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# A Theory of the Microdynamics of Occurrent Thought and the Neural Correlates of Consciousness

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**Abstract**

A portion of a phenomenologically based model of thinking and conscious mental states called, A Theory of the Microdynamics of Occurrent Thought (TMDOT), is outlined (Demmin, 2015). Micro phases of occurrent thoughts (OTs) are delineated that consist of phenomenal contents in which a central executive (CE) becomes immersed, followed by one of several transitions of attention characterized by its "face up" or "face down" surfacing from them. The transitions bring about different degrees of consciousness of those contents, ones that reflect different forms of cognitive processing, revealing a relatively invariant structure that carries "on-line" cognition. In this article, it is shown that TMDOT can account for how self-consciousness develops out of object-consciousness during OTs, for how different degrees of object- and self-consciousness are engendered by the interaction of a CE with different phase-based contents of the thought process, for how a gradually intensifying phenomenology of object- and self-consciousness are engendered within OTs, for a how a pulse-like phenomenology of object- and self-consciousness are engendered across OTs, and for an integrated CE that functions "within" the specious present and traverses the OT process. Significant cognitive and neuroscientific data appear to be consistent with phenomenological observations outlined in TMDOT and are incorporated into it. The integration of such data within the model appears to result in clarification, reinforcement, and validation of each other. A direction is offered for future neuroscientific research which may be able to establish a neurological link between consciousness of an object and pre-reflective self-consciousness embodied in a CE which is attending to that object, thereby validating (or not) the TMDOT proposal that a CE "moves" through phenomenal contents in two fundamentally different ways, each of which serves different cognitive functions that are necessary for the on-line processing of such contents and for different degrees of consciousness of that object.

**Key Words:** Phenomenology, philosophy, mind, brain, cognition, thinking

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## Introduction

In recent decades there have been requests for a phenomenologically based account of thinking and the conscious states that occur therein. In 1987, Gardner indicated that more veridical models of human

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cognition were needed to better inform and influence new directions in cognitive science. In 2003, Zahavi stated that the ongoing search for the neural correlates of diverse types of conscious mental states may require accurate phenomenological descriptions of such states to better clarify what scientists are trying to find the correlates of.

Neuroscientists have been attempting to specify the neural correlates of consciousness for decades, meaning that they are trying to identify "…the minimal neural mechanisms jointly sufficient for any one conscious percept…" (Crick & Koch, 1990). Though a great deal of progress has been made in identifying these correlates, there is a need for theoretical models of consciousness that can account for them (Overgaard, et al., 2020). Similarly, other researchers believe that for a neuroscience of consciousness to be satisfactory it needs to account for *phenomenal properties* via neural properties and integrate evidence from behavior and *introspection*.

In this article, a portion of a phenomenologically based model of occurrent thinking (TMDOT) is outlined that incorporates cognitive and neuroscientific data regarding conscious mental states and helps make further sense of that data. In turn, that data appears to inform the model and lend validation to it. Neuroscientific research is provided that indicate the durations of time necessary to produce different degrees of consciousness of perceptual/quasi-perceptual stimuli, ones that are consistent with phenomenological observations offered in and integrated into TMDOT. A description of the CE and its functioning is then presented followed by neuroscientific evidence that appears to support its proposed phenomenology and functioning, and that description potentially informs and supports that evidence. Subsequently, TMDOT provides a phenomenological account of how self-consciousness develops out of object-consciousness /Consciousness, along with accounts for the gradual, increasing Consciousness and explicitness of intentional objects based on the duration of attention to them, the latter of which increases the likelihood that one will utilize that content for the purposes of the self, all of which appear to be supported by neuroscientific research outcomes, again suggesting mutual validation and clarification. A phenomenological description of how pulse-like qualities of object-consciousness/Consciousness and self-consciousness are engendered is outlined, along with neuroscientific evidence that appear to support their pulse-like nature.



## The Phenomenological Model of Occurrent Thinking and Conscious Mental States

TMDOT indicates that every OT is a conceptual reaction to an objectified and identified object of attention called an excerpt. In contrast, an *occurrent cognition* is a behavioral and/or emotional reaction to an excerpt. Adapting Julian Jaynes' concept of excerpts,

an *excerpt* is a stimulus that has been selectively attended to, followed by its objectification and identification. Excerpts typically rise into phenomenal experience as a function of association in the stream of immanent events (i.e., the "internal" flow of a person's private, subjective experience) and typically take the form of quasi-visual mental images that serve as on-line memory forms which are extracted from personal events in everyday life and stored in the brain. Excerpts can also be of any passing content in the stream of immanent events and of stimuli in the physical surroundings.

William James proposed that OTs are made up of *substantive* and *transitive parts.* He said that the substantive parts of thought are its "resting places" or "perchings" which are occupied by "sensorial imaginations of a sort." He indicated that the transitive parts are the "places of flight" that lead from one substantive conclusion to another.

*Primary excerptive experiences* (PEEs) are the experiential forerunners of excerpts. Utilizing James' meaning of the word, "transitive," PEEs are transitively based experiences of a sensory-perceptual or quasi-sensory-perceptual nature within which a CE is immersed. They are like mini dreams of micro durations. Primary excerptive experiences frequently appear in phenomenal experience due to associative networks in the brain that are related to the contexts/contents that give rise to them. Because the CE seems completely "lost" in their brevity (less than one tenth of a second) when they occur, most of us are never aware of their transitive existence.



When the CE first attends to a perceptual object in the surroundings, it becomes completely immersed in, and seems to become one with, the phenomenal content embodied in it. Similarly, when the CE becomes immersed in a PEE in the stream of immanent events, it seems to become fused with the PEE's phenomenal contents such that there is no distinction between it and those contents (i.e., it loses its sense of subjective presence). In the stream of immanent events, the CE often becomes immersed in a transitively based PEE before attending to it, but the instant it surfaces from and attends to it, that PEE seemingly becomes a fixed, substantive object relative to the CE, which renders it an excerpted object the instant it is identified.

As an example of a PEE experienced in the stream of immanent events, I saw a puddle of oil that my car leaked in the driveway and asked myself if I should clean it up now. Following that question, a quick act of attention on my passing experience revealed that I was just fleetingly awash in an extremely brief, quasi-visual, experientially, and transitively based memory of having left some oil in a friend's driveway that I later learned had damaged it. That PEE was like a snippet of a movie, less than one tenth of a second in duration. I noticed too, that as I seemed to surface from and attend to that passing experience, I responded to it as if it were a static object/image, to which I experienced the conceptual reaction, "I'd better clean that up now." The CE fleetingly "lost itself" as a sense of subjective presence

while immersed in the latter PEE, followed by surfacing from, attending to, objectifying, and identifying it relative to its excerpted, substantive form.

Relative to a given environmental stimulus, a PEE often occurs when the CE first attends to, briefly fuses with, becomes immersed in (i.e., lost in and to itself), the perceptual experience of that stimulus, followed by surfacing from and identifying it. Related to the latter, Husserl (1991) says that a sense datum must be constituted as an immanent temporal unit before it can be interpreted or identified. He adds that when a given interpretation begins, a portion of that sense datum already elapsed, indicating that it was experientially and temporally there for us just prior to its interpretation (i.e., a PEE). Similarly, according to Buddhist cognitive theory, preconceptual awareness precedes the onset of a conceptual determination. For example, Gunaratana (2002, p. 138) says, "Just as you focus your eyes on a thing, ... before your mind says, 'Oh, it's a dog,' there exists the preconceptual experience during which your sense of subjective presence disappears in the experience" (i.e., a PEE).

At the outset of the interval of the *juncture of receptivity* (JR) of an OT, the CE is surfacing from its initial immersion in a PEE while directing its attention to it. The latter might be compared to submerging one's head in the water and surfacing from it face-down. When the CE surfaces face-down from a given PEE and attends to it, it seems to suddenly exist in a fixed, quasi-visual, substantive/objectified form (i.e., an instance of one of James' "perchings"). The attention to that seemingly static image and its content can be recognized or identified almost immediately, in part, because the CE was just immersed in its transitively based experiential form (i.e., an instance of one of James' "flights") and because the CE is attending to its content while surfacing from it. Therefore, the outset of the JR is marked by the CE's face-down surfacing from, attention to, and objectification of the passing phenomenal content of a given PEE.



Once the PEE is objectified, the CE can implicitly identify it very rapidly, thereby establishing it as an *implicitly identified excerpt* (IIE). The presence of the excerpt as a seemingly static object/image seems to last no more than two tenths of a second or so. The implicit identification of the content of an objectified PEE co-occurs with the phenomenal experience of a slight differentiation between the CE as a seeming subject and the substantively based content of the PEE as object, the latter of which often takes the form of a quasi-visually based excerpt/image. If no identification of that passing content occurs, no OT will develop.

Within the interval of the JR of an OT, the objectification, detection, recognition/identification, and consciousness of an objectified PEE (e.g., IIE) occurs at the outset of an *experience of implicit knowing* (EIK), the remainder of which often takes the form of

a conceptual reaction that somehow relates to the identified content embodied in the IIE or that represents a simple recognition/identification of that content. The end of the JR is marked by a transition of attention out of and away from the EIK.

At the outset of an EIK, the objectification and implicit identification of a phenomenal content is one of a recognition of its gist or main theme and is quite global, non-detailed, and extremely fleeting. The remainder of the EIK often consists of a conceptual response to its IIE. For example, I look at an object on the floor, quickly recognize it as a spider, and conceptually react in the following form: "Yikes, how am I going to get it out of the house"!? The latter embodies having identified the object very fleetingly and globally, which then influences the nature of the conceptual reaction to it.

An IIE is a stimulus that is detected, implicitly recognized, and rendered fleetingly conscious. I refer to this type of consciousness as small "c" consciousness because one's consciousness of the IIE is too fleeting to be remembered beyond one's conceptual reaction to it, especially if the reaction itself is not attended to in the next OT. The detection and consciousness of the excerpt lasts approximately one to two or three tenths of a second. In contrast, an *explicitly identified excerpt* (EIE) is one in which the identity of a stimulus is rendered explicit (i.e., more detailed) and Conscious based on a longer duration of attention to its forerunner, an IIE, for a total of about three to five tenths of a second. I refer to the latter type of consciousness as big "C" Consciousness because one's awareness of the excerpt is stronger and will lend to an ability to remember and report it, in part, *because an increasing sense of self presence co-occurs in relationship to* one's increasing Consciousness of it (to be discussed below). For example, in looking at the spider on the floor for a slightly longer duration I might experience the following conceptual reaction, one that is apt to be more about it than a reaction to it: "Oh, that's not a spider, it's a piece of thread."



Like EIKs, *experiences of explicit knowing* (EEKs) are transitively, associatively, and narratively based reactions in which the CE is fleetingly immersed. Whereas EIKs render their objects implicitly identified and conscious, EEKs render their objects explicitly known and Conscious by attending to their excerpts (EIEs) for a slightly longer duration than that which occurs during EIKs.

Because an EIK or EEK is so fast, coupled with the fact that the CE is immersed in either one to varying degrees, its content is rarely remembered after it passes. In addition, once the EIK or EEK passes, one will likely have no memory for the content of its respective PEE/IIE or PEE/EIE, as well. In other words, OTs and intentional acts come and go thousands of times a day, leaving us with no memory of them nor of the excerpts to which they are reactions.

EIKs and EEKs end in several different ways called transitions of attention (TOA). Any given EIK/EEK may simply *dissipate* if the CE, as it surfaces from its immersion in it, does not attend or react to any aspect of its passing content. Alternatively, the CE can surface from its immersion in an EIK/EEK in a *face-up* fashion, meaning that it is not focusing on any of the passing narrative content and is instead, awash in an associatively based reaction (i.e., a memory form) to that content which is frequently in the form of a new PEE. That narrative serves as a transitively based "springboard" from which the PEE arises and in which the CE is immersed. Due to this face-up TOA, the content of the PEE is less directly related to that narrative content than one that is initiated by a face-down surfacing from and attention to transition. Furthermore, this face-up phenomenal experiencing is transitive in that the CE has no consciousness of its transition from the passing EIK to a new PEE, thereby seemingly losing itself by becoming immersed in/as this transition.

The CE can also surface from an EIK/EEK in a *face-down keeping in mind* fashion, which means that it is skimming over or sweeping across some of the EIKs/EEKs passing content, which reflects a very subtle form of objectification of that content, much like a glance. This glance is not long enough to "transform" any of the passing content into a seemingly substantive object. This face-down keeping in mind TOA typically evokes a conceptualization that is a simple repeat of or re-wording of the passing EIK/EEK.



Lastly, the CE can surface *face-down from and attend to* a passing EIK or EEK, thereby fixing it into a seemingly static, substantive object. This face-down surfacing from and attention to TOA lends to that content's seeming objectification and will be followed by its implicit or explicit identification and its consciousness or Consciousness depending on the duration of attention to it.

There are two general forms of OTs. OTs that are conceptual reactions to IIEs are called *elaborative thoughts.* The objects of elaborative thoughts are implicitly identified because the attention to them is extremely brief, resulting in their detection and fleeting consciousness. OTs that are conceptual responses to EIEs are called *reflective thoughts*. The objects of reflective thoughts are explicitly identified because the attention to them is of a slightly longer duration than that which occurs during elaborative thoughts, resulting in their Consciousness.

Like the JR of elaborative thoughts, the *juncture of receptive-reactive presence* (JRRP) is the time frame within which certain phases progress during *reflective thoughts*, but the JRRP reflects a longer attention to an IIE than does the JR of elaborative thoughts. At the outset of the JRRP, the CE surfaces face-down from and attends to a PEE, thereby (seemingly) transforming it into a substantively based object. A longer attention to the objectified PEE during an embodiment of explicit knowing (EEK) engenders an increasing Consciousness and

explicitness of its content, thereby rendering it an explicitly identified excerpt (EIE). The remainder of the EEK is a conceptual response to the EIE that is likely about it. When a TOA results in the surfacing of attention out of and away from the EEK, the JRRP has ended.

Elaborative and reflective thoughts can be broken down into several types which show case their distinct functions based on their respective micro phases. For example, a *prototypic elaborative thought* is a type of elaborative thought marked at its outset by the objectification of a PEE by an embodiment of implicit knowing, resulting in its implicit identification (e.g., IIE), followed by a narrative reaction to it through the remainder of this EIK that leads to a face-up surfacing of the CE from it which transitions into a new PEE. For example, I look at an object on my desk (PEE/IIE) followed by the conceptual reaction (EIK), "Mom gave that to me on my last Birthday." Arising in a face-up fashion out of the latter, a PEE of the shirt she gave me "came to mind." If the latter PEE isn't subsequently attended to via a new OT, it will be lost without notice.

TMDOT outlines different types of OTs that take *passing conceptualizations* as their objects. The first is a type of elaborative thought called *implicit reflective identification* (IRI). At the outset of IRI, the CE surfaces face-down from, attends to, objectifies, identifies, and conceptually reacts to an EIK/EEK of a passing thought within a duration of time only long enough to render it detected, implicitly identified, and conscious. The second is a type of reflective thought called *explicit reflective identification* (ERI). At the outset of ERI, the CE surfaces face-down from, attends to, objectifies, identifies, and conceptually reacts to an EIK/EEK of a passing thought within a duration of time long enough to render it detected, explicitly identified, and Conscious. Without these two types of OTs, the contents of passing conceptualizations would be quickly forgotten and have little cognitive or behavioral impact. In addition, they engender chains of OTs that are thematically consistent.



Because instances of IRI and ERI take the passing conceptualizations of OTs as their objects, they are called *secondary OTs* (SOTs). Secondary OTs incorporate into their makeup the meanings embodied in the conceptualizations of their immediate, predecessor thoughts. As an example, I experience the EIK, "I need to call Jane about her request for a new appointment time." As I surface face-down from and attend to that EIK for a duration of time only long enough to render it conscious, I experience the following EIK as a conceptual response: "I'd better call her now." The latter response is an SOT because it is taking a passing conceptualization as an object and is conceptually reacting to it.

As an example of ERI, I experience the same EIK about Jane but while surfacing face-down from while attending to it long enough to render it more explicit and Conscious, I experience the following EEK: "Oh, she requested a certain time of the week, I need to check my

schedule to see if I can do that." The latter conceptual difference between IRI and ERI is impossible to predict but the longer duration of attention to that passing content will likely engender a different conceptual response due to the more explicit information gleaned from that excerpted content and the greater Consciousness of it.

*Noncomparative reflective thinking* (NCRT) is a type of reflective thought which is responsible for introspective self-awareness and that takes a passing conceptualization as an excerpted object of attention. It is characterized by the CE's face-down surfacing from and attention to a passing conceptualization (EIK or EEK), thereby engendering an EIE at the outset of an EEK, the remainder of which is a conceptual response about it. Embodied in this new EEK is the tacit experience of becoming increasingly Conscious of the now objectified EIK's/EEK's content and of construing the objectified EIK or EEK as an instance of self in thought-based form (e.g., "That's me.") As with any form of object-Consciousness, as the CE attends to its object, an increasing, tacit sense of self progresses in relationship to it.

The description of the microdynamics of OTs reflects a nested hierarchical structure within and frequently, across OTs. As one of numerous potential sequences, the transitory presence of the PEE and its meaningful content is attentively captured via a substantive instant in the form of a following IIE (at the outset of an EIK) and the meaningful significance of the IIE is reflected in the remainder of the EIK. Then, the transitory presence and the meaningful significance of the EIK is attentively captured via a substantive instant in the form of a new EIE (at the outset of an EEK) of a new OT, and the meaningful significance of the EIE is reflected in the remainder of the EEK of this new OT. Each capturing instance is a substantive moment, followed by a transitively based reaction to each instance which incorporates its predecessor's meaning into its makeup while embodying new, emergent meanings relative to each such instance. Each substantive and transitive element has its own time scale (as indicated above) and appears to reflect different quasi-perceptual/perceptual forms (e.g., cinematic (e.g., IIEs and EIEs) and extensional (e.g., the PEE and the narrative reactions of EIKs and EEKs). These forms manifest in absolute consciousness, which the CE embodies, along with Husserl's three temporal modes, consistent with the proposal offered in Singhal & Srinivasan (2021). Of note is the premise that while the CE is swept up in its varied appearances and disappearances during the OT process, it often returns to its default state, coming back to a tacit awareness of itself relative to the surroundings *and its own present goals*, one of which is likely that of harboring some degree of awareness of the meaningful significance of its last thought, thereby extending the time scale of the phases of thought just highlighted to the limits of the specious present, which is about three seconds in duration (Dainton, 2010).

## The Central Executive

The CE possesses a set of cognitive processes that function "on-line" within a finite time span in working memory. Those processes include the ability to selectively attend to stimuli (mental and physical), receive and identify temporarily activated memory forms, briefly retain those forms in immediate and short-term memory stores, and conceptually react to those forms in the service of making judgements, arriving at solutions, coming to decisions, etc. The CE can be viewed as a supervisory attentional system functioning within working memory but in contrast to earlier conceptions of its abilities, it can function at a much faster rate than initially conceived and is therefore centrally involved in on-line cognitive functions about which one is rarely conscious (Potter, 2012).

Importantly, Baars (1997) says that attention and awareness are highly implicated in working memory and that consciousness is involved in all working memory input, output, and voluntary/explicit problem-solving operations. Baddeley (1996) adds that consciousness is one of the qualities of the CE and that it is one of the least specified components of working memory.

Given Barrs', Baddeley's and others' opinions that consciousness is centrally involved with the CE, I posit that the CE embodies consciousness in its absolute, Husserlian sense. The CE is a center of attention and *position of reference* from every object to which it attends and typically acts out an initial set of automatic, unconscious, habitual cognitive functions relative to each such object. It can be conceived as a functioning *center of receptive-reactive presence* (Demmin, 2015) which is grounded in the specious present (Hodgson, 1878), the duration of which may last from one to two tenths of a second to as many as three seconds (Dainton, 2010) depending on context and task specifics. It is likely equivalent to the minimal self-posited by Gallagher (2000) in that it is an intuition of oneself as an immediate subject of experience, unextended in time, and that is a pre-reflective *point of origin* for thought, action, and experience.



I posit the CE as functioning in the temporal horizon of absolute consciousness consisting of the conjunction of retention, primal impression, and protention. Absolute consciousness is an inner time-consciousness which is atemporal. As such, the CE is a center of *knowing*, relative to stimuli presented to it, coupled with the cognitive habits of attending to, receiving, and conceptually reacting to them in swift fashion. It could readily be referred to as *operational awareness* because it is the embodiment of awareness coupled with cognitive processing functions which are automated, fast, and influential. I propose that absolute consciousness, coupled with a CE which is manifesting and functioning through it, is the most fundamental and necessary feature of all on-line cognitive processing.

## Neuroscientific Evidence for the Central Executive or Operational Awareness

The idea of self, as reflected by the presence and functioning of a CE posited by TMDOT, is consistent with that of William James' notion of the self. James said that the 'I' is "that which at any moment is conscious whereas the 'me' is only one of the things which it is conscious *of*." He said that the self is "partly known and partly knower, partly object and partly subject." He did not believe that stable, core processes of self-hood existed beyond the "transient flow of consciousness," meaning that thoughts themselves are the thinkers. He viewed the self as more of a process than a structure.

Similarly, Baars (1997) believes that consciousness relative to the CE is highly implicated in most working memory functions and so too does Baddeley (1996). Therefore, understanding the neurocognitive bases of self-related representations and processing is central to research on the neural correlates of consciousness and on research in the cognitive sciences. However, the relationships between different aspects of consciousness and self-related processing remains uncertain (Goldberg et al., 2006).

Neuroscientific research exploring the neural correlates of consciousness indicates that brain areas related to self in prefrontal regions, and that are often associated with introspection, exhibit *inhibition* during demanding perceptual tasks (Goldberg et al., 2006). The latter suggests that self-consciousness is not a constant and therefore, is not pervasively overseeing all aspects of cognitive processing, for example. The researchers indicate that rather than being like a pilot in a cockpit playing the role of an overarching, separate self that is observing aspects of the conscious flow of visual information, for instance, the self of consciousness is more of a phenomenal self as an ongoing integrated process. According to TMDOT, this self is the CE which is inextricably swept up in an ongoing integrated process of its alternating immersions/disappearances in transitive phenomenal contents followed by its surfacings/appearances from those contents, both of which facilitate different cognitive functions (outlined below). The latter seems consistent with neuroscientific research which indicates that brain areas related to self show inhibition during demanding perceptual tasks.



### Cognitive and Neuroscientific Support for the Durations of Time Necessary for Different Forms of Consciousness

In his "Time-On" theory of consciousness, Libet (2004) views awareness as a unique phenomenon that is associated with specific neuronal activation requirements. His research has shown that responses to sensory signals can be performed unconsciously and made within 100-200ms. after their presentation, well before

awareness of them. Libet concluded that the effective duration for neural activation in unconscious functions is approximately 100ms. and that signals can be detected by the brain unconsciously without awareness of them. He and others indicate that 500 milliseconds are the total duration of time necessary for neuronal activations to produce awareness, the latter of which is assessed based on subjects' reports of their experiences of signals.

Mary Potter's (2012) research outcomes regarding the times in which stimuli are detected and made conscious versus reportable and made Conscious are consistent with Libet's and other researchers' results. She proposed the existence of a bridge between the contents of a given visual representation, for example, and stored information in long-term memory (that can give meaning to those contents) called *conceptual short-term memory* (CSTM). During the CSTM interval, conceptual representations of given stimuli are rapidly activated, quickly forgotten, and serve as the raw material for the identification and comprehension of words, pictures, scenes, sentences, and intelligent thought. It is a form of working memory that functions during many cognitive tasks and makes up the bulk of information processing.

Research results support a two-stage model of CSTM in that all or most items selectively attended to are detected and identified, whether they can be reported or not (Potter, 2012). More specifically, most items selectively attended to during RSVP tasks are detected and identified in about 100-200ms., followed by a second stage during which they are consolidated in reportable form within a duration of 300-400 additional milliseconds of attention to them. Items that have not been structured/consolidated are quickly forgotten.



Potter believes that Baddeley's phonological loop and visuo-spatial sketchpad help with tasks associated with short-term memory that stretch the temporal limits of these systems to several seconds in duration (i.e., the temporal limits of the specious present) but adds that they are not suited to the types of rapid and effortless conceptual processing that takes place within milliseconds of the onset of a stimulus during CSTM. She also states that both systems sub-serve the cuing and construction of conceptual memory in CSTM.

I believe that it's fair to generalize the CSTM research results and Libet's and other researchers' experimental outcomes about the times necessary for the CE to detect and become conscious of or to report and become Conscious of environmental stimuli *to "stimuli" in the stream of immanent events*, and therefore, to the hypotheses presented in TMDOT. In doing so, the identification phase (i.e., 100-200ms.) of the CSTM interval is *consistent with the JR of elaborative thoughts*, during which an object is quickly rendered detected, implicitly identified, and conscious by the CE. The consolidation phase of the CSTM interval is *consistent with the JRRP of reflective thoughts* in that the CE's longer attention (e.g., 300-500ms.) to an object renders it

increasingly explicit and Conscious, thereby allowing for its potential report or utilization, relative to the goals of the self. Therefore, CSTM research results, along with Libet's, have been incorporated into TMDOT regarding the time it takes for the CE to detect, identify, and become conscious or Conscious of such stimuli. In turn, TMDOT specifies the cognitive processes that can occur following such identification and consciousness/Consciousness of such stimuli and their dynamic relationships between each other, as well as the nature of the transitions that occur across them, all of which involve the CE. Of significance is the likelihood that a CE is intimately involved in subjects' cognitive processing across all cognitive research tasks, and therefore, in all normally functioning human beings.

## The Phenomenological View of Self-consciousness Developing Out of Object-Consciousness

According to TMDOT, the CE can surface face-down from its immersion in a passing transitive content and attend to, objectify, and identify it. In so doing, it establishes a substantive object as a reference point in time and while maintaining attention to the identified object, experiences itself as other to it, and thereby becomes increasingly self-conscious, albeit, pre-reflectively. Due to the latter temporal progression, across which the CE attends to while moving away from that identified object in time, a tacit self-consciousness of being other to it is engendered. Self-consciousness, manifesting in the form of the CE, is tacitly recognizing that its identified object is not-self or other-to-self. The CE becomes increasingly (pre-reflectively) self-conscious by not being the object of which it is objectively Conscious. In addition, while maintaining its attention to an identified object, the CE tacitly experiences itself as occupying the "position" *of owning the present moment* relative to the contrasting "position" of that identified object which is tacitly understood as past. The latter progression in time reflects an intensification or pulse of tacit self-consciousness relative to an intensifying pulse of object-Consciousness. Many phenomenologists support the latter phenomenology of a sense of self-presence developing out of an increasing awareness of an object.



## The Gradual Transitions to Consciousness and Explicitness of an Object

TMDOT proposes that when the CE surfaces face-down from and attends to a passing phenomenal content for a short duration of about 100-200ms., that content is objectified, detected, implicitly identified, and rendered *increasingly* conscious via an EIK of an elaborative thought, the latter of which typically embodies a narrative reaction to it. When the CE surfaces face-down from and attends to a passing content for an additional duration of 300-400ms., that content is rendered *increasingly* explicit and Conscious, relative to an increasing

but tacit sense of self-consciousness progressing relative to it through the remainder of an EEK of a reflective thought.

## Cognitive and Neuroscientific Support for the Gradual Transition to Consciousness and Explicitness of an Object

There is neuroscientific evidence that suggests that conscious experience is gradual versus dichotomous/all-or-nothing. For example, the allocation of attention to a stimulus has been shown to increase the subjective intensity of the conscious experience of it (Carrasco, et al., 2004) and appears to induce an increase in the intensity of neural activity coding for its specific properties (Fazekas & Nanay, 2018). It appears that the neural underpinnings of the subjective consciousness of the intensity (i.e., how salient the content of the experience is), specificity (i.e., how distinguishable a content element is from other elements), and stability (i.e., how long the content element is present in experience) of a phenomenal content match the intensity, precision, and maintenance of its underlying neural population codes, respectively (Fazekas & Overgaard, 2018). Therefore, it appears as if there are well-known mechanisms that can gradually change the proposed neural underpinnings of the various qualities of the contents of conscious experiences.

Similar cognitive neuroscientific research supporting this gradual view of consciousness utilize the Perceptual Awareness Scale (PAS), which provides a measure of the gradation of consciousness. Utilizing PAS, subjects' statements of their experiences go from reports of no subjective impressions of stimuli, to weak impressions, to increasingly clear ones (Sandberg & Overgaard, 2015), indicating that their experiences of stimuli move along a continuum of degraded (i.e., less intense, specific, and detailed) to increasingly clear. Therefore, it appears that perceptual awareness can be viewed as a gradual process starting from an absence of consciousness and detail of stimuli to becoming fully conscious and aware of more detail based on the degree of allocation of attention to them.



## The Pulsing of Consciousness

During EIKs and EEKs a transition occurs that lends to a distinction between the *reflective conceptual phase* and *elaborative conceptual phase* of any given one. The reflective conceptual phase occurs at the outset of an EIK when the CE surfaces face-down from and attends to a PEE, thereby objectifying, identifying, and rendering its content *increasingly* conscious, the height of which subjectively manifests as a pulse-like experience of object-consciousness, in response to which a fleeting and tacit sense of self-consciousness occurs relative to it. Similarly, if the reflective conceptual phase occurs at the outset of an EEK, the CE surfaces face-down from and attends to a PEE, thereby

objectifying and rendering its content *increasingly* explicit and Conscious, the height of which subjectively manifests as a pulse of object-Consciousness, in response to which an intensifying sense of tacit self-consciousness occurs relative to it.

As an EIK or EEK ensues, the reflective conceptual phase transitions into the elaborative conceptual phase, the latter of which is marked by attention turning away from its object while remaining immersed in the conceptual/narrative remainder of either one. In so doing, it seems as if the CE loses any sense of self-presence along with any sense of presence of its object. Furthermore, the remainder of this phase often evokes a new association somehow related to it in the form of a PEE that can serve as an object for a new OT.

During and *within* the *reflective conceptual phase* of an EIK, one's experience is that of a swift but *gradual increase* in the intensity of consciousness of the content of the excerpt to which the CE is attending and conceptually reacting. When that content only becomes intense enough along the continuum of awareness to lend to its detection and implicit identification, a pulse of object-consciousness seems to manifest in subjective experience, representing the seemingly sudden presence or detection of the object to the CE. In contrast, during and within the *elaborative conceptual phase* of an EIK, the CE begins to "turn away from" its object and becomes immersed in and takes the phenomenal form of the remainder of the narrative/conceptual reaction that the EIK embodies.



The immersion of the CE in the elaborative conceptual phase of one thought is followed by the apparent surfacing of the CE during the reflective conceptual phase of the next thought, during which it becomes increasingly present to itself (tacitly) as it becomes increasingly conscious of its new object. Because the CE loses a sense of subjective presence during the elaborative phase of one thought, it can now have the experience of coming back to itself during the reflective conceptual phase of the next thought, an experience that at its height, feels like a pulse of object-consciousness/Consciousness along with an intensifying tacit sense of self (i.e., pre-reflective self-consciousness) progressing relative to it. The CE cannot experience a pulse of renewed self-presence without having been absent and without a new object from which to become present.

Cognitive neuroscientific research indicates that prefrontal areas of the brain that are associated with the self as reflected by introspective activity exhibit *inhibition* during demanding perceptual tasks (Goldberg, et al., 2006). Similar results have been reported by other neuroscientists who say that brain regions which act as a workspace for self-referential processing show reduced activity during goal directed tasks, suggesting that cognitive functioning during such tasks is facilitated by the inhibition of such processing.

The latter research supports the notion that pre-reflective self-consciousness is not a constant, which is consistent with the phenomenological observations that tacit self-awareness dissipates when the CE becomes immersed in transitive contents (seemingly disappearing as in James' "flights") and becomes increasingly prominent when it surfaces face-down from and attends to them (seemingly appearing relative to James' "perchings"). While immersed in a new, transitively based association, the CE loses its sense of subjective presence, which may correspond to inhibition of neuronal activity implicated in pre-reflective self-consciousness, all of which is meant *to facilitate the transitively based on-line manifesting of that association.* Subsequently, when the CE surfaces face-down from, attends to, and objectifies/identifies that transitively based association, it experiences itself as increasingly present relative to it, which may correspond to excitation (or disinhibition) of neural activity implicated in pre-reflective self-consciousness, all of which *facilitate the likelihood of utilizing that substantively based association* for the self's own purposes. In other words, the latter contents and processes relative to the CE are teleologically based in that they are meant to serve the function of increasing the likelihood of the self's utilization of relevant memory associations for specific reasons.

## Cognitive Neuroscientific Support for the Pulsing of Consciousness



The description of object-consciousness/object-Consciousness and self-consciousness as being like pulses is meant to convey the subjective reality of their greater saliency/intensity which is consistent with neuroscientific research outcomes noted above which show that allocating attention to given stimuli increases their subjective intensity as an apparent function of the increasing amplitude of the populations of neurons corresponding to them. Research has also shown that there is a strong correlation between the intensity of neuronal activity in relevant content-specific regions of the brain and the vividness of the conscious experiences of mental images. The greater subjective intensity of one's awareness of an object, the greater its respective brain region's bioelectrical activity.

The phenomenology of the intermittent manifestation of pulses of object-consciousness/Consciousness and self-consciousness also appears to be indirectly supported by the following research. For example. EEG studies posit that the dynamics of the EEG field can be characterized by intervals or "microstates" with sudden transitions between them that are associated with spontaneous and abstract thought, and visual imagery (Strik & Lehmann, 1993). The latter research results suggest pulse-like bioelectrical correlates to the phenomenal experiences of different cognitive activities and that brain states change in a non-continuous manner such that the seeming continuous stream of consciousness actually consists of successive steps of brain operations. They cite William James and state that these

successive steps of brain operations are "*reminiscent of the flight-perch-sequences of subjective experience*" (italics added) to which William James refers when he characterizes the transitive and substantive parts of thoughts, respectively, consistent with what happens during conscious mentation and functional interactions with the environment.

## A Future Research Direction

According to TMDOT, across the OT process, transitively based micro phases progress relative to each other, the contents of which can be captured by a CE that surfaces from and attends to their contents as they pass. The longer the attention to such contents the more likely they will be captured in substantively based, perceptual/quasi-perceptual forms with a co-occurring increase in the consciousness of those contents relative to an intensifying (pre-reflective or tacit) sense of self in the form of a CE attending to them. In other words, an increasing consciousness of such contents co-occurs with an intensifying tacit sense of self (in the form of a CE) attending to them. It is proposed that a pulse-like subjective intensity occurs at the height of the intensity of such substantively established contents which co-occurs with the height of intensity of the pre-reflective sense of self attending to them. These pulses are likely correlated with increased amplitudes of bioelectrical activity in neuronal populations related to those contents/processes.



Dehaene and Naccache (2001) propose a GNW model with subsets of global workspace (GW) neurons that interact cooperatively to encode objects, such as visual or memory items, while inhibiting neurons coding for competing objects. The model posits that the encoding of an object is associated with enhanced neuronal activity within assemblies of distributed neurons coding for it. A given object encoded in the nervous system is inaccessible (unconscious) in the GW if there is less than 100ms. of attention to it, is potentially accessible (preconscious) if there is less than 200ms. of attention to it and is consciously accessible if there is another 300ms. of attention to it. Therefore, the GNW model suggests that there are perceptual awareness moments in the stream of consciousness that have a specific duration and that perceptual discriminations occur one at a time. These fast and slower forms of temporal discreteness in mental activity appear to co-exist, intimating that the faster intervals for temporally structured firing exchanges in currently dominant, large-scale thalamo-cortical assemblies for conscious access are nested within the slower integrated periods linked to the short-term stability of the assembly itself. Such co-existing nested time frames appear to parallel the respective perceptual/quasi-perceptual contents proposed by TMDOT. In other words, unconscious contents for potential conscious access would be the PEEs of OTs, preconscious ones would be the IIEs of OTs, and conscious ones would be the EIEs.

Singhal and Srinivasan (2021) propose that the processes of cognition have their own respective time scales directly related to either their cinematic contents (e.g., TMDOT's IIEs/EIEs) and extensional contents (e.g., TMDOT's PEEs, EIKs/EEKs). They indicate that these contents and their time scales are hierarchically nested. As indicated in this article, TMDOT proposes that the meaning-laden contents within a given OT and across some successive OTs are hierarchically nested, as are the time scales associated with them, across their progression. However, the proposed successive, meaning-laden connections between the nested levels or contents of consciousness that Singhal and Srinivasan propose are wholly based on Husserl's atemporal modes of consciousness whereas TMDOT indicates that they are also based on extremely fleeting acts of attention by a central executive, acts of which we tend not be conscious, and that engender their own phenomenology of the passage of time and of the passage of the contents in it.

According to TMDOT, a peaking consciousness or sense of self is functionally relevant to a peaking consciousness of perceptual/quasi-perceptual contents and co-occurs relative to the consciousness of such contents. A possible direction of future neuroscientific research is to utilize neuroscientific measures/techniques that capture the hypothesized fleeting absence of a CE during transitive phases of OTs, on the one hand, and its increasing intensification or presence just following the substantive capturing of such phases on the other. If such measures/techniques can establish the latter phenomena, further support might be garnered for an on-line center of attention, reaction, and response that functions extremely rapidly to facilitate the phenomenal processing of cognitive contents by first becoming lost/immersed in them, followed by, potentially, becoming increasingly aware of them and pre-reflectively aware of itself relative to them as it surfaces from and attends to them. TMDOT proposes that the latter "movements" of the CE may represent the two most fundamental cognitive functions necessary for successful on-line cognition.



## Conclusion

According to TMDOT, while awake, phenomenal contents in the specious present often take the form of OTs and *across* successive OTs, subjectively manifest as *pulses* (i.e., heightened intensities of experiential contents) of object-consciousness, object-Consciousness (including the potential to objectify an apparent self), and tacit self-consciousness (relative to object-consciousness/Consciousness). In addition, *at the outset of and within* the reflective conceptual phase of a reflective thought, the CE experiences a swift but *gradually* increasing phenomenal intensity of object-consciousness to object-Consciousness, *co-occurring with* an increase in the intensity of tacit

self-consciousness relative to the latter, all of which are facilitated by the duration of attention to its object.

In the context of TMDOT and its phenomenological accounts of object-consciousness, object-Consciousness, and the tacitly occurring sense of subject-consciousness (relative to them) that occur during OTs and intentional acts, neuroscientific evidence was presented that explicated the durations of time necessary to help engender those forms of consciousness, that appeared to support the phenomenological observations of the gradual nature of their increasingly conscious and explicit manifestation (at the outset of and during the reflective conceptual phases of EIKs and EEKs), and the phenomenology of their pulse-like nature across the elaborative conceptual phase of one thought to the reflective conceptual phase of a subsequent thought. In addition, neuroscientific evidence was offered that appeared to be consistent with the integrated nature of the self within the stream of consciousness as reflected by the central executive's brief, intermittent disappearances in phenomenal contents in the service of transitively based cognitive processing and its brief, intermittent appearances from phenomenal contents in favor of substantively based cognitive processing. The latter is consistent with William James' belief that the self's core processes do not go beyond the transient flow of consciousness and that within the flow, the self is partly known, partly knower, partly object, and partly subject.



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