the kind of working memory that is implied by retention. Varela references several of Husserl's diagrams that indicate a source point in the primal impression, but he also notes dissatisfaction with the diagrams because they represent Husserl's earlier static view, and he quotes favorably Maurice Merleau-Ponty's (2012: 440) note in reference to the diagrams: "Time is not a line but a network of intentionalities." Varela thus suggests that we take a dynamical view on the structures of time-consciousness.[2]

« 23 » To set out this dynamical account, however, Varela turns back to the neuroscience. The emergence of a transient non-linear synchrony of coupled oscillators subtends the arising of structure in the flow of consciousness and an integration of experiential phases into dynamical trajectories. "Each emergence bifurcates [undergoes a phase transition] from the previous ones given its initial and boundary conditions. Thus each emergence is still present [still retained] in its successor" (Varela 1999a: 283).[3] The important point for Varela is that the biologically based model of the dynamical system he describes captures the flow structure that Husserl was after. Varela appeals to an unstable system in which "There are no attractor regions in phase space, but rather ongoing sequences of transient visits in a complex pattern of motion, modulated only by external coupling" (ibid: 288).

« 24 » Varela offers more detail in fleshing out Husserl's account of time-consciousness, including a discussion of the double intentionality of retention – the fact that it retains phases of the enduring object by retaining the flowing phases of consciousness itself, thus providing both a sense of the continuity of the object and a pre-reflective sense of the experiencing self. Citing a point I had made about the retentional-protentional structure not being on a different level from the flow (Gallagher 1979), Varela argues that

> "The inseparability of these two intentionalities here is not only descriptively accurate but part of the intrinsic logic of complex nonlinear dynamics. It would be inconsistent to qualify the self-motion as a 'deeper layer' of the dynamical process and to describe these trajectories as mere appearance." (Varela 1999a: 295)

The double intentionality is more like what Merleau-Ponty would call an intertwinement or what Gibson would call an ecological relation (also see Gallagher & Varela 2003 and Thompson 2007: Chapter 11 for more details of this neurophenomenological account). For my purposes in this article, however, I want to shift focus to Varela's account of protention.

« 25 » Rightly noting that protention is not symmetrical to retention, Varela suggests that protention is closely connected with affect and action. If we think that the experiencing subject is always characterized by an affective disposition, then the idea is that one's disposition modulates protention. This idea finds application in considering certain pathologies that may involve the sense of agency. Thus, in the case of schizophrenia, where there are modulations in affect, there is also in some cases a disruption in the sense of agency that may be tied to a problem involving anticipatory experience (Gallagher 2000; 2005; Gallagher & Varela 2003; Jeannerod 2009). One might also think of issues related to the experience of time in subjects with major depression (Gallagher 2012). I think the important point here involves the sense of agency and action, and this is consistent with Varela's transition to a discussion of the notion of coping, transparency (or non-reflection) as one is absorbed in action, and flow, which involves a readiness disposition or protention (anticipation) that is oriented towards where the action is going.

« 26 » Varela provides more analysis, especially in terms of constructing more dynamical diagrams of temporal experience. He also suggests there is even more to explore. As he transitions to his discussion of the flow of consciousness, he asks his readers "to consider what I propose in the remainder of this text as a sketch of future work more than anything else" (Varela 1999a: 289). I think, however, that we have explored Varela's view sufficiently to motivate a closer look at the connection between protention, action and enactive perception.

The future: An enactivist account of time-consciousness[4]

« 27 » The protention/primal-impression/retention model applies to movement and non-conscious motor processes, as well as it does to consciousness (Berthoz 2000; Gallagher 2005, 2011, 2016). Both human experience and human action are characterized by a ubiquitous intrinsic temporality. In regard to action, consider that at any one moment the body is in some precise posture, as one might capture it in a snapshot, for example. That snapshot posture, however, is a complete abstraction from an ongoing movement. Moving is not occupying a different posture from moment to moment; rather it involves a trajectory and is constantly on the way, in a movement flow, such that any abstract postural moment only has significance as part of that process. On third-person measurements, at any moment the body is in a specific posture. But if that

2| It is interesting to note that in some interpretations of early Buddhism (prior to the development of the *Abhidharma*) one finds a similar emphasis on the dynamical interconnection "within a finite segment of time as constituting our immediate experience" (Kalupahana 1974, 185). David Kalupahana provides a good review of the complexity of Buddhist views on temporality. Varela was influenced by Buddhist teachings more generally. I thank an anonymous referee for pointing to this connection.

3| He provides a simple phenomenological example using visual perception of a figure that transitions across multiple variations of a male face to a female body. "When the ambiguity has increased sufficiently (when the observer has moved to a position sufficiently advanced in the series), we pass through a bifurcation or phase transition and the emergence of a new percept becomes possible" (1999a: 284).

4| This section is based on analyses in Gallagher & Zahavi (2014) and Gallagher (2016).

postural moment is anything, it is the product of an anticipated trajectory, of where the action is heading. Moreover, we can define that abstract postural moment as what it is only when it is already accomplished, which means, only in retention, as an end point of what had been a movement characterized primarily by anticipation.

« 28 » As Husserl describes it, consciousness operates in the same way – as a flow, intentionally directed so that when I am hearing the current note of a melody I am already moving beyond it, which is already a leaving behind in retention. The basic datum of experience is a process in which the primal impression is already collapsing into the retentional stream even as it is directed forward in protention. Hearing a melody never involves hearing a currently sounded note, *and then* moving beyond it; rather, the "and then" is already effected, already implicit in the experience.

« 29 » Our experience of the present is always dynamic in this protention/primal-impression/retention structure, in such a way that a focus on any one of the three components in isolation runs into an abstraction. There is no knife-edge impression of the present; rather, as Husserl suggests, primal impression is already fulfilling (or failing to fulfill) protentions that have just been retained, and in doing so is already informing current protention.

« 30 » As Husserl had suggested in the *Bernau Manuscripts*, and consistent with what Varela proposes, we should abandon the idea that primal impression is a direct, straight and simple apprehension of some now-point of a stimulus (S) that is unaffected by retention and protention. The current note of melody I perceive is already modified by my just-past and passing awareness of whatever came directly before. Primal impression is already modified by the retentional performance of consciousness. It is not that in a now phase of consciousness I have a retention of a past phase *in addition to* a primal impression of a current S. It is not an additive function. Rather, for a series of notes, A, B, C, the primal impression of B is already qualified or modulated by the just-previous experience. The primal impression of B (iB) is always something that works its way through the retention of a previous primal impression of the previous S (iA). In other words, iB would be a different experience if it were preceded not by iA, but by i[~A], just as much as the retention, r[iA] would have to be different if it were r[i{~A}].

« 31 » Consider now the effect of protention (p). First, the primal impression of A, (iA) produces a determination of what my protentional horizon is – e.g., a protention of B … C … and so on. Whatever I anticipate must be somewhat determined by what I am currently experiencing. Furthermore, when in the next moment iB comes along, it is already qualified by the previous protention (which is now currently retained), as a fulfillment, if the previous protention was of B, or as unfulfilled if the previous protention was of something else. Generally speaking, then, primal impression

a constrains the current protention by providing partial specification of what I am anticipating (protentional specification) and
b is constrained by the previous protention (being its fulfillment or non-fulfillment).

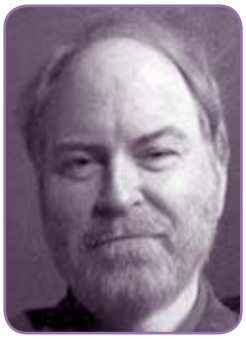
The primal impression of B that confirms a previous protention of B is different, indeed, different in terms of its affective character, from the primal impression of B disconfirming a protention of ~B.

« 32 » Consider an example (from Gallagher & Zahavi 2014). In many cases the meaning of a word in a sentence is deferred until a phrase or the sentence is complete, so that the word itself, as it is read or sounded, motivates a certain anticipation towards the fulfillment of its meaning. The word "cases" in the previous sentence is an example. It does not refer to a container (e.g., cases of wine), or to grammatical cases (cases of a noun or pronoun); but its meaning is already anticipated before that ambiguity gets resolved, and the remainder of the sentence fulfills that anticipation. If the content of the paragraph that preceded this paragraph had been about a grammatical point, then it could have biased my anticipation of the meaning of the word "cases," and clearly my subsequent primal impressions would have been different since they would not have fulfilled the prior protention. Such things often slow down our reading and make us go back over text to get clarification.

« 33 » If primal impression intuits the current moment, it does so already constrained by the effects of retention and protention. If primal impression is part of the structure of the living present, it is itself structured in its relations to retention and protention (and vice versa). In this sense, we can say that time-consciousness has a fractal character (Gallagher & Zahavi 2014). Each element of the protention/primal-impression/retention structure reflects that same structure. Any attempt to define primal impression in itself always finds the effects of retention or protention already included, and likewise for any attempt to define retention or protention. To think of one of these elements *as part of* this structure is to think it *with* (or *having*) this structure – primal impression reflecting retention and protention, and vice versa. This is consistent with Husserl's indication that "it pertains to the essence of conscious life to contain an intentional intertwining, motivation and mutual implication by meaning […]" (Husserl 1977: 26; see Thompson 2007: 356 for discussion).

« 34 » Accordingly, there is no primal impression without it already being anticipatory (on the basis of what has just occurred), so that my primal impression of the present is already involved in an enactive anticipation of how my experience of the stimulus will unfold. With protention leading the trajectory, the protention/primal-impression/retention structure is an *enactive* structure with regard to the stimulus in the sense that a certain anticipatory aspect (already shaped by what has just gone before) is already complicating the immediacy of the present. Consciousness is not simply a passive reception of the present; it is not simply self-affective. It enacts the present. In its dynamical intertwining it constitutes its meaning in the shadow of what has just been experienced, and in the light of what it anticipates. Consistent with the idea of a self-constituting flow, the coherency of consciousness (or action) is not static, or an additive kind of unity, but an enactive unity.

« 35 » This intrinsic temporality is not independent from the intentional nature of consciousness and action; it is what explains its directionality towards things. It is enactively in-the-world, in very pragmatic terms. This account lines up well with Husserl's conception of embodied experience as an "I can," a concept that foreshadowed James Gibson's (1977) notion of affordance.



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As Husserl (1966a: 301; English translation: 313) put it, "every living is living towards (*Entgegenleben*)." In this anticipatory intentionality the apprehension of the not yet is not an apprehension of an absence (*Entgegenwärtigung)*, it is rather an apprehension of the possibilities or the affordances in the present, the anticipation of what S *can be* for my experience, possibilities that will be fulfilled or not fulfilled as our enactive perception trails off in retention.

« 36 » This intrinsic temporality constitutes the possibility of an enactive engagement with the experienced world (the object, the melody, etc.). Nothing is an affordance for my enactive engagement if it is presented to me passively in a knife-edge present; that is, nothing would be afforded if there were only primal impressions, one after the other, without protentional anticipation, since I cannot enactively engage with the world if the world is not experienced as a set of possibilities, which, by definition, involves the not yet. And just as nothing would be possible if there were only primal impressions without a retentional-protentional structure, so too nothing would be possible if there were no primal impression. If there were only retentions, everything I experience would already have just happened; we would be pure witnesses without the potential to engage. If there were only protentions, there would only be unfulfilled promises of engagement. Meaning itself would dissipate under any of these conditions.

« 37 » This means that the enactive character of perception, action, and intentionality in general, goes all the way down; it is embedded in the micro-structure of time-consciousness; indeed, one does not get this enactive character without this intrinsic temporal integration. Experience thus has an enactive character, not only on the level of full acts of perception or actions, but in its most basic self-constituting, self-organizing level, in its intrinsic temporal structure.

Conclusion

« 38 » Varela (1999a) proposed an account of time-consciousness that brought Husserl's phenomenological analysis of the temporal structure of experience into contact with contemporary neuroscience and dynamical systems theory, and pushed it towards a more enactivist conception of consciousness. This motivates a closer examination of the phenomenological aspects of the intrinsic temporal structure of experience,[5] understanding it in terms of its enactive character, in its most basic manifestation. I have argued that this enactivist phenomenology of time-consciousness both remains consistent with and goes beyond Husserl's later writings on time-consciousness.

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5| Possible approaches to this further analysis, consistent with Varela's philosophy, could include micro-phenomenological analysis and the use of mindfulness meditation as a phenomenological method (see, e.g., Bitbol & Petitmengin 2017; Petitmengin 2006; Petitmengin et al. 2017).

Open Peer Commentaries

on Shaun Gallagher's "The Past, Present and Future of Time-Consciousness"

Protention and Predictive Processing: The Wave of the Future

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> Upshot • Gallagher's main claim can be enhanced neurophenomenologically. In his 1907 lectures *Thing and Space*, Husserl argued that perception in general is enactive. Moreover, the neuroscientific theory of predictive processing connects neatly to a future-oriented phenomenology.

« 1 » Your flight is about to land. As you look out of the window, the ground rises toward you, its details more sharply etched with each passing second. Soon the end of the runway flashes into view, with stripes and skid marks streaking by. Suddenly there's a loud clunk and the plane shudders. Now you expect either a rapid deceleration as the plane rolls toward a stop, or a violent burst of excruciating heat and pain – a fiery death. The experience of the landing gear touching down with a bang is clearly very different under the two different expectations. These vivid anticipations – Husserlian protentions – modify the immediate sensory present, or what Edmund Husserl called the Primal Impression (PI). The primal impression (of landing) has no phenomenal features that are not already infused with the conscious anticipation of what is immediately to follow.

« 2 » Shaun Gallagher endorses Husserl's insistence that the temporal phases of protention, primal impression, and retention are each abstractions from a unified whole, rather than phenomenological isolates. But within the Husserlian tripartite sandwich, how thick is the primal impression? Gallagher develops the idea that the PI is as thin as can be, a mere theoretical boundary of protention and retention. (The arguments in the target article were also developed in Gallagher & Zahavi 2014). The infusion of protention underwrites Gallagher's push toward an enactive conception of protention and thus of temporality overall.

« 3 » Gallagher grounds his enactivism (as does Dan Zahavi) in the phenomenology of time, going first to Husserl's Time lectures from 1905, and Husserl's subsequent afterthoughts. But for Husserl's enactivism a richer source is his 1907 lectures on *Thing and Space* (Husserl 1997). Here we encounter the stirring idea that the consciousness of things and their environments is *essentially* compounded from combinations of sensation and bodily movement. For Husserl, the problem inherent in our awareness of objects and scenes is that the senses give us sequences of images (visual, auditory, tactile) dancing about without an organizing principle to make sense of them. In addition to these jumbled sensory inputs, however, we find another stream of sensation, that of our bodies in motion, sensations Husserl calls kinaesthetic (or nowadays, proprioceptive). Taken by themselves, the kinaesthetic stream is just as arbitrary as the sensory stream. But when these two streams are combined, they harmonize. Our kinaesthetic awareness serves to situate the points of view that ricochet through the sensorium, and thereby enable us to construct a stable world (Husserl 1997: §§48–57).

« 4 » The common example of this harmony of informational flows is the relationship between saccadic eye movements and the visual world (Husserl 1997: §48). As our eyes turn right, the retinal image slides to the left. We do not see a jumpy world, however, because the retinal slide is cancelled by afferent feedback from the muscles controlling the eyes. The result is a stable visual environment. In *Thing and Space*, Husserl works through an encyclopedia of variations of agents in interaction with static and moving configurations of objects and scenes.

« 5 » Time is essential to this understanding of perception, of course, since the world is built from the coordination of dynamical trajectories, but temporal *experience* emerges as constitutive of thinghood. Husserl notes that visual objects, almost without exception, always have parts that are hidden from view:

> "The thing, as given in perception, has more than the appearing […] front side […] and this 'more' lacks presentational contents. It is […] co-included in the perception, but without itself coming to presentation." (Husserl 1997: §16)

To see objects as things that can be distinguished from other things and to perceive them as enclosing wholes, we apprehend their back sides. But without direct sensory contact, how do we experience a hidden side as a surface with visible and tactile features that nonetheless do not appear? We can un-

derstand these obscurities as protentions, as predictions of what we will find when we circle the object, or turn it around:

> "The thing […] is in and with the stream not only of its actual changes but also of its possible changes, and the latter are indeed infinite, though firmly delimited." (Husserl 1997: §48)

These anticipated percepts will have the same dual flow as occurrent perceptions. We'll see (for example) that if we *move* a certain way, we'll *see* a certain image. In this way the tangle of impressions and movements resolves as a world of things in space.

« 6 » The world is thick with things, and thus is saturated with protention. Where then is the primal impression? I concur with Gallagher's conclusion that to be impressed in any way already enfolds expectations. No experience is primal. Husserlian phenomenology fully converts expectation into action, and thereby creates for consciousness a world.

« 7 » As the above suggests, I think Gallagher is on solid phenomenological ground in his valorization of protention, more solid even than his exposition would suggest. In a Varelian vein, we can also strengthen Gallagher's protentive push with an appeal to contemporary cognitive neuroscience.

« 8 » One theme of much recent cognitive science and neuroscience is predictive processing (PP; for example, Friston 2005; Friston & Stephan 2007; Hohwy 2012; Hohwy 2013). Andy Clark summarizes its main claim:

> "To perceive the world is to meet the sensory signal with an apt stream of multilevel predictions. Those predictions aim to construct the incoming sensory signal 'from the top down' using stored knowledge about interacting distal causes." (Clark 2016: 6)

« 9 » One traditional view of perception suggests that the world drives a cascade of feature detectors from the bottom up (or from the periphery inward). PP upends this picture. Instead, it imagines a cascade of predictions from the top down, where each "higher layer" projects its best guess for the future into the layer below, where it inhibits congruent inputs. What propagates upward then is an error signal, the mismatch (if any) between the predicted and the incoming neural signal. That error signal is used to adjust the predictions for the next round.

« 10 » Neural conduction takes time, so both the traditional bottom-up scheme and PP have straightforward temporal implications. Simply stated, bottom-up processing *follows* a stimulus; PP, being predictive and top-down, *precedes* the stimulus. Since the predictive signal inhibits the matching input, it seems that the downward-propagating information is mainly running ahead of the incoming stimulus, and more or less replaces it. The error signal, on the other hand, follows the input, just as in the traditional bottom-up scheme.

« 11 » These temporal divisions of labor suggest intriguing phenomenological analogies. PP describes systems in which the detailed model of the perceptual world is protentive. Such systems live in the world of their imagined futures until rudely contradicted by stubborn error. The error signal, meanwhile, encodes a just-past; its content is most like retention. And, just as the target article suggests, nothing remains of a bare "primal impression."

« 12 » This strikes me as an attractive alignment. The seeming (illusory) plenum of the perceived world is a complex assumption, and we ride the wave of this future. However, the barebones PP sketched is still tightly bound to the phenomenal immediate present, as its predictions run just ahead of inputs, and error signals just behind. As predictions range further into the future, their reliability rests on intermediate predictions. This cascade of intermediate anticipations co-occur with present perception but they must be kept in their proper temporal order. Thus, PP leads to a picture of the present perceptual moment as a compound of expectations, ordered by their time of expectation. This temporal penumbra of predictions is analogous to Husserlian protention.

« 13 » The proposal that PP structures neural computation in alignment with Husserlian temporality can be contrasted with similar ideas in the work of Varela (especially Varela 1999a). As Gallagher describes (§§18–26), the centrepiece of Varela's account is the transient cell assembly (Varela 1999a: 273), a distributed network of active neurons bound temporarily by synchronized oscillations. These assemblies are stable only for brief periods, moments whose durations comprise the "integrative (or '1') scale" of neurodynamics. Varela conceptualizes these complex patterns of oscillation as points in a trajectory through a high dimensional neural-activation space. Each trajectory is unique, and is quasi-stable long enough to embody a fringe or tail of retentional information.

« 14 » As Gallagher mentions, protention (in Varela's analysis) is not simply "retention in reverse," but an "affective disposition" (§25). Varela's full proposals are too elaborate for consideration here, beyond noting that he stresses the concreteness and specificity of retentional content, contrasted with the openness of protention. According to PP, however, it is the predictive content that is most elaborate, while retention emerges primarily as error. Both Varela and the PP theorists face a parallel challenge: How in the tumult of neural activity is the *structure* of temporality to be embodied? We navigate the temporal landscape with great precision. How that temporal field of view is organized by the brain is still more conjecture than science.

« 15 » Meanwhile, from two directions, the phenomenological and the neuroscientific, I am inclined to join Gallagher in his push for an enactive temporality. Neurophenomenology continues to be the wave of the future.

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Some Shortcomings of Naturalization

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> Upshot • Gallagher hardly refers to the central issue of the phenomenological reduction, and he perpetuates the historical blunder of Chisholm, misinterpreting Husserlian intentionality as linguistic intensionality. This misunderstanding opens the way to a "naturalization" of phenomenology, which misses the very method of the phenomenological reduction as well as the essential dimension of subjective lived experience.

« 1 » In the first part of his target article, Shaun Gallagher presents and analyses the Husserlian concept of time-consciousness. The latter is structured into a past, a present and a future, a tripartite structure that consolidates a differentiation between the primary impression (situated in the present of the perception of an object), the retention (which contributes a consciousness of the "just-elapsed" of this perception), and the protention (which anticipates what is "just-about-to-happen"). These three moments define a triple unified structure of time-experience.

« 2 » On the basis of this initial presentation and this tripartite differentiation, Gallagher then proceeds to propose a "naturalization" of temporal experience. I would like to draw attention to two characteristics of Gallagher's approach, characteristics that I consider call for critical examination.

Phenomenological reduction

« 3 » First of all, Gallagher evokes very briefly – *too* briefly – the theme of the phenomenological reduction. He merely alludes to it just once in his §2, saying only that Edmund Husserl's phenomenology involves "bracketing or setting aside assumptions about time as objective or measurable by the clock." But concerning the whole question of wrenching oneself away from the "natural attitude," the unquestioned and unquestioning belief in the existence of transcendent objects and other persons, Gallagher says practically nothing. This cursory treatment of the phenomenological reduction (in particular the *epoché* in Husserl's later work) seems to me insufficient and perilous. In particular, it opens the way to purely and simply *juxtaposing* the phenomenological approach and the enterprise of naturalization. This way of merely putting these two approaches in parallel amounts to an unfortunate oversimplification, which seriously obscures the complex relation of *intertwinement* (*Ineinander* in the German original) between phenomenology and the sciences (in particular the sciences of mind), which Husserl (1982) went to considerable lengths to elaborate. This relation of intertwinement carries indeed a major implication: the naturalist approach to the experience of time (and more generally to consciousness), perfectly legitimate in itself, exerts in addition a *feedback effect* (*Rückbeziehung*) on the phenomenological description. This intertwining gives rise to "a double and mutual presupposition between science and the pre-donation of the world" (Husserl 1971: §45); and this, in turn, puts into question the mere juxtaposition that Gallagher proposes.

« 4 » However, Gallagher concludes this section on Husserl by noting that after 1917, and in particular in the *Bernau Manuscripts* written in 1917 and 1918 (Husserl 2001), Husserl himself reconfigures his tripartite analysis of the temporality of lived experience. The point here is that the "primal impression," far from being constitu*tive*, is constitu*ted* by the intertwining of retentions and protentions. Gallagher concludes this section (§§11–13) by emphasizing that this displacement marks the passage from a *static* phenomenology to a *genetic* phenomenology, and this opens the way to a more dynamic conception of temporal consciousness. This seems to me essentially correct. Whether this more dynamic conception justifies an "enactivist" reading of Husserl, and whether it validates the enterprise of "naturalizing" phenomenology, is more dubious.

Intentionality

« 5 » My second remark is that Gallagher perpetuates the blunder committed by Roderick Chisholm (1957) in his interpretation of the key concept of "intentionality." According to Husserl, the distinctive type of act specific to consciousness consists of an "intentional aiming" whereby consciousness directs itself to something outside itself, without for all that leaving itself: this is the notion of "transcendence within immanence" (Husserl 1982: §57). Gallagher systematically confuses this "directedness-to" of the conscious mind with linguistic intensionality (with an "s"). Indeed Chisholm, who historically introduced Franz Brentano to the Anglo-Saxon world, committed a serious misunderstanding in his reading. The correct interpretation of intentionality is that of a psychical *act* (the *noesis*) that transcends itself from within, in correlation with a sense (*Sinn*) that remains interior to itself (the *noema*): hence the notion of "noetico-noematic correlation" that Husserl attempted to grasp. However, Chisholm – and following him Quine – interpreted intentionality as a mental *state* (not an act); this state is endowed with a "content" that refers to a physical object. The existence of this (putative) object is not (and cannot be) guaranteed by the fact that the mental state itself exists. It follows that this "content" can only be intensional in the linguistic sense (Dupuy 1994; Havelange 1995). This misunderstanding thus goes directly against the core of the phenomenological approach, i.e., the phenomenological reduction.

« 6 » Because of this, cognitive science[1] remains beholden to a philosophy of *language* rather than a genuine philosophy of mind. Consequently, attempts at the "naturalization" of this psycho-linguistic philosophy engender a permanent dilemma confronting a materialist theory of mind, oscillating hopelessly between an "eliminationist" position and a vague, indefinable "non-reductionist" stance. It seems as if it is because he has understood neither the *epoché* nor the "intentional aiming" that Gallagher sees in "enactivism" a royal road for his project of naturalizing phenomenology.

1 | At least in its original version of the "computational theory of mind" and its cognitivist derivatives. Whether this also applies to the putative paradigm shift towards enaction is an open question.

Neurophenomenology

« 7 » Gallagher refers to Francisco Varela in order to further his project of naturalization. This is notably the case concerning the introduction of neuroscience in the form of "neurophenomenology." What Gallagher seems not to notice, or to care about, is that this introduction of neuroscience and reference to brain-states leads us even further away from the existential dimension of Husserlian intentionality. The point is that Husserlian phenomenology lays the basis for seriously taking into account the *subjective* dimension of lived experience. Phenomenology engages and challenges the subject in the intimacy of their own lived experience. On the contrary, Gallagher waters down this subjective dimension by shifting what is given in first-person experience to a third-person register; this is, to be sure, much more amenable to a conventional scientific approach, but unfortunately misses the main point.

Conclusion

« 8 » The theme of this special issue is "Missing the Wood for the Trees." Ironically enough, this article of Gallagher is a prime example of how easy it is to lose one's way and to fall wide of the mark; in other words, neither more nor less than to miss the wood for the trees.

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Time As the "Acid Test" of Neurophenomenology

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> Upshot • Gallagher provides a suggestive solution to the problem of articulating the neurophenomenological and the enactivist components of Varela's approach to cognition, although one that perpetuates a problematic understanding of the naturalist dimension of the idea of neurophenomenology.

« 1 » Shaun Gallagher provides a concise but remarkably comprehensive account of Francisco Varela's application of his neurophenomenological perspective to the topic of time. A topic that was undeniably crucial for Varela, and the only one about which he had the time to offer a detailed illustration of what a neurophenomenological inquiry looks like. This crucial role is concealed by the fact that in his programmatic 1996 paper "Neurophenomenology: A Methodological Remedy for the Hard Problem," time figures only as one among four types of phenomena mentioned as possible fields of application. It is interesting to note, however, that in the initial version of the article submitted in August 1995, the investigation of temporality is the only case study presented under a developed form. One might therefore reasonably suppose that the phenomenon of time is the main source of the neurophenomenological project, and that Varelian neurophenomenology is in this sense primarily a neurophenomenology of time. A hypothesis reinforced by the fact that in the "Specious Present" (Varela 1999a), his central work on the topic, Varela also explicitly qualifies time as the "acid test" (ibid: 267) of the whole neurophenomenological project.

« 2 » Accordingly, the key question raised by his innovative approach to temporality – although it incarnates neither the only nor the earliest version of the general idea that a rigorous descriptive account of the subjective dimension of cognitive processing must be integrated into a scientific study of cognitive faculties – is whether it successfully passes this acid test. In other words: Does Varela offer a sufficiently satisfactory neurophenomenological investigation of time, an inquiry that validates the general neurophenomenological project to which it belongs? And such is precisely the question addressed by Gallagher in his target article. His answer can be seen as a twofold one. To the extent that it is a test of the soundness of the neurophenomenological project at large, Gallagher agrees that the investigation of time carried out by Varela validates his general ambition of "providing a naturalized account" of the subjective side of cognition along neurophenomenological lines. However, as a neurophenomenological account of the specific phenomenon of temporality, it suffers from a weakness regarding an additional, and no less central, ambition of the neurophenomenological project, which is to contribute to the development of an enactivist perspective on cognition. In other words, despite making "some important headway," Varela offers a neurophenomenological account of time-consciousness that is insufficiently enactive in Gallagher's eyes, and consequently does not score on the acid test as well as it should in this regard. The goal of Gallagher's contribution is precisely to improve this score by offering a reorientation of the idea of a neurophenomenology of time in a more fully and radically enactivist direction.

« 3 » Gallagher's criticism touches on a rather deep and important issue about Varela's overall project, namely that of finding a proper way of articulating its neurophenomenological and enactivist dimensions. It is often neglected that the neurophenomenological claim emerges late in Varela's theoretical itinerary, and only as a complement to the formulation of the enactivist claim, itself derived from the autopoietic one about the phenomenon of life and belonging to the foundations of life sciences. And although Varela certainly saw these three claims regarding neurophenomenology, enaction and autonomy as obeying one single deep theoretical logic, a non-neurophenomenological enactivist theory of cognition is arguably conceivable, as well as a non-enactivist neurophenomenological one. As a matter of fact, the principles of neurophenomenology are formulated by Varela in fairly neutral terms regarding the descriptive content and

the neurobiological content of its phenomenological and neurocognitive components. And it is hard to see any reason why a disciplined account of the content of conscious cognitive experience along these principles (reduction, use of intuition, description of experiential invariants, training, establishment of mutual constraints) could not be developed in a kind of classical neurocognitive framework that enactivism takes as its main target. Furthermore, even though Varela explicitly reiterates that the "background of [his] discussion of temporality" is the enactive approach (Varela 1999a: 272), it is far from clear whether a good deal of the discussion dedicated to nowness, retention and the genetic analysis of temporality relies on much more than the hypothesis of neural assemblies based on phase-locking. There is more to enactivism, however, than the neural-assembly hypothesis and the dynamical-systems framework associated with it, both of which also figure as constitutive elements in non-enactive approaches. Consequently, by emphasizing the need to tighten the link of Varelian neurophenomenology of time with its enactivist background, Gallagher points with good reason to a problematic connection within Varela's theoretical construction. So, the first issue raised by his contribution can accordingly be put as follows: How well integrated into its enactivist framework is the Varelian neurophenomenology of time, according to Gallagher, and how exactly does he propose to integrate it better into this framework?

« 4 » The answer to this twofold interrogation depends, of course, on what one takes the essence of enactivism to be. Gallagher locates it fundamentally in the claim that action is essential to cognition, and hence to temporality (§16), even though he fully acknowledges that this essentiality of action claim is complemented by several additional ones (§17). On this basis, he further locates the enactivist dimension of Varela's phenomenology of time in his analysis of protention, which connects protention "closely with action and affect," and in which Varela puts, indeed much more evidently, the basic tenets of the enactivist framework to bear on the investigation of temporality. Varela concentrates in particular on the relation that protention has with the affective dimension of the disposition to act, considered as a central aspect of the key phenomenon of coping. Unfortunately, Gallagher does not push his critical examination so far as to specify why this Varelian analysis falls short of providing a satisfactory enactivist account of protention. But it can be surmised from his own proposal that its main insufficiency consists in its not anchoring the enactivist dimension of protention deeply enough in the structure of experiential temporality. As is made clear in §37, Gallagher thinks indeed that the enactive character of cognition finds its ultimate source in this structure itself, and specifically in the nature of its protention constituent. For Gallagher, protention is an intrinsically enactive constituent of the structure of temporality, and furthermore everything else inherits its enactive dimension from participating in this structure. Why does Gallagher consider protention to be intrinsically enactive? The core of his answer can be found in §34, where he writes:

> "[T]he protention/primal impression/retention structure is an enactive structure with regard to the stimulus in the sense that a certain anticipatory aspect (already shaped by what has just gone before) is already complicating the immediacy of the present."

Protention is thus considered intrinsically enactive to the extent that it is intrinsically anticipatory, and therefore future-oriented. But how does the notion of anticipation itself relate for Gallagher to the idea of essentiality of action, considered as the most essential defining feature of enactivism? The answer is: through the further idea that anticipating is a form of acting. Indeed, Gallagher characterizes an analysis of the temporal structure of experience in terms of anticipation as an "active" or "dynamic" one, as opposed to a "passive" or "static" one.

« 5 » It is thus clear that Gallagher's proposal goes right to the heart of the problem of articulating neurophenomenology with enactivism, and takes a radical stand on the matter, inscribing what might be called the principle of enactivism into neurophenomenology, and neurophenomenology of time in particular. He even inscribes it into the very core of the neurophenomenology of time, i.e., in the content of the description of time consciousness, and not in its methodology. As a result, any type of phenomenological inquiry accepting this description qualifies as a form of enactivism. And this, he feels, also applies to Husserlian phenomenology.

« 6 » The next question raised by Gallagher's proposal is naturally that of determining to what extent it is a better enactivist candidate for passing the acid test than Varela's. The answer to this question exceeds the limits of this commentary, as it requires, in particular, critically and comprehensively comparing their respective analyses of protention drawn from the same late Husserl source. It nevertheless opens an important new space of discussion for future debates in the search for a neurophenomenology of time.

« 7 » I will content myself with mentioning one difficulty elicited by Gallagher's proposal, which relates directly to an important problem concerning the validity of the Varelian neurophenomenology of time. The difficulty is that Gallagher sticks to a standard interpretation of Varelian neurophenomenology as a naturalist account of experience, and that this interpretation is quite problematic. Detailing the reasons why it is so, is also beyond the scope of this commentary, but the bulk of the argument is quite simple. The claim is that if we stick to the definition of neurophenomenology offered by Varela in 1996, and repeated in later writings, neurophenomenology cannot be construed as a naturalist enterprise because it leaves the core of the problem of cognitive naturalism unanswered. Varela certainly did provide an answer to this problem, and one that takes the form of a type of causal emergentism, whose best and most explicit articulation and defence can be found in an article that was published posthumously and co-authored with Evan Thompson (Thompson & Varela 2001). However, the problem is that this answer is not explicitly integrated into his central formulations of the definition of neurophenomenology. Some (e.g., Bitbol 2000) have concluded from this strange absence (an absence that contrasts here again with the first version of the 1996 article that explicitly mentions emergentism) that Varela transforms the general notion of cognitive naturalism and circumvents the hard problem instead of confronting it. Nothing could be more erroneous in my opinion.

« 8 » Neurophenomenology is explicitly introduced as a "remedy to the hard prob-

lem," although one of a "methodological" sort. This means that, for Varela, contrary to what Chalmers thinks, we do not need a new naturalist principle of explanation, for the reason that we do have a valid one in our hands with causalist emergentism. The only thing we need, in order to eliminate the explanatory gap, is to enrich this emergentist framework with the introduction of a level of first-person description of the explanandum as well as of some reciprocal constraints between this level and the other ones. In other words, the motto is: close the descriptive gap, and the explanatory gap will go. Consequently, neurophenomenology without emergentism is not a naturalist doctrine, and cannot be a solution to the hard problem. Mutual constraints *per se* do not and cannot deliver the sought-for naturalist explanation of consciousness. The consequence is that if one sticks to the standard understanding, suggested by Varela's own formulations, of what neurophenomenology is, his neurophenomenology of time scores much worse in the acid test on the issue of naturalism than it possibly does on the issue of enactivism. One can always retort that it is enough to supplement the missing element and assess the achievements of the Varelian neurophenomenology of time in light of the right understanding of neurophenomenology. But it is not clear whether Varela did not somehow fall victim to his own problematic formulations and did much more, as a result, than illustrating how one can establish mutual constraints, instead of relations of causal emergence, between the Husserlian analysis of the structure of time-consciousness and neural-assemblies dynamics.

Jean-Michel Roy collaborated with Francisco Varela at the time Varela laid the grounds of his neurophenomenological project. A co-founder of the Paris research group Phenomenology and Cognition, he organized the 1995 Bordeaux conference that gave birth to the collective volume *Naturalizing Phenomenology* (1999), of which he is a co-editor. In a series of subsequent papers, he developed his own view of the possible relevance of a phenomenological investigation to contemporary cognitive science, and of Husserlian phenomenology in particular.

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Life is Intrinsically Temporal

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> Upshot • In this commentary I invert Gallagher's argument and argue that the account he gives of temporality should be applied to enactive cognition across the board. Instead of enactivising phenomenological accounts of time-consciousness, I suggest Gallagher ought also to be read as arguing for a temporalizing of enactive cognition.

Introduction

« 1 » In this important target article Shaun Gallagher sets about providing a new "full-fledged" enactive interpretation of time-consciousness. He does so by following up on the neurophenomenological account of time-consciousness Varela developed in a series of papers in the late 1990s (Varela 1999a, 1999b). Gallagher argues, however, that Varela's ideas were insufficiently integrated with his enactive theory of cognition. In this essay Gallagher shows how to make Varela's ideas truer to the spirit of his enactivism. The key move Gallagher makes is to look to the later genetic analysis of time-consciousness Edmund Husserl (2001) provided in the *Bernau Manuscripts* of 1917–18. In what follows I will try to bring out the consequences of Gallagher's argument, not for how one thinks about time-consciousness but for the enactive approach to the mind more generally. In the next section I begin with some brief remarks about how Gallagher characterises the enactive approach to the mind. The middle section provides an overview of Varela's work on time-consciousness. I aim to provide just enough of an overview of this work to highlight what one might take to be missing when seen through the lenses of Varela's broader commitment to enactivism. The final section turns to Gallagher's treatment of time-consciousness in his target article. I show how the enactive account of time-consciousness Gallagher proposes can also be interpreted as an argument for the temporalizing of enaction more generally.

Gallagher's enactivism

« 2 » Enactivism is described by a Gallagher as a theory of embodied cognition (§17). As such, enactivism as a theory should apply to all cases of embodied cognition, not only to conscious episodes of experience. In his recent book, for instance, Gallagher shows how enactivism can be applied not only to action and perception but also to "higher-order capabilities such as memory, imagination, reflective judgement and so on" (Gallagher 2017: 186). Thus, we can see already his argument has implications that potentially go beyond time-consciousness. The account of temporality he arrives at potentially applies to cognition across the board, I suggest, and not only to time-consciousness.

« 3 » Gallagher says quite rightly that enactivism is a "specific theory" of embodied cognition. In his list of the defining commitments of enactivism, however, it was not completely clear to me what sets enactivism apart from other theories of embodied cognition. Anthony Chemero's radical embodied cognitive science would agree with all the propositions Gallagher associates with enactivism (Chemero 2009). Does this mean that radical embodied cognition is just enactivism? Proponents of the extended mind might also be able to embrace all of these propositions for at least some cases of cognition (Clark 2008). Thus, proponents of the extended mind may embrace Gallagher's description of enactivism but argue that it is restricted in scope to certain types of cognitive processes.

« 4 » The latter possibility raises the question of the scope of Gallagher's enactive propositions. I take it from propositions (f) and (g) in §17 that Gallagher's enactivism is intended as a theoretical and conceptual framework for understanding cognition across the board. It applies to both so-called "lower" processes of online sensorimotor control, and to "higher-order" processes of offline cognition. Perhaps, then, it is in part the scope of enactivism that distinguishes it from other approaches to embodied cognition.

« 5 » In addition, I would suggest proposition (b) is a distinguishing feature of enactive theories. This is the claim that "[t]he world (meaning, intentionality) is not pregiven or pre-defined." Exactly what Galla-

gher has in mind here is complicated by the parentheses. Based on what he says in initially introducing enactivism, I will take him to mean the life-world or the environment – the meaningful world as it is experienced by organisms belonging to a form of life. The environment has to be understood in relation to organisms that live in it because it is from their activities that the environment is given meaning. What sets apart enactivism from other theories of embodied cognition (but not from radical embodied cognitive science) is that it thinks of cognition in terms of an organism-environment co-determination. The organism as a self-producing and self-sustaining unity establishes a meaningful relation to the environment based on its living cares and concern. The environment is a domain of interactions, a niche, defined in relation to the organism. The organism engages in recurrent patterns of active engagement in the niche it inhabits in order to maintain its own viability, and its way of life more generally (Rietveld & Kiverstein 2014).

Varela's neurophenomenology of time-consciousness

« 6 » Varela approaches the naturalisation of time-consciousness through his work on the neurodynamics of consciousness. He makes a distinction between three temporal scales of processes in the brain. These three temporal scales already help us to understand how the temporality of processes in the brain can come apart from the temporality of processes in the world. Within the elementary timescale of 10–100ms, for instance, events that occur successively in the environment can be fused by sensory systems and treated as simultaneous. Similarly, it is processing at this temporal scale that allows for experiences in different sense-modalities to be combined and integrated, presenting me with, for instance, the sight of the ballerina's movements in sync with the sound of the music to which she is dancing.

« 7 » Varela hypothesised that at the integration timescale measured in seconds, brain processes organise in such a way as to give rise to a temporally structured flow of consciousness. He applied his neurophysiological work on the transient phase-locking of cell assemblies in neural synchronisation to explain the temporality of the stream of consciousness. The transient non-linear synchrony of coupled oscillators only emerges on the basis of what has gone before in the brain. Prior patterns of activation set the boundary conditions for the emergence of neural synchrony. Thus, each preceding dynamical trajectory remains present and is *retained* as the boundary condition for the emergence of its successor. Protention is understood by Varela as bound up with the agent's affective disposition that readies the agent for action (see, e.g., Varela & Depraz 2005). Temporality thus arises out of the large-scale self-organising dynamics of "functionally distinct and topographically distributed regions of the brain and their sensorimotor embodiment" (Varela 1999a: 271). These diverse neural elements are brought together within a window of time that Varela suggests "corresponds to the duration of the lived present" (ibid).

« 8 » Viewed from the wider perspective of enactivism, what is missing in Varela's important treatment of the biological basis of time-consciousness is a story about how integration in the brain takes place in the wider context of the animal's sensorimotor embodiment in its environment. Gallagher finds a clue for developing such an account in the intrinsic temporality that is shared by both perception and action (§27).

The intrinsic temporality of life

« 9 » As my hand moves towards the cup of coffee I am reaching to grasp, my arm goes through a sequence of different postures. At each moment my movement is unfolding because of the cup I am moving to take hold of. There is thus a retaining in perceptual presence of the cup's affordances – its possibilities for action – to which my movements are coordinating and adjusting (Rietveld & Kiverstein 2014). At the same time, my movements are unfolding in a way that anticipates my taking hold of the cup of coffee to drink from it. My movements thus unfold along a particular trajectory based both on a retention of my body's configuration in relation to the environment, and an anticipation of where my movement is heading next. Similarly, perception is not a "knife-edge impression of the present." Perception instead arises with what Gallagher describes as an "empty anticipation" that is either fulfilled or not fulfilled by a primal impression. This empty anticipation is in turn constrained by a retention of what was just anticipated. The primal impression does not make a contribution to the constitution of temporal experience on its own but is itself constituted by the relationships that hold between retentions and protentions.

« 10 » Gallagher does not elaborate further on the significance of perception and action as sharing a common temporal structure. However, a thought along these lines seems to be behind his characterising the temporal structure of the stream of consciousness as enactive. He writes:

> "With protention leading the trajectory, the protention-primal-impression-retention structure is an *enactive* structure with regard to the stimulus in the sense that a certain anticipatory aspect (already shaped by what has just gone before) is already complicating the immediacy of the present." (§34)

What is not entirely clear to me, however, is why protention leading the trajectory suffices to make the temporal structure of the stream of consciousness enactive? Why does Gallagher say that, because of its intrinsic temporality, consciousness "enacts the present"?

« 11 » This becomes somewhat clearer (in §35) when Gallagher writes that intrinsic temporality is what explains the directedness of both consciousness and action towards things in the environment. Consciousness as enactive is to be understood as an "I can" that is as an "apprehension of the possibilities or the affordances in the present." Gallagher then proceeds to offer the following argument for this conclusion. There would be no engagement with affordances were perception to only present an animal with a knife-edge present. To apprehend and be sensitive to possibilities, a perceiving animal needs protentional anticipation – it needs to have experiences that reach out into the future, anticipating what could be. This is just what it takes to perceive possibilities. Gallagher does not spell out whether perception of possibilities would be possible without retention. However, since what is retained is just the fulfilled or unfulfilled protention that has just

past, we can infer, based on the argument that has just been given, that it would not. Perception without retention would be perception that is unconstrained by what was previously anticipated. But we have just argued that there can be no perception of possibilities without protention. Finally, Gallagher does consider whether there could be engagement with possibilities without a primal impression, and answers in the negative. "If there were only retentions, everything I experience would have just happened; we would be pure witnesses without the potential to engage" (§36).

Conclusion

« 12 » Gallagher's argument has far-reaching consequences. It is not so much the structure of time-consciousness that is enactive. Instead it seems to me that what Gallagher has shown is that cognition conceived in terms of enaction (across the board in all of its guises from "lower" to "higher-order cognition") has a temporal structure. Gallagher has found in Husserl a description of the temporality that is intrinsic to the self-organising processes that unfold as the agent dynamically couples to its environment in perception and action. He has shown how intrinsic temporality has its roots in life.

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What Is the Exact Directional Causality Between Affect, Action and Time-Consciousness?

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> Upshot • A triple schematic connection between affect, action and time-consciousness can be represented as follows: "affect → action (anticipation) → time-consciousness (protention)." Two questions are raised: what is the exact directional causality between these three phenomena? And does empirical evidence from the study of certain conditions where the time-experience, affect and action were shown to be transformed support the proposed connections? While psychiatric disorders show a similar schematic causation between these phenomena, this is not the case for meditation. One possible explanation of the inconsistency is the question of the interplay in affect between arousal and valence.

« 1 » The thread hat passes through the target article by Shaun Gallagher is the enactivist account of time-consciousness, understanding it in terms of action-oriented embodied phenomenology, consistent with Francisco Varela's constructivist approach. Specifically, the author claims that time-consciousness (the third part of the structure of the temporal-experience, the protention – which is an implicit anticipation of what is just about to happen) is tied to action (i.e., anticipatory behavior), which is closely connected with affect. In §25, the author writes:

> "Rightly noting that protention is not symmetrical to retention, Varela suggests that protention is closely connected with affect and action. If we think that the experiencing subject is always characterized by an affective disposition, then the idea is that one's disposition modulates protention. This idea finds application in considering certain pathologies that may involve the sense of agency."

« 2 » Thus, there are three phenomena – affect, action and time-consciousness – that seem to have a causal connection between them. But what is the exact directional causality between these three phenomena? And does empirical evidence from the study of certain conditions where the time-experience, affect and action were shown to be transformed support the theoretical connections?

« 3 » If we consider that Varela and Nathalie Depraz (2005: 74) refer to affect as "embodiment of readiness-for-action," then the first causal connection might be schematically seen as "affect → action." And when considering that "It is this active side of perception that gives temporality its roots in living itself" (Varela 1999a: 272), then the second causal connection might be schematically seen as "action → time-consciousness." Thus, theoretically, the schematic connections can be represented as follows: "affect → action (anticipation) → time-consciousness (protention)."

« 4 » The schematic connections can be put to empirical test by using the intentional binding paradigm as a measure of agency, as subsequently elaborated. The sense of agency (the sense that I am the one who is causing or generating an action) is a bridging empirical concept between action and time-consciousness, because it is associated with a subjective compression of time, such that causal actions and their effects are perceived as bound together across time (Haggard, Clark & Kalogeras 2002; Moore & Obhi 2012). This phenomenon is known as "intentional binding," and according to the influential "Comparator Model" it depends on sensorimotor prediction of action outcomes (Blakemore, Wolpert & Frith 2002). Specifically, an efference copy of motor commands is used to predict the likely sensory consequences of a voluntary action, and the match between these predictions and the measured sensory consequences promotes the feeling of self-agency, whereas a mismatch reduces it.

« 5 » Yet, the question arises – is the sense of agency a cause or a consequence of the subjective compression of time between actions and their effects? While more experimental work is needed to clarify this relationship, one hypothesis – aligned with the proposed schematic triple connection

– is that sense of agency is the cause rather than the consequence (Stetson et al. 2006), which aligns closely with Varela's view. According to this hypothesis, we expect that outcomes caused by our own actions will be temporally contiguous. Once we recognize that an outcome is dependent on our own behavior (high sense of agency), then a recalibration mechanism is activated, bringing these two events closer together in subjective time. This suggests that perception of time may be strongly modulated by prior expectancy, as applies to other perceptions (Moore et al. 2013). Importantly, empirical support for the connection "affect → action" was provided using the intentional binding paradigm: it was shown that negative emotional outcomes attenuate intentional binding for negative compared to positive or neutral outcomes (Yoshie & Haggard 2013).

« 6 » A good model to empirically test the proposed relationship is schizophrenia, a condition in which modulation of affect, and problems in anticipatory experience, agency and time-consciousness were found (Gallagher 2000; Gallagher & Varela 2003; Jeannerod 2009). Patients with schizophrenia show an absence of predictive action binding (Voss et al. 2010), as well as deficits in sensorimotor prediction, in alignment with the Comparator Model (Moore et al. 2013). According to the Comparator Model of agency, experiences of passivity in patients with schizophrenia can be explained by impaired sensorimotor prediction during voluntary action. This impairment is said to lead to a faulty mismatch between the experienced and expected sensory consequences. As a result, patients experience a reduced feeling of self-agency for their movements. It is noteworthy that schizophrenia also entails an impairment in temporal estimation, towards longer perceived durations (e.g., Volz et al. 2001). In terms of affect, a recent meta-analysis of experience-sampling studies indicate that people with schizophrenia consistently report more negative and less positive emotion than healthy control participants (Cho et al. 2017). Thus, in schizophrenia patients there is evidence for negative valence, reduced sense of agency, and slower time-flow, supporting the following schematic connection: "↓ positive affect → ↓ agency → ↑ time estimation" (arrow down means decrease, and vice versa).

« 7 » Another condition in which modulation of affect and problems in anticipatory experience and time-consciousness can be found is depression (Gallagher 2012). Both phenomenological and experimental studies show that depressed subjects have a slowed experience of time-flow and tend to overestimate time (Gallagher 2012; a recent meta-analysis in Stanghellini et al. 2017). Phenomenologically, the sense of agency in depression is reduced (Slaby, Paskaleva & Stephan 2013). Negative emotions obviously pervade, although the proportion between sadness (i.e., negative valence with low arousal) and anxiety (possibly negative valence with high arousal) varies between patients (Liverant et al. 2008). Thus, in depression, as with schizophrenia patients, there is evidence supporting the following schematic connection: "↓ positive affect → ↓ agency → ↑ time estimation."

« 8 » While the schematic connection "↓ positive affect → ↓ agency → ↑ time estimation" generally applies in cases of psychiatric diseases, this is apparently not the case in meditation. Mindfulness meditators generally show, as a trait, increased positive and reduced negative affect compared to non-meditators (Berkovich-Ohana & Glicksohn 2015; Farb, Anderson & Segal 2012). Building on the schematic connection found in psychiatric conditions, this anticipates a heightened sense of agency, and shorter time estimations. Indeed, as a trait, mindfulness meditators seem to exhibit a stronger sense of agency, manifested by a stronger intentional binding compared to non-meditators (Lush, Parkinson & Dienes 2016) (but for contradicting findings see Jo et al. 2014). Specifically, meditators showed a larger shift in the timing of an outcome toward the intentional action that caused it, argued to reflect improved metacognition of motor intentions (Lush, Parkinson & Dienes 2016), in alignment with the fact that meditation is an exercise in metacognitive processes, and that mindfulness meditation practice involves awareness of the causal connections between different mental states, including intentions and their outcomes (Gunaratana & Gunaratana 2011). Yet conversely, the state of deep meditation seems to involve phenomenologically a reduced sense of agency (Ataria, Dor-Ziderman & Berkovich-Ohana 2015), aligned with some philosophical accounts of Buddhist practice (Hyland 2014). Thus, the current empirical evidence is scarce and ambiguous.

« 9 » Now, turning to time-consciousness, the expectation of shorter estimates of time interval is indeed met by Peter Lush, Jim Parkinson and Zoltan Dienes (2016), who report a shorter estimate of the time interval between an action and its outcome in meditators. Yet, this contrasts with ample evidence that mindfulness meditators experience an "extended now," based on reports of a slower subjective passing of time (Berkovich-Ohana, Glicksohn & Goldstein 2011; Wittmann & Schmidt 2014), and a relative overestimation of durations (Droit-Volet, Fanget & Dambrun 2015; Kramer, Weger & Sharma 2013). Thus, in meditation the results show "↑ positive affect → ↑ agency (but still controversial) → ↑ time estimation."

« 10 » The inconsistency in the schematic relationship between different conditions presented above shows that, currently, the relationships are not well understood, and more theoretical and empirical work is needed to clarify and better articulate the causal connections. A possible direction for further investigation is a finer-grained account of affect, as its subcomponents are known to have varying effects on time-consciousness, as subsequently briefly shown.

« 11 » Affective states are generally agreed to bear two phenomenal features; the one is bodily and the other mental (reviewed by Lambie & Marcel 2002). These can be called "arousal" (extent of bodily excitation) and "valence" (a subjective feeling of pleasantness or unpleasantness). The empiric connection between affect and time-experience shows differential effects for the two sub-components of affect. There is accumulating evidence for an arousal-induced temporal distortion, namely that when the level of physiological activation decreases/increases, the internal clock varies in accuracy (Droit-Volet & Gil 2009; Glicksohn 2001). However, the exact direction is less clear, as a strong arousal level had different effects on the participants' time judgements as a function of their affective valence. In high-arousal conditions, unpleasant pictures were overestimated, whereas pleasant pictures were underestimated. Inversely, in low-arousal conditions, unpleasant pictures

were underestimated and pleasant pictures overestimated (Angrilli et al. 1997; Droit-Volet & Gil 2009). This opposite direction of the valence effect as a function of arousal suggests that two different mechanisms are triggered by arousal levels: an attention-driven mechanism for low arousal, and an emotion-driven mechanism for high arousal (Droit-Volet & Gil 2009). This raises the possibility that the interplay in arousal-valence, and possibly also attention, is the cause of the inconsistencies in empiric evidence shown above.

« 12 » To conclude, a schematic causal relationship between affect, action and time-consciousness was proposed and put to empirical test. While psychiatric disorders show a similar schematic causation between these phenomena, this is not the case for meditation. One possible explanation of the inconsistency is the question of the finer-grained effect of the interplay between arousal and valence.

« 13 » As a response to the target article, I outlined some interdisciplinary aspects by searching for exact causality that can be empirically tested and integrated. The empirical inconsistencies presented here draw the scientific attention back to the importance of affect in Varela's account of time-consciousness, suggesting that while current work mostly focuses on understanding the role of perception and action, more work is needed to consider the role of affect and its sub-components.

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The Transcendental Character of Temporality and the Buddhist Contribution to Time-Consciousness

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> Upshot • Enriching the parallel between transcendental phenomenology and enactivism, I briefly discuss the compatibility of the Buddhist perspective with Gallagher's contribution to time-consciousness. Grounded in his meditative practice and heartfelt engagement with Buddhist philosophy, Varela de-constructed representationalism and its underpinning metaphysical dualism, building up the generative concept of enaction. His approach has been deeply inspired by Madhyamika Buddhism, which describes time-consciousness as that double illusion that frames phenomena as either becoming or permanent.

« 1 » Shaun Gallagher's target article, centered around Francisco Varela's continuation of Edmund Husserl's work on time-consciousness, elaborates on the embodied approach pioneered by Varela. The rigor of this analysis starts with the definition of Husserlian distinguishable-yet-inseparable moments: retention, primal impression, and protention. Then, towards the conclusion, the author intertwines them with an enactive approach to temporality, based on the mutual interdependence of such a threefold structure of time-experience. The precision and clarity of Gallagher's article leave almost no space for critiques, re-enhancing a neglected theme in contemporary literature. Even though time shapes our lives with both intense and empty moments, it recedes ephemerally from our analysis, as we try to catch its essence. The implications of the target article retrieve classical unadulterated philosophical questions and deserve some further considerations.

"Knife-edge" present transcendental deconstruction

« 2 » Gallagher's article sets the stage of the "knife-edge present" deconstruction from its very beginning (§2): "Consciousness must in some way grasp more than the punctual now." Then, in his enactivist account of time-consciousness (§§29–36), Gallagher points out the interdependency of primal impression, retention, and protention: "Our experience of the present is always dynamic […] in such a way that a focus on any one of the three components in isolation runs into an abstraction" (§29). Considering each factor *per se* reciprocally presupposes the other two factors in a circular way: "[I]f primal impression is part of the structure of the living present, it is itself structured in its relations to retention and protention" (§33). This brings Gallagher to discuss time-consciousness's phenomenological "fractal character": as each block is acknowledged, it collapses into the "following." As we grasp a primal impression based on protention, it ends being held in retention, and so on; retention dissolves into protention, as "every living is living *towards*" (Husserl 1991: 313).

« 3 » Nowadays, Immanuel Kant's philosophy finds little attention with respect to this theme. In Kant's framework, any fact, to become meaningful, must match our *a priori* structure, which in turn predetermines it (Kant 1990). Given that the transcendental structure constitutes only selected aspects of the phenomenal world, time as an inner form of intuition cannot become the direct object of our conscious attention. Nonetheless, we perceive and conceive of things only insofar as they unfold in time. Husserl relied on Kantian refined conception, considering time neither as an objective fact existing in the world nor as a private, subjective projection. He inherited from Kant the view that both spatiality and temporality are a priori empty intuitions permeated by sensorial, a posteriori ones. Kant argued that the properties that we can assign to the object are nothing but the very preconditions for knowing the object itself, overturning the relationship between the knowing subject and the experienced object. However, he did not formulate a phenomenological reduction of time-consciousness, as Husserl did.

With phenomenology, Husserl turned Kantian time from a pure intuition – as a non-empirical representation – into a living, dynamic phenomenon that relies on the horizon of experience. Moreover, Husserl developed phenomenological methods, such as the *epoché*, in order to reduce experience to its minimal, invariant character. Building upon this, Varela then situated time-consciousness in an embodied process. Enactivism reminds us that we cannot access the objects *per se* but only those aspects of objects that are co-constituted by our ongoing cognitive activity (§17). This a priori structure is grounded in the embodied retention of all previous successful couplings, and circularly shapes and is shaped by its affordance possibilities.

From passive to active perception and action

« 4 » Consider the Husserlian example of the temporal succession of melody (§2): the unitary, punctual essence of "duration blocks" of individual tones A-B-C. While the duration-blocks, in themselves, do not possess melody, if considered independently, melody arises out of the interplay of past retentions and occurring protentions as we listen to the blocks in continuation. Music is more likely to create temporal form while unfolding in time and co-originating with it: a melody is a melody only as it unfolds in time, and time does not exist outside of that melody. According to Husserl, the intentional act of hearing *each* appearing singular tone is simultaneously intertwined with the dynamic interplay of the "coming-to-be" and "about-to-be." Overcoming Franz Brentano's isomorphism, Husserl conceived a transcendental reconstruction of time as a somewhat passive immanent character of experience itself. Following the *epoché* reduction, the diachronic succession can be deconstructed in its transitory components, all immanent to the intentional bond: "[M]y retentional awareness of the just-passed note is not itself just past; it is part of the present structure of consciousness" (§9).

« 5 » Given that the threefold structure of time-consciousness unfolds through intentionality, the author concludes that consciousness itself, "is not simply a passive reception of the present; it is not simply self-affective. It *enacts* the present" (§34). As our attention is driven towards the present moment, the linearity of the succession is undermined by the self-referential enactive character of the temporal stream: "[F]or Husserl temporal experience is not itself an object occurring *in* time, but neither is it merely a consciousness *of* objective time; rather it is itself a form of temporality" (§9). Embedding perception into action, Varela (1999a: 272) shows how the *act of* viewing a multistable image "gives temporality its roots in living itself" (§16). The anticipatory apprehensiveness of the "not-yet" thus becomes complementary to the retention of the "just-past," showing how we are "active perceivers, rather than passive listeners" (§16). Similarly, recalling James Gibson's notion of affordance, Gallagher depicts intentionality as an embodied spatial protention in the action towards objects (§35). The "not-yet," far from being a mere absence, is full of enactive possibilities that will be fulfilled or not "as our enactive perception trails off in retention." In Khachouf, Poletti & Pagnoni (2013), we discuss, from an "embodied-transcendental" perspective, how the predetermined enactive architecture of an autopoietic organism dynamically structures its ecological niche, defining its *Umwelt*, intentional affordances, and world-view.

« 6 » Time-consciousness may relate to various inertial phases in the recollection of stored contents, enabling the interpretative activity of the sensorial input flow, in a self-referential predictive anticipation (Gallagher & Allen 2016). For example, the localized activity associated with face processing biases subjects before the detection of a face rather than a vase during a decision task on Rubin's ambiguous vase-face figures (Hesselmann, Kell & Kleinschmidt 2008). This finding fits with Varela's idea of conscious self-referentiality as an embodied hierarchical process: in his hypothesis, neural dynamics unfold at multiple temporal scales. In Guido Hesselmann et al.'s example, the phase synchrony of neural discharges is first hypothesized to occur at lower levels within scattered sensorimotor assemblies, associated with the "pure present" character of the ongoing experience. These neural discharges are in turn recruited by higher-order assemblies that integrate their activity. The hierarchical inclusion of these assemblies in larger dynamic structures could represent a stage associated with the phenomenological threefold structure of the "living present" (Varela 1999a). Thus, Varela described the "living present" as a pre-narrative "pure present" encircled by a horizon of retention and protention, associated with higher-order neural phase synchronies unfolding at multiple temporal scales and modifying the present act of perception *as* "just past." The transient phase locking of cell assemblies in neural synchronization goes conjointly with that constant modification of the present (Varela 1995, in §20).

Time-consciousness in Buddhism and the problem of dualism

« 7 » Acknowledging certain weak spots in Husserl's methodology, Gallagher (1998) maintains that pre-noetic and hermeneutical factors (such as embodiment, language, historical effect, and intersubjectivity) should be integrated into it. Literature, art, cognitive psychology, and social sciences, he argues, may be useful in overcoming intrinsic limitations of phenomenology, as they all encompass extra-intentional dimensions. However, to adequately meet this transdisciplinary challenge, Gallagher admits that new radical paradigms might be needed. These paradigms should involve the minimum of interactions between methodological reductions and metaphysical assumptions.

« 8 » In the enactivist approach (§17), intentionality is accompanied by prereflective awareness (Depraz, Varela & Vermersch 2000), which in turn is embedded in situated physiological processes (Lutz & Thompson 2003). Varela methodologically dissolved any objective, metaphysical stance on "a mind-independent reality," showing the impossibility of being able to describe consciousness "within nature as it is supposedly described by our best scientific theories" (Bitbol 2002). Neurophenomenology encourages a transdisciplinary integration of extra-intentional, pre-noetic factors, starting by "clearing out" researchers' minds. In fact, these factors can be considered as directly immanent in one's mind, given that it actively maintains intentional bonds with socio-cultural constructions

such as language. Incorporating these factors as being co-produced with the experience, the Buddhist contemplative practice, which is grounded in body-awareness, is supposed to unveil the intentional characters immanent to time-consciousness. As reported in Gallagher's article, Buddhism brought Varela to frame our immediate experience as a dynamical interconnection "within a finite segment of time" (§22). Later, in §24, referring to the double intentionality, Gallagher quotes Varela's consideration of a "pre-reflective sense of the experiencing self": certainly, Varela accessed it personally, scrutinizing Buddhist philosophy and practicing meditation.

« 9 » Following Varela's example, neurophenomenology can be intended as a radical constructivist research program, matching the conceptual analysis with a profound, embodied, existential commitment (Vörös & Bitbol 2017, this issue). With respect to time-consciousness, meditation seemingly suspends the self-confirmatory loop of the predictive, transcendental process, including Gibsonian affordances (Khachouf, Poletti & Pagnoni 2013). In Buddhism, unreleased-stored reactions, often referred to as dispositions (Skt, *samskaras*) held in deep storehouse consciousness (Skt, *alaya vijnana*), are said to push forth attachments and consequent existential suffering (Skt, *dukkha*). The retention of these salient memories is said to show up through individual inclinations to act (Skt, *vrittis* and *vasanas*). That is why meditation is said to help us get rid of past impressions, purifying the ongoing dependent origination of time-consciousness.

« 10 » Buddhist interdependent origination addresses time-consciousness and related problems head-on. For example, with refined logical arguments, Nagarjuna attempted to show how time has no self-existence, since it can never be grasped (Garfield 1995). In a less analytical way, Dogen defined being-time as a unified, co-emergent pure activity, since Being unfolds itself as beings, and time unfolds Being as beings (Kim 2000). In Dogen, Being and time are the activity of space-awareness, based on "forgetting oneself." Such an interpretation takes on its full meaning only following the "letting-go" gesture, reclaimed by Varela himself. Forgetting the "specious-present," time structure can be reabsorbed into minimal activity. Letting-go both time-impression and concept, the Buddhist soteriology aims at getting rid of recorded retentions, which keep us in the threefold circle of retention-primal impression-protention, determining our personal worldview and thirst/desire (Skt, *trishna*), marked by karmic influences impressed in our beliefs and in our dualistic worldview. Dualism starts with the (pre-reflective) attitude separating ourselves from the supposed "external world"; hence, the core sense of "I" exists only insofar as its evidence is supported in its auto-confirmatory process based on salient retention-protention cycles that determine self-attachment.

« 11 » In both Hinduism and Buddhism, primary existential craving is said to shape this transcendental activity, building up the condition of suffering (Skt. *dukkha*), as impermanence (Skt. *anitya*) and self-emptiness (Skt, *anatman*) go unrecognised. Contemplative practices are supposed to allow that acknowledgement through refined analysis of the ongoing experience. Clearly, time-consciousness is radically at stake there and has to deal with our ego-centered interpretative framework. Considering the gap between the three components of time-consciousness, Madhyamika philosophers proposed a refined conception of time, filling the gap between the act of knowing and perceiving (Garfield 1995). As in Husserlian *epoché*, the attempt of Buddhist meditation is to collapse all interpretative inclinations towards the noetic side of intentionality. Trying to overcome the subjective dimension, its endeavor is to abandon ego-centered action-perceptions, a principle that was crucial in determining Varela's own worldview.

Conclusion

« 12 » Considering the contemporary recurrent naïve reduction of temporality to a linear discrete process through which neurophysiological data can be interpreted, time-consciousness in all its phenomenological complexity deserves more nuanced elucidations. In both his deconstructive and generative intentions, Gallagher's works (e.g., Gallagher & Varela 2003; Reinerman-Jones et al. 2013; Øberg, Normann & Gallagher 2015) bring important contributions to the constructivist approach, enriching transdisciplinary research. Neurophenomenology still deserves a deeper philosophical integration of phenomenology and meditation in order to access and reframe transcendental processes' dynamics.

« 13 » Time-consciousness shows fruitful connections with many research topics, e.g., the predictive confirmations of the narrative-self in integrative clinical practice. Autobiographical-identity is sustained by self-referential thoughts triggered by past memories and consistent anticipatory patterns (Gallagher 2000). As reclaimed by Khachouf, Poletti & Pagnoni (2013: 8), the Default Mode Network (DMN) activation could be related to an activity that is "being prepared for the future." This may be especially useful for what concerns the function of the DMN in enacting and looking out for environmental confirmation of an autobiographical-based model of narratives. Finally, as recommended in a conclusive footnote (§38), the complementary interplay of micro-phenomenology and meditation could improve Western scrutiny of consciousness's micro-dynamics (Petitmengin et al. 2017).

Stefano Poletti, a psychologist, is especially interested in phenomenology and contemplative studies. During his PhD in Social Sciences, he developed qualitative research on Mindfulness-based Intervention with cancer and epileptic patients in order to explore its interaction and meaning in chronic suffering. To this end, he deepened patients' metaphysical worldviews after mindfulness programs, exploring in the meantime the soteriological conception of Buddhist expert meditators with respect to pain and existential suffering.

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Author's Response

Internatural Relations

Shaun Gallagher

> Upshot • I offer some clarification on how enactivism is related to naturalism, predictive processing and transcendental phenomenology, and I point to a paradox that requires further clarification with regard to the structure of intrinsic temporality and the nature of self.

« 1 » I thank my commentators for their insightful and critical commentaries. I will respond to each in turn and highlight some contrasts and connections as I go.

« 2 » Dan Lloyd proposes that predictive processing (PP) may provide an alternative model that is nonetheless consistent with the main thesis of my target article about the enactivist account of the primacy of protention. I am in general agreement with Lloyd that it is worth considering PP as a model that brings recent neuroscience together with phenomenological and enactivist approaches to time-consciousness. In such considerations, however, there is a further question that needs to be addressed: which model of PP will best fit with neurophenomenology and with what Lloyd calls Edmund Husserl's enactivism as found in *Thing and Space*?

« 3 » Husserl rightly and insightfully emphasized the role of kinesthesis in exteroceptive perception. Kinesthesis/proprioception is typically thought of as reafferent sensory input generated as the result of bodily movement, and therefore after the fact of that movement. This is clearly one aspect of kinesthesia. Importantly, however, kinesthesia is involved in feed-forward control processes activating a kinesthetic signal that anticipates movement, as part of protentional/anticipatory movement preparation (Gandevia et al. 1997; Lethin 2005, 2007). This is consistent with Husserl's notion of the perceptual "I can" – the idea that I perceive the world in terms of how I can act on it (Husserl 1989), which in turn is consistent with the notion of affordance as James Gibson (1977) later developed it, and with enactivist views on sensory-motor contingency (e.g., O'Regan & Noë 2001). In this respect, it is important to keep in mind that kinesthesia is not reducible to brain processes. It involves the peripheral nervous system, and more generally reflects the motor intentionality of the body as it is coupled to the environment.

« 4 » As Lloyd suggests, these ideas can be captured by the theoretical model of PP. But these ideas also suggest that internalist models of PP, represented by Jakob Hohwy (2013), fall short of what is needed for the enactivist view. On the internalist reading, which wraps the brain in a tight Markov blanket and cuts it off from the world, the brain is making anticipatory guesses about the world based on priors informing a generative model that is constantly correcting itself in the light of prediction errors. As Lloyd shows, this is nicely consistent with Husserl's analysis of intrinsic temporality and the enactivist emphasis on the dynamical processes involved in the back-and-forth adjustments of the system to the world. For the enactivist, however, this is not just an isolated dynamics confined to the brain. It involves the whole body as it is coupled to the environment. Accordingly, what predictive coders call priors are not reducible to what Andy Clark, even in his more liberal and embodied view of PP, refers to as "stored knowledge" (Clark 2016: 6, 27, 79) in the brain. Rather, within the PP framework, one can understand priors to involve the dynamical coupling of brain-body-environment. This is clearly shown, for example, in studies by Lisa Barrett and Moshe Bar (2009; also Barrett & Simmons 2015; Chanes & Barrett 2016). They propose the "affective prediction hypothesis," which

> "implies that responses signaling an object's salience, relevance or value do not occur as a separate step after the object is identified. Instead, affective responses support vision from the very moment that visual stimulation begins." (Barrett & Bar 2009: 1325)

« 5 » They show that along with the earliest perceptual processing, activation of the medial orbital frontal cortex and a train of muscular and hormonal changes throughout the body are initiated, generating "interoceptive [and kinaesthetic] sensations" from organs, muscles, and joints associated with prior experience, which integrates with current exteroceptive sensory input. In other words, it is the organism as a whole that constitutes the priors. This means, consistent with Husserl's enactivist leanings, perception is

> "intrinsically infused with affective value, so that the affective salience or significance of an object is not computed after the fact. […T]he predictions generated during object perception carry affective value as a necessary and normal part of visual experience." (ibid: 1328)

« 6 » I am in agreement with Lloyd that PP offers a model that can capture much of the enactivist story. What is important, however, is to flesh out an enactivist version of PP, which is not reducible to an internal set of brain processes (so-called "inferences") "in-the-head," but is a form of *predictive engagement* in-the-world (Gallagher & Allen 2016). Indeed, it is possible to see Karl Friston's concept of the Free Energy Principle as consistent with Francisco Varela's notion of autopoiesis (Allen & Friston 2016; Bruineberg, Kiverstein & Rietveld 2016). As Lloyd predicts, this combination of phenomenology, enactivism, and predictive processing may be the "wave of the future" (§15).

« 7 » In contrast, Véronique Havelange offers a reactive undertow oriented to the past, and consistent with the classic version of phenomenology, which, seemingly for her, does not include Husserl's insights into the embodied, kinesthetic aspects of operative (*fungierende*) intentionality or the "I can." According to Havelange, I "systematically" confuse Husserl's concept of intentionality as "'directedness-to' of the conscious mind with linguistic intensionality (with an 's')" (§5). This is a view that Havelange associates with Roderick Chisholm (1957). It is not clear to me, however, where she finds this view in my account. If I shift the emphasis away from act-intentionality, it is a shift towards operative or bodily intentionality (Husserl 1989; Merleau-Ponty 2012) rather than towards some Fregean notion of intensionality. Indeed, enactivism eschews the latter notion as a model for intentionality to the extent that it rejects the notion of propositional or semantic representational content (e.g., Gallagher 2017; Hutto & Myin 2013). Havelange may simply be associating the term "cognitive science" with its early Fodorian emphasis on

propositional representations. The idea of naturalizing phenomenology in the context of cognitive science, however, does not put phenomenology to use in the service of an already established cognitive science. Rather, phenomenologically inspired embodied-enactivist approaches pose a challenge to this good-old-fashioned version of cognitive science.

« 8 » This can be made clear by considering Havelange's more substantial claim about the shortcomings of naturalization, and Jean-Michel Roy's remarks on issues related to naturalism. First, in contrast to Havelange's worry, neurophenomenology does not give up the phenomenological reduction. Indeed, in Varela's account, and in experiments he conducted, he is careful to employ a version of the phenomenological reduction (Varela 1996; Lutz et al. 2002). This is not, however, Husserl's transcendental reduction. And, certainly, neurophenomenology is a different project from transcendental phenomenology. But this is not something that Husserl would reject as heretical. In fact, Husserl, who did not intend that the insights provided by transcendental phenomenology should be ignored by science, gives his imprimatur to the very idea of a naturalized phenomenology. He suggested, quite clearly, that

> "every analysis or theory of transcendental phenomenology – including […] the theory of the transcendental constitution of an objective world – can be developed in the natural realm, by giving up the transcendental attitude." (Husserl 1970: §57)

The idea that phenomenological insights could inform the natural sciences is not inconsistent with the value of transcendental analysis. The idea of a phenomenological psychology would follow along this line.

« 9 » At the same time, the naturalization of phenomenology does not mean that phenomenology succumbs to the classic conception of nature that still guides most of contemporary science (excepting quantum mechanics). It rather motivates a rethinking of the very idea of nature. Maurice Merleau-Ponty, in pursuit of some of Husserl's critical comments about scientism and the objectification of nature, comes to the idea that there is a "truth of naturalism" understood not in terms of the classic concept of nature (Merleau-Ponty1964: 201ff), but rather in terms of a reconceptualization of nature – not as a collection of objects or objective relations, but in terms of form (structure, gestalt), or, as in his later work, "flesh" (Merleau-Ponty 1968) – where nature is not independent of the perceiver or the agent. Indeed, Merleau-Ponty (1995: 373) cites Niels Bohr on the harmony between phenomenology and contemporary physics (see Bohr 1999). In this regard, Merleau-Ponty, and the neurophenomenology inspired by him, does not, *pace* Havelange, shift away from "what is given in first-person experience to a third-person register… [or] to a conventional scientific approach" (§7). Indeed, *that* would be to miss the main point of a naturalized phenomenology.

« 10 » This also addresses the worry that Roy expresses about whether Varela transforms "the general notion of cognitive naturalism" (§7). Roy is still looking for a solution to the hard problem of consciousness. Although Varela responds to David Chalmers (1995) by promising a "remedy" to the hard problem through neurophenomenology, this was not meant to be the *solution* for which Roy is looking (§8). Anything that could count as a solution to the hard problem would have to buy into the assumptions of classic naturalism, since those assumptions define precisely the framework within which the hard problem is defined, namely, that a complete scientific description of the brain will be deterministic, and completely independent of first-person experience. To think that there is a solution to the problem is to accept the terms in which the problem is defined, and this is not something that Varela, even as a scientific neurobiologist, was willing to do. The remedy was indeed to circumvent the problem by reconceiving nature.

« 11 » Roy poses an important question about why Varela, in his finalized version of neurophenomenology, shifts away from the emergentist position he expressed earlier, and then again later in his article with Evan Thompson (Thompson & Varela 2001). This is a difficult question that would lead us too far afield in this short response. Although Varela was rightly invested in the concept of different timescales, there is still a question of whether the best way to think of enactivist conceptions of cognition involves differentiations captured by the vocabulary of lower-level *versus* higher-level processes. If, instead of a hierarchy, we think of brain-body-environment in terms of a dynamical gestalt, where processes may be better conceived of in terms of figure-ground, it is not clear how to conceive of emergentism. Indeed, the question of emergentism gets completely caught up in Varela's (and Thompson's 2007) attempt to rethink the concept of nature. This is not an issue that can be resolved here, however.

« 12 » Julian Kiverstein, like Roy, raises the issue about the tension between Varela's neurophenomenological project and enactivism. He suggests that there is some element of enactivism missing in neurophenomenology. This is another way to frame the issue that I attempt to address in my target article. That is, by thinking further along the lines that Varela already set in regard to intrinsic temporality (characterizing both experience and action), we can make the neurophenomenological analysis more enactive. What is unresolved in Varela, however, speaks to the ongoing theoretical struggle between the task of remaining scientific (which Varela certainly wanted to do) and reconceiving nature (and therefore reconceiving what science actually is).

« 13 » Kiverstein also points to nuanced differences between different versions of embodied cognition – the differences between ecological, extended and enactivist conceptions. He wants more clarity about how enactivism can be distinguished from other approaches and focuses on the idea that the world and its meaning is not pre-established or pre-given. My own view of this is that there are ways to understand enactivism as including conceptions of ecological and extended cognition as long as we give up functionalist commitments, especially in versions of extended mind (Gallagher 2017). So, my project, rather than providing a clear distinction between these approaches, is to find a way to integrate them. Kiverstein goes some distance in this direction in his own ecological analyses of affordances (Rietveld & Kiverstein 2014). Indeed, as Kiverstein notes, the very relational and enactive structure of affordances requires the kind of intrinsic temporality that I attempt to describe.

« 14 » **Aviva Berkovich-Ohana** raises questions about the causal relations between affect, action and time-consciousness. She reviews a number of empirical studies that suggest that the relation is "affect → action (anticipation) → time-consciousness (protention)" (§3). In asking about the "exact directional causality between these three phenomena" (§2), **Berkovich-Ohana** seems to confine herself to a linear concept of causality that is itself in question in the enactivist approach. Thinking of the ties between affect, action and intrinsic temporality in more dynamical terms requires that we consider non-linear reciprocal causal relations. This is, in part, what Varela's distinctions among different timescales are meant to suggest. An account of the enactive system must include the kind of reciprocal causality that explains how, in cognitive processes, there are relational couplings between brain and body, and between body and environment that are constitutive of cognition (Gallagher, in press). This involves a dynamical integration across specific timescales.

« 15 » In §§18ff of my target article I detail different timescales distinguished by Varela. Although these timescales can be plotted on linear objective clock time, as indicated by the temporal variations in milliseconds and seconds, objective time does not capture the significance of the relations among these scales. The integrative timescale of conscious experience is not an additive composition of the intervals on the elementary level. I mentioned, for example, a form of inter-level (elemental to integrative) temporal compression. Specifically, from the perspective of the integrative scale there is no experiential difference between 10 and 20 msecs as measured on the elemental scale. Accordingly, between the elementary and the integrative timescales, relations are not straightforwardly linear or additive such that we can simply sum up a number of elementary time periods or put them in a specific order to get to an integrative second or an experience of that same order (see, e.g., Ronconi & Melcher 2017). For example, when a stimulus of 50 msec. is followed by a stimulus of 100 msec. the integrated event (i.e., the combined event experienced on the integrative level) is not necessarily an additive sum of 150 msecs.

> "Instead, the earlier stimulus interacts with the processing of the 100 msec. interval, resulting in the encoding of a distinct temporal object. Thus, temporal information is encoded in the context of the entire pattern, not as conjunctions of the component intervals." (Karmarkar & Buonomano 2007: 432)

« 16 » The integration occurs according to dynamical, non-linear principles. Thus, even in Husserl's favorite example of listening to music, the temporal experience of a tonal sequence will not necessarily match the sequence of tones as they occur in objective time, or the sequence of processing that occurs on the neuronal level (Bregman & Rudnicky 1975; also see Dennett & Kinsbourne 1992; Gallagher 1998). Indeed, these dynamics help to explain the phenomenon of intentional binding and a lot of the experimental results cited by **Berkovich-Ohana**.

« 17 » I agree with **Berkovich-Ohana** that a good understanding of these phenomena requires more research. She makes an interesting suggestion about differential effects for the two sub-aspects of affect: arousal and valence (Lambie & Marcel 2002). Likewise, it will be important to pursue differences across these various parameters and dynamical relations in the cases of meditation and psychopathology. It is not at all clear whether we can consider the structure of intrinsic temporality as an a priori structure if in cases of meditation or psychopathological experiences this structure breaks down (see Frith & Gallagher 2002).

« 18 » This brings us to **Stefano Poletti**'s comments. He appreciates the connections to be found among enactivist interpretations, predictive processing, and Varela's explanation of the living present in the integrative timescale. Citing Michel Bitbol, he notes that

> "Varela methodologically dissolved any objective, metaphysical stance on 'a mind-independent reality,' showing the impossibility of being able to describe consciousness 'within nature as it is supposedly described by our best scientific theories' (Bitbol 2002)." (§8)

This reinforces my remarks in §8 above concerning an enactivist conception of nature. The enactivist view, that nature is not just the mind-independent objectivity that science takes it to be, is reinforced by Bohr in light of his considerations concerning quantum physics. According to Bohr, if we want to give a "description of any phenomenon to which the term 'physical reality' can be properly attached" we need to include the

> "conditions which define the possible types of predictions regarding the future behavior of the system […]. In objective description, it is indeed more appropriate to use the word phenomenon only to refer to observations obtained under specified circumstances, including an account of the whole experimental arrangement." (Bohr 2014: 148)

« 19 » As Bitbol puts it, for Bohr, "phenomena are indissolubly *co-defined* by the experiments which are used to make them manifest" (Bitbol 2002: 204). For the enactivists, phenomena are co-relational with the perceiving agent. But the perceiving agent is embedded in multiple extra-intentional factors – including affective, social and cultural factors that define affordances and the solicitations we ordinarily take to be valuable. We are caught up in a set of ongoing priming effects that shape how we perceive the world.

« 20 » **Poletti** suggests that meditation practices can suspend such effects. Meditation helps to neutralize the priors and the retentions that supposedly inform our predictive processing. "That is why meditation is said to help us get rid of past impressions, purifying the ongoing dependent origination of time-consciousness" (Poletti: §9). This is, as **Poletti** suggests, a deconstruction of our temporal experience, and along with it the "I" which exists "in its auto-confirmatory process based on salient retention-protention cycles that determine self-attachment" (§10). On this view, certain forms of Buddhist meditation practices involve selfless states. If the retentional-protentional structure of intrinsic time explains the possibility of pre-reflective self-awareness, then absent that retentional-protentional structure, pre-reflective self-awareness would collapse into this selfless state.

« 21 » This view seems consistent with **Berkovich-Ohana**'s experimental studies on meditation, although, at the same time, it motivates a paradox. Distinguishing between narrative self (NS), minimal self (MS),

and selfless (SL) experiences, Berkovich-Ohana (in Dor-Ziderman et al. 2013) sought to identify the neural correlates of the elimination of NS and MS during meditation, and a characterization of SL. The SL condition, however, seemed to involve a decentering process where there still exists an "observer perspective" since subjects are able to report on such states. "A careful reading … of the participants' first-person descriptions of their SL experiences indicated three rather broad but distinct types of experiences": lack of ownership (LO); altered experience; and less happening (Dor-Ziderman et al. 2013) Consider the LO experience, which was attained by the most experienced meditators. The sense of ownership, or what phenomenologists call the experience of mineness, is considered to be one of the most basic aspects of pre-reflective self-awareness (or the minimal self), and it can be described in terms of our retentional hold on our passing experience. If Poletti is correct in suggesting that some meditation practices help to eliminate the retentional aspect of experience, then we would expect to find meditators in the LO experience. The paradox, however, is that these meditators are seemingly able to describe this experience, according to Berkovich-Ohana (Dor-Ziderman et al. 2013; 2016). For example, one meditator reports on SL: "There was an experience but it had no address, it was not attached to a center or subject …." Another states: "Sensations of all kinds of things flickering. A sort of meditative phenomena and flickering of light and darkness – difficult to describe in words." And another: "There was a feeling of a shift in alertness, a cessation of reflectivity. A different kind of quiet" (these reports are cited in Dor-Ziderman et al. 2013: 6). If, however, one's retentional consciousness (and pre-reflective sense of mineness) is eliminated in SL, then when asked to report the selfless experience, should the subject not say something like, "I don't know, I wasn't there"?

« 22 » On the logic that informs the analysis of intrinsic temporality in Husserl and Varela, the fact that there can be a report on experience seems to suggest that the particular experience is not selfless, but that it still involves a minimal pre-reflective self-awareness and sense of ownership or mineness (Gallagher 1996). If phenomena are co-relational with the experiencing agent (§12 above), and if there is no experiencing agent, then there is no phenomenon to report. Accordingly, I suggest that further clarification is needed of the "observer perspective," and how that perspective relates to the retentional-protentional structure of time-consciousness.

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