

Thoughts, Labyrinths, and Torii

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ABSTRACT

Cognition is addressed since millennia but started to be systematically studied around the middle of last century, together with other intellectual initiatives in its neighbourhood. It has been approached from several perspectives while grounded on several intellectual disciplines, most of them scientific. Yet, there is still no consensus about what a cognitive occurrence or fact is from the scientific point of view. Moreover, cognition is an individual-centred science.

This text presents a case-study and advances an empirical conjecture about the relations between mind-processes, brain-organisation, signal-perception, and knowledge-creation. This *ansatz* is associated with the investigation of cognition and of creative mental processes, without specifically adhering to any of the current approaches regarding these subjects. It was suggested by a personal experience and can only be adequately expressed with the aid of ideas emanating from that experience. The *ansatz* is thus uncommitted to existing approaches, touching nevertheless most of them.

To motivate and put things in context, we tell a true story centred on mental states and recalled from the mists of time, of which I hold the key. The description of what goes on inside our minds is though. We address this puzzle using allegories and metaphors, particularly three: thoughts as self-dialogues, labyrinths as in any game, and *Torii* the Japanese portals separating laic from sacred things. We also discuss how the three mental entities represented by them interact and stand in relation to each another.

Keywords: Thoughts, Reasoning, Dialogues, Understanding, Knowledge, Explanations.

1. INTRODUCTION

The importance of a theory lies not in the degree of finality attained by definition and analysis, but in the power and grasp of general principles appearing in diverse instances.

KJW Craik, 1943 [27]

Cognition is of concern since millennia but began to be systematically studied as an intellectual movement only around the middle of last century, intertwined with a constellation of other intellectual disciplines that focused in neighbour subjects [1] [2] [3] [4]. Cognition has been approached from several perspectives and its investigation grounded on several

intellectual disciplines, most of them scientific. Yet, there is still no consensus about what a cognitive occurrence or fact is, from a scientific point of view [5] [6]. This semantic inconsistency probably results from the key role modelling has when addressing organised complexity [6], from differences in research programs aiming to investigate life theoretically [7] [8], and from the fact that considering cognition as a scientific phenomenon completely blurs the distinctions between research subject and investigator, experiment and theory, model and modeller, challenging scientific objectivity, methods, and institutions [9] [10] [11] [12]. A much deeper reason will appear while introducing the *ansatz* in section “Back to Future” below. Aiming to contribute to a clearer picture about cognition, this article reports an intellectual struggle to find a concept of information conformant with life phenomena and introduces an *ansatz*, an empirical conjecture, that arose because of the reporting effort itself. (Reading hint: generally, ‘we’ refers to the research contents, embracing co-creators, while ‘I’ to this text, its composition, and personal experiences.)

To motivate and put things in context, we tell you a story—a true story recalled from the mists of time of which one of us holds the key. Discoursing about what goes on inside our minds is though. We are trying hard to present mind-events to the best of our abilities and as objectively and accurately as possible, relaxing on precision to retain accuracy. To this end, we resort to three main allegories and metaphors as follows. Thoughts, internal to the mind, are still to be defined. We advance a crude, roughly delineated description of what a thought may be hoping to encourage further investigations and observations of thought-instances. Labyrinths are labyrinths, a situation or place wherefrom one cannot get out easily, if at all. Indeed, the picture presented below shall evolve into an ever-changing labyrinth. *Torii*, the Japanese sacred portals are meant to rearrange noise and chaos into harmony. They symbolise gates uplifting our minds to new, more encompassing, (meta) level of understanding and explaining, which are often associated with non-trivial reorganisations of our minds and, maybe, brains.

The next section enrolls facts that induced the search for a life-conforming notion of information, pins down the meaning of certain key terms, as well as how they shall be used in the present text. The one following it describes the mental struggle to find such notion and how this quest sharpened understanding and allowed new ideas to crystallise. We counterpoint thoughts and reasoning while discussing them, elaborating a model of how thoughts lead reason into *Torii*—the magic-pass leading to new dimensions of perception and understanding. Next, all these elements are summed up in an *ansatz* that intertwines the

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discovery-effort, explanation, creativity, and enlarged awareness. Before concluding, all ideas above are re-viewed with the aid of concepts that resulted from this struggle: the organisations/in-formation framework, which also underlies the mind description induced by it and the world-vision it supports. This is done deep enough just to unveil certain important but subtle aspects of thoughts, Torii, and the *ansatz*.

2. THE LAUNCHING

I first met the Amazon landscape decades ago, while appointed to develop computational models for the limnological behaviour of artificial lakes and used lakes in its flooded areas as exemplars. These are utterly complex phenomena laying at the fringe of our scientific abilities. Under the existing environmental science paradigms, landscapes are collections of ecosystems that are represented firstly by food webs, that account for the possible paths of mass and energy, and secondly by balance reaction-diffusion equations, that describe how mass and energy flow in the system. Due to a total soil sterility, Amazon ecosystems require the representation of redundant (biodiversity) growth and decomposition paths and a huge number of aspects to be meaningful. Moreover, due to the annual floods, lakes in flooded areas have a varying food-web and may also have an intermittent existence. The resulting model for this kind of phenomena was intractable at the time and still is today if we want meaningful results and knowledge, even when considering just non-human factors. This is due to characteristics intrinsic to the underlying phenomenon, like the wide differences in life-cycles and their spans that can be of hours or centuries [13]. No rise in computational power will overcome this, only advances in the underlying mathematics and numerics may.

Furthermore, adding the necessary account of human aspects as well as the description of critical humans-landscape interactions in the models turn the development and analysis of the mathematical or computational expressions of such models into an epistemological nightmare [14] [15] [16]. Dealing with this kind of intellectual objects put me at a crossroad. I could either fight for more data and the resources to gather them, or I could stop and start seeking for simpler ways to describe Life. Driven by personal interests and pragmatic considerations, I have chosen the second stance, that lasted long after the end of the modelling project and its funding.

Existing literature concerning theories for living phenomena [17] [18] acknowledged the importance and conspicuousness of organisational aspects in life phenomena but widely suggested that organisation could be explained by means of information. This stance has produced an appealing intellectual sphere entitled self-organisation. The existing concepts of information worked just fine in physics (statistical mechanics) and to build the self-organisation framework but are of little use among biologists that refer only to code and coding when discoursing about genetic inheritance or cell communication and almost never to information. May be this was the subliminal reason why I started searching for alternative concepts of information rather than keeping my mind open towards any sort of new ideas that would simplify descriptions of life-phenomena. As shall be seen later, I first found a definition and mathematical expression for organisations. Only later, after a lot of unsuccessful attempts to mistakenly employ organisations as if they were information, the notion of in-formation and its anticipatory nature became clear to me, although it required the introduction of time and observers in its definition.

Vocabulary: Cognitive sciences spring from manifold roots and the meaning of words stemming from several of them is not exactly uniform. At the same time, the audience for their results and explanations possess different backgrounds and cultures. Moreover, there is here a third element distorting meanings, namely the resulting formal definitions of organisation and information that now underly our thinking. We address this fact in two stages. An initial one, to allow for a common understanding of the description of mental states and processes reported in the following sections, and a deeper one, when we perform a first interpretation these descriptions using ideas emanating from the organisation/in-formation perspective [17]. During this retrospective analysis, terms shall be dissected more deeply but only as needed. References to brain and mind should always be taken as cartoons regardless their intended depth.

Most terms referring to neuropsychological entities and processes shall retain their original meaning [19] unless modified in the sequel. For instance, *Reasoning* and *thinking* will be employed in their neuropsychological connotation that do not require the use of logics or more controlled manners of manipulating and connecting mental conceptions or states. Both processes form enchainments of existing mental conceptions and memories that may 'cross' one another (by sharing some of them). Together, these enchainments form networks and organisations. The difference between the two processes being that reasoning enchainments always possess references to something outside the mind, generally in the "real" world, while thinking is completely internal to the mind referring only to elements registered within it. Terms related to the modelling procedure will be taken as in [6] [12] [18], and to organisation, embodied organisation and in-formation as in [7] [17]. Torii is the Japanese word denoting portals looking like the Greek letter Γ that lead from a profane dimension to a sacred one. In this text, they will symbolise the uplifting to new, more comprehensive, levels of understanding and explaining.

To simplify exposition and prevent undesirable metaphysical detours, *brain* is the network of neurones and their sister cells inside our skull, together with any elements regulating their activity. Mind is the constellation of ever-changing electrical and chemical signals flowing over this network and constrained by it [20]. These flows coalesce and stabilise into flow-modules that often offer definite spatial patterns. Stabilised flow-patterns may exchange signals between themselves at various levels of aggregation resulting in hierarchies and organisations of signal-flows and, by extension, the mind.

It is taken for granted that brain and mind interact interfering on each-other and changing their organisations, although the responsiveness and readiness of each part to interferences of the other is distinct. As a result of flow-patterns that become almost permanent (by reinforcement) and aggregates at several hierarchical levels, the brain-mind complex forms a unit that modifies itself [21] and extends through the whole body [22] in a simpler organisation along neurones. Therefore, it may be also considered that, reversely, the whole organism forms an extended sensorial apparatus feeding the brain-mind coupling with signals from outside. For instance, sight signals come intermixed with several other signals that become registered as an integrated imprint. **Figure 1** tentatively summarises what is accepted about observations and perceptions of brain-mind physiology and functional dependencies. References to organisations are however my reading.

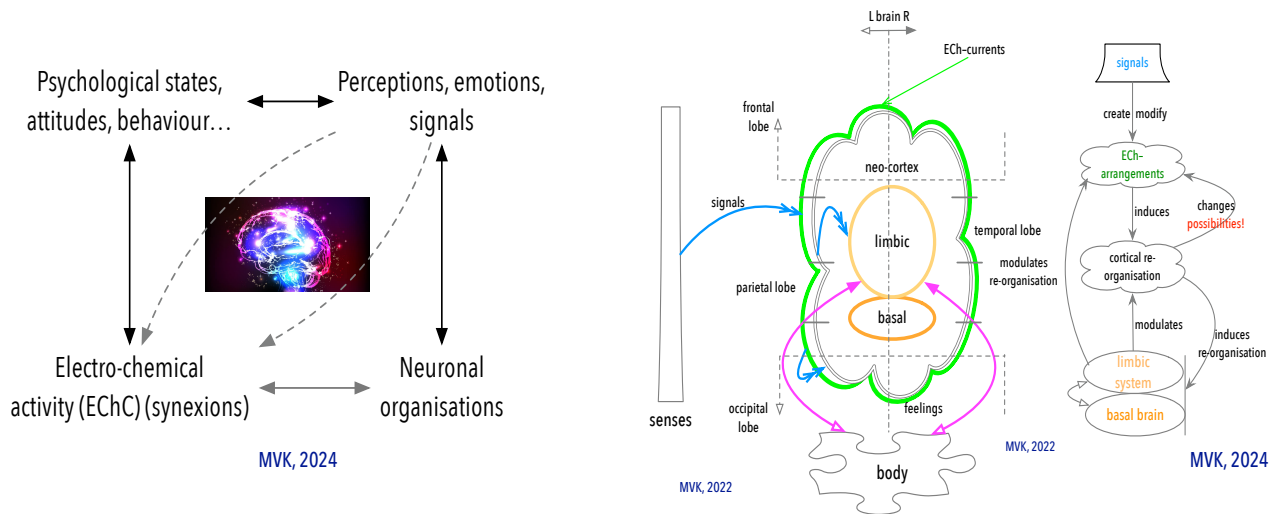


Figure 1: Systemic hypothetical cartoon of brain-mind and their dependencies at all levels.

3. THE MENTAL JOURNEY

The description of what has gone in my mind along those years is a mixture of allegories and sharp meta-level observations reflecting how I remember having perceived states in my mind. This description is moulded by everything I have learned concerning this quest up to that moment and influenced by what I have discovered then after.

Preamble: The whole mental journey was influenced and even driven by my training as a eager reader, scientist, and student of mathematical sciences, but also as a martial-arts practitioner, diver and climber. The first half forged my mind along western science and culture as well as in its modes of thinking and communicating, while the second taught me about group-action, mind-body distinctions, zen philosophy, its companion perception of time and space, as well as an integrated grasp of reason-emotion-instinct interdependences and their mutual interferences. However short, this is a rather cohesive and encompassing account of my mental backcloth at that time. Moreover, I had already been in contact with biologists and

ecologists long enough to be affected by their relational, comparative, and anticipatory ways of reasoning [16]. However, much of the then present-day cognitive knowledge intertwined in the following lines was unknown to me. They are a bonus offered by looking backwards.

When I started to search for simpler narratives of living phenomena, I have already been interested in building biological and social theories for a while and have been in contact with several initiatives in these directions, including the generic systems approach [3] [4]. Most initiatives, though, were trying to mimic chemico-physical thinking, instead of biologists' relational, architectural (organisational) or empirical-intuitive thinking. Theoreticians soon embraced information as the main aspect differentiating life phenomena from physics and chemistry, despite organisation being a much more conspicuous aspect and plenty of explanatory potential as well. Regardless of the communal pressure in favour of information, it was clear since the first half of last century that Shannon's information was insufficient to address the semantic and effectiveness levels of communication, that are essential to address life at any level and

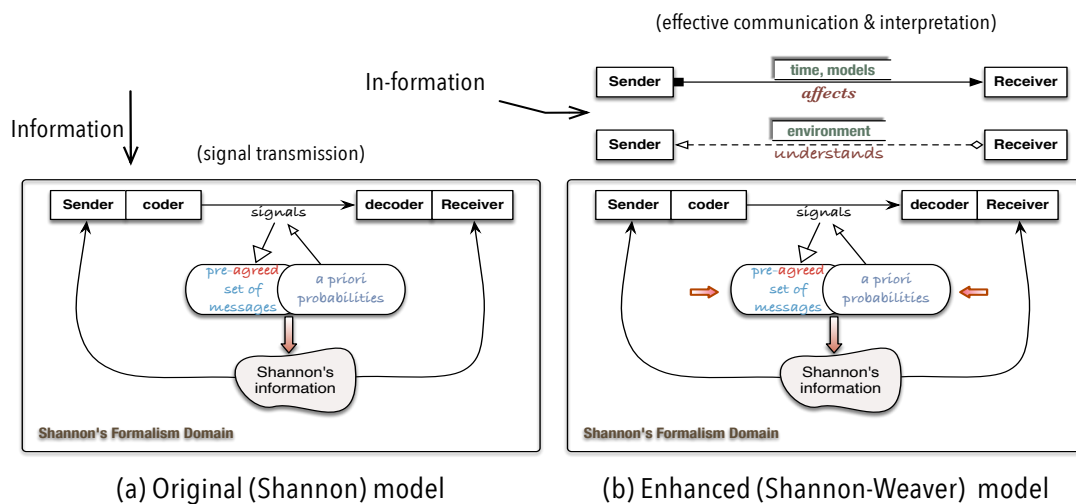


Figure 2: Communication channels, information, and in-formation [17], [23], [28]

from whatever perspective. **Figure 2** is a rereading from [23], with commentaries based on actual knowledge.

Labyrinth: In scientific investigations, the first steps explore what exists and how it may be used to explain newly gathered observations or concerns. In this case, there were no immediate observations easily identifiable, since they were buried in my previous knowledge and practice of modelling living phenomena, and my general experiencing with the process of building models and using them [6] [7]. Nevertheless, the initial

trying to prevent clarity and progression. By the mid of the third year, I started repeating myself. I felt small and impotent because at this point reason has been largely overwhelmed by emotions, frustration mainly. This picture is what we consider a labyrinth, a labyrinth plenty of rotten and slipping paths, even if the Minotaur couldn't be discerned. My sights of immediate aims got short and fuzzy and the way to them faint.

I realised it was time to clean the courtyard (or battlefield) and started it by filtering emotions out. However though, this move



Figure 3: The Labyrinth board game.

[<https://boardgamegeek.com/boardgame/1219/labyrinth>]

reasoning was centred around the scientific method as usual: identifying things, grasping their importance, flirting with induction and deduction, and starting anew each time from different ideas aiming at distinct goals. This procedure generated rather traditional enchainments (law-conforming, causal) of not necessarily traditional perceptions. It is important to emphasise that these perceptions could be rather elaborate and complex when focusing life, being by no means singletons. Gradually, biological and ecological events started adding-up to the memories-base and a more relational approach was attached to my previous intellectual toolset. Despite these efforts, no idea about what a life-compatible information should be or how to approach it popped-up in my mind at any rate for more than 3.5 years. This is the amazing fact addressed here. The many existing logics and strata of logics and of mathematic [24] didn't help.

After so many trials and revisitations, each enchainment looked more like a chain—corridor, tunnel, or track at the deepest bottom of a valley with steep walls—than a concatenation of useful perceptions. Little beyond it could be discerned and it was difficult to see alternatives, even other paths already inspected. Except at crossings, where switching from one trial-track to another was possible although difficult, due to the fuzzy awareness of where I was in that morass of potential reasonings. Moreover, tracks got narrow and deep with the passing of time, becoming occasionally blocked, as if a frightened hand was

showed there was still light and clarity in my mind among that reasoning morass. Seen from today, the best allegory is that of playing the Ravensburger Labyrinth board game (1986) where contenders can change the board to impeach others to reach their own goals (**Figure 3**). Their blocking intent could be felt, their moves and goals remaining obscure. The only difference being that the “contenders” were my own self.

Notwithstanding the power of this allegory, considering reasoning-mazes as labyrinths constrained in 2-dimensions and seen from above is definitely misleading. The dimension of the one in my mind could barely been guessed. A glimpse on how I perceived it and its enchainments can be acquired by reading Flatland [25], a book for children.

Thoughts and thinking: Reasoning-mazes can only be found in complete form within minds. And focusing on them to understand what is missing or inadequate requires thinking about those many trials and why weren't they successful. But...

“What are thoughts and what is thinking?” Seeing them as neuropsychologist do, reduce them to singletons keeping them locked and inaccessible; it is not possible to inspect their inner workings. Let us hence try something else and look at thoughts like the Greek philosophers used to do—as dialogues or debates with oneself. The following model for dialogues was proposed in [26]. It is based on Shannon-Weaver channel (**Figure 2**) to access the necessary semantic and effective levels that are fully

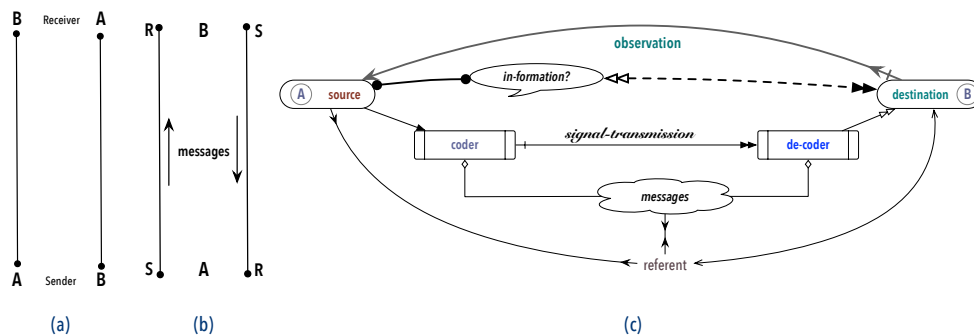


Figure 4: Dialogues and their channels.

accessible to us inside our minds, even if here and there their content is blurry.

Dialogues may be represented by pairs of SW-channels inverted with respect to sender and receiver (**Figure 4a**) or as a switching channel (**Figure 4b**). Both intervening channels have all the elements depicted in Figure 4c. Note that dialogues are equipped

always imposes a new and refreshing way of looking upon us, no matter what is being aimed at.

Torii: At this point I was ripe for the next adjustment that didn't occur swiftly at all. A push was needed, as it has often happened along my life with trivial or important affairs. In that case it was a dream, a short dream of less than 15 min. Out of the misty

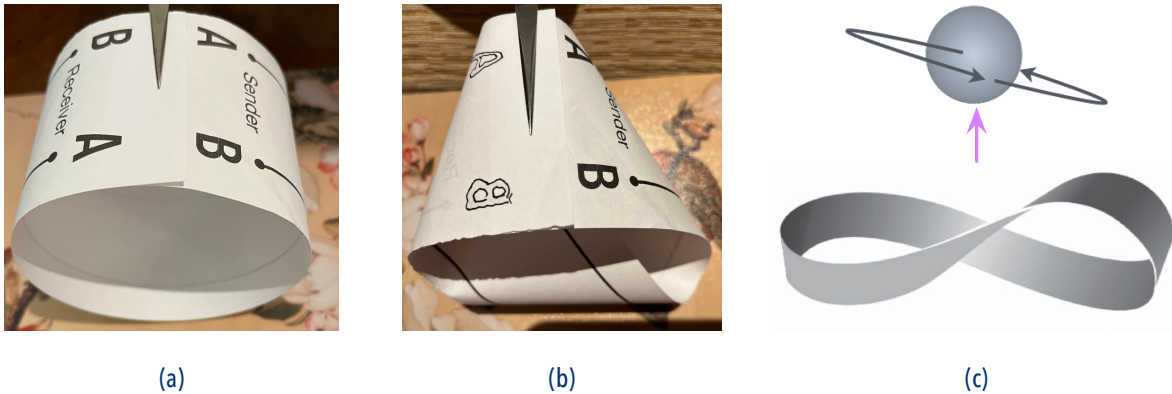


Figure 5: Dialectical dialogues into thoughts.

with active elements and can change not only the message set but the semantic content of messages. However, thoughts are dialogues of something with itself; they are debates indeed. This means that in Figure 4a the sender and receiver are the same entity, keeping nevertheless all elements of a SW-channel (**Figure 4c**) in each communication direction. Thus, to represent a self-dialogue we need to fold representation in Figure 4a into a wristband where sender and receiver are superimposed (**Figure 5a**) become the same. This move brings me 'A' over me 'B' and vice-versa enforcing a double personality conflict, or at least a lack of identity in argumentation, impairing communication and thinking. To prevent this psychological puzzle, we need to weirdly twist the band along the wrist middle circumference line to bring 'A' onto 'A' and 'B' onto 'B' while still equating sender and receiver (**Figure 5b**). The result is a Möbius band (**Figure**

collection of oneiric images and looking backwards a little, I would say I have dreamt with something looking like the chromatin: the lively molecular assemblage around a DNA molecule. At least I was sure it was the chromatin. Comparing with the description based on Figure 1, the DNA molecule is the brain and the chromatin the mind. It took a while, though, after that moment to arrive at some plausible concept but I knew right upon awaking that I have found a way to the solution. This was the crossing of the Torii and a whole new world unfolded itself before me. Thinking did not stop but now I was reasoning and thinking alike, pondering how to lay down to others my ("new") perceptions. Slowly, very slowly, the opinion and arguing of the two selves inside my mind converged. Perceiving and thinking were now plenty of awe for the unbounded possibilities lying ahead (Figure 6).

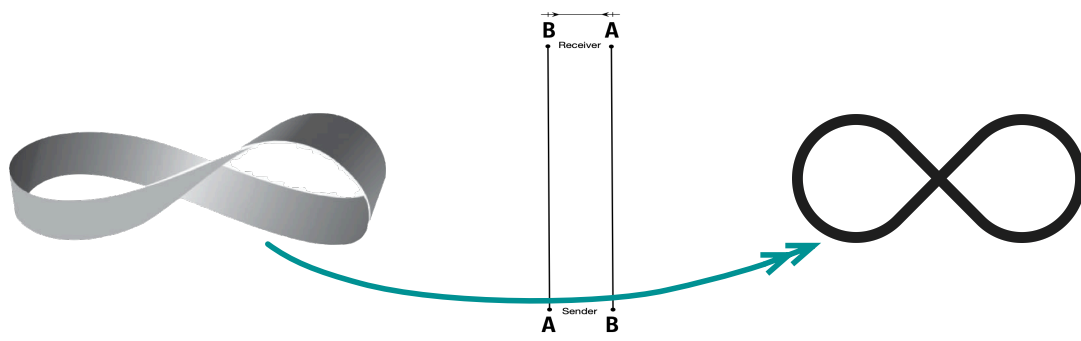


Figure 6: Transcending thinking.

5c), which can de novo be considered as a singleton since it has just one side and one border. But now we have a singleton that is "open" and may have its inner secrets unveiled. Note that the wristband can be brought back inside the labyrinth while the Möbius band cannot, maintaining forever the enlarged perspective that presents the reasoning morass in a different manner. This seems to be a central characteristic of thinking. It

4. BACK TO THE FUTURE

Re-reading brain-minds and Figure 1 from the organisation/information perspective, that originated in the mental process described above, highlight that brains are organisations of neurones while minds are organisations of signal-fluxes enabled, supported, and constrained by brains and their transitory

organisational statuses. At large, signals can be either biochemical molecules or electro-chemical pulses. The brain-mind complex is therefore an ever-changing organisation resulting from the interaction of brains and minds as stimulated by perceptions that may come partially through our sensorial apparatuses (reasoning) or come entirely from within that complex itself (thinking).

Accordingly, the whole brain-mind dynamics may be considered as re-organisations of this organisational complex triggered by perceptions that, in any sense contemplated, are formed by a train of imprints [17] ending up on a more resilient imprint in a specific sub-organisation of the brain-mind complex. Conforming to the definition of in-formation [17], perception is a process rather than an organisation and imprints are representations of the signals being perceived. These representations are naturally affected by the complexity and organisation of the signal being perceived and by the complexity of the sub-organisation hosting the imprint, as well as by previous organisational states. This (mathematical) fact can impinge distortions in the imprinted-signal that are intrinsic to the present brain-mind state and have nothing to do with noise, as the following unintended experiment shows.

Once ago a decades long friend of mine surprised me in the morning suddenly showing up for breakfast. The (Brazilian) porter called me saying that a friend of mine called “João Lima” was willing to enter the building and come up. Since I know very few “Joãos” and no “João Lima”, I followed the security procedures going down to check who was there and became gratefully surprised to see a friend across the street, whose name is “Jean-Yves.” Granted that the porter has never heard any language but Portuguese, his mind had no room for French-like sounds and registered the closest phonemes available, guided by the porter experience and the imprints available to him. He could also have registered nothing at all, had not my friend annoyed him directly. Compare this occurrence to the case where, in a noisy environment, my brain/mind spliced into a meta-cognitive state and part of it continued a conversation while the other filtered a word-based sound to discover what was hidden therein—pure in-formation versus pure decoding Shannon procedures.

5. ANSATZ

Based on the foregone remarks we advance the *ansatz* below, that is also supported by the similitude from the mental and organisational perspectives of quite different procedures: brain-mind recovery, learning, reasoning, and thinking.

“The Labyrinth-phase is possibly an incubation-phase where brain-minds alter themselves **adapting** their complexity and organisational state (i.e., themselves) just enough to allow the perception of signals that have always been available but remained unregistered and unnoticed, due to inadequacies our brain-mind organisation.”

Observe that I already knew about the chromatin and its workings before dreaming with it and associating my oneiric perceptions with what I have been struggling to find.

6. CONCLUDING

An *ansatz* or conjecture is far from being a testable hypothesis wherefrom deduction may be started to unveil possibilities. A lot

of evidence must still be acquired, and a lot of checking done to achieve this status, what can even substantially improve the *ansatz* wording. This article is then the report of a collection of facts that form a study-case. Since the underlying phenomenon is cognition, ideas and ideals become facts in a natural and seamless manner. We have tried to keep everything as objective and sincere as possible. However, we have not employed psychological tests or monitoring while registering and reporting the events here enrolled. We hope that their publication will lead to associations with systemic research institutes focusing on cognition and neuropsychology and to a better understanding of concepts and processes underlying this *ansatz*, what could improve its statement, enlighten, and bring it to a hypothesis-status.

7. ACKNOWLEDGEMENTS

This text is my sole responsibility. But it couldn't exist or have even been dreamt without the collaboration of several people. Rehira Silveira Kritz, neuropsychologist, helped me to extract mental facts, images, impressions, and processes from the mists of past expressing them coherently. She also introduced me neuropsychology basic terms, concepts, and thinking, guiding me through their wilderness, being co-author of the *ansatz* proper and its expression in acceptable words. Nelson Papavero, an entomologist adhering to phylogenetic systematics, taught me about theories in biology by sustaining innumerable discussions about biological explanation for years. In an intangible and wonderful manner, he is co-author of whatever refers to organisation in [17]. Years of utterly rich intellectual interaction with colleagues at the Faculty of Life Sciences, now Faculty of Biology, Medicine, and Health, at the University of Manchester, particularly Andreas Prokop, David L. Robertson, and Jean-Marc Schwartz, forged and put forth many ideas and explanations deployed above. Moreover, generous beta-readers and beta-listeners have improved the expression of this text contents. My heartfelt gratitude to them all. Last but not least, I would like to thank the editors and promoters of JSCI for their unbounded generosity and trust on my humble abilities, which allowed these ideas to become freely available.

Disclaimer: The invitation I received from JSCI was encompassing, this meaning: charges free and no directives or reviewing. Frightening, the last one. I hope to have matched their expectations. However, I must remark that their invitation had gradually unleashed my imagination to unbearable levels during the writing phase and, may be, this is the reason that I had had more beta listeners than beta readers. I honestly hope that this account of a personal and subjective experience and the subsequent daring *ansatz* are readable by all. I also desire that it will stimulate non-standardised reasoning and thinking, being of value to humankind.

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