

Making Sense of Social Complexity through Strange Attractors

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ABSTRACT: *Strange attractors – emerging out of the chaotic dynamics of the thoughts and feelings constantly swarming in the mental space of each individual – encapsulate topologies of meaning-making units and offer a key to a unified semiotic and cognitive understanding of meaning. Being dynamic constructs, Strange Attractors of Meaning have both spatial and temporal characteristics. The spatial characteristic relates to ‘areas’ of context(s) where signs reveal their meaning; the temporal characteristic relates to the ability of meanings to evolve, transform and initiate new meanings that emerge as new attractors in the mental space of an individual (a group or society). Learning crucially depends on the potential of the strange attractors of meaning to lose their stability and undergo crises.*

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INTRODUCTION

We navigate through the whirling dynamics of life by making sense of social complexity, which we both create and are created by.

Dynamic Semiotics (Brandt 1995) explores the process of making sense of dynamical signs, that is, signs standing for objects (phenomena, events, processes) that constantly move, change, evolve and transform in the scope of our perceptions. It is these kinds of objects that constitute the fabric of social complexity.

The key hypothesis in Dynamic Semiotics is that in the mental space of humans – the space of our understanding-supporting thoughts and feelings – there are structures based on forms and forces linked or merged into spatio-temporal units, which make things meaningful. Complexity and Chaos reveal the dynamic topologies of these meaning-making units.

The intention of this paper is to show that the strange attractors emerging out of the chaotic dynamics of the thoughts and feelings constantly swarming in the mental space of each individual encapsulate the topologies of meaning-making units and offer a key to a unified semiotic and cognitive understanding of meaning.

STRANGE ATTRACTORS OF MEANING (SAM)

Mathematically, the strange attractor is defined as an attracting set with *zero measure* (that is, a set capable to be enclosed in intervals with arbitrarily small total length) in an embedding n -dimensional space (called *phase space*); it has a *fractal* structure (that is, a structure, which displays self-similarity on all scales of its manifestation). The trajectories, that is, the traces of the energies and forces whirling within the strange attractor, appear to skip around randomly.

The cause for a meaning to emerge can be any dynamical sign projected onto human mental space (Dimitrov and Woog, 1997). Insofar as the projection of each meaning-evoking sign is only an energy pattern – a kind of whirlpool in the flow of thoughts and feelings that can neither be seen nor touched but only expressed in arbitrary small spatio-temporal units of perception – its ‘measure’ is zero.

The phase space where meaning emerges is the ‘multi-dimensional’ mental space of an individual – a non-material space (transcendental in Kantian terms), energised by continuously generated thoughts and feelings.

Meaning has fractal structure: once a certain dynamical sign makes sense to an individual, this individual can ‘zoom’ deeper and deeper into the meaning of this sign. Although each level (‘scale’) of meaning-exploration may differ from any other level, there is similarity between the levels, as they all relate to the dynamics of one and the same sign interpreted by one and the same individual.

The Strange Attractors of Meaning (SAM) can exhort human actions. Although the actions may appear to skip around randomly, they relate to the attractors of meanings that propel them. If there are no attractors of meaning behind one’s actions, the actions are simply meaningless; they are running at the physical level only. The lack of intelligent support, be it mental, emotional or spiritual, is incompatible with growth as an holistic individual.

At a societal level, one can think of a philosophy, like Marxism, which has its attractor in socialism. Millions around the world did and do follow this movement. Millions more subscribe to it at a physical level only, emulating what they think is appropriate and representative behaviour. The lack of recognition of the attractor and its replacement by physical, superficial behaviour may partly explain events in the historical progress of this paradigm.

Iconic and Symbolic Characteristics of SAM

Being dynamic constructs, Strange Attractors of Meaning (SAM) have both spatial and temporal characteristics. The spatial characteristic of SAM relates to 'areas' of context(s) where signs reveal their meaning. For example, the sign of a *cross* reveals its meaning in the 'area' of the Christian texts, the term *strange attractor* reveals its meaning in the field of chaos theory (where this term was initiated and explained in detail); the expression *class struggle* becomes meaningful in the context of the Marxist ideology; *quarks* and *gluons* become filled with meaning in the scope of today's quantum research. The spatial characteristic of SAM can be described as iconic; an icon (whether a pictorial representation or word or physical construction) is always attached to a certain core context. The cross is an icon in the Christian doctrine; Lorenz's butterfly attractor is an icon in the studies of Chaos; the class struggle is an iconic expression in Marxism; the Eiffel Tower an icon in French tourism; the music of Sibelius an icon in the Finnish culture.

The temporal characteristic of SAM relates to the ability of meanings to evolve, transform and initiate new meanings over time. For example, the meaning of chaos has undergone a significant evolution – from being associated only with disorder, confusion and 'states of things where chance is supreme', to being associated with the inherent unpredictability in the behaviour of nature and with a property known as extreme sensitivity to initial conditions. The word 'chaos' has brought into life entirely new meanings like strange attractor, fractal structure, bifurcation diagram, Feigenbaum number, self-organised criticality. The temporal characteristics of SAM can be described as symbolic in its capacity to act like a symbol, which always suggests 'something else' (by reason of relationship, association, convention or accidental resemblance), and thus to excite entirely new meanings.

The word *globalisation*, carries evidence of both spatial and temporal characteristics. The spatial-iconic character can be that of a world united in an implied context of peace, balance, equity and persistence. It is a concept of globalisation much written about in religious texts (which interestingly enough describe the ultimate global conditions in the same way, but differ markedly in how it will be achieved and who will bring it about). The recent temporal characteristic of the world has attracted strong negative connotations and has become a synonym for a hateful term of economic dominance and hegemony.

EMERGENCE OF NEW MEANINGS

New meanings correspond to new strange attractors brought to life in the mental space of an individual (a group or society). According to chaos theory, *the spontaneous creation of an attractor happens if systems parameters pass beyond certain critical values*. It is at such a point that the attractor loses its dynamic stability.

Two (or more) strange attractors can simultaneously lose their stabilities and merge to form a new attractor (a phenomenon known as an attractor-merging crisis) or one strange attractor can be suddenly destroyed (a phenomenon called boundary crisis) or it can dramatically decrease/increase its size (folding/expanding interior crisis) or it can split into two or more attractors (attractor-splitting crisis).

Similar crisis phenomena occur with SAM. The role of systems parameters, in other words, of systems characteristics whose dynamics can be put under control, is played by the activities consciously undertaken by individuals in order to increase the depth of their understanding of social complexity.

Examples of activities aimed at deepening the levels of understanding can be any form of learning, of strengthening individual awareness, of honing the intelligence, of energising individual ability for direct intuitive knowledge. When certain critical levels of development of these kinds of understanding-oriented human activities are achieved, they play the role of critical values, that is, they can make SAM suddenly lose their stability – shrinking, expanding, destroying, splitting or merging with other attractors of meaning that are also 'pulsating' in mental space.

It is always a kind of magic when an articulated or written word spontaneously 'explodes' with meaning, if the language-state of the listeners (or readers) has entered the critical level of its understanding-oriented preparedness to make such 'explosion' happen. And there are also many examples when no meaning-explosion happens, when the individual levels of understanding are far below the critical ones.

From experience we know that one and the same sign (text, formula, piece of music, dance, ritual) can be meaningless for some and full of meaning for others. And even for one and the same person, signs perceived initially as meaningless can become meaningful later. The process of learning and any experienced-based growth of the individual's knowledge, awareness and wisdom provide conditions for such kinds of transformations.

Martin Luther King's celebrated 'I have a dream...' speech illustrates how the word, 'dream', can explode in meaning, undergoing the varietal forms of attractor crisis to emerge as a Strange Attractor of Meaning (SAM).

LEARNING: INSTABILITY AND FUZZINESS

Learning crucially depends on the potential of SAMs to lose their stability and undergo crises, resulting in emergence of new meanings or destruction of the old ones. Such are the *attractor-merging* crisis, the *attractor-splitting* crisis and the *boundary crisis*. The first two types result directly in the emergence of new SAM; the third type brings the energy liberated through the destruction of an attractor back to mental space and thus increases the capacity of mental space to 'produce' a new SAM.

Meanings that tend to preserve their stability become dogmas, and dogmas impede the emergence of new SAM. In the light of chaos theory, the formation of a dogmatic meaning can be explained through the expanded form of the interior crisis – when some meaning attractor expands to a such degree in the mental space (of an individual or group) that there is simply no place for emergence of a new SAM. The prejudices of people, their rigid stereotypes and standards in thinking, their doctrines and ideologies, plus all kinds of mental, emotional and spiritual patterns, deliberately implanted through intensive propaganda, social brainwashing and other (direct or subtle, rough or gentle, simple or sophisticated) methods of mind control, act as powerful catalysts for an expanding interior crisis to burst. Once this happens, it is hard (if not impossible) to stimulate the emergence of a new SAM.

The folded form of the interior crisis is also non-productive: this type of crisis results in a gradual loss of meaning – the attractor shrinks in time and disappears without being able to stimulate emergence of a new SAM.

As we have seen, the instability of SAM is of a vital condition for emergence (discovery, creation) of new meanings. This instability directly reflects in the fuzziness of any meaningful statement related to social complexity (Dimitrov 2000).

The famous principle of incompatibility of Zadeh (1973), the founder of fuzzy logic, says: "As the complexity increases, our ability to make precise and significant statements about it diminishes until a threshold is reached beyond which precision and significance (or relevance) become almost mutually exclusive characteristics."

In other words, as complexity increases, precision and meaningfulness become incompatible. While precision thrives on stable (fixed) meanings, fuzzy meanings are unstable. They can simultaneously relate to several attractors and express specific types of meaning-generating crises. Instability of the fuzzy meanings makes them flexible for interpretation and open for evolution and transformation, and these are precious qualities necessary for understanding social complexity.

Power groups and factions seek to have one meaning gain predominance over another. Continuing with the example of 'globalisation', at the protests against the World Trade Organisation in Seattle in 2000, the venom and hate displayed by the protestors and demonstrators, in fuzzy meaning-making, was in itself as oppressive and dictatorial as the actions of those they sought to revile.

SYMMETRY BREAKING AND TRANSDUCTION

Although Strange Attractors of Meaning are able to provide energy and information for actions, the transition from the human mental space, where SAM abide, to the physical world, where human actions take place, is not easy. It often requires a great amount of effort.

We can understand the importance of a certain kind of knowledge, say, for our physical health, and yet we can be unable to act according to this knowledge. In mental space, SAM can function in perfect harmony, that is, at the edge of chaos where the potential for creating new meanings reaches its maximum. We can happily perceive the meanings of our brilliant plans and dreams and scenarios, but the moment we start to move towards their realisation, the symmetry in the pulsation of SAM suddenly breaks.

Spontaneous symmetry-breaking in physics is often illustrated by a simple example from elementary classical mechanics – the example of a ball on the top of the 'Mexican Hat'. The initial state of the system is clearly symmetric under rotations about the vertical axis, and there is no predetermined direction for the ball to move, because gravity acts only in the vertical direction. Yet, the initial state is 'perfectly unstable', and the ball will eventually move (fall) in one direction or another. And as it loses energy through friction, it will eventually come to rest somewhere in the rim of the Mexican hat. Its final situation there is 'perfectly stable', but no longer has rotational symmetry. The physicists say that the rotational symmetry in the underlying forces is 'broken' by what actually happens. The actual position in the rim is purely random, and cannot be predicted by the theory. The actual outcome has no deep significance, yet it influences what happens from then on, for all time.

Symmetry breaking occurs every time the 'virtual' becomes 'real'. The energy, which propels the attractors of meaning in the virtual reality of our thoughts and feelings, needs to be transduced into energy that propels the attractor of actions.

How does the process of transduction work? What are the conditions that stimulate it and what are the conditions that impede its realisation? How can these fuzzy meanings *be transformed into concrete actions*? The answers to these questions will be the focus of a future paper devoted to social complexity.

CONCLUSION

A large generalisation is now made from cognitive understanding of meaning-making, which was the subject of the paper. The proposition is that in order to understand and work with systems, a degree of cognitive sophistication is necessary. Should such sophistication be absent in an individual or a group, it is most likely that they will deal with systems concepts more at a structural and physical level, and thus neglect the creative dynamic and propositional potential they offer. Following this line of argument, one can ascribe a degree of power in systems thinking not to the paradigm but more to the conceptual ability of the practitioner who is capable of dealing with the Strange Attractor of Meaning (SAM).

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