A PERFORMATIVE-EXTENDED MIND AND A LAW OF OPTIMAL EMERGENCE

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ABSTRACT

This paper introduces a performative-extended model of the mind; adds time as a new element to previous accounts; proposes a law of optimum emergence then uses the present financial crisis as an example to show that this new model of the brain has profound practical implications, since psychologically reified concepts (of which values are one example) can be understood better using this new model of the mind.

The brain may be just what it looks like: a bunch of wires in endless loops, through which synaptic plasticity creates a pattern-based memory-process. This anatomy doesn't make sense if we search for "a mind" inside it. It does make sense if we define "mind" as emergent, created by dynamic brain-world interactions. This model based on "deep simplicity creating surface complexity" underpins a model of a "performative extended emergent mind" that is not "under the skull". Critical conditions for emergence are movement, diversity and tangibles. These make the mind a time-dependent self-organizing emerging pattern, created by looping, modulation of a basic rhythm; decentralized cybernetical-control; emergent 75-100ms microstates as the basis for perceptual frames. The mind interacts with the world through the cortex which can be viewed as a requisite variety generating pattern-sponge. Meaning and self-consciousness emerge by recursive self-reference. Split-second comparison of mental patterns delivered over millions of years of evolution, and actually still delivers, superior survival value.

Psychology's set of so-called "intangibles" can be redefined as "emergent properties". If stabilized by multiple feed-back- and feed-forward-loops, these emergent properties can be called "attractors". I will use human values as an example. Values are attractors created by messy patterns of behavior over time without logical cause-effect relationships, and dynamically stabilized by memory. Messiness (unpredictability) is essential to maintain the diversity necessary to emergence: "predictable patterns can only be created by unpredictable behavior". This illustrates key characteristics of values: it takes time to create trust, for instance, but, despite its "intangibility" it can -if violated- cause split-second-rage as if the organism's life is threatened, which shows its very "tangible" nature. Obviously values are *not* intangible: intangibles are tangibles plus time plus diversity. Classical psychology uses a model where the mind is defined within the brain and is time-independent. This psychological approach makes the mind a background-dependent theory where intangibles must be reified. The concept of the performative, extended-brain adds time and makes the mind background-independent. This model builds on the work of Rodney Brooks (MIT) who shifted to this performative-brain model starting the progress of AI, leading to Turing-test-robust-robotica. System theory is pivotal in creating this paradigm.

The performative-extended mind where movement (time), diversity and tangibles (feedback loops) create emergence can now be easily linked to a law of optimal emergence in order to explain fundamental psycho-social processes (of which values are the representative example I use). The mind, actually, becomes an eco-system within a larger eco-system.

The word "performative-extended" refers to the performative approach from Pickering (2010) describing the work of Brooks and the extended mind as described by Clarke (2011). The combination is mine.

Growth can be seen as an S-curve shaped shift from feed-forward-steering to feedback-control. In this process, the three components (movement, diversity and tangibles) necessary for stable emergence shift from conditions that are "non-favorable" (no-tangibles) to "favorable" (a dynamic balance between tangibles and no-tangibles) to "non-favorable" (too many tangibles). In the beginning there are not enough tangibles to create attractors and at the end the feedback-control becomes so overwhelming that movement slows and repetition replaces diversity. Growth creates and then destroys emergent properties in a time-dependent process. Stable emergent characteristics (attractors) can only exist for a while in the middle part of an S-curve.

A contemporary real life example might be that leaders who focus on financial growth and administrative rules often create corrupt organizations. This might be a falsifiable general systems law with implications for organizational and leadership practice. This is an example of how the "performative-extended mind/ law of optimal emergence" combination can lead to relevant conclusions and implications for the future of sustainable society, governance and business.

Keywords: Cybernetics, Consciousness, Mind, Feedforward, Feedback, Performative Extended Mind, Emergence, Attractors, Values, Brain, Ecosystem

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"It has always seemed strange to me," said Doc. "The things we admire in men, kindness and generosity, openness, honesty, understanding and feeling are the concomitants of failure in our system. And those traits we detest, sharpness, greed, acquisitiveness, meanness, egotism and self-interest are the traits of success. And while men admire the quality of the first they love the produce of the second."
John Steinbeck (1945), Cannery Row, Chapter 23

"We are not outside the ecology for which we plan-we are always and inevitably a part of it".
Gregory Bateson, (1973), Steps to an Ecology of Mind

INTRODUCTION

A recent paper by Paul K. Piff (2012) called "Higher Social Class Predicts Increased Unethical Behavior", might seem like common sense. That power, status and wealth have a corrosive, corrupting or even criminalizing effect on the human mind seems obvious to many people (Smith, 2012) Another 'received opinion' tells us that leaders work at the border where power, status and wealth lure them to cross the line (Jensen, 2004). As John Steinbeck observed, we strive for power, status and wealth, but this drive seems at odds with what we really think is worthwhile. In this article I will bridge this paradox, one that leaders face all the time, by a falsifiable ecological model which applies to both individual psychology and organizational culture.

I will use the current economic crisis as an example, interpreting it as a crisis in leadership and, as I will show, an ecological crisis. The financial problems are a "disease" with symptoms such as the abuse of power, greed and other signs of lack of ownership and social responsibility (Jensen, 1976) . This leadership misconduct happens at all levels in government, commercial enterprises, business schools, non-governmental organizations for social-profit, medical institutions and others. This doesn't happen all the time, everywhere. Every so often great leaders stand out and surface as examples for the many. Many leaders work with the best intentions. Despite this the pattern of corroding, corrupt or even criminal leadership emerges, particularly in relation to power, money, status and bureaucracy. The Harvard Alumni who ruined Enron were normal intelligent social civilians yet, at some point, their leadership went awfully wrong (McLean, 2003) . Most dysfunctional leaders started as normal people and would never have dreamt of cheating or behaving badly. In other words "bad leaders" aren't born "bad".

The process that erodes good people serves as a vivid example of the ecological model I am proposing drawing on sciences that are the foundation of ecology: chaos (modern nonlinear dynamics), self-organization theory, and the thermodynamics of evolution (Goerner, 1994) . Cybernetics and Information Theory are intertwined with those. In this context I will also focus on fundamental neurophysiological and ethological research and concepts. I will leave expanding on this example and other applications of this approach till the end of this paper focusing first on its theoretical foundations.

Approach

First, I will approach this challenge by combining three vantage points (cybernetical, philosophical, neurophysiological) to support the concept that the human mind is an eco-system within larger eco-systems. Second, I will work towards a concept of what values are in the context of eco-systems. Third, I will to add to the ecological concept that growth will, seemingly paradoxically, always be an eroding force within eco-systems and values in the second phase of the S (growth)-curve. Fourth, I will return to the example of erosion of good people as leaders and the challenges they face if they want to stay good leaders, explaining the practical implications in more operational terms.

In ecological terms I use the model that the mind and consciousness are emergent properties, where the constituent parts derive from both the brain and the environment (Noë, 2009). Then I propose that values are emergent characteristics of patterns of

behavior. I follow Bateson (Bateson, 1973) and Varela (1993) in this thinking. Then I focus on growth from a cybernetic perspective: that growth and the increase of feedback-loops always go together and that, in many human cases, this is basically a shift from feedforward-steering (Pribram 1976) to feedback-control. This is a description of the classical growth-curve, most often called the S-curve (Robertson, 2005, 2012). I propose that the natural and unavoidable increase of feedback-loops in any system will make the conditions for creating stable emergence less and less likely. The growth, streamlining and increased efficiency of systems destroys them (Lietaer, 2008). The conclusion I draw is that growth first creates emergence and then destroys it. Given that mind and values can be defined as an emergent integrated part of the ecosystem this process of growth will erode them. I suggest that mind, values, emergence and eco-systems are almost different words for the same phenomenon. The flip side of the coin is that values also cannot exist if there is no growth which means that values are always caught between a rock and a hard place, time driving them inevitably from emergence to destruction.

Eco-systems and emergence

The performative-extended mind model I am proposing, assumes that mind is an eco-system that is part of a larger-ecosystem. “Emergence” is central to this proposal so I will give a short introduction to that topic.

The first use of the word in the relevant way is in Lewes (1875). A characteristic modern definition is in Goldstein (1999): “the arising of novel and coherent structures, patterns and properties during the process of self-organization in complex systems” The key characteristics of this definition are: (1) the patterns are unique (2) there are integrated wholes that maintain themselves over some period of time (3) there is a property of "wholeness" (4) there is an evolving dynamical process (5) the patterns can be perceived. I would like to add (6) the patterns have an optimum of viability (Ulanowitz, Lietaer, 2009) and (7) the unique “surface” complexity these patterns may show is created by a deep simplicity (Gribbin, 2005): they are complicated in appearance, but with deep simple rules (O’Connor, McDermott 1997).

An eco-system can be recognized by patterns and an optimum of viability (Lietaer 2008). The strengths of a wild prairie (alt.: pasture, meadow), a human personality, a brand like Coca-Cola, the reputation of a country or a leader, a rainforest or an ant-hill can all be looked at as “emergent properties”.

Viable complex systems create their viability from an infinite number of dynamic feedback-loops between its constituent parts. There is a very strong relationship between the constituent parts and their overall emergent characteristic, but this relationship is not based on cause-effect and is not predictable from the interactions of the constituent parts.

An example which illuminates the complex appearance and deep simplicity of eco-systems is the flocking behavior of groups of birds when they are foraging or in flight. Computer simulations and mathematical models which have been developed to emulate this phenomenon can generally be applied also to the behavior of other species. As a

result, the term "flocking" is sometimes applied, in computer science, to species other than birds.
"flocking" is the collective motion of a large number of self-propelled entities and is a collective animal behavior exhibited by many living beings such as birds, fish, bacteria, and insect (O'Loan, 1998). Flocking is considered to be an emergent pattern arising from simple rules that are followed by individuals and does not involve any central coordination. The three simple rules discovered (Reynolds, 1987) are: *Separation (avoid crowding neighbors =short range repulsion), Alignment (steer towards average heading of neighbors), Cohesion (steer towards average position of neighbors =long range attraction)*.There is no central control in flocking; each bird behaves autonomously.

To give another example of deep simplicity: "no individual ant ever builds an anthill". The individual ant follows a few quite straightforward algorithms and an anthill is the emergent result. There is diversity in an anthill, because different ants show different patterns of behavior. Sometimes ants of the same type can be seen as "industrious" or "lazy" depending on the frequency of their interactions, for example. (Gordon, 2010).

The seven key characteristics of patterns listed above are used to denote "strong emergence". This means that the emergent characteristics create a system where the system characteristics cannot be reduced to their constituent parts. "Life" can be seen as strong emergence, because it is difficult to relate the simple core of the system to the complexity of the whole pattern we call life. Water can be called a weak emergence because it is quite clear that you only need a small number of water molecules for the characteristics of water to emerge. These characteristics are easily traced back to the molecules. In this paper I largely refer to strong emergence to which I give the name "attractor". Goertzel suggested this option from the perspective of chaos theory (Goertzel, B. 1994).

The mind as an eco-system within a larger eco-system

The example I refer to throughout this paper is the fact that our minds seem systemically vulnerable to the loss of values: that leaders become corrupt for reasons associated with power, wealth and status.
To make this argument we must get at least some basic understanding of the hardwired aspect of our brain which generates our mind. I describe the brain in the following sections in terms of a system that is organized in such a way that it ties in with the complexity of the ecosystem around it, without needing to copy or mimic it. I'll then show that it's logical to think about the mind as an eco-system following all the same rules that also apply for any eco-system.
I will show that the dynamic anatomy of the brain is such that it supports the idea that the mind is not within the brain under the skull, but that the mind is a dynamic pattern created by the brain and its environment.

The brain may be just what it looks like: a bunch of wires in endless loops, through which synaptic plasticity creates a pattern-based memory-process. This anatomy doesn't make sense if we search for "a mind" inside it. Looking for the mind within the brain is the same as looking between the strings of a pianoforte for the music.

A Performative-Extended Mind and a Law of Optimal Emergence

During the last few decades we have started to look at the mind in an entirely different way. This shift towards a new paradigm about what the mind is and what the relationship between the mind and the brain is can be described as the shift from the representative-brainbound model to the performative-extended model of the mind.

The representative-brainbound model is the dominant model (Noë, 2011). Whether or not we call ourselves professionals in understanding the brain, most of us think that the mind 'lives' within the brain just as the brain lives inside the skull. From the inside of that "dark cave of bone" we assume that our mind peeks into the world through eyes, ears and other sense organs designed for "this purpose". We assume that there is some "inner place from where each of us operates". We are convinced that our mind must be extremely complex. Even when we are asleep, it works, sorting out yesterday's issues in something we call the "unconscious". That "unconscious", by definition, never sleeps and is unknowable at first hand. Perhaps this model has been adapted slightly in the light of media reports that we've found the 'gene of homosexuality' or the 'place in the brain which lights up when we pray or which makes us like classical music.' But, the basic model still informs most debate. The mind is a complex object, isolated from the world and, indeed, well-protected from it.

The performative-extended model of the mind turns this notion upside down: it explores how the mind, far from being isolated in its cave, is connected to and part of the whole ecosystem 'out there'. The brain is not a place within which the mind is happening. It creates the 'mind' through action as an integral part of the world around us. The mind is an emergent characteristic, stabilized by brain connection. The brain is very important in creating the mind, but in itself is just a constituent part of a larger emergent process involving the outer world.

Once we realize that the mind is just another eco-system and, as such, always part of a larger eco-system, we can approach both the mind and its environment with similar paradigms, theories and models A practical implication of this is the notion that we cannot separate ecological solutions from the people who have to deliver the implementation of those solutions. If we suggest that government or corporations, needs to do something for the better it is more likely than not that the minds working in those organizations are, in fact, a larger part of the problem than one might have ever imagined. We are not facing an organization with people in it, but simply one total eco-system, of which people and systems are just constituents parts. Obviously we will go into this topic in more detail at the end of this paper.

To understand the literature and research leading to this ecological performative-extended concept of the mind we can follow three intertwined vantage points that support it. The first is cybernetics, the second is philosophy and the third one is neuroscience.

The cybernetical vantage point

The start of cybernetical thinking on the performative-extended model of the mind is well described by Pickering (2010). The English psychiatrist Grey Walter, an EEG expert and a close colleague of Ross Ashby, an expert in cybernetics, started to create small devices, based upon simple cybernetical principles, constructed using electronic material left over

from World War II. These were small electromechanical robots that looked like tortoises from the outside . The purpose of these cute devices was to show how a model of the brain could work, built from very simple components, wired up to provide an extremely rich life through interaction with people. These devices could initiate and maintain similar emotions and interpretations among spectators as those typical of human-human interaction. Walter's simple tortoises were 'black boxes' because their behavior was unpredictable. From the interaction between the living or static environment and the tortoise, patterns emerged that were surprising and not programmed in the brain of the tortoise at all. In fact nothing was programmed.

In a 1950 Scientific American article , Grey Walter suggested that, based upon the fact that his 'tortoises' had only two "feed-back systems", one could calculate that it might be possible to create a human being with only around ten of these systems. Understanding that human brains do have indeed only a small series of these systems, such as dealing with food intake, fluid intake, attachment, sex, exploration (as a feed-forward "system"), temperature, blood pressure regulation we get close to that number. This is another example of deep-simplicity and surface-complexity.

What happened to Grey Walter's deep-simplicity-surface-complexity kind of thinking ? It got marginalized over many decades until Rodney Brooks rediscovered it again in the mid-eighties and it lives now at the Artificial Intelligence (AI) department of the MIT.

Since the Dartmouth College 1956 conference AI, sponsored by millions in defense money, has sought to develop a representative model of the brain. This reflects the classical, dominant psychological idea of the mind; the conviction that our brain is a computational device, within which a representation of the world is needed to act upon that world. This reflects the common sense (but wrong) idea in psychology that I mentioned earlier, in which our mind works inside our heads.

But since 1956 computers were never fast enough to deliver real-time control within advanced (or symbolic) AI. Brooks himself got frustrated, when he helped Hans Moravec develop a robot which moved so slowly (due to the time taken for computation) that, outdoors, the movement of sun and shadows confused its internal representations (Pickering, 2010, 63). The more money thrown at representative AI, the less it produced. Rodney Brooks describes his frustration on realizing that Grey Walter's robots (Brooks created one himself as a youngster) costing only a few bucks appeared to function better than the million dollar equipment AI used in the mid-eighties. He then threw away the representative model and started where Walter left off, creating a performative robot called Allen. Rodney Brooks' first article where he proposed this tectonic shift in thinking about intelligence was first rejected by many conferences and journals. Once the world of AI changed because of the success of his work, the article "Intelligence without Representation" was published in the esteemed Journal for Artificial Intelligence.

Brooks was quite impressed by the level of complexity small animals and insects like spiders can create without anything like a matching brain. There is nothing in a spider's nervous system that even gets close to being able to process the complexity of its web or

prey-catching strategies. There must be something else going on rather than a representation of the outer complexity within the neurological system of the spider.

What has happened in the world of Artificial Intelligence from Walter via Brooks to the MIT Media Lab and the development or Robotica up to now is a fundamental shift from a representative to a performative model of intelligence.

The philosophical vantage point

Philosophical thinking on the brain and mind has undergone a similar shift. Andy Clark calls it a switch from a brainbound to an extended mind (Clark 2011).

Alva Noë writes: "In a way our problem is that we have been looking for consciousness where it isn't. We should look for it where it is. Consciousness is not something that happens inside us. It is something we do or make. Better: it is something we achieve. Consciousness is more like dancing that it is like digestion".

I rephrase and follow Clark's classification (2011, pp. 136-137) which summarizes the thinking behind the extended mind paradigm:

1) There is no "magic dust", which basically means neurons are neurons and have nothing special about them. They just conduct electrical impulse, fire, inhibit or stimulate each other and that is all.
2) There is no "inner homunculus". There is no specific area in the brain that "does the thinking". The brain is supporting structure all the way down (just a bunch of wires and connections) with mind and reason the emergent properties of a well-functioning swirl of self-organizing complexity.
3) The brain doesn't care how and where key operations are performed. (here a short personal comment: the sentence "the brain doesn't care" is already a dangerous one, because it could imply that the brain is something that "could care for something else" and as such could be an entity with a will or power to direct, which it is not).
4) Much human thinking benefits from cycles of self-stimulating activity in which structures that drive and constrain evolving thought processes are created on the fly.
5) The flow of control is decentralized, distributed and actually fragmented.

I have oversimplified Clark's classification and added some of my interpretations, but the key of what he and others are stating is basically not very different from what I described in the previous section on historical developments: a migration from a representative/ brain-bound to a performative/ extended model of intelligence/ mind.

What are the neurophysiological substrate of this model? Philosophers could benefit from a better understanding of the real hardwired underpinning for their thinking. Neurophysiologists who care for electro-chemical neurophysiological research into also need to revise and extend their thinking. They have made huge strides in understanding how the brain works and need a better model of where the mind sits in all their material. So, let us move on to this perspective.

The neuro-physiological vantage point

It becomes more and more clear that the best way to look at the brain is as a network of networks and nothing more (Sporns, 2011). In his massive work on this subject Sporns concludes that empirical studies, agent-robot models, and theoretical work suggest that the application of network thinking to brain-body-environment interactions promises to reveal principles that enable autonomy and intelligence. A key conclusion of Sporns is that this functioning does not reside within some clever control algorithms or computations of higher brain regions, nor that they are deeply embedded within the brain's blueprint or wiring diagram. Rather, Sporns concludes, they draw heavily on ideas of information and dynamics within networks, as well as on embodiment and extended cognition.

Building upon this network paradigm, I will use a review by E. Roy John (2005) as a backbone for these following paragraphs. He summarizes a wide range of empirical evidence suggesting the need for a paradigm shift to explain how synchronous and distributed neuronal discharges are transformed into a seamless global subjective awareness.

He describes a theory of consciousness that proposes that constituent parts as elements of consciousness are dispersed as islands of negative entropy (order) within many cell assemblies. Once these local islands of negative entropy are integrated into more whole brain negative entropy (order) it is likely to give rise to consciousness. John describes consciousness as "an inherent property of an electrical field resonating in a critical mass of coherently coupled cells". He leaves it open where that "consciousness" might be, but reading his article, I assume that he suggests it is within the brain.

John describes a two way process of how the brain organizes information. The first is the creation of what I would call a "background". This background is generated by Local Field Potentials (LPF) on a modular level. A single neuron is far too erratic in its behavior so the module of operation in the brain is always a cluster of neurons that fires in clusters and generate the LFP's. Modules all over the cortex generate, via a homeostatic, self-organizing process, a state of readiness. There are millions of entities (modules) that can connect with each other throughout the brain which are all part of networks. These networks change all the time with the same neurons working in complete different networks generating complete different meanings. Eccles (1977) compares this with the key board of a piano where the same 88 keys can generate an endless amount of melodies, rhythms and accords. If one minute a key is used for playing Billy Taylor, and another minute it is a piece of Ligeti and then Mozart the key doesn't change at all. It doesn't care (I need to make the same caveat about the word care as I did above). It doesn't even know it is playing music. (To be clear, our neurons aren't any smarter than a piano key). There is strong relationship between the QEEG (Qualitative Electro-Encephalo-Gram) and the states of the mind neurologists discriminate from deep coma to alert wakefulness. This is what one calls being conscious i.e. being awake in a resting state ready to deal with information. So the first process John describes it just "getting the piano keys ready", like switching an electronic piano on. It is possible to play, but it is not yet happening.

The second part of the process John summarizes is that dealing with information runs parallel with observations that relate to the networked state of the brain. This relationship between the amount of integration and consciousness is worked out by John in detail, and also stated by others like Lamme (2010) who argues that we should understand consciousness as the integration of information.

Below I follow the backbone of John's summary of his major conclusions whilst adding my own comments and clarifications:

- *Attributes of complex stimuli are fractionated and projected by the thalamo-cortical relays of the sensory specific ''exogenous system'' to the basal dendrites of ensembles of pyramidal neurons throughout the cortex, and thus encoded as time series of nonrandom synchronization within dispersed cell assemblies rather than by discharges of dedicated cells. These fragments of sensations constitute islands of local negative entropy.*

  Information from the outer world is fractioned by our sense organs and distributed over the cortex to the basal inputs of the cells forming a module. They form patterns.

- *Collateral fibers from afferent sensory pathways project to the ascending reticular activating system from which they are distributed as time series of nonrandomly synchronized volleys that are propagated to structures in the limbic system, where they are encoded as episodic memories. Those representations of previous experiences most similar to the momentary present input, which have been stored in the limbic system, are simultaneously activated by associational mechanisms and readout as a time series of nonrandom discharges. This ''endogenous'' readout is propagated via the nonsensory specific nuclei of the diffuse projection system to the apical dendrites of the cortical sheet of pyramidal neurons.*

  The same input as in 1) generates a second stream of pulses, activating existing patterns, which are the same as memory. Those patterns do not have a direct relationship with the sensory data. These pulses connect with the same modules but via other dendrites.

- *Coincidence detection between the converging time series of inputs to basal somatic and apical dendritic synapses of dispersed pyramidal neurons causes enhanced excitability, converting those assemblies that are currently encoding fragments of sensation into fragments of perception, which further increases the local negative entropy. This coincidence integrates encoded sensory information with output of systems encoding expectations, memories, planned actions, interoceptive, affective, and motivational states.*

  When the excitatory patterns of the two pathways to the cortex "add up", the level of "information" increases because experience matches the here-and-now. The level of information is defined by even sharper patterns of activation in the cortex.

- *Integration of these fragments is required to yield a global percept. Modulation of membranes by local field potentials (LFPs) facilitates discharge of excited cells as a coherent cortico-thalamic volley, followed by back-propagated high-frequency*

> *reverberating oscillations. Coherent interactions of these "cortico thalamo limbic cortical" oscillations cause a state transition of the system into resonance, binding these fragments into global negative entropy that creates consciousness, producing a unified perception.*
>
> Activated modules connect throughout the whole brain, where resonance or reverberation creates (for a very short while) a stable pattern, where all sensory and non-sensory past and present information are connected.

John also describes the research pointing towards perception being created by discontinuous perceptual-frames that define "a travelling moment of perception". These discontinuities are called "microstates" and last about some 75-100 ms.

Libet (2004), who received the 2003 virtual Nobel Prize in Psychology from the University of Klagenfurt, Austria, found in his most famous experiments that unconscious electrical processes (the readiness potential) preceded conscious decisions. At least one general conclusion is that conscious experience takes some time to build. This well accepted discovery fits the notion that the timing of things is framed into a microstate and as such quite discontinuous, although we do not notice it.

To cite John in his concluding remarks of the article I referred to above: "The global negative entropy of the brain encompasses all of the momentary information content of the entire system, as an ''information field'' that subsumes the parallel processing circuits that are simultaneously activated at a nonrandom level in the brain, and comprises the content of consciousness."

So we are left now with a conclusion that whatever happens in the brain that we can relate to conscious information processing, involves networks, the creation of patterns and emergence and that "time" is a pivotal factor.

This idea is shared by many thinkers including Sporns (2011) and Nunez (2010). The thinking of Clark (2011), Clark and Chalmers (1998), Noë (2011) and others states that we do not need to find anything special, but that reality itself is the set of constituent parts that create consciousness by emergence.

It seems more and more evident that the brain is creating from external and internal stimuli and integrated patterns that flows in microstates, where consciousness is positively related to the level of global (whole brain) integration.

John (2005) sums this up (I have abbreviated this slightly):

"The content of consciousness is based upon integration of momentary perception of the external and internal environment with the working and episodic memories activated by associative reactions to that perception. I contend that the conscious organism, and particularly the human being, is continuously interpreting awareness of the present in the context of both the recent and the remote past, to attribute "meaning" to the present events. A further major hypothesis of this theory is that information in the brain is not encoded by the firing of dedicated neurons in particular brain regions that represents

specific stimulus attributes or features, but rather by distinctive temporal patterns of synchronized firing dispersed among many brain regions. Individual neurons can participate in numerous such temporal patterns."

Integration of the three vantage points: the mind as an eco-system

The key question in the science of consciousness concerns (where the hell) that consciousness is.

Based upon the three vantage points above I like to suggest that the very question points us in the wrong direction. "Where" asks for a location and that location isn't there. To clarify this let us start from a neurophysiological vantage point. As I've shown, there is a broad consensus that the brain is a big pattern generator, translating multi-modal information into time-framed patterns that are created by constituent parts all over the brain.

The challenging observation is that, within the boundaries of this consensus, most observers still localize mind within the brain and it is difficult to find references to critical role of time. The implication of the model I have proposed, supported by many thinkers is that "time" is a critical condition for the mind. The mind can only exist dynamically. The philosophers I mentioned in vantage point two, are very close to understanding the issue but need to realize that time and emergence always go together.

The brain is one big dynamic rhythmic pattern sponge and through interaction with the outer world generates a continuous loop of emergent microstates which we can call the mind.

It is interesting that Grey Walter and Ross Ashby (Pickering, 2011), using their cybernetical background and less influenced, I assume, by mainstream psychology, started precisely from this point. Simple dynamic feedback loops in interaction with the outer world created patterns that observers felt to be human. Rodney Brooks' work suggests that it seems to be possible to create a performative kind of brain.

The paragraphs above make the notion of a performative-extended mind plausible and provide further evidence for the proposition of defining the mind as an ecosystem within larger ecosystems, and of working out some consequences.

The ecological definition of values and other intangibles

In the next section I attempt to frame the concept of human values in ecological terms, using frameworks and concepts I have used to give an ecological account of the brain in the earlier sections.

The line of thinking is as follows. I have proposed that the mind is an emergent property of the interaction of the brain and its environment. Cyberneticians and philosophers point us in this direction and receive increasingly support from the field of neurophysiology. The performative-extended brain model increasingly fits with the way the brain seems to work.

If our brain creates a mind that is part of a larger eco-system and if values can also be explained in ecological terms, mind and values (and other such phenomena) can be explained within a similar frame of reference, allowing us to suggest ways of dealing with seemingly intractable, non-material topics such as values which are of such a pivotal importance for the human condition.
To stress the importance of this, I refer to the research done under the umbrella of the The Union of International Associations (UIA) , a research institute and documentation centre, based in Brussels. It was founded one hundred years ago, in 1907, by Henri La Fontaine (Nobel Peace Prize laureate of 1913), and Paul Otlet, a founding father of what is now called information science .

The purpose of this research was and is: "What are values, how do they relate to one another, and how do they change? How do they relate to the problems with which society is confronted? Knowledge of these matters remains primitive relative to the needs of the time. And, no problem can be recognized, or adequately formulated, unless the values involved, and the apparent threat to them, are stated. Many world problems can be specifically associated with the values which they threaten or violate in some way."

A result of their research is that there is no agreed worldwide definition of values. The UIA's Human Values Project is an unrivaled piece of work focusing on how values relate to each other and how they change. In the commentary on this project a suggestion is advanced that values might be seen as (strange) attractors: "One of the key insights of chaos theory is that of strange attractors. Is there a sense in which human values can be usefully understood as attractors?

To cite further: "A prime characteristic of a strange attractor is that it is defined as the focus of a pattern of seemingly chaotic behaviour. But it is the pattern that signals the presence of that focus which cannot be identified in any other way. Like strange attractors, human values do not manifest in any tangible manner but rather through interpretations of the way behavior is governed. But the intangible attractor may indeed be a matter of direct subjective experience under appropriate conditions of human development. […]

There is also a sense in which behavior may be described as trapped by particular attractors. However it may also drift in such a way as to be temporarily captured by another. From this perspective behavior may be seen as swinging between and around attractors. Chaos theory may offer insights into the laws governing such behavior." (end citations)

My paper builds on this insight but goes a step further, using this route to connect values to emergence and to define values as the connected emergence characteristics of the environment and the brain, generating a performative-extended mind.

My definition of values is:

"Values are emergent, self-organizing properties of complex, diverse, dynamic systems"

"Am I honest?' Some workshop delegates hesitate for a moment when I ask that, but most keep their hands down to indicate they're uncertain. In order to be certain, they need

to see me far more often, in many diverse situations rather than once, on a stage, in a conference centre or hotel. ‘ Are you sure you will trust me if you see that I always tell the truth?’ Delegates at my workshops quickly realize that unwavering honesty will actually cause a great degree of uncertainty. For example if I am an unfailingly honest person it’s unlikely that even my best friend would ask my advice about the affair he or she is involved in and agonizing over. If asked by his or her partner I’d tell the truth, when lying might well protect my friend from harm. In that situation, my honesty clashes with other values such as ‘having respect for others’ or ‘keeping agreements’. The paradox here is that, in order to trust my honesty, people need to see me adapting it to the demands of everyday life and of other values. The irony is that a solitary value, pursued without exception is an obsession, not a value and, in ecological terms, a single-minded obsession with one virtue lacks diversity. Values come in teams, interact and, while they cannot be precisely defined, they can be felt very strongly. You cannot act on one in isolation without finding lots of others jostling for attention.

What would destroy their trust in my honesty ? One ‘accident’ might be allowed, but if I show one moment of pure dishonesty, they’d reappraise me completely.

The beauty of a bouquet of flowers is an emergent property created by the flowers and their dynamic interaction with us, as observers but the beauty is NOT contained in one single flower, or just two. There must be a critical mass of flowers, a certain degree of diversity (even when the flowers are the same species and are the same overall color) to make a bouquet a bouquet. We cannot logically trace the bouquet’s beauty back and find a cause-effect relationship with a single flower. The whole emergent beauty of a bouquet can be destroyed by just a single withering, foul-smelling blossom. As we’ve seen, values work the same way. We look at an individual or an organization, gather individual behavioral incidents, arrange them in a ‘vase in our brains’, and when we get a critical mass of them, observe a pattern and give it a name: ‘truthfulness’; ‘honesty’; ‘concern for others’ or ‘selfishness’, ‘dishonesty’; ‘greed’. This is not a logical process but the result of self-organization. The whole emergent judgment can be destroyed by one counter-instance though there needs to be diversity – messiness – in how we negotiate between values for a value to exist.

Only a pattern of deeds over a period of time, none of them necessarily perfectly fitting the value, will create a value. We recognize values as values when they endure rather than just display themselves in one act, so they are attractors. Once a value is established, we focus on the value, not at individual, detailed incidents. On this basis we can make a decision about someone’s values almost instantaneously. Attractors such as values emerge after a period of information and instance gathering. Once they’re established we can jump straight to a judgment without thought.

As I have suggested, values, are just one small set of examples within a far broader set of similar phenomena. Other attractors include identity, brand, image, loyalty, flexibility, emotion, happiness, sadness, changeability, service, motivation, culture, climate, beauty, spirit and uniqueness. They all have similar characteristics.

Rephrasing Bateson (Bateson, 1973) these non-tangible, abstract, reified descriptions carry some dangers with them:

a) to create the idea that they are, after all, tangible;
b) to create the idea that they can be localized "at some place" ; and
c) they can be dealt with as entities in cause-effect relationships.

To use my organizational/leadership example, such dangers might lead to situations in which a) one thinks the organization "has" (instead of "is") a culture and that b) it is "the people" making that culture so that c) we expect to solve a low levels of client service by training.

By contrast, I observed a more systemic approach in a global service firm where some thousand plus stories were generated around one single question: why clients stayed with the firm or left. Those stories became the basis for building three USA-based centres where partners and consultants could relive and enact, as pilots in a flight simulator, the emergent characteristics of the messy and dynamic client-firm relationship.

Descriptors of the non-material phenomena we call now attractors, such as values, can be understood and addressed using the same principles, which are actually not that difficult once we realize that complexity-theory can provide us with a well-developed account of how emergence is created and sustained. This is the issue I turn to now.

There are three key conditions for emergence:

- Dynamism (time, movement, continuity and other synonyms)
- Diversity (information, differences, variety, some sloppiness or messiness)
- Tangibility (a certain mass of concrete things)

This leads us to the following illustration. For the time being, I call it the 'practical physics of all intangibles.'

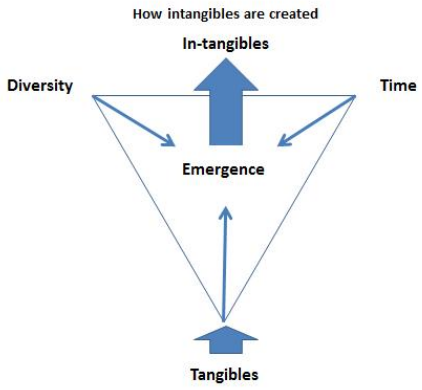

Figure 1

This definition of intangibles might look complicated but one can feel its truth very easily. Imagine listening to a piece of music, say a pianist playing a Beethoven Sonata. How does beauty 'emerge'. Obviously to experience this you need a number of things: time or movement; a good pianist; and, of course, a piano. The pianist and the piano are pretty tangible. So far time and tangibles are covered. But where's what I've called diversity? A musician needs structure (another tangible) to anchor himself into a rhythm, but a good musician never plays a piece exactly the same way twice and no two musicians play even a tightly scored piece identically. Good musicians always play around, experiment, make mistakes. They break rules every second to create the music. You can prove this by asking our pianist to play the sonata with a metronome, as I sometimes do by making a pianist wear headphones down which, I tell my audience, I'm going to play a mechanical metronome. I also tell the audience that I have asked the pianist, once he hears the sound of the metronome, to play precisely following the beat and that they should raise their hands as soon as they think the pianist is doing this. In all instances the people in the audience raise their hands within 3-5 seconds. They immediately hear that the beauty (the emergent characteristic between you as a listener and the piano) has disappeared. The performance is not attractive but mechanical.

This is an example of how a lack of diversity kills emergence. Rules, procedures and all kind of norm-controlled repetitive structures block the process. Without some "messiness" there can no emergence.

The growth-curve and the time window for optimal emergence

In the next section we look at the well-known growth-curve or S-curve which we use to explain the process of emergence and its inevitable failure (Modis, 1998, van der Erve 1994, Robertson 2005).

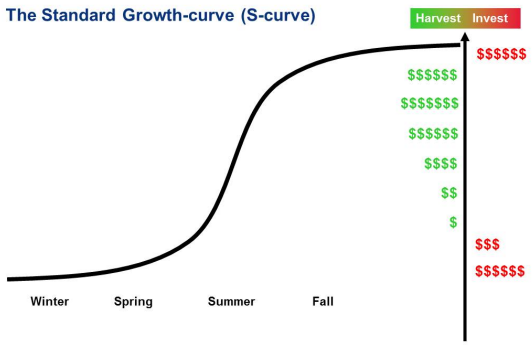

Figure 2

Everything's growth flows from nothing to something. Attractors like values are no different from other living systems. Time always drives this process in one direction, moving from feed-forward-steering to feed-back-control. At the beginning of a growth-curve there is very little tangibility. Growth and emergence start through a highly diverse range of options and possibilities. Then stability increases and growth and emergence start to become faster and easier. Feed-back-control (=structure, repetition) is

created and as this increases, the dynamism of the systems and thus growth and emergence slows down. Finally so many feed-back loops are added that diversity, time and movement fail, emergence stops and the system dies .

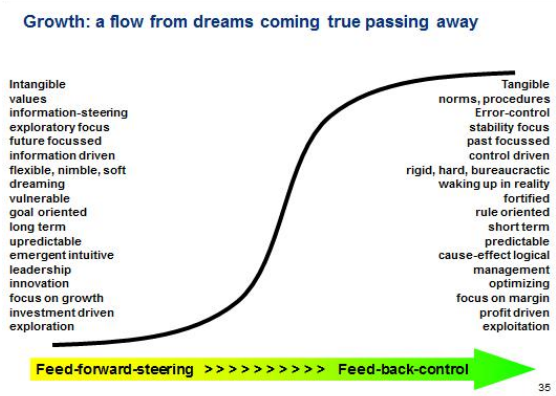

Figure 3

If we look back to the conditions of emergence and the triangular representation explaining the physics of intangibles you can see that it is difficult to create emergence at the beginning of the growth curve because of there are too few tangibles and too much diversity (=more or less chaos). You lack a pianist and piano. By contrast, at the end of a growth-curve, there are too many heavy tangible things, too much structure and almost no dynamism and no diversity. The metronome rules! It is around the middle part of a growth-curve that the conditions for creating emergence are optimal. This can be illustrated by the following diagram.

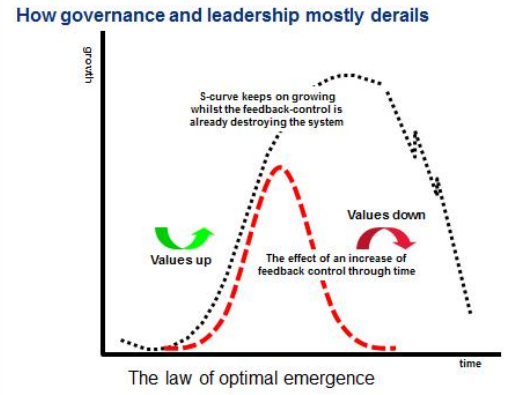

Figure 4

This law shows that emergent properties such as values are always on the move along the path laid out by the growth curve. As a person, a leader or as part of an organization, one has to work hard to get them. Once all your dreams come true (= tangible) the very same process that created your emergent values will destroy them. This is inevitable. So, there is only one solution. Give up the old heavy, ‘metronomic’ system and start a new growth-curve.

Occupy versus The Tea-Party; Democrats versus Republicans; innovators versus investors. Binary oppositions are endemic to human society. By contrast, the law of optimal emergence proves that there is a need for cooperation rather than war between all two 'party' systems. The key question is whether any two 'party' system is capable of behaving ecologically in the long term or, rather, whether they lurch from explosive crisis to explosive crisis such as economic recessions, bankruptcies, social unrest and even civil wars. It might well be that a viable social system should involve a much larger number of parties or pressure groups who struggle within an ecosystem, balancing each other out and preventing the system from derailing.

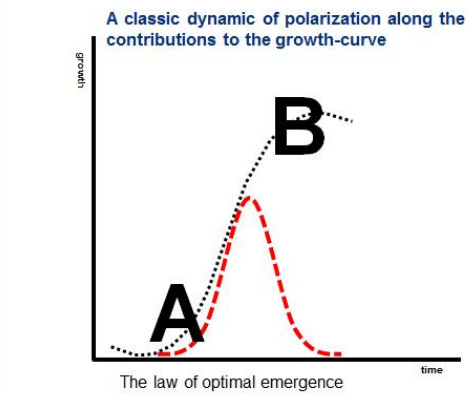

Figure 5

Large polarizations in the world such as though I mentioned earlier are often the result of the clash between feed-forward and feed-back control. You can use the picture above and fill in for "A" or "B" whatever you want: Inventors (A) versus Investors (B), Democrats (A) versus Republicans (B), Artists(A) versus Technologists(B) or any other binary division. In other words they involve an opposition between the beginning and the end of the process of growth and emergence. Both groups feel they are right (and they may well be) but rather than seeing themselves fighting each other, they need to see that they are fundamentally connected, contributing to different phases of growth-curves. The opposites are not divided by space, they are connected by time. Such oppositions leave a big "execution gap" in the middle of the growth curve and the result is that not much gets done while a lot of heat is generated.

To prevent the decline of values and to optimize the real added value of "the two opposites" the only effective strategy is "surfing the waves of time" or, less poetically, jumping S-curves by continual transformation rather than sticking with the S-curve until growth dies. When you do this B can contribute a sense of reality while A can innovate.

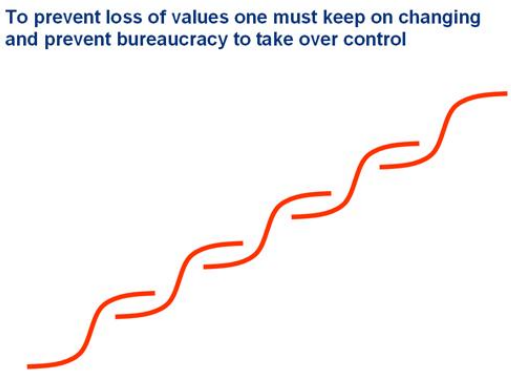

Figure 6

To summarize: the law of optimal emergence shows how systems inevitably destroy their values. Values are self-organizing emergent characteristics of a system inseparably connected with the viability of a system. We recognize them as patterns, with no cause-effect relationship but a condition-effect relationship between their constituent dynamic parts and the emergence itself.. Time always drives in one direction and will create and kill values through the same process, involving the shift from feed-forward-steering to feed-back-control.

A similar account of this optimum of emergence is described by Lietaer, Ulanowitz & Goerner van der Erve and Boisot & McKelvey. Lietaer et al developed a sustainability curve that looks very much like the curve showing the dynamic of optimal emergence I drew underneath the S-curve. On the left they call their phase "Resilience" as a combination of diversity and interconnections. This is precisely what I would call the more exploratory, feed-forward driven context of the growth-curve where one must have tangibles and a certain level of diversity. If there is complete diversity, there is basically chaos and nothing can exist. On the right they define the sustainability curve as efficiency or streamlined. That is where, on the S-curve, a lot of structure and feed-back-control comes into play and, as with the S-curve, a maximum of efficiency will lead to destruction of the eco-system. Lietaer, Ulanowitz and Goerner have developed this observation mathematically (Ulanowitz 2009) which is less intuitive than the law of optimal emergence. Van der Erve developed a similar model and connected this more dynamically with the growth-curve concept (van der Erve 1994). Boisot and McKelvey used a complexity interpretation of Asbhy's law of Requisite Variety to define "the Asbhy Space" which is again, another but basically similar perspective on the optimum conditions for creating emergence and attractors in a complex-dynamic system.

I focused on adding elements including time which drives growth in only one direction and the connection with values (and other traditionally reified phenomena). In a complex and sustainable ecosystem it is the whole diversity of the constituent parts in different phases of S-curves that keeps a system viable. Underlying the sustainability-curve there is a whole ecosystem of S-curves in different stages renewing themselves all the time. As soon as those S-curves start to resonate in one phase the whole system will shift out of balance.

I now want to address, very briefly, a second, linked question which returns to the opening of this paper. We have referred to how this process works in organizations, but why do individuals, most specifically leaders, follow the same path leading to the loss of values ? The answer is that our mind, is an emergent property of our brain (Libet a.o.): another ecosystem in the larger ecosystem. Our minds follow exactly the same ecological process as organizations or any other living system.

So we can answer that early question by stating that the corruption we saw in the financial collapse was not the result of bad personalities, but was an unavoidable characteristic of nature and of the minds of the leaders driving that very industry. Good people inevitably do bad things because of the way ecologies work. It is, therefore no surprise that the most famous examples of value-driven leadership (such as Gandhi, Lincoln and, in more recent times Aung San Suu Kyi) instinctively (or should I say ecologically?) kept themselves away from creating any excess number of feed-back-loops in their mind by detaching from possessions and signs of status as possible. What you possess possesses you. (this last sentence is also an example how dangerous language is: this sentence is only describing a loop and not a Cartesian "you" existing somewhere and possessing something! It is just a feedback-loop and for that reason so dangerous for the emergence of the ecosystem whether that is human values or the organization it is part of)

Perhaps business school students should not focus on learning to become better leaders (they were probably already good when they entered and passed the selections) but need to learn how natural processes underlie leadership derailment. They need to learn ecology.

Conclusions and suggestions for further thinking

This paper moves towards an understanding that the mind is an ecosystem which is part of a larger ecosystem, and is subject to the laws and rules of ecology. The paper builds on the ideas of those who propose a paradigm shift from the model of a representative-brainbound mind towards a performative-extended mind. The focus on the hardwired constitution of the brain is used to add strong evidence for the model that the brain itself is designed to have the mind outside herself as an emergent phenomenon created by both internal patterns (connections) and external data.

Systems are strongly emergent (creating, on a behavioral level, what I call attractors) and as such our brain is part of a system creating attractors. In my account, human values are a subset of those strong emergent characteristics.

As a consequence of this, human values can only exist within the same window of viability of any other ecosystem: that is, when there is a balance between diversity, dynamic and material (=behavioral) constituent parts or in other words between "too much diversity" and "streamlined efficiency". Because growth drives any system towards streamlined efficiency, all growth drives values out of any system. For this reason, a sustainable eco-system for values emergence should have a highly diverse set of subsystems in different stages of the growth-curve in order to keep the diversity just high enough to be sustainable. Based upon this notion it seems that over-controlled, efficient,

streamlined, bureaucratic systems are not promoting the existence of values or, in other words, are simply not-self-sustainable systems. This is what Franz Kafka described almost a century ago in 'The Trial' a novel set in a nightmare bureaucracy. An ecological view on bureaucracy seems to confirm his observations.

My account provides an underlying grammar for scientifically tackling a huge number of human issues: ones which before this breakthrough in our understanding of the brain and mind seemed to be the province of discursive philosophy, theology and theories of citizenship, the law and politics. Put simply we can see that the mind is one element in an engine which creates emergence. Growth both starts and stops emergence and the conditions for creating long-lasting emergent properties (attractors) can be analyzed using the law I have described. This grammar is ecological. By understanding how this process works we can begin to suggest practical strategies to address critical problems,

We have looked at how inevitable loss of values led to financial collapse but this is only one area which this grammar of emergence and the performative-extended view of the mind can be applied. Other organizational and business areas are cases in point: the creation of conditions for the emergence of genuinely customer-oriented cultures and the creation of brands are instances. So are issues of public policy such as the encouragement of healthy lifestyles, anti-smoking campaigns and tax avoidance. Issues of anti-social behavior and crime are obviously amenable to an ecologically based approach. In cybernetics this account is beginning to bear fruit. While hard AI approaches seem to have stalled, projects applying evolutionary and emergent processes to very simple base components seem to be bearing fruit in machines which learn through adaptation to their environment. The new performative-extended mind model has an obvious application in various branches in psychology. It calls into question many aspects of the multi-billion dollar psychometrics industry, suggesting different processes and different measurement parameters. It can cut through the fundamental binary genetics vs. environment debate about the nature of mental illness which still rages. Although it is somewhat outside my area of expertise it's clear than many modern movements in the arts, perhaps from the 19th century impressionists onwards, are based on a usually empirical understanding of emergence. Many of the last century's heated debates about aesthetic and other types of 'meaning' also seem based on a misunderstanding of how meaning is created through interaction of ecologies of mind and the wider world. And it would make sense that the most fundamental problem facing us should be addressed by an ecological view of human minds and brains. Bureaucratic legislation does not seem to be energizing our critical reaction to environmental destruction and global warming. Understanding and applying the processes of growth, emergence and relate topics will help to develop more effective strategies. Global norming is not the answer to global warming.

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