Article

Brentano & Panikkar's Beautiful Anticipation of the Cognitive Cycle & the Emergence of Knowledge & Meaning: Towards a Broader Understanding of Transcendence

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Abstract

This work briefly addresses three major subjects and their interrelationships, namely: (a) the analysis of ECoG data to identify synchronization moments associated with sudden transitions in spatio-temporal neurodynamics in the brain of rabbits, (b) the observed and analyzed response period that shows various significant nonlinear events within the cognitive cycle of the creation of knowledge and meaning in the 1 second duration window following stimuli, and (c) similarities with Brentano's 'three beat' cognitive operations when compared to a parallel account about the creation of meaning and transcendental knowledge in spiritual experience proposed by Panikkar. All of these views support a viable interpretation of our experimental findings related to the hypothesized cognitive cycle.

Keywords: Meaning, values, knowledge, cognition, intentionality, cognitive cycle, ECoG

I. Introduction

The harmonization between subjective and objective meaningful experiences has been a puzzle for ancient and modern mystics, prophets, philosophers and scientists. Though the subjective and objective approaches to understand how consciousness and meaningful experience arise are quite different from one another, nevertheless, they are certainly complementary requiring both theory and practical experience and a good understanding of the systems levels involved and their networks and dynamics. This poses a challenge if we ought to explain both through philosophical inquiry and scientific analysis, the neural pattern associated with the creation of knowledge and meaning and particularly the study of the diversity of meaningful experiences leading to spiritual insight, identity and wisdom.

When embarking on such an adventure, it is important to have a sense of the destination and in that respect it is ultimately the goal to find ways of improving decision making together with the quality of intentions. The first questions to be asked are: (1) How is knowledge created in the brain? (2) How does meaning arise or emerge in the brain? This entails the understanding of how raw sensory input is processed and integrated to give a human being the perceptions of, for

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example, love, beauty and peace or anger, guilt and discomforts. Thompson and Varela made valuable observations about inner states associated with anticipating affordances that shape cognition [1] and in this work, we will expand our exploration by presenting some ideas to show how this is achieved by the brain, complemented with a relevant analysis by Franz Brentano and therefore creating a link between our hypothesized cycle of creation of knowledge and meaning [2] and Brentano's ideas in *Psychologie vom epmirischen Standpunkt* [3].

In order to create the link between Brentano's ideas and the results we have obtained analyzing rabbit data, we introduce some important concepts prior to understanding the cycle of knowledge and meaning. These include the Analytic Amplitudes and Instantaneous Frequencies derived from Hilbert Transforms, the Pragmatic Information Indices [4-6] and graphics showing the Spatio-Temporal dynamics of the different parameters and indices [7]. Having done that the reader is left in the position to understand our hypothesis about how the brain creates knowledge and meaning, or as we call it, the Cycle of Creation of Knowledge and Meaning and its implications for social networks of inter-subjective shared meaning with the possibility to aspire, through constructive intention and creativity, towards a peaceful future for humanity with an ethical framework for decision making based on universal values expressed in social behavior [1, 8].

II. Brentano's Contribution and Legacy

When he described the foundation of conscious experience, the founder of 'the science of consciousness', Franz Brentano, identified certain 'logical moments' of experience that need to be in place within human consciousness. He reasoned that selective attention was required by the subject in order to differentiate three types of cognitive operation.

- **Type 1** - Targeting, noticing or detecting the object.
- **Type 2** - Differentiating its characteristics (features) from those of its context (binding its stimulus characteristics).
- **Type 3** - (Steps 3 & 4, Table I – searching and Aha!) - Categorizing or comparing it with others (attaching a semantic marker to it).

Brentano's analysis of conscious perception is remarkably similar to the cognitive cycle and the different phases or 'steps', which are seen in the post-stimuli brain activity within the visual cortex of rabbits.

Brentano published works in *Psychologie vom empirischen Standpunkt* in 1874, and it would seem that his initial analysis, which he carried out in further essays, was something of premonitory to these and more recent discoveries and insights. He addresses these moments in later works published in *Sensory and Noetic Consciousness* [9] (pp. 13, 19, 21).

The three above mentioned 'logical moments' or phases, all of which take place within a 'blink of the eye', convey 'a clear and distinct idea' of the content of a perception. That content nests the moment in what, for humans, is a lived story ecologically situated in a biopsychosocial context [10]. This creates a circuit of life-settings and the associated language imbued significance that places the moment in the history of a culture with its rich network of meaning and spirituality.

The first is related to the moment that something first catches your attention, when the neurocognitive body parts in the brain recognize or register the stimulus as novel and yet to be connected or associated to any other resonant information in the global cognitive workspace [11, 12] and brain. This may evoke an inquiry as to "What is that?", at least for a creature that speaks, and thus arouses the connections necessary locally in the brain for the creature to identify a need to investigate further and make some sort of connection.

Phase two is what we today refer to as binding, a moment that Kant [13] referred to as synthesis. This could point to more than simply the bringing together of a model that is predictive, one which adds and assimilates to an existent representation or schema for perception and action, it could also be referred to as a global attractor within a neural network [14]. This moment goes farther than the first instance in which your attention is caught, to create associations and relationships sufficient enough to be linked to some form of object that the creature has met before and has already established some sort of meaning for. This could be seen as the core of the gestalt distinction between 'figure and ground', where the perceiver identifies which of the elements in the stimulus comprise the representation of the object as recognizable and thus thought of in a set manner. Since certain quasi-stable associations have been made, the 'moment' tends to direct the cognition/control of behavior in several yet to be decided directions, rather than creating a random state or disorder (or free energy). To think of an object in a certain way, as something meaningful like a duck or rabbit [13, 15], is a process where the current array of stimulus is ordered neurocognitively to maximize its weighted Symbolic Mutual Information as suitable with the object for the ready-response of the creature to be made and adapted to the given situation and circumstance.

The above two steps or phases bring us to Brentano's 'third moment' in perception, comparison and differentiation, where the 'moment' places the object into the subject's cognitive lexicon having classified it as being of a particular kind. A variety of terms have been used by Brentano to define this: comparisons and categorizations under general concepts (where multisensory presentations are cognitively integrated to increase the likelihood and power of a response) [9], differentiation (from other objects and other types of object), clarifying analysis [9] (p. 13).

Brentano foresaw this as a mathematical process [9] (p. 9) likened to Bayesian computations, a hypothesis by which a creature apprehends a situation in a set of simultaneous and multiple judgments, both positive and negative, based on the evidence they have at hand and optimizing the result in relation to the patterns and information already held within the system. According to Kant this was a matter of comparison or contrast of representations, which apply certain categories that may, because of judgment, fit the representation and show ways in which the object shares common or different elements or features with certain kinds of other objects. When we try and quantify the 'fit' between the present moment and a cognitive structure, we arrive at a kind of quantitative Bayesianism which, in quantum theory, is abbreviated to QBism (cf. Cubism) to recognize the link between abstraction and the experienced world.

The exploration for informational connection of perception/experience, along with the 'three moments or phases' leads to a process that has been analyzed in different settings and named in a variety of ways, each one part of any neuro-philosophical account of our awareness of objects being recognizable types of objects that are naturally disposed for cognition, intention and action [16], such as: gestalt figure-ground differentiation (Wittgenstein, Part II, section 11) [15]; the interactive cycle of perception [17]; the schemata that informs perception; the binding of different properties of the stimulus in forming a representation of an object [18]; the construction of patterns of weighted Symbolic Mutual Information [19] amongst others. As Brentano [9] has explained:

> The person who differentiates compares; and the person who compares notices the two things that he compares … the object of an act of sensing very often encompasses a great diversity. The act of sensing relates to a whole in its totality, but, of course, refers to the parts as well, yet only in so far as they are given explicitly with the object; it does not explicitly stand in a particular relation to each individual part.

Global attractors [14] or the idea of confluences of weighted Symbolic Mutual Information which pull upon coherent excitation of multiple areas of the cortex, investigated by King et al. [19], resonates well with the idea of a connection between the whole object and the conscious perceiver.

The intentionality or "aboutness" of a cognitive state is an internal relationship between the object, which is at the core of an experience and a subject and it is what phenomenologists consider fundamental or the essential property of the mental [9]. As such it gives a philosophical understanding of such an object of thought (or cognitive focus).

From the mechanistic, reductionist and non-metaphysical views of Hughlings-Jackson, neuroscience and cognitive science have come a long way towards a form of ecologically-oriented cognition, considering that Neisser suggests that emotion, reason, action and memory each contribute to the global attractor states binding incoming information altogether (a predictive model) and that the combining of these elements gives form to emergent schemata ready for action or for more cerebral connectivity [20, 21, 17]. An example of this would be noticing a fly on the wall, which certainly you note to be something (for example, a dot, some dirt or a small insect). This specification of content is dependent on both the physical world (referent in the Fregean scheme) and the way in which humans think about it (mental analogue of sense (Frege's *Sinn*) [22], which conveys the significance that is placed on the stimulus cognitively. An explanation follows about the connectivity of the stimulus and its cognitive significance, when a human takes notice of the way he or she differentiates the object from context or ground and creates a new synergy by engaging it in his or her cognitive action-oriented world. When we reflect deeply on this way of actively defining the contents of conscious experience, we realize that it underlines the kind of intentionality that phenomenological explanations place at the core in the process of cognition, mapping the world in a way that allows the subject or person to plan and organize his or her action in the world.

Human beings use senses and meanings and shared knowledge expressed in language to inform cognition and consciousness [23], as in phenomenology and Luria's analysis [24]. Animals show less informed consciousness by focusing their attention and activity to the things in their close proximity. They show flexibility and an integration in their response to significant elements within their environment, as well as simple or particular objects, however, in their response they do not articulate their experience through a shared differentiation and use of language. It is important to note that a normative context is created when the use of language is present, allowing novice thinkers to be trained so as to show avenues to demonstrate both mutuality and inter-subjectivity [25-28] and creating the opportunities for shared learning as described by Aristotle's second nature [29]. All of this is indicative that animals act very differently than humans in the sense that in humans, consciousness is informed by memory, reason and emotion and regarded as the highest level of mental evolution as indicated by Hughlings Jackson, who explored possible solutions to the mind-body problem, such as: (a) Cartesian dualism, (b) mind-brain identity theory and (c) the doctrine of Concomitance [20, 21].

Currently the neuroscience behind this process is being explored through research and work on the active 'broadcasting' of information in a global cerebral workspace along with the ever-increasing study on the different areas of the brain, which involve subcortical and cortical circuits, and their patterns of coherence [30]. We start to see that the most recent electrocorticographical research builds on this and reveals an aspect of the process which supports Brentano's claim that consciousness most certainly involves: (a) patterns of excitations received in one or more cerebral areas, (b) a set of communication feedback loops with immediately associated areas that add detailed properties to the stimulus as an object that is apprehended in more than one sensory mode (e.g. visual-auditory-proprioceptive and spatial senses) and (c) an evaluation of the relevance of the apprehended object that may be associated to an affordance or adaptively relevant opportunity that ought to be seized via an intentional act. The period between the first type of signal and the subsequent two information types will potentially reflect a path of complex processing and varying degrees of cerebral proximity, resulting in a progressive time delay being observed in the band-widths relevant to cerebral activity (3Hz, 14 Hz, 20 Hz…). The fact that we see this process in animal data in the work described here, as suggested by phenomenological analysis, is exciting and a thorough and in-depth look at the findings will bring a greater understanding to these connections.

III. The Cycle of Creation of Knowledge and Meaning, Unraveling the Meaning of Meaning

This story relates how synchronization-de-synchronization moments with sudden transitions in spatio-temporal neurodynamics could be relevant to cognition and awareness, where the moments of very high synchronization after stimulus (3.25-3.5 seconds) relate to intense attention followed by a learning and integration period with very high de-synchronization (3.5-4 seconds). In previous studies where data was obtained from an intracranial array of 8x8 electrodes implanted over the visual cortex of rabbits [31-33], ECoG data was analyzed to identify the above mentioned brain dynamics. The data was processed using the Hilbert transform methodology to produce the analytic signals as described in other studies [4-6, 34]. It was found amongst other things that for example, a very high synchronization was associated with low amplitudes and a very dramatic de-synchronization was coupled with a dramatic drop in amplitude [7, 35]. It was conjectured that the spatially distributed analytic and signal amplitude patterns may carry some information about the meaning that the animal may associate to the stimulus and its relevance for a choice of response to such a stimulus [32, 33, 36, 37].

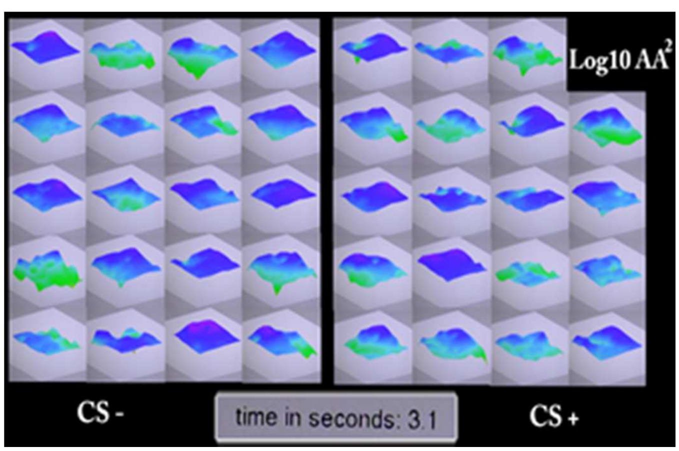
In order to better illustrate brain dynamics together with our findings, we produced a diverse set of movies showing the spatio-temporal patterns of the signal amplitude (SA), the analytic amplitude (AA), the analytic phase (AP) and the Instantaneous Frequency (IF). Here we only show some time frames displaying the 39 runs simultaneously for the Log10 of AA^2. After watching these movies many times we derived some evidence concerning the hypothesized cycle and the emergence of awareness experience in the neocortex [5-7, 38]. We also produced a complementary analysis with the aid of pragmatic information indices based on information theory and semiotics [4-6].

The Cycle of Creation of Knowledge and Meaning is comprised of five steps:

- Step 1 (3 - 3.1 s): Initial impression, which may be termed the '*Awe*' (or noticing) moment.
- Step 2 (3.1 - 3.3 s): Chaotic exploration of memory traces with highly distributed and desynchronized patterns '*Search for meaning*' (wider analysis and connection).
- Step 3 (3.3 - 3.45 s): Recognition/identification of the searched clue/decision and it can be termed the '*Aha*' moment.
- Step 4 (3.45 - 3.6 s): Integration of the new knowledge in a chaotic dynamic process.
- Step 5 (3.6 - 3.9 s): Dramatic drop in the indices toward the end of the post-stimulus brain activity, showing a return to the usual, background/default level.

This cycle is illustrated for the Gamma band in consecutive pictures (1-5) each associated with one of the steps of the hypothesized cycle respectively. The Log10 $AA(t)^2$ behaves differently for each 'step' yet it behaves in a similar manner across the 39 runs within each 'step'. Picture 1 shows a moment of high synchronization and low amplitudes for all runs.

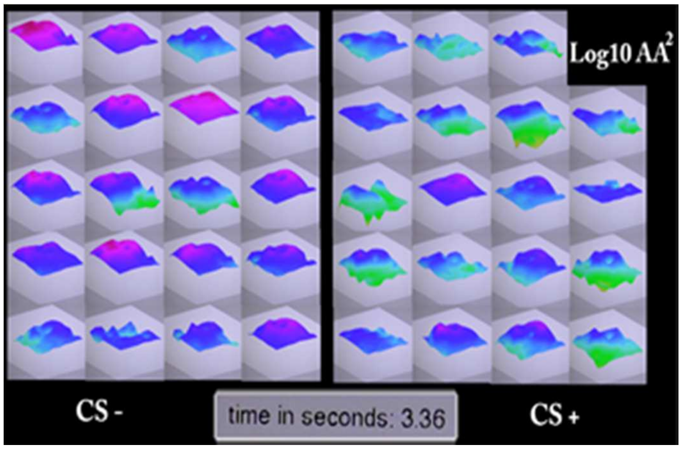
Step of Awe (3 - 3.1 s)



Picture 1. The 8x8 Spatio-Temporal patterns for the Log AA^2 over the Gamma band (30 Hz – 36 Hz) for the 39 runs, for the Awe step (3-3.1 s).

Picture 2 presents us with a desynchronization period with associated 'null spikes' [7, 35, 37, 39]. Just after that, a strong raise of the Log10 $AA(t)^2$ is observed in large regions of each 8x8 spatial array. These regions are different from the ones where the 'null spikes' occur just before the raise in amplitudes. This destabilization is more likely associated with a search for meaning.

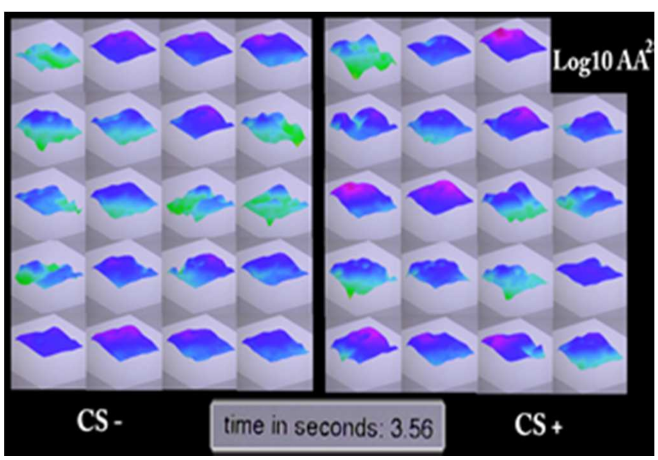
Step of Chaotic Exploration (3.1 - 3.3 s)



Picture 2. The 8x8 Spatio-Temporal patterns for the Log AA^2 over the Gamma band (30 Hz – 36 Hz) for the 39 runs, for the Chaotic Exploration step (3.1-3.3 s).

Picture 3 shows the dynamics associated with the '*Aha*' moments presenting a tendency towards synchronization together with drops in Log10 $AA(t)^2$ amplitudes. The 39 runs tend to drop together in this period of time showing a form of metastability, since peaks in Log10 $AA(t)^2$ patterns forming in large regions coexist at the same time with drops in other regions.

Step of the Aha moment (3.3 - 3.45 s)

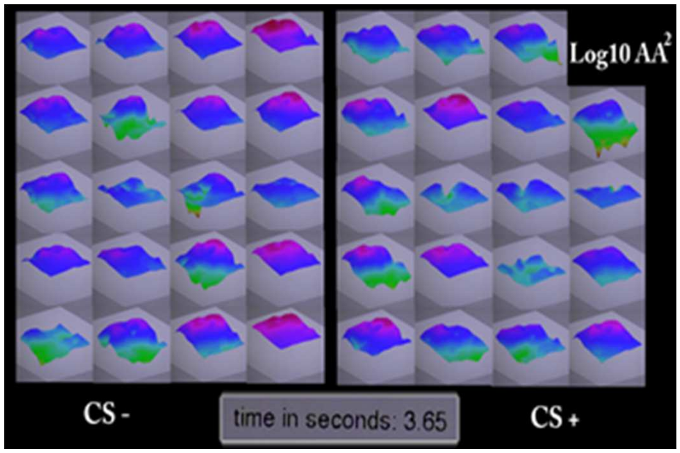


Picture 3. The 8x8 Spatio-Temporal patterns for the Log AA^2 over the Gamma band (30 Hz – 36 Hz) for the 39 runs, for the Aha moment step (3.3-3.45 s).

This step is also associated with tornado-like patterns observed simultaneously for all runs in other movies showing the signal amplitudes in 2D (a vista from above) for this period of time.

Picture 4, Chaotic Integration, resembles the behavior in the step of Chaotic Exploration (Picture 3) where also 'null spikes' have been prominent and very abundant. This is also accompanied by an even higher raise in Log10 $AA(t)^2$ patterns reflecting a returning cortico-cortical activity concerning the former exploration of other areas, as in Step 2, when searching for meaning.

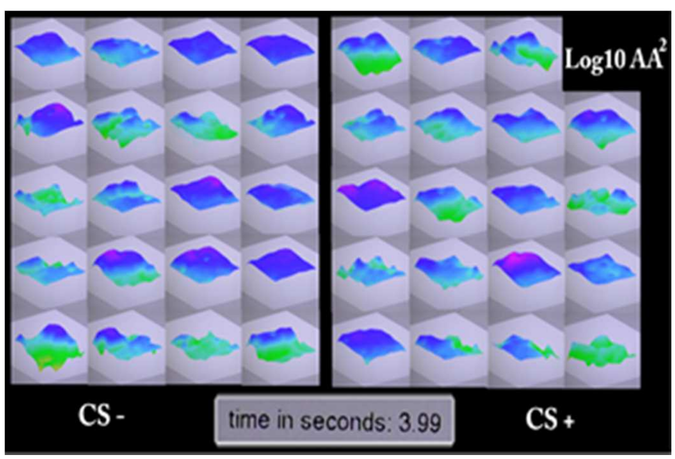
Step of Chaotic Integration (3.45 - 3.6 s)



Picture 4. The 8x8 Spatio-Temporal patterns for the Log AA^2 over the Gamma band (30 Hz – 36 Hz) for the 39 runs, for the Chaotic Integration step (3.45-3.6 s).

Finally, the Dramatic Drop in Picture 5 clearly shows a tendency of the system to return to background state.

Step of Dramatic Drop (3.6 - 3.9 s)



Picture 5. The 8x8 Spatio-Temporal patterns for the Log AA^2 over the Gamma band (30 Hz – 36 Hz) for the 39 runs, for the Dramatic Drop step (3.6-3.9 s).

Generally speaking, outside of the post-stimuli window of 1 second the system shows synchronization between channels with associated low amplitudes. This is accompanied with periods of mild desynchronization showing relatively higher amplitudes.

Overall, we can state that there are clear qualitative visual differences between the CS+ and CS- collective responses. To formalize this statement and give it statistical conclusive support, robust quantitative methods of classification like discriminant or cluster analysis, for example, will have to be applied, we suggest, with the aid of the pragmatic information indices. These dynamic images 'show' what can only be 'said' using complex mathematics (the contrast between 'saying' and 'showing' was prominent in Wittgenstein's work).

Following we briefly introduce the reader to one of the five Pragmatic Information Indices [4, 38] which are calculated as a ratio between the $AA(t)^2$ and the Euclidean distance (ED) of $(AA(t)^2$ - $AA(t\text{-}1)^{2)}$ or alternatively the Euclidean distances between contiguous channels of AP(t). This procedure has been well explained in other studies where the indices (I) have the general form, $I = <\text{Amplitude}>/<\text{ED}>$ where, $< X >$ is the mean value of X, and the indices are calculated for a certain time window size (T) of granularity [7]. Figure 1 shows an example associated with the pragmatic information index HRSA for a window of granularity T=0.125 s. These indices, we conjecture, are a better quantitative measure for classification between CS+ and CS- than the AA, AP and IF by themselves. This still remains a hypothesis to be tested.

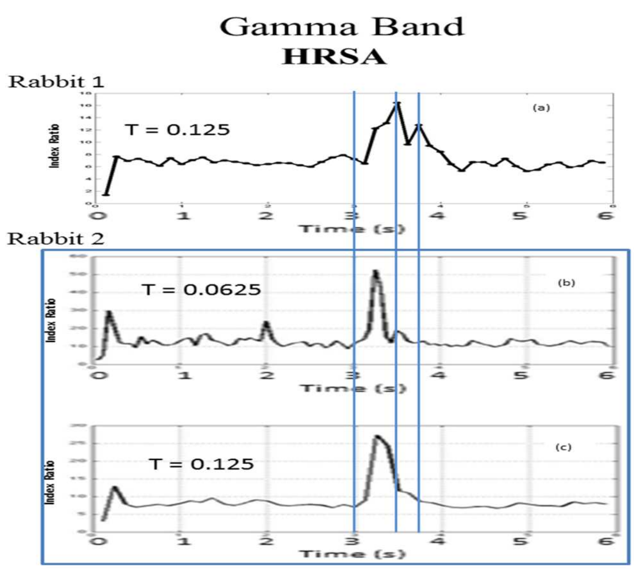


Figure 1. Average of the Pragmatic Information Index HRSA over the Gamma (24 Hz – 40 Hz) band for the 39 trials, for a window of granularity (a) T=0.125 for Rabbit 1, (b) T=0.0625 for Rabbit 2 and (c) T=0.125 for Rabbit 2.

In Figure 1 the reader can appreciate the mean values for the pragmatic information index over 39 trials for the Gamma band. The average allows us to clearly detect some features of the post-stimulus responses of the rabbits that consistently appear for different runs, bands and rabbits. However, the price to pay when using the average index across trials is that the subtle differences between them are filtered out. Having a close look at Figure 1, a delay in onset of the increase in value of the HRSA index is observed, followed by a significant increase in value that can be easily noticed between 3.2 s and 4 s. This is a consequence of filtering out the initial strong impact of sensory stimulation that is the effect of the visual data passing through the sensory tracts on the primary sensory cortex.

IV. Discussion

In previous studies, the authors have mentioned these imprints as Type I responses and have made it clear that they do not involve higher cognitive functions [2]. Two major peaks are also present in the 3.2 to 3.8 s period characterizing the different steps of the cycle usually studied for different frequency bands. In other studies, the presence of more than two significant peaks (3 or 4 for T=0.0625 s) were found [7, 38], closely corresponding to the one predicted by Freeman's optimum window size for gamma [40, 41]. This index allows a good description of the hypothesized cycle of creation of knowledge and meaning [38]. Both are related to doing or participatory 'being in the world' which is part of the process of human knowing and certainty à la Wittgenstein [42].

Finally, it is worth mentioning again that the post-stimuli period behaves significantly different from background activity and in particular, the time periods between 3-3.5 s and 3.5-4 s behave very different from one another. Using smaller time window sizes for some bands and different rabbits [38] [39], a better description of the cycle was achieved. This fact poses another challenge, which is the appropriate selection for the optimum window that we found, that is not only band dependent, but also subject dependent.

In summary, we found further support for the hypothesized cycle of knowledge and meaning creation in Brentano's three step cognitive operation comprising human consciousness (see Table I), where more likely, each band is telling a story about particular aspects of the cycle. With more analysis on different rabbits and cortices, we are confident that we will be able to confirm Brentano's insights concerning the three step cognitive operation involved in conscious intentional behavior. We found another striking similarity between Brentano's ideas, the cycle of creation of knowledge and meaning and the ideas and writings of Raimon Panikkar, PhD in Philosophy, PhD in Science, PhD in Theology and a Doctor Honoris Causa. These similarities are to be found both in Panikkar's work [43] and Sergio Bergman's reference to Panikkar [44].

Table I. Similarities between the Knowledge and Meaning Creation Cycle, Brentano's Types and Panikkar's four moments in spiritual experience

		Post Stimuli Period	*Characteristic Behaviour*	*Brentano's types*	*Panikar's Types*
Knowledge Creation Cycle Steps	**Awe** Step 1	3 - 3.1 s	Hyper Synchronization and low AA2	Type 1 (targeting, noticing)	First moment, pure experience
	Chaotic Exploration Step 2	3.1 - 3.3 s	Desynchronization with dramatic drops ("null spikes") Followed by a strong raise for AA2	Type 2 (binding its stimulus characteristics)	Retrieval of that moment available for later referral
	Aha Step 3	3.3 - 3.45 s	Tendency towards synchronization and drops of AA^2	Type 3a (categorizing it, attaching a semantic marker to it)	Interpretation we make about the experience with the aid of language
	Chaotic Integration Step 4	3.45 - 3.6 s	Strong desynchronization with abundant "null spikes" and a strong raise in AA^2	Type 3b (categorizing it, attaching a semantic marker to it)	Linguistic Integration with cultural context
	Background Activity Step 5	3.6 - 3.9 s	Synchronization with low AA^2 & occasional desynchronization periods showing high AA^2	Type 3c (categorizing it, attaching a semantic marker to it)	Delivery and reception of wisdom and understanding of the knowledge of the transcendental

It is interesting to ponder on Panikkar's work about religious or spiritual experience and the almost one to one relationship with the cycle of creation of knowledge and meaning. According to him there are four relevant and distinct moments in spiritual experience where *meaning, relevance* and *transcendence* emerge together with the articulation of the experience in language and culture. The first moment is what he calls a *pure experience* similar to the Awe moment or 'Step 1', the second moment is associated with the retrieval of that moment available for later referral, similar to Chaotic Exploration or 'Step 2', which serves the purpose to outline the content of the experience in relation to stored schemata. After that, it follows another moment concerning the interpretation we make about the experience with the aid of language, paralleling the Aha moment or 'Step 3'. Finally follows the delivery and reception of the wisdom and understanding associated with our experience into the culture that we coexist with and where we conduct our meaningful actions (this involves the comparison with the linguistic and cultural symbolic database and the experiences that they refer to) and in the spiritual case, with having achieved or realized the knowledge of the transcendental, reminding us of the final stage of Chaotic Integration or 'Step 4'.

The combination of philosophy and science hand in hand with the experience of the transcendental reported by philosophers, prophets and saints allows for the broadening of our understanding of consciousness, leading us eventually to the kind of integration that shapes human identity. This comes with the potential towards the embodiment of spiritual values [45] that play a part in the creation of meaningful life experiences, allowing us to apply new knowledge and wisdom, in order to improve our sense of well-being in relationships, as beings-in-the-world-with-others, aided by creativity and acts of constructive intelligence in our daily life.

Freeman's views on meaning and knowledge creation and intentionality are closely related with the ideas expressed here: "the philosophical foundation from which the sciences grew is accessible through the work of one of its originators, Thomas Aquinas. The core concept of intention in Aquinas is the inviolable unity of mind, brain and body" [46]. Together with W.J. Freeman, who echoes Aristotle, Aquinas, Kant and the way we understand Brentano, we concur that the creation of meaning and knowledge arises in cortical activity, instead of in sensory input and so far, based on our observation, it seems to be well represented by the cycle that we have described. The indices of Pragmatic Information are a good initial point to quantitatively approach this challenge and when combined with Freeman's techniques of video transformation (which we conjecture show the structure of meaning qualitatively) equips us with powerful tools to improve our understanding of the kind of brain dynamics associated with the cycle that we have described, and therefore brings us closer to the core of what conscious human action based on meanings and values, really is.

V. Future Perspectives

In our quest for the understanding and comprehension of consciousness and particularly in how meaning and knowledge are manifested in the brain, we foresee future studies to measure EEG activity in humans while in states of relaxation and peaceful meditation accompanied by psychophysiological coherence mediated by breathing and positive emotions and values like love. We also foresee the need to contrast such states with other types of mental activity that manifest in brain dynamics while humans are engaged in unpleasant energy depletion activities leading to stress. These ideals come with a set of questions to be explored and answered in relation to human awareness and consciousness and their relation to spiritual experience and mental health, leading to a better and more intimate cognitive attunement to the human life-world, towards a more inclusive or universal ethical framework of action expressed in social behavior that can be studied under new emerging paradigms.

Some of these questions are: (a) Could it be that the brief periods of desynchronization-synchronization intermittency further leading to the integration of experience and gestalt perception are at the core of what we experience as eureka or 'aha' moments when engaged in scientific research, philosophical inquiry or other types of creative activities?

(b) Could it be that the vastly reported moments of enlightenment associated with religious, spiritual or mystical experiences come under the same cognitive structures of meaning and knowledge creation?

(c) Is it possible that people could learn how to function in different societies according to a universal framework of ethics, and overcome unhealthy habits, addictions, disease and compulsive survival needs? Without a doubt, these are very relevant questions for our times. Perhaps finding answers to them has become mandatory for our survival, as well as in leading us in the direction of social harmony.

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