Master`s thesis

The enactive self state model: a proposed analytic tool for traumatic experience

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Karakter: 12 - A

Résumé:

The thesis is a theoretical thesis that has the aim of helping to enlighten the complexity of traumatic experience and how this is of the dynamics of posttraumatic stress and dissociation that may follow such experience. This will be approached by building a model, the enactive self state model, which can be used as an analytical tool for traumatic experience. The theoretical approach is one of scientific holism, and the central theories are the meta-theoretical framework of complexity theory, and a theory from cognitive science called the enactive approach. Besides these theories inspiration is found in Janetian trauma theory and relational psychoanalysis. The use of the model combined with results from basic research will show that posttraumatic stress and dissociative conditions may be proposed to be maintained enactive approach´s notion of embodied intentional action in the world.

Contents

1. Introduction

When Isaac Newton made his great discoveries in the 17th century science took a giant step (Wudka, 2006). The system of mathematics he developed allowed him to describe the laws of the planetary movement around the sun (Strogatz, 1994). Developing these insights Newton became a founding figure of a very widespread method and approach to science, the still ruling paradigm of reductionism (Gleick, 1987). When following the reductionist approach to science, scientists break things apart and look at them one at a time, promoting detailed studies of limited domains in individual sub-disciplines of science (Coveney, 2003). This trend is enhanced by the explosion in knowledge and articles that have made the individual sub-disciplines demand more specialization (Zachariae, 1998). A limitation of reductionism is that it does not have an approach to causal interrelations in large collections of components. In reductionism patterns of such large collections have traditionally been considered as random, noisy, and not showing any kind of meaning (Guastello & Liebowitch, 2009).

The following theses is a theoretical thesis with the aim of putting a new perspective on the dynamics of traumatic experience and how these are maintained by studying relations of the whole rather than trying to isolate parts. This is a quest of capturing essential parts of the complexity of traumatic and posttraumatic dynamic phenomena. The project of the thesis is to build a model of experience that can be used to analyze the specific context of traumatic experience. I am well aware that such a construct will always be a simplification of reality, but hopefully it will make analyzing and approaching the complexity of traumatic experience more clear. I will apply the model and combine it with research compatible with the approach of the thesis to find a common starting point of posttraumatic stress and dissociation in the central notion of embodied intentional action. The project is expressed in the following problem formulation:

Utilizing a non-linear dynamical systems (complexity) theory perspective to inform our understanding of the development of posttraumatic stress and dissociative conditions: Emergence and self-organization, enaction and embodiment.

Besides complexity theory just as central a foundation for my analysis of these conditions will be a theory emerging from cognitive science called the enactive approach (Thompson, 2007). Applying these specific theories to this area is treading new ground, as they have not been used in this way before. The enactive approach has not been applied to the study of psychopathology, except to a very minimal extent (Di Paolo & Thompson, in press; Fuchs & Schlimme, 2009; Koch & Fischman, 2012; Slaby, Paskaleva & Stephan, 2013), and complexity theory to my knowledge after

extensive searches on diverse search databases, and a generally good network of complexity scientists, though having been applied to some clinical research (e.g. Schiepek & Perlitz, 2008), has not been used in a significant extent in trauma research. To support these two non-clinical theories I have found inspiration in the relatively old theories of hysteria by Freud and Janet (Janet, 1901; Breuer & Freud, 1893). These theories have aspects that fit well with the approach taken here. A point on which the thesis is a little untraditional is the empirical research on which it draws its evidence, as this comes mainly from cognitive neuroscience, emotions research and other basic psychological research. I was originally motivated by clinicians expressing that there is too wide a gap between basic psychological research and clinical psychology (Fog & Hem, 2009), and in the process found that basic research just fit the thesis.

The general method and analytical approach of the thesis is one of neurophenomenology, an offshoot of the enactive approach. The main point of neurophenomenology is to put neuroscience and the disciplined approach to experience of continental European phenomenology (the tradition founded by Husserl) in an illuminating relation by using in the framework of nonlinear dynamical systems theory, or complexity theory as I will refer to it in this thesis (Varela, 1996; Thompson, 2007). This means that the language of dynamics is central in both neurological models and descriptions of phenomenology, which hopefully makes it a coherent and understandable narrative.

2. Complexity theory

Complexity theory is an ideal framework for the goal of the thesis to apply a view on systems as a whole and considering relations between components, rather than to try and isolate them. The science of complexity proposes an approach to this by presenting a multi-level view of the world (El-Hani & Pereira, 2000). In this section I will give a sufficiently comprehension of complexity theory to understand the way in which I apply it to posttraumatic conditions later. To validate its use I consider also the philosophical underpinnings of the theory and how it is actually meaningful to talk of multiple levels.

2.1 Reductionism and scientific holism

As I mentioned in the introduction, the discoveries of Newton meant great progress for science, but it also led to the development of a somewhat narrow focus on reduction that has infiltrated science up until today. This is what we call reductionism, which is neither a positively or negatively charged word in its original scientific context. Behind reductionism lies the belief that every scientific law can be reduced to simpler scientific laws, i.e., that all phenomena in the universe are reducible to the laws of physics (Holland, 1998). In psychology for instance, this is expressed in quite widespread theories that make implications about there being no principles that can be understood except through the study of the human brain, which in turn must be understood on the basis of physics and chemistry (Abbott, 2009).

Since the 1960s a scientific approach questioning reductionism has been emerging. This is such a radically new view that it has been called a revolution or even a complete paradigm shift (Goener, 1995; Gleick, 1987; Guastello & Liebovitch, 2009). This new paradigm, as I will chose to call it, on the basis that it presents a radically new approach to a wide range of problems, and asks entirely new questions (Kuhn, 1962), is the science of complexity (Johnson, 2007). This is a scientific holistic approach. Different level dynamics of complex systems are seen as levels of descriptions that are non-reducible, objective and thus needed to do complete scientific research (Abbott, 2009).

The problem being pointed out in the complexity paradigm is not so much that reductionist methodology is being used. Reductionist methodology, it is acknowledged, is quite useful and informative in its own way (Churchland & Churchland, 1995; Schuster, 2007). What complexity theorists are saying is that a problem occurs when reductionist science is regarded as the end all, be all (Barabási, 2012). If you always reduce away levels in science a blind spot will be created, causing real ontological phenomena to disappear from our scientific view (Abbott, 2009). Important

for this thesis and the understanding of posttraumatic stress and dissociative conditions, certain phenomena can simply only be discovered when the research is done on whole organisms or populations of organisms (Schuster, 2007). This is a quite different realization than the Newtonian mechanical systems view upon which reductionism is build. This says that the function of the whole can be understood by understanding the function of each of the parts (Guastello & Liebovitch, 2009; Goener, 1999). Interestingly complexity theory shows that we may not need a completely full understanding of the constituent objects in order to understand what collections of them might do (El-Hani & Pihlström, 2002; Johnson, 2007).

Importantly, the macro-scale laws of the higher levels of complexity are not contradicted by the micro-scale findings and laws of reductionism, or vice versa. Reductionism and scientific holism when both viewed the right way are actually very complementary (Churchland & Churchland, 1995; Holland, 1998). If sight is lost of this however, it is easy to end at the extreme opposite to reductionism, of describing higher level phenomena as only holistic, with no connection to anything more basic (Holland, 1998; Lewontin, 1992).

A pervasive part of the reductionist paradigm is the hierarchical reduction of theory, epistemological reductionism (Karlsson & Kamppinen, 1995; Schuster, 2007). This view is that the scientific theory that deals with the smallest components to which we can possibly reduce is at the top of the scientific hierarchy. At the current time this puts physics on top (ibid.). In effect this means, that chemistry is based on physics, biology is based on chemistry, psychology is based on biology, sociology is based on psychology, and the social sciences: political science and economy, and anthropology is based on sociology (ibid.). An unfortunate side effect to this theoretical reductionism has been the prejudice that psychology and the social sciences are secondary to the natural sciences (Karlsson & Kamppinen, 1995).

Through history the reductionist foundation and the tendency of this to infiltrate and dominate scientific research has also been questioned by some psychological theories[1]. The main concern in such theories has been the individualism that emerges as a result of reductionism. The message has been one of moving the focus on to relations instead of individual components. Of important theories one could mention social constructionism (Gergen & Gergen, 2004; Burr, 2003), relational psychoanalytic theories (Bromberg, 2009), and before everyone else; gestalt psychology (Tschacher & Haken, 2007), the Russian activity theory of e.g. Vygotsky and Leontiev (Kozulin 1986,

[1] Sociological and other social science theories too have done this.

Leontiev, 1978), and American pragmatism, represented by the likes of people like John Dewey, William James and George Herbert Mead (El-Hani & Pihlström, 2002; Mead, 1934).

Complexity theory as a meta-theory has the possibility of bringing the insights of such psychological theories to a harmonious coupling with the natural sciences. Here scientific disciplines can really contribute to each other. Indeed researchers within the complexity paradigm actively promote interdisciplinary mutual enlightenment and cooperation (Coveney, 2003; Johnson, 2007).

The approach I take as a psychologist in this thesis, besides being inspired by the above mentioned relational theories, is inspired by a certain relational view of human beings emerging from cognitive science, called the enactive approach (Thompson, 2007).

2.2 Non-linear dynamical systems

The reductionist methodology has been an efficient foundation for human progress, especially progress of and through manmade constructions. However, troubles with this method have emerged when undertaking the purpose of understanding natural phenomena (Gleick 1987). The central difference between manmade and natural phenomena is the linearity of most manmade constructions vs. the non-linearity of most natural phenomena (ibid.). This non-linearity is the central area of research in complexity science (Johnson, 2007). Nonlinearity has often been hyped as something exotic and newly discovered. It has been known for centuries however. The tools historically, just were not there to understand it, or rather to study it properly (Poincaré, 1914). Newtonian physics are simply blind to it and using it as your scientific method renders the non-linearity one finds to be written off as some random event (Gleick, 1987; Poincaré, 1914).

The paradigm of reductionism is a continuation of Euclidian geometry. The objects of this now classical geometry are lines and planes, circles and spheres, triangles and cones. This system of geometry has been of astounding usefulness in the creation of all kinds of manmade constructions, and even artists have found an ideal beauty in them. For understanding complexity however, it turns out to be the wrong kind of abstraction; as one pioneer of complexity science, Benoit Mandelbrot, has put it: “Clouds are not spheres, mountains are not cones. Lightning does not travel in a straight line” (ibid.). Linear science and reductionism traces back to founding figures of modern science Newton and Leibniz, and their discovery of infinitesimal relationships in mathematics. This is the discipline we now know as calculus. This was an extremely important mathematical discovery (Gleick, 1986). Calculus allowed Newton to make mathematical descriptions of the laws of the movements of planetary motion around the sun (Strogatz, 1994).

In infinitesimal analysis you reduce phenomena down to infinitely small linear pieces, which are variables related to each other, some being functions of others. Given that we are talking about a continuous dynamical system, or in other words, if the passage of time is considered to be continuous (like the sweeping second hand of a clock), we talk about the system being a differentiable one. Such a system has variables changing in a smooth and continuous way. The change of the states of the system takes the mathematical form of differential equations (Strogatz 1994; Thompson, 2007). Further, given that we are talking about a linear system, that is to say that the input is proportional to the output, you can know all the future states of the system from the starting values of the variables (initial conditions), without having to recalculate for every state. In calculus this is what is called integral calculus, where you integrate a differential equation (Strogatz, 1994). Differential equations like natural phenomena however, are almost always not this simple, most of them contain nonlinear terms, and have no such solution (Thompson, 2007). This is essentially why nonlinear systems are so much harder to analyze than linear ones. Linear systems can be broken down into parts, to then be solved and recombined for an answer. The system is, so to speak, precisely equal to the sum of its parts. Nonlinear systems contain components that are interfering, cooperating or competing, creating nonlinear interactions or dynamics, which makes the linear method unusable (Strogatz, 1994).

This means that another approach is needed to make predictions about the system and to this aid complexity theory has been a most helpful addition to science. As it will become clear later, although the roots of complexity theory are mathematical, it is not necessary to reperform derivations, solve differential equations, or anything of such a nature, to apply it to science (Guastello & Liebovitch, 2009). There are many pictorial and graphic representations of the concepts making the understanding clear, and conceptual definitions in themselves are a major contribution to understanding.

2.3 Emergence or supervenience?

Complexity theory applies the concept of emergence as a central theoretical and analytical tool. In this sense complexity theory has revived an old discussion of reductionism versus emergentism (Emmeche, Køppe & Stjernfelt, 1997, 2000). In spite of the fast growing scientific base of complexity science though, systematic accounts of the philosophical underpinnings that actually validate the anti-reductionist concept of emergence are rarely found (Witherington, 2011). The following will give such a clarification. This will center on the concepts of *supervenience* and *emergence* which have been central parts of the discussion (El-Hani & Pereira, 2000).

2.3.1 Supervenience

Supervenience theory entails the notion that higher level properties are wholly dependent on lower level properties. For any object there is a supervenience-base consisting of the constituent component relations, all other levels one may conceive are dependent, or supervene, on this base (Bickhart & Campbell, 2000). Notions of causality are reduced to micro-level local dynamics, and thus support the reductionist research methodology of reducing down to individual components (ideally to particles effecting particles) (ibid.). In this view higher levels as they are not attributed any causal effect, are considered mere epiphenomena (Bickhard & Campbell, 2000; Kim, 2000). An integral part of reductionism is the central claim of supervenience that: *if some set of* A-*properties reduces to a set of* B-*properties, there cannot be an* A-*difference without a* B-*difference*. Jaegwon Kim has reviewed the history of the concept, and found two broad categories: *strong supervenience* and *weak supervenience* (Kim, 1984, 1987). The difference is one of philosophical description that makes no real difference in the argument against emergence (Bickhard & Campbell, 2000). The weak concept of supervenience does not adequately account for the principles that it is used to describe, which should apply not only to the world we know, but to any conceivable world, and it does not (Kim, 1987). To mend this shortage of weak supevenience Kim (1984) points to strong supervenience, which is defined by Brian McLaughlin (Kim, 1987):

> [A supervenes on B if] For any worlds w_j and w_k, and for any objects x and y, if x has in w_j the same B-properties that y has in w_k, then x has in w_j the same A-properties that y has in w_k (Kim, 1987 p. 317).

Thus the problem of between world indisceribility is solved and may be put: A *strongly supervenes* on B just in case *cross-world indiscernibility in B entails cross-world indiscernibility in A*.

Theories of supervenience take a physicalist/materialist stance, i.e., there are no concrete existents or substances in the world other than material particles and their aggregates (El-Hani & Pereira, 2000). On this point there is complete agreement between complexity theory and supervenience theory. Both theories are what is called *constitutive reductionism*, i.e., in a purely material sense the higher levels can be reduced to the material sum of the lower level (Emmeche, Køppe & Stjernfelt, 2000). If constitutive reductionism is correct, Kim claims, then supervenience is the only liable explanation of levels. If supervenience does not explain the relation between levels, he says, one would have to invoke nonphysical causal agents to explain the higher level phenomena (El-Hani & Pereira, 2000).

The conflict is about causality. For higher level emergent phenomena to be valid central analytical concepts they must have some causal properties, either so-called *downward causation*[2] or same level causation. If they do not, they are mere reducible epiphenomena (Kim, 2000).

Jeagwon Kim (2000) argues that higher levels always supervene on lower levels, and that same level causation at the supervenience base is behind all changes in the system regardless of level. Firstly, *upward causation*[3] must always entail same level causation as such:

> Suppose that a property M at a certain level L causes another property M^+, at another level L+1. Assume that M^+ emerges, or results, from a property, P, at level L… In this picture there appear to be two competing answers [to what causes M^+]: First, M^+ is there because, as initially assumed, M caused it; second, M^+ is there because its lower-level base P has been realized.. I believe that the only description of the situation that respects M´s causal claim is this: M caused M^+ by causing its base condition P… This shows that upward causation entails same level causation; that is, upward causation is possible only if same level causation is possible (Kim, 2000, p. 309).

This means that upward causality is always instantiated by a preceding basic supervenience level state or property. What does this mean for the notion of downward causation? Kim continues to argue how downward causality will always collapse into a physical reduction:

> In my view, the difficulties essentially boil down to the following single argument. If an emergent, M, emerges from basal conditions C, why can´t C displace M as a cause of any putative effect of M (Kim, 2000 p. 318)?

This argument says that in cases of downward causation, an emergent phenomenon causes some lower level property change. But since this emergent phenomenon itself has a lower level cause, that lower level actually qualifies as the real cause of the lower level change. Further, the relation between lower and higher level is not causal in itself. In a common-sense view one could be tricked into thinking that higher levels are caused by lower levels. In a proper scientific view we see that the higher level consist of the lower level and thus that they exist simultaneously, ergo one cannot be a cause of the other (Emmeche, Køppe & Stjernfelt, 1997). Just as we saw in Kim´s analysis of upward causation that the real causation was same level, the emergent phenomenon cannot be a mediating link between the two lower level properties (Kim, 2000).

2.3.2 Emergence

Emergence can be construed in two ways; 1) in respect to time, 2) in respect to ontology. When we talk about emergence in respect to time, as say in history or evolution, we are simply talking about a

[2] The determination of micro levels by higher levels (more about this in section 2.3.2
[3] Micro level determination of higher level (more about this in 2.3.2)

first occurrence of a phenomenon. When we are talking about the stronger concept of emergence with respect to ontology, as is done for instance in complexity theory, we are referring to something new coming into being with each instance of a level or pattern of lower level constituents (Bickhard & Campbell, 2000).

Behind all concepts of ontological emergence lies the notion of *upward causation*, which entails a causal process leading to the emergence of a higher level entity from a lower level (Kim, 2000). If this is the only notion of causation applied to conceptualizations of emergence however, the emergent phenomena as described above have the status of epiphenomena (Emmeche et al, 2000; Witherington, 2011). The notion of downward causality entails that emergent phenomena do have causal power to effect lower levels. This point separates the concepts of emergent and supervenient phenomena from each other (Bickhard & Campbell, 2000).

As mentioned above, complexity theory (and the enactive approach) shares a constitutive reductionist stance with supervenience theory. This puts certain constraints on the concept of emergence, one of such being a physical closure of causation (i.e. there are no immaterial causal agents) (Witherington, 2011). This means that certain versions of emergentism are just too strong to fit complexity theory. For the separation of these notions of emergence a differentiation of the notions of causality inherent in these different conceptualizations will be useful. The classification can be put into three groups of causality; *strong, medium and weak downward causation* (Emmeche, Køppe & Stjernfelt, 2000).

Strong downward causation appears in contrast to complexity theory in relation with *constitutive ir-reductionism;* i.e., the notion that though being constituted by the lower level components a phenomenon cannot be reduced to these, and thus constitute its own substance. So the emergent phenomenon with strong downward causal powers constitutes an ontological change at its higher level that causes direct change on lower levels. Examples of this are found, besides in religious beliefs, in philosophical and psychological dualist theories that assume the existence of an immaterial soul that inhabits and is able to control the body (ibid.). This notion conflicts with the notion of causal closure of the physical that Kim (2000) uses in his argument against downward causality. It is also in conflict with the inclusivity of levels that says that no higher level can break lower level laws (Emmeche, Køppe & Stjernfelt, 2000).

Medium downward causation is related to constitutive reductionism, and violates no causal closure of the physical. This concept of causality entails the notion that higher levels are factors in the selection, from several possible, of lower level states. Said another way; higher levels puts

constraints on the emergent activity of the lower levels. Though this does not mean breaking any lower level laws, the higher level still has an effect on which higher level emerges out of the lower level. This is not, as in strong downward causality a strictly speaking efficient causation; i.e., this is a causation that happens as a function of efficient causation between lower level components, the material form of individual components, and the form of the whole (ibid.).

Weak downward causation takes the higher level form to be irreducible but does not grant it the constraining properties inferred in the concept of medium downward causation. Instead it holds that there are different patterns which several different configurations of initial conditions will end up in, and like the medium version this is a case of formal causation. Weak downward causation is a organizing principle for the lower level that takes a higher level form.

With these notions of downward causation, the arguments of supervenience theorists like Kim can be met with a valid explanation without any mysticism or breakage with the causal closure of the physical world.

2.3.3 Complexity theory and emergence

Complexity theory is a non-reductive physicalism; i.e. it sees diverse levels of organization as identical in nature but non-reducibly different in complexity (El-Hani & Pereira, 2000). In these non-reducible levels lies a causal effect. This causal effect of higher levels is represented in the notion of medium downward causation, just described (Emmeche et al, 2000).

The concept of emergence in complexity theory implies both upward and downward causality: the parts generate the whole and the whole constrains the parts. This concept of causality in complex systems, this reciprocal cycle between structures and function, is called *circular causality* (Freeman, 1999; Witherington, 2007, 2011).

The concept of emergence in complexity theory is closely tied to the concept of *self-organization*, which denotes a process of spontaneous dynamic interactional processes between components at the microscopic level from which the macro-scale emergent phenomena emerge (Coveney, 2003). This means that there is no central plan of planner driving the process of emergence, it is self-organization. There is no self inside the system doing the organizing, the components of the system cooperate and synchronize, or even compete (Holland, 1998). In that process they create emergent patterns that cover distances in space much larger that individual components interacting (Kelso, 1995). The emergent pattern then captures the individual

components and in the described formal causal manner constrains them this, systemic developing motion is circular causality (ibid.).

For self-organization to occur two properties must be present in the system; it must be *dissipative* and it must be nonlinear (Coveney, 2003). Nonlinearity, described in section 2.2, is an inevitable consequence of a system being far from equilibrium, and is also a necessary foundation for self-organization (ibid.). In complex systems nonlinearity is the result of positive and negative feedback loops between multiple components within the system and across the system environment coupling (Thompson, 2007), i.e., loops between components either inhibiting or enabling each other (Freeman, 2000; Rickles, Hawe & Shiel, 2007).

A dissipative system is an open system, which thus makes it susceptible to the environment, which is to say it exchanges energy and matter with its environment; it dissipates energy (Kelso, 1995). Such open systems are everywhere; in fact, the only truly closed system is the universe as a whole. This makes theories of self-organization in complex systems hugely relevant, especially when considering that most fundamental theories in physics where build to apply to closed systems (Johnson, 2007).

The second law of thermodynamics is one such law that applies only to closed near equilibrium systems, it says that over time, the disorderly amount of energy, entropy, inexorably increases, and the orderly, usable arrangement of energy decreases; i.e., a system will end in equilibrium and thus get full entropy with time (Juarrero 1999). Thus the direction of increasing entropy in closed systems makes spontaneous generation of order, self-organization, highly improbable, self-organization requires external driving forces, i.e., it must be an open dissipative system (Tschacher & Haken, 2007). This in fact is a reason why the system must be open and dissipative, if a system is in thermodynamic equilibrium, as for instance an ice crystal, it will be as rigid and dead as anything can be (Kelso, 1995).

The more or less stable conditions in the environment that affects the open complex system and in some more or less strong way determine the systems behavior is a *control parameter* (Tschacher & Haken, 2007). In the physical and social and psychological systems interesting to this thesis the control parameters are naturally occurring environmental variations or even specific manipulations that move the system through different patterned states (Kelso, 2000). Control parameters can effectively be conceptualized as *gradients* that the system works with and breaks down (Tschacher & Haken, 2007). Mathematically speaking a control parameter, in essence, would be an independent variable or driving parameter (Guastello & Liebowitz, 2009). Control parameters need

not always be found be found in the external environments of the system, they can be found in the internal environment too. What typically defines control parameters is just that they are independent of the emergent patterns (Kelso, 1995).

For both mathematical analysis, and description at a more qualitative level, the higher level pattern that emerges out of the nonlinear dynamics between constituent components that puts constraints on or selects which future lower level is realized can be called an *order parameter* (Kelso, 1995). An order parameter is certain functional variable, also called *collective variable,* it gets its value from collective relations between components, not individual components (ibid.). Mathematically speaking, in essence this is a dependent variable in the function of the system (Guastello & Liebowitz, 2009). In its own way, with the circular causal effect of form, you could say that the order parameter is also a control parameter (Kelso, 1995). With the concepts of order parameter, control parameter, and gradients, a functional system for analysis of different systems is in place that can be applied to different real world phenomena in, among other fields, psychology (Tschacher & Haken, 2007).

In the area of psychology and human development there is a group that applies their own alternative view on complex systems and levels utilizing a weak version of emergence (Witherington, 2007). This group is represented by the school of Esther Thelen and Linda B. Smith. They have a special contextual here and now approach to dynamics (Smith, 2005, 2006; Thelen & Smith, 2003). What make the group somewhat different are their radical context dependent conceptualizations. Because dynamics have been overlooked through the history of psychology Thelen and colleagues emphasizes the importance of these by seeing them and describing every process as real-time. This emphasis means describing phenomena by only using verbs, eschewing nouns (Smith, 1995). This approach has particular difficulty with constants and categories (e.g. the concept of concepts). Holding to the claim that as every experience is a new one and that every sense impression is unique in time, such constants are of no ontological reality or theoretical use (ibid.). This means that different levels are flattened out, and the whole is seen as no more that its parts. Smith makes it clear that:

> The global orders are made in real time in the collective action of individual molecules, and these global orders have no permanent reality outside their real-time occurrence… The system is nonlinear; all the patterns result from the same system; the global patterns are products of the local processes, not the cause of them.. (Smith, 1995 p. 56).

Essentially we are talking about emergence in time of global patterns but these are in effect epiphenomenal driven from the bottom up in an upward causation (Witherington, 2007).

Critics of this approach coming from the multilevel view of complexity theory viewing emergent phenomena as order parameters with causal effect have emphasized integrating the contextual here and now approach with a more organismic view (van Geert & Steenbeek, 2005; Witherington, 2007). The main concern is that insistence on a real-time focus, the flattening out of levels, and the implications of the notion that no two states are alike and all bottom up driven ignores all structural time bound constraints. They maintain that the multilevel system described above of order parameters and control parameters is necessary (Witherington, 2007, 2011)

This dispute needs not be of any inconvenience for this thesis, though I and the theory I adhere to, the enactive approach, uses the whole framework of order parameters and control parameters etc (Thompson, 2007). The enactive approach in its focus on living organisms elaborates on this framework in terms of *dynamic co-emergence*, signifying that part and whole co-emerge and mutually specify each other (ibid.), i.e., these are *autonomous* systems, or more specifically biochemical *autopoietic* systems, which autonomously create and maintain their own constituent parts (ibid.). This means that though the same principles apply, there are some differences from just an open dissipative complex system and an autonomous open dissipative complex system. A physic-chemical dissipative system needs not be autonomous, and it is never an autopoietic system (ibid.). This will elaborated in 5.1.

2.4 Examples of self-organizing complex systems

One of the simplest ways of demonstrating self-organized emergent phenomena in a complex system is a Bénard system (fig. 1). This is the standard and most studies example of self-organized non-linear emergent phenomena (Tschacher & Haken, 2007). The system consists of a layer of fluid in a container which is heated from below. This makes the fluid dissipate (steam), as it absorbs energy from the heating below. At a certain point the difference between the temperature at the top of the fluid and the fluid at the bottom will exceed a certain threshold, and what is called *dynamic instability* occurs, i.e., because the cooler liquid at the top is more dense it will tend to fall, whereas the warmer liquid at the bottom that is less dense tends to rise. Thus the liquid begins to move as a coordinated whole, creating what is called *convection rolls* (Kelso, 1995). This is an open system that is activated by the application of the heat from below. This heat at the bottom, or actually, the temperature difference between top and bottom it creates, is the *gradient* that drives the system; this is a *control parameter* (Kelso, 1995; Tschacher & Haken, 2007). The amplitude of the convection rolls is a *collective variable,* or in dynamics systems jargon, an order parameter. The order parameter constrains the parts of the liquid which no longer behave independently, but is sucked

into an ordered coordinated pattern (Kelso, 1995). As the temperature gradient is increased and as different instabilities is reached more and more complex patterns will emerge, and eventually the behavior will become irregular and turbulent (ibid.).

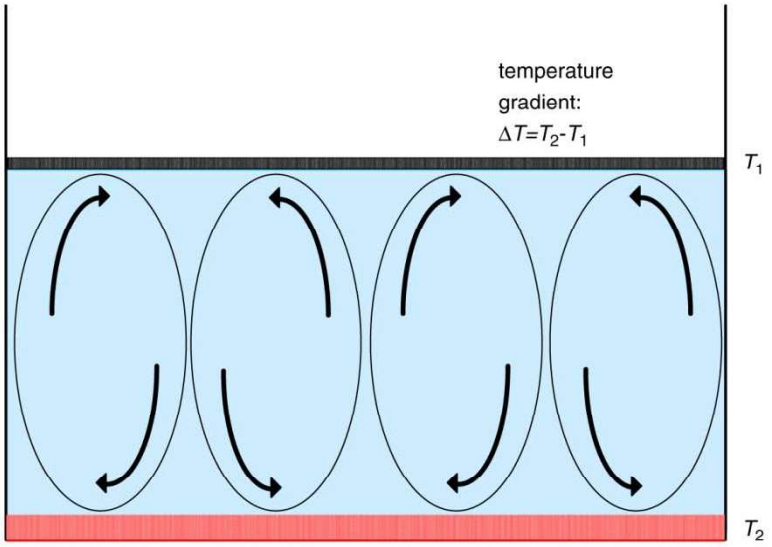


Fig. 1. Schema of the Bénard system. A layer of fluid is heated with temperature T_2 from below. The temperature at the upper surface of the fluid is T_1. Arrows symbolize the convection patterns that emerge beyond a critical value of $\Delta T = T_2 - T_1$. *From:W. Tschacher, H. Haken / New Ideas in Psychology 25 (2007)*

Another classic study, and a standard example, of a self-organizing complex system was a study on coordination dynamics using rhythmic finger movement (Haken, Kelso, and Bunz 1985). Participants in the study were asked to move the two index fingers at the same frequency from side to side. Two patterns turn out to be comfortable at low speeds: either the fingers move in-phase or anti-phase. When the speed of the finger movements is increased, the coordinated in-phase pattern of equivalent muscle groups in each hand contracting simultaneously becomes unstable. Eventually at a certain critical frequency the fingers spontaneously switch to a pattern of anti-phase, i.e., equivalent muscle groups alternate in their contraction and expansion. With decreasing speed, the in-phase pattern will become stable again, it will do so, however, below the original switching point, a phenomenon known as *hysteresis* (Thompson, 2007).

This can be described in complexity theory terms: the evolving relative phase relation (i.e. the difference between the angles of the two fingers) between the two fingers is an order parameter or collective variable; it has the characteristic that it gets its value by the relation between other variables values, namely those describing the individual finger movements. During in-phase finger movements, the collective variable or order parameter of relative phase is zero, then once the critical transition or what mathematically is called a *bifurcation* (bifurcations will be addressed

later) to anti-phase happens, the relative phase becomes nonzero up to some maximum value. The frequency determines when the transition between phases of finger oscillation occurs, due to this the frequency is a control parameter for the system; i.e. it drives the system, its changing values lead the system through a variety of possible patterns or states.

Mathematically speaking we have the control parameter of finger-movement frequency leading the system through different order parameter patterns of finger coordination. This could be expressed in differential equations and given all the necessary measurements we have a range of finger movements – frequency relations. This range would describe the state space of the system; i.e. the abstract and multidimensional space that represents all possible states of the system by specifying all possible values of the system's variables (Kelso, 1995; Thompson, 2007). The temporal evolution of the system corresponds to its trajectory through this space.

The model predicts the observed switching from one phase to another without positing any internal motor program that directs the switches by issuing symbolic instructions. Instead, the phase transitions occur spontaneously as emergent properties of the system's self-organizing dynamics (Kelso, 1995).

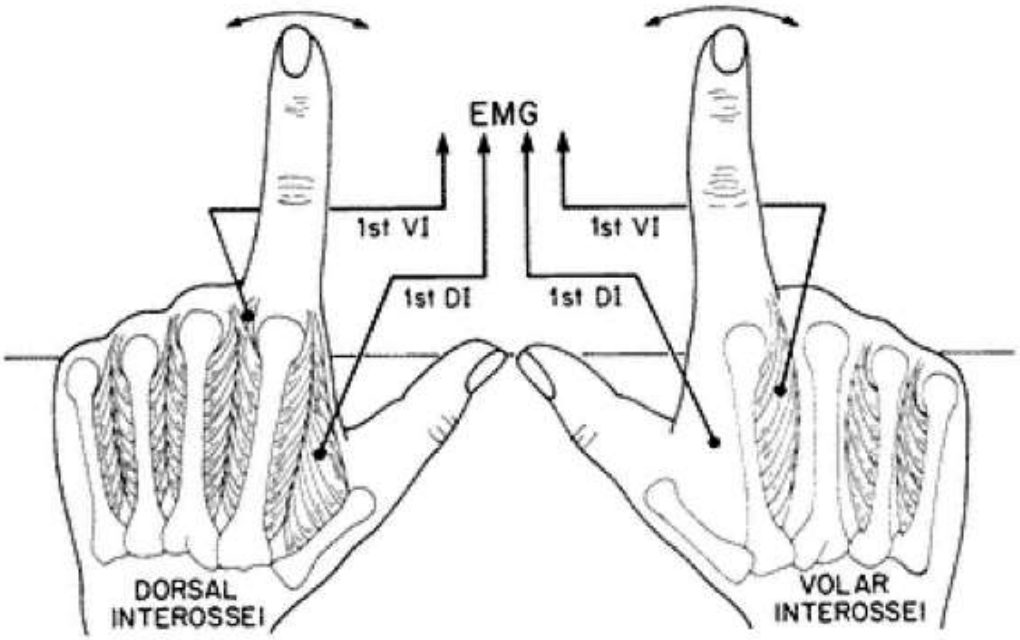


Fig. 2 Subjects move their index fingers rhythmically in the transverse plane with the same frequency for the left and right fingers. The movement is monitored by measuring continuously the position of infrared light-emitting diodes attached to the fingertips. The electromyographic (EMG) activity of the right and left first dorsal interosseus (DI) and the first volar interosseus (VI) muscles are obtained with platinum fine-wire electrodes. ***From: Kelso (1995).***

In different sciences there will be many others systems that will be of much more interest than a benard system or phase shifting in finger movements. These are however good examples to present the conceptual system and the terminology, and as we have even seen no mathematics was actually needed to do so. Complexity theory is slowly beginning to become integrated in psychology, though it is by no means in the mainstream. The prevailing concept of change in psychology research is linear change, which holds that input is proportional to output. As seen through the lens of complexity theory this is a view is undifferentiated, distorted, and non-compatible with the complexity of the real world (Mitchell, 2009). In reality sometimes large inputs produce small outputs, and sometimes even very small inputs, produce dramatic output results (Guastello & Liebovitch, 2009). An over dimensional reliance on the general linear model as a statistic, has furthered this distorted view of change (ibid.). In psychology, complexity theory has been applied to basic disciplines: perception, cognition, and developmental psychology, and to a less extent clinical psychology (Haken, 1992; Hollis, Kloos & van Orden, 2009; Thelen & Smith, 2003; Tschacher & junghan, 2009). Various studies have been done to show the circular causal complex properties of cognitive processes. Using the foundational framework of complexity theory studies have been made of e.g.: perception, reading, listening, and thinking. Specific experimental setups have been developed and nonlinear data analysis techniques such as fractal analysis looking for white, brown and pink noise (measures of interdependency between components) (ibid.), nonlinear statistics, e.g. nonlinear regressions, and many more interesting methods (Bertenthal, 2007). As it has become clear that my limit on pages for this thesis leaves only space for the particular study I am doing, and no room for reviews. Going further into this, though very interesting, lies beyond this thesis as this is indeed material for several theses. The main objective in this one, however, is a particular theoretic enlightenment of the development and treatment of posttraumatic stress and dissociative conditions that has not really been attempted shape before.

2.5 Summary

The Newtonian mechanistic linear viewpoint and the method of reduction face problems with natural phenomena that are nonlinear (Gleick, 1987). Reductionism finds randomness or noise with no apparent connection to prior events when observing emergent nonlinear phenomena (Guastello & Liebowitch, 2009). In contrast complexity theory looks at higher level abstractions or patterns as meaningful and non-reducible ontological entities (Guastello & Liebowitch, 2009). Further, by being aware of causation of form and structural constraints you can argue for the non-reducibility of

higher level emergent phenomena of a multileveled world (Emmeche, Køppe & Stjernfelt, 2000). This awareness has created a meta-theoretical approach for a science of complexity, which can be used as an analytic frame across sciences and disciplines, indeed inter-disciplinary research and enlightenment is a key attribute of complexity theory (Johnson, 2007). Looking at the patterns of complex systems and finding parameters of the system offers new insights; psychology is a branch of science that may benefit from this inter-disciplinary process. This framework of multilevel complex systems is the inspiration behind the model that will be developed in the thesis, which is an initiative to not isolate aspects of posttraumatic conditions and reduce the understanding to these. The next section looks at what is understood by a system being complex.

Fig. 3 The whole is more than the sum of its parts – the whole cannot be predicted by looking at one of the individual constituent parts. ***From: Haken (1992)*****.**

A painting by Arcimboldo

3. The emerging patterns of complex systems

As psychologists we start by finding the control and the order parameters on our chosen level of description. In this study of traumatic experience, coming from complexity theory and the enactive approach, this level is the complex dynamic coupling of brain, body and world (Thompson, 2007). The embodied action in the world and the emerging phenomena of experience can be conceptualized as patterns. Complex systems shift between different emerging stable patterns of movement through state-space. These emerging patterns are different behaviors of complexity. The shifts between them are unstable and chaotic. This makes the behavior of complex systems a movement between stable and unstable behavior. In this section I will give a presentation of central concepts to describe central notions that will be used in the model and later analysis of posttraumatic stress and dissociative conditions.

3.1 Complex, not complicated or chaotic

Theoretical understandings of the behavior of complexity are complicated by the fact that there is no complete consensual and rigorous description of complexity (Johnson, 2007; Mitchell, 2009; Edelman & Tononi, 2000). There are, however, at least two points about complexity upon which every complexity expert agrees: 1) it consists of many parts that interact in heterogeneous ways, i.e. many parts connected together in different ways forming different patterns, 2) complexity is not completely random nor is it completely regular (e.g. an ideal gas (random) or a perfect crystal (ordered)) (ibid.). Complexity is; orderly and disorderly, regular and irregular, variant and invariant, constant and changing, stable and unstable. It displays highly differentiated though highly integrated (they interact heterogeneously) components. Systems that are composed of components that are completely independent (complete disorder) or completely integrated (orderly and homogeneous), have no complexity (ibid.).

An important distinction should be made between two concepts that may be confused with one another; the one between a complex system and a complicated system. It is the relatedness and interactions among system components that make the difference. Complexity happens when the dependencies among components, so to speak, become important (Page, 2007). A complicated system consists of a multitude of elements, making them hard to navigate and understand. In the complicated system the elements always maintains a certain degree of independence from one another. This independence in complicated systems is larger than in a complex system (ibid.). In a complicated system if you remove an element or component (decreasing level of complication) you

do not change the behavior of the system except for that directly attributable to the removed component. In a complex system, however, if you remove a component it changes the systems behavior to a degree reaching far beyond the removed component (ibid.).

A complex system may become chaotic, this happens among other times between changes between stable states. The defining characteristic of chaotic systems is what is called *sensitive dependence on initial conditions* (Mitchell, 2009). This is a system that is so sensitive that even small disturbances to is will cause major changes. Even if we knew all the initial positions and velocities of components of a chaotic system we would never be able to measure them exact enough to make precise long term predictions as *any* error, no matter how small, will make long term predictions vastly inaccurate (ibid.). Though chaos is unpredictable and looks completely random, this is not the case. Chaotic systems have ordered patterns in them; there is "order in chaos". Chaos is behavior that never repeats itself going on in infinity on its path. It has what is called *fractal dimensions*, a phenomenon that has also been called self-similarity. This entails that smaller pieces of the pattern are "copies" of the larger patterns (Gleick, 1987).

3.2 Attractors and repellors, bifurcations and phase shifts

As a complex system develops different emerging patterns or states it is moving through its state-space (i.e., the collection of all possible states that the system can be in, e.g., the state space of an individual's psychological range: varying types of alertness, fatigue, contentment, distress, etc. (Freeman, 2000)). The trajectory the system is on presents a more or less stable pattern; to describe this Freeman (1999) makes the analogy to a person on a bus:

> A person standing on a moving bus and holding on to a railing is stable, but someone walking in the aisle is not. If a person regains his chosen posture after each perturbation, no matter in which direction the displacement occurred, that state is regarded as stable, and it is said to be governed by an attractor. This is a metaphor to say that the system goes ('is attracted to') the state along a transient trajectory. The range of displacement from which recovery can occur defines the basin of attraction, in analogy to a ball rolling to the bottom of a bowl. If a perturbation is so strong that it causes concussion or a broken leg, and the person cannot stand up again, then the system has been placed outside the basin of attraction, and a new state supervenes with its own attractor and basin of attraction (Freeman, 1999, p. 152).

As Freeman notes, the trajectory of the system through its state-space is called an attractor. An attractor has, like a magnet, a certain range in which it draws in objects, and this range is what is known as the *basin of attraction*. The size of the basin is determined by the strength of the attractor,

which is a consequence of characteristics of the individual system (Guastello & Liebovitch, 2009). When a system or its environment is changed (usually to a more complex pattern) the system may switch from one attractor to another. This could be because a control parameter is changed enough for a state of instability to occur and a change in the behavior of the system, a state transition, happens. This change is what mathematically is called a *bifurcation* and in the language of physics a *phase shift/transition* (Kelso, 1995, 2000). Dissipative systems (e.g. people) always contain fluctuations. As system moves through state space it will likely be fluctuating around the attractor, but staying within the basin of the attractor. A phase shift may happen if a perturbation of energy from outside the system feeds the fluctuations and thereby increase their amplitude to the boundary of another basin and bring the system into another attractor (Freeman, 1999). Alternatively the basin may shrink due to some change in the system, and then even a microscopic fluctuation may carry the trajectory into another attractor (ibid.). These notions are well suited with the trauma theory of Janet (1901), which shall be explored later. There are initially three main categories of attractors: *point attractors, limit cycle attractors, and strange attractors.* These and a variety of other transient and irregular behaviors make up the dynamic behavior of complex system (Kelso, 2000)

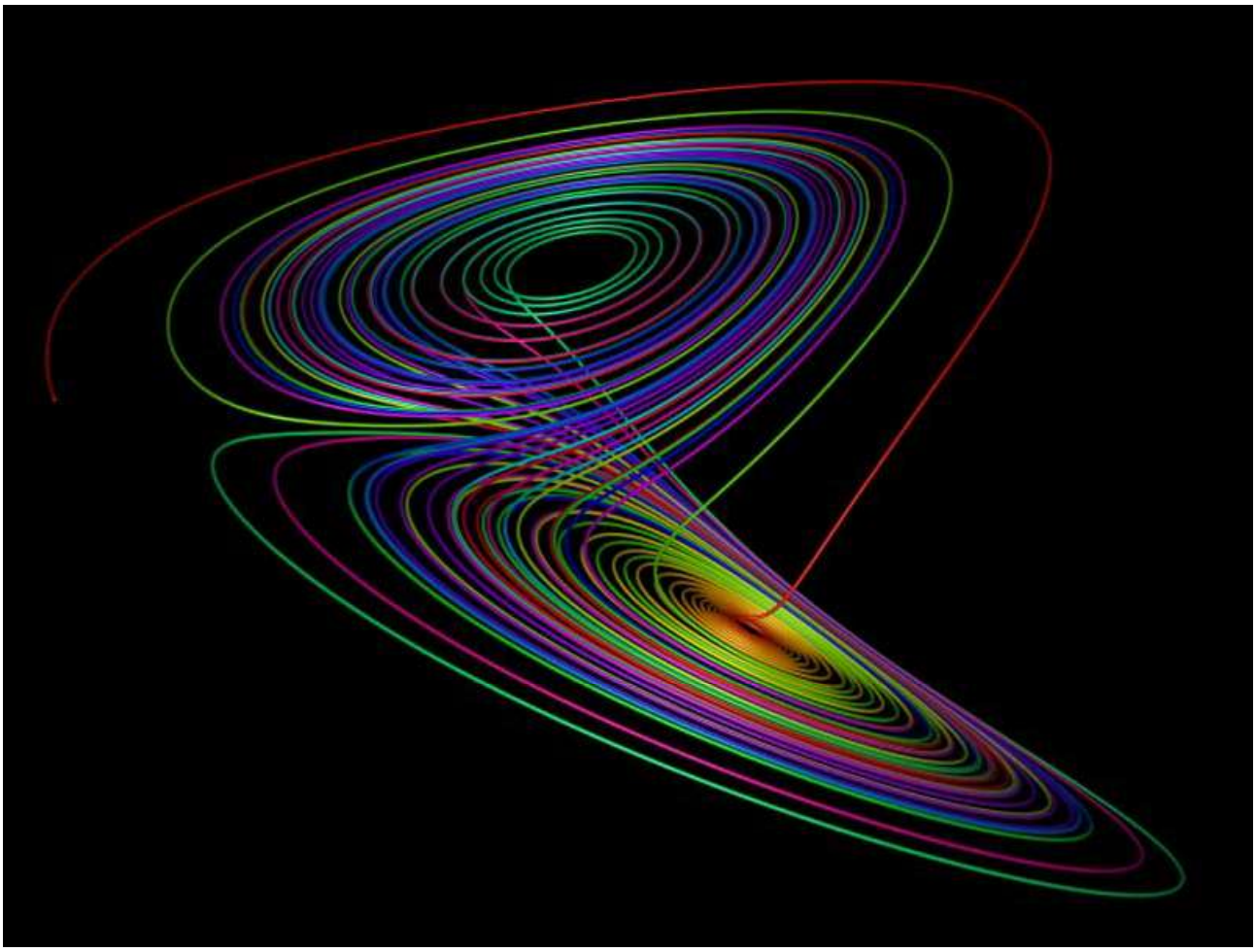
A point attractor will end up in a certain behavior regardless of initial conditions, and once it has reached this behavior it will only change behavior if it is perturbed by some outside force. A limit cycle attractor occasionally changes behavior. It always goes through one circle of behavior which it repeats indefinitely. The strange attractor is more complex, its behavior never repeats itself; it constantly changes, though it may show recognizable patterns through its trajectory, as is the instance with chaos (Freeman, 1999). There is a vast range of complex behaviors in between a completely rigid and ordered point attractor and a chaotic strange attractor (Johnson, 2007). A complex system has a range of different attractors, an attractor landscape, which may exist on different levels, in relation and resonating with each other in circular causal ways (Freeman, 1999). Out of relations between subsystems governed by their individual attractors a global attractor, an order parameter, may emerge, putting constraints on the individual subsystem attractors (ibid.).

Another important concept is the concept of a *repellor*. This is also a part of state space but it has the opposite effect of an attractor. When the behavior of a system gets too close to the repellor space it is deflected away from the epicenter of this (Guastello & Liebovitch, 2009). A *saddle point* is a state that has properties of both attractors and repellors, is attracts system states on the other hand the system does not stay long there before they are deflected in another direction (ibid.).

With the notion of an attractor landscape I will add two more behaviors to the list of these three attractor types, complex multi-stable attractors, and meta-stable behavior, which may not exactly be said to be an attractor, rather attraction without attractors (Kelso, personal communication), but it is an important part of human mind and behavior (Kelso, 2008). These are behaviors of complex systems. Conceptual confusion sometimes occurs about the concepts of a chaotic system and a complex system, a general distinction is that chaotic systems have strange attractors, while complex systems have evolving state, or phase, spaces that have a range of possible attractors (Rickles, Hawe & Shiel, 2007).

Fig. 4 A visual image of chaos. The Lorenz weather model and the Lorenz attractor: Three simple differential equations, x, y, and z make up the system state, t is time, and σ, ρ, β, are the system parameters. When the result of a huge range of iterations of the three equations have been done we find the attractor. The Lorenz attractor is a strance attractor that displays chaos, a chaotic attractor. This can be plotted in a three dimensional coordinate system to visualize the attractor, thus getting a notion of the weather pattern. The image below shows this. In effect this is chaos seen on high level (an enormous amount of iterations are made to get this pattern).

$$\frac{dx}{dt} = \sigma(y - x), \quad \frac{dy}{dt} = x(p - z) - y, \quad \frac{dz}{dt} = xy - \beta z$$



4. The Enactive Approach

To make the connection from the notions of complexity theory to building a useful model to the clinical psychological domain of posttraumatic stress and dissociative disorders, which is the actual aim of the study, I will apply a theory called the enactive approach. This is a theory coming from cognitive science where it has been proposed to be whole new paradigm to interdisciplinary cognitive science (Stewart, 2010). It was introduced in the book *The Embodied Mind* by Varela, Thompson & Rosch (1991). As I point out in the introduction this is a theory that has not been applied to clinical psychology, it does, however, seem ideal for my endeavor of putting an anti-reductionist view on posttraumatic stress and dissociative conditions. The Enactive Approach is itself a theory that builds on complexity theory. It combines quantitative knowledge of dynamics and embodied cognition with more qualitative analyses from continental European phenomenological philosophy (e.g. Husserl, Heidegger & Merleau-Ponty) (Varela, Thompson & Rosh, 1991; Thompson, 2007). The enactive approach will supply the notions of the human mind to enlighten the conditions under study; it will do so by being a theory of the mind as an embodied intentional active process. This gives us a starting point for a new understanding of posttraumatic conditions. In this chapter I will present the relevant notions of this theory. In later sections they will be combined with the inspiration found in relational psychoanalysis and Janetian trauma theory.

4.1 Embodied cognition of autopoietic systems

The central element of the enactive approach, and the foundation on which my analysis of the dynamics of traumatic experience will rest, is the notion that the mind emerges from whole body intentional actions in the world (Thompson, 2007). It has become increasingly scientifically clear that the central nervous system simply cannot be isolated from the peripheral nervous system and the rest of the body (Chiel & Beer, 1997; Gallagher, 2011). The brain is connected to the rest of the body on many immensely complex biochemical levels, e.g. molecular components of the endocrine, immune, and nervous systems (Thompson & Varela, 2001). A brain reductionist and disembodied view of the mind is easily refuted by the fact that the properties of the body interact with and affect brain dynamics (Chiel & Beer, 1997), as for one example:

> Muscle acts as a low pass filter of motor neuronal outputs, that is, it filters out the high frequency components of the neural outputs. Moreover, the tendons connecting muscle to bones create a musculotendon actuator whose filtering properties in response to neural outputs or changes in length are greatly affected by the different degrees of stiffness or compliance of the tendon, as well as by the level of activation of the muscle. In addition, the mechanical

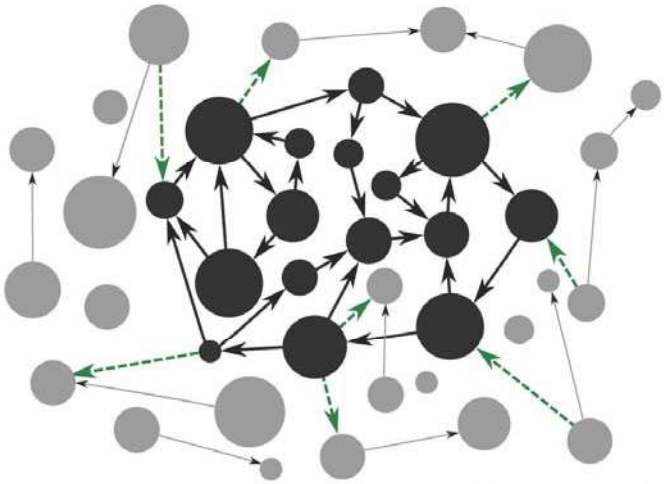
> advantage of a muscle and the response of the whole body to the contraction of any particular muscle are a complex function of the geometric relationships and positions of other muscles and joints, and the prior history of activation of that muscle (Chiel & Beer, 1997, p. 553).

Behavioral studies have demonstrated mind states - body dynamics reciprocal loops. Obviously humans express their thoughts and emotions in bodily behavior. The dynamic feedback of behavior however, is itself part of the self-organizing processes of thought and emotion (Koch, 2011; Smith, 2005). A simple example appears in an experiment in which the effect of facial mimics was measured: one group of participants was assigned to the task of holding a pencil between their lips, and another to holding a pencil between their teeth (Koch, 2011). While doing this they looked at cartoons. The aim was to study the effects of smiling; i.e., the ones with the pencil between their teeth automatically and inevitably smiled, while it was quite simply impossible to smile for the group with the pencil between their lips. The results showed that those who had the pencil between their teeth found the cartoons significantly funnier than the ones that had the pencil between their lips (ibid.). Another study to quickly mention on body feedback is one that did an experiment that showed that participant who sat in a slumped position (spine bowed, head hanging) recalled more negative life-events when asked to generate memories as did a group that sat in an upright position (spine upright, head held high) (ibid.). Studies with far more complex dynamic feedback are also beginning to be explored. One showed that a group that performed implicitly indulgent movements versus a group that did implicitly aggressive fighting movements showed more feelings of relaxation and joy, whereas the fighting movements showed more tense and aggressive participants (ibid.).

Such studies have helped present evidence for the embodiment of the mind. The enactive approach has developed insights to more fundamental implications of embodiment. These will supply central concepts for the analytic model for the understanding of the complexity of traumatic experience and the dynamics of posttraumatic conditions. The enactive approach views humans as embodied dynamic systems that maintain and bring forth their own identity; they are what we call *autonomous* systems (Di Paolo & Thompson, in press). It is not initially about establishing whether mental processes extend beyond one or another boundary, such as the skin, skull, or central nervous system, isolating inside from outside. Rather, the central question is how a system must be organized in order to be an autonomous system (Thompson & Stapleton, 2009). The notion of *autonomy* in the enactive approach was initially a generalization of the concept of *autopoiesis* (Di Paolo & Thompson, in press). Autopoiesis means that the ongoing processes of material and

energetic exchanges with the world, and of internal transformation and metabolizing of living organisms relate to each other in such a way that their organization is constantly regenerated by the activities of the processes themselves (Di Paolo & Thompson, in press). This is essentially a kind of self-organization, but there is the distinction as to for instance a benard system (see: 2.4), that autopoiesis is a process of material self-production generating a self-distinguishing concrete unity, not just a physical pattern (Di paolo, 2005). To qualify as an autopoietic system, the system must dynamically produce its own material boundary (thus making it self-distinct) or membrane, as biological systems do. An autonomous system, however, does not necessarily have to have such a material boundary, e.g. various kinds of autonomous social systems that have social and territorial boundaries instead (ibid.).

The notion of an autonomous system brings insights to the nature of living organisms that cannot be derived from the concept of autopoiesis (Di Paolo, 2005). An autonomous system is defined as an *operationally closed* and *precarious* system (Di Paolo & Thompson, in press). Operationally closed does not mean that the system is closed. We are still talking about open dissipative far from equilibrium systems, indeed they must be to maintain their autopoiesis (and life), which requires exchanging energy and matter with their environment (e.g. humans that eat, drink, sweat, defecate, etc.) (Thompson, 2007). Operational closure is the property that among the enabling conditions for any constituent process in the system one will always find one or more other processes in the system, i.e., there are no processes that are not conditioned by other processes in the network. This does not mean, of course, that conditions external to the system cannot be necessary as well, for such processes to exist (De Jaegher & Di Paolo, 2007). Figure 7, made by Evan Thompson and Ezequiel Di Paolo, illustrate operational closure.



From: Di Paolo & Thompson (in press)

Fig. 5 operational closure

The black circles depict processes of an operationally closed system. An arrow going from one process to another indicates that it enables that other process. Looking at the black circle we can see that they are all enabled by other black circles while themselves enabling other black circles, this is operational closure. The concept of the system being precarious means that without the organization of the system as a network of processes, given equal other physical conditions, the isolated component (in the model black circle) processes would tend to run down or extinguish (ibid.).

For autopoietic systems (e.g. humans), in their autonomic operationally closed maintenance of their identity, lies the very important implication that encounters with the world are intrinsically meaningful. It is a kind of natural teleology. The continuing self-production brings forth meaning in reference to the processes of which the self-production consists (Di Paolo, 2005). Linking autopoiesis with such an inherent organismic meaning is a specific characteristic of living beings, *adaptivity* (ibid.). As we have established, autopoietic systems exist far from equilibrium. They prevent entropy, and death, by being open systems that exchange matter and energy with their environment. In biological terms we can say that they are *robust*, i.e., they can sustain a certain range of perturbations, as well as a certain range of internal structural changes before they lose their autopoiesis (i.e. self-maintenance, and life). The limits of this range are set by the organization and state of the system. Adaptivity is a way in which the system actively monitors perturbations and compensates for their tendencies. Meaning emerges as the system senses how the mutually enabling processes establish the system and what consequences this has for its maintenance. Meaning becomes possible in the dialectics between monitoring and regulation that establishes an inner norm for what is good, bad and neutral ways of realizing autopoiesis (ibid.).

The process of adaptivity is inextricably linked to autonomy, as it emerges from the regulation of the processes of self-production and the continuation of identity. It is a recursive process in the sense that an adaptive process may function on more levels; initially it may have the function of regulating the system if it gets close to the limits of the range of robustness, but on a higher level it can create distinctions that are not directly involved with such direct danger to autopoiesis. Also the adaptive regulating processes may be plastically be rearranged according to their efficiency learned through experience (ibid.).

This means that autonomous adaptive systems are intrinsically sense makers, e.g. humans who by constitution make sense of the world; their behavior is governed by the dynamics towards maintaining their own identity. Humans establish relevance in the constant facing of disintegration (Di Paolo & Thompson, in press), and this relevance on which the person regulates his coupling with the world entails a web of significance that the person casts on his world (De Jaegher & Di Paolo, 2007). The regulation of embodied dynamics is thus an intrinsically meaningful foundation of the complex high level cognition, and the body´s dynamic coupling with the world is behind cognition; i.e., we move before we think.

In practice this means that in enacting the world we do not passively receive information which we then interpret, in our embodied dynamic action we are active participants in bringing forth the world as meaning, i.e., our exchanges with the world are inherently meaningful. Adaptively we regulate our coupling with the world to maintain our self-generated (but still relational) identity, giving us a unique perspective (De Jaegher & Di Paolo, 2007). This concept of *sense making* has a deeper level, but on a phenomenal level is similar to Gibson´s (1979/1986) conceptualization of *affordances*, the world emerges to us as meaning, relational to our movement in it, as relational to what it affords us, as *affordances*.

4.2 Continental phenomenology: intentionality and empathy

In applying phenomenological analyses continental European philosophers has found insights to the human mind that will be important to my study, this is 1) the inherent intentional and active nature of the human mind, and 2) the fundamentally intersubjective nature, and the emphatic development of the human mind. The concept of intentionality is not meant in the common sense usage of the word, i.e. as having some specific purpose. It denotes that consciousness aims at something beyond itself, in other words, that it is always about or points to the world (Depraz, 2001; Thompson, 2007). Further, it is implicit in the notion that intentionality is an active striving towards, or in other words, acting into the world. The inter-subjective openness of the mind becomes obvious when

becoming aware that the world is disclosed, or brought to awareness, as inter-subjectively accessible (ibid.). Husserl and Merleau-Ponty pointed out that objects of perception, tools, flowers or whatever else, from an observer's point of view always possesses a horizon of co-existing profiles. These are all momentarily inaccessible to the observer, they could, however, be perceived by other subjects, thus making them open to others view (Zahavi, 2001). If this aspect was not fundamental to perception, objects in the world would be presented to us as two dimensional images, instead of three dimensional things[4] (our binocular view makes this physically possible) (Thompson, 2001). Heidegger in his analysis emphasizes the fact that we live in a world that expresses social processes, through culture, i.e., that our primary contact with the world is manmade artifacts and equipment, which as a fundamental feature contains references to other people, making our being-in-the-world fundamentally inter-subjective (Zahavi, 2001).

In the understanding of the effects of different type's trauma experience, notably interpersonal violence, a certain aspect of our relationship with other people will be relevant in the analysis. This is the notion that we develop our sense of selves in a process of empathy. Here empathy is a somewhat different concept than the higher level cognitive and affective processes psychologists usually refer to (Preston & De Waal, 2002; Thompson, 2007). In phenomenology the notion of empathy signifies any intentional act that discloses foreign experience (Thompson, 2007). Empathy is founded on a deeply embodied form. It goes beyond a mere grasping of the other´s experience, as for instance joy or sadness. It is the fundamental experience of the other as an embodied being with intentional experience as oneself (Depraz, 2001; Thompson, 2001). On this foundation empathy as it emerges in its different forms in different situations enables a delving into the others experience. This level is not a passive form, but an imaginative self-transposal to the place of the other. In such a meeting we become aware of egocentric space, i.e., we see the other as being another centre of orientation in the space of the world, and this provides a viewpoint in which one´s own centre of orientation becomes one among others (Thompson, 2007). If one were confined to one´s own first person point of view without empathy, and hence to how one is experienced by others, one would be incapable of grasping one´s own body as a physical object. A physical object is something that can stand before you, but the body, from a first person perspective cannot do this. No matter how I turn my body is always here (Thompson, 2001). It is in empathy that a subject understands herself as being another to another subject, and this is when the subject not only sees herself as a physical

[4] Note, it is not sufficient to recognize that I may view other angles at other times. To comprehend meaningful special depth other viewpoints must be present at the same time as mine.

object, but as an actual subject. A realization of being recognizably sentient has occurred and the sense of personal selfhood, self-awareness, emerges (Depraz, 2001; Thompson, 2007). In my analysis I will couple the enactive approach with a modern offspring of psychoanalysis called relational psychoanalysis. The two theories I find, enrich each other, as the enactive approach has deep roots in natural science and psychoanalysis has of any theories maybe the largest base of clinical cases. Both are relational.

There have been many of studies that corroborate this deep notion of empathy in disciplines such as neuroscience and experimental developmental psychology (Thompson, 2001, 2007), a few important ones I will mention here.

Developmental psychologists Meltzoff & Moore (1994) did studies that showed that newborn human infants were able to imitate[5] another person's facial expression. These infants had never seen themselves, yet could still imitate. This suggests the notion of a deep embodied ability for inter-subjectiv understanding and interaction (Meltzoff, 2002). From the enactive approach the interactive aspect of the encounters is central. The babies take part in sustaining the meeting with the other, indicating that the children have a readiness to interact, a social disposition. They become part of and co-create the emerging interaction; they co-emerge with the adult as interactors, in the situation (Di Paolo & De Jaegher, 2012). In another study, 18 month olds were shown an adult human demonstrate a failed and unfinished action with a toy. Upon seeing the failed action the children performed the action without failing, i.e., they had felt some interaction and understood the intention of the adult (Meltzoff, 1995). Interestingly, when the children observed a machine trying to perform the action but failing, the children had no clue as what to do with the toy (ibid.).

Contrary to the enactive approach, the mainstream in cognitive neuroscience and psychology has the individualistic explanation of "mindreading" (a cognitive interpretation of intention) as the dominant assumption concerning such social cognition (Di Paolo & De Jaegher, 2012). This leads to a focus, like in other areas of cognition in the traditional view of cognitive psychology, on independent sub-personal modules, in individual and separate brains. This is a view of interpreting social stimuli not directly perceivable in the linear process: sensation → perception → interpretation and decision making → action planning and output initiation (ibid.). This is exactly the kind of cognitivist explanation that the enactive approach takes distance from (Varela et al, 1991; Thompson, 2007).

[5] E.g. the experimenter stuck his tongue out, upon which the babies did the same.

In neuroscience the discovery of certain groups of neurons in the pre-motor cortex, so-called "mirror neurons", have been explained by this linear view as a hardwired sub-personal individually functioning interpretation module, in a string of other information-processing modules (Preston & De Waal, 2002). The mirror neurons are neurons that show same patterns of activity when observing performance of certain goal directed actions, as is shown when the observer performs the actions herself (Rizzolatti & Craighero, 2004). The mirror neurons have been studied using various techniques: fMRI experiments, showing the activity in functional brain images, transcranic magnetic stimulation measuring signals from muscles in the motor cortex and vice versa, EEG and MEG measuring brain waves (Galleze, 2001; Galleze, Keysers & Rizzolatti, 2004). The mirror neurons are important in the fundamental inter-subjective nature of our embodied being in the world; by the enactive approach though, they should not fall into the linear mindreading category (Di Paolo & De Jaegher, 2012). They should not be seen as passive inborn "hardwired" modules though. It has been found that the mirror neuron system is highly plastic, i.e., it appears that the functionality of the mirror neurons is shaped by experience (ibid). It was showed that by a relatively short period of sensorymotor training, i.e., performing one action while observing another, it was actually possible to change the function of the mirror neuron system. When two actions are correlated in an interaction they will be associated in the mirror neuron system. When watching for instance a thumb move, neurons in the mirror system associated with an index finger will fire, if the subject has linked the index finger behaviorally with observing thumb movements (Catmur, Walsh & Heyes, 2007). This to me indicates that an enactive developmental path in social systems is initiated from the fundamental open quality of *plasticity*, probably already *in utero* (Di Paolo & De Jaegher, 2012; Pluess & Belsky, 2011).

Studies have found that the ability to transpose oneself to the other and vice versa emerges at around nine to twelve months, with the development of a cluster of cognitive abilities known collectively as joint attention (Thompson, 2007; Tomasello, Carpenter, Call, Behne & Moll, 2005). Joint attention covers the notion of interacting subjects keeping their attention on some common object, aware that they have their individual perspective, though they share attention to the object. They have mutual awareness of what the other chooses to attend to. Tomasello et al (2005) describes the development of this in children:

> At around 9 to 12 months of age, as infants are beginning to understand other persons as goal directed, they also begin to engage with them in activities that are triadic in the sense that they involve child, adult, and some outside entity toward which they both direct their actions. These are activities such as giving and taking objects, rolling a ball back and forth, building a block

> tower together, putting away toys together, "pretend" games of eating or drinking, "reading" books, and pointing-and-naming games. During these activities, infants' looking becomes coordinated with that of the other person triadically toward the relevant outside objects as well (Tomasello et al, 2005, p. 681).

Joint attention has been found in numerous experiments with infants. The ability to transpose oneself to the others place is fundamental for this action; you need to know the other is a self and she is looking at this (Thompson, 2007).

The empathic relation in which self-awareness emerges for the first time in a period around the emergence of joint attention, in the situation where the infant is following the attention of another person it will sometimes happen that the person focuses on the infant (ibid.). This is not to be mistaken with the mutual gazing of proto-conversations that happens earlier in the first year of life, which is a direct engagement; the infant is not monitoring the adult´s looking at her (Tomasello et al, 2005). The focus of the adult on the infant in joint attention marks a transition in the infant of developing shyness, self-consciousness, and a sense of self-esteem (Thompson, 2007).

4.3 Enaction: encultured, embodied being, bringing forth the complexity of world

Adding these insights about intrinsic inter-subjective openness to the notions of intrinsic sense making makes sense making a social phenomenon. In the enactive approach the concept *participatory sense making* has been developed (De Jaegher & Di paolo, 2007). Participatory sense making refers to the autonomy that to different extents emerges in social systems. This is what one experiences directly in a meetings with others where the social system takes on its own autonomy, e.g. the narrow corridor situation where people walking in opposite directions become stuck trying to get past each other, arguments that cannot seem to be avoided, telephone conversations that linger on after having already said goodbye, escalations in intensity of utterances or antagonistic actions, and so on (ibid.).

I propose we see an interaction may as an order parameter, which in return influences the interacting people who are state variables that to some greater or smaller extent are affecting the control parameters (e.g. biological, bodily, emotional, situational, and cultural) that drive the system through different states. In further complexity terms; the interactors are dynamically coupled systems coordinating their behavior to each other in the emerging interaction, the dynamics of which cannot be reduced to individual behavior (ibid.). For this to be a social situation, not only must the situation have acquired a degree of autonomy, but the interacting persons must retain their autonomy too. A conversation, for instance, is a social interaction where subjects agree on a subject

and regulate beginning, middle, and end of the conversation and influence each other (ibid.). In a situation where one part of an interaction tries to break the autonomy of the other, as say in torture, and if they succeed the interaction must be said not to be social anymore.

In more deliberate processes of joint sense making meaning is created in patterns coordination and breakdowns between people and meaning is a collective phenomenon that emerges in patterns of joint activity (ibid.).

At a higher level, human beings develop in structural coupling with cultures. The cultural historical contexts in which human beings enact their worlds are centrally defining of who they become. The cultural structures that surround us have been shaped by a history of social processes and these contain meaning of their own which we incorporate in out enacted worlds (Ilyenkov?). The point Heidegger made about our culture consisting of artifacts that express sociality hits right on this notion, it is the expanded participatory sense making, and it is an emergent process that existed before we were born, and it will exist after (hopefully) we die (Zahavi, 2001). To Heidegger and Gadamer this was central point; the bringing forth of meaning from a background of understanding, we are not just embodied; we are also encultured (Thompson, 2007). Any context has inherent meaning, just like the embodied organism has its own intrinsic meaning. This makes for a whole world of expansion for the mind, and a whole world of analysis as this meaning is coupled to the embodied mind. The implications of our embodiment and inter-subjective nature are situated embodied dynamics in a social world, a culture, in which we bring forth the world; i.e. our minds are not just some passive reflections of an objective world, we enact the world, but not individually, socially (ibid.). To avoid misunderstandings this must be made clear: this does not mean that the enactive approach is neither a solipsism nor idealism. Bringing forth or enacting the world does not equal creating or fabricating the world; rather, the world is as it is to us, because of the way it is brought to awareness by the intentional activities of our embodied minds (ibid.). My intentional experience of the world is inter-subjectively open to other sense making subjects. We are constantly making sense, further; we are constantly making social sense in our interaction with the world, even when there are no other people there. The meaning we enact is colored by the history of interactions we have and the artifacts and structures of our culture inherently express sociality (Zahavi, 2001)

4.4 Summary

The enactive approach is an anti-reductionist theory that combines continental phenomenology with complexity theory. It is a mind science that considers intentional action in the world the process out

of which the mind emerges. The fact that people, and other biological systems down to the level of cells, are autopoietic systems that enact their own worlds in this way makes every experience unique to the individual organism environment coupling. A part of worlds are organism to organism coupling, and higher human consciousness emerges in the particular empathic relationship between people (Thompson, 2001).

5. The psychological concept of trauma

The current mainstream concept of psychological trauma is build upon three separate lines of investigation that has emerged since the concept was adopted by psychology in the 19th century: 1) hysteria, the archetypal disease that was attributed to woman. 2) Shell shock or war neurosis. 3) Sexual and domestic violence (Herman Lewis, 1992).

What does trauma actually mean? In this section I will outline the development of the concept of trauma in psychology and psychiatry, starting with the studies of hysteria and Charcot and his students, among those Pierre Janet and Sigmund Freud, through the trauma of war debates, to its modern use in the official systems of diagnosis; i.e., from the World Health Organization (WHO) the *International Classification of Diseases* (ICD), and from the American Psychiatric Association (APA) the *Diagnostic and Statistical Manual of Mental Disorders* (DSM).

5.1 From railroad accidents to hysteria

The concept of trauma originates from medicine where it has the purely physical meaning of a wound to the body. It was not until around the end of the 19th century that the concept was adapted to psychological discourse (Hacking, 1995; Herman, 1992; Young 1995). The word trauma etymologically has Greek roots where it literally means a wound (Moskowitz et al, in press). The word *traumatic* first appears in the *Oxford English Dictionary* is in 1656 where this is defined as "belonging to wounds or the cure of wounds" (Young, 1995).

Historical accounts of the trauma concept used as a psychological construct is routinely traced to the description of survivors of train accidents in the 1866 publication *On Railway and Other Injuries of the Nervous System* by John Erichsen (Ibid.). Erichsen was part of a small group of medical surgeons who was interested in the condition of shock in train accident survivors. Erichsen attributed the condition of shock to concussions to the spine. Others saw it as the result of other different physical injuries that were caused by emotional reactions of the brain (Hacking, 1995; Young, 1995; van der Kolk, 2007). The experts on train accidents came to adopt the concept of psychic trauma to describe this physically caused but mentally painful condition (Young, 1995). The neurologist Albert Eulenburg, wrote about developments on this field (Eulenburg, 1878) and is the first to propose a concept called "psychic trauma" (Moskowitz et al, 2013; van der Hart, 1990). He did this in a chapter about the effects of shock in his massive two volume work from 1878 *Lehrbuch der Nervensystem*. Eulenburg believed that the shock created physical damages to the

brain, not the spine as Erichsen, so the concept was not completely psychological yet (Eulenberg, 1878).

It turned out that there were clear similarities between the behavior of the sufferers of railway spine and that seen in the condition called hysteria. This condition was usually diagnosed in women and had the characteristic symptoms of paralysis, amnesia, sensory loss, and convulsions (Micale, 1995). There were passionate discussions about whether a comparison could be made between the two (Hacking, 1995), and it is here that psychology´s adoption of the trauma concept really begins (Leys 2000). The first to fully adopt the concept of trauma in his studies of hysteria was the director of the famous Parisian infirmary called "the Salpêtrière", Jean-Martin Charcot (Young, 1995), a neurologist who at the peak of his career was thought of as the greatest expert on hysteria (Hacking, 1995; Micale, 1995). Charcot believed that hysteria was caused by extreme fright. That it was a dysfunction of the central nervous system caused by an environmental provocateur (the psychic shock) and a hereditary predisposition (Micale, 1995). The great popularity of Charcot and the fact that he had a large amount of followers made the study of psychic trauma a field of study for psychology (Janet, 1907; Micale, 1995). The movement towards psychic phenomena in the study of hysteria was much needed, as Janet (1907) pointed out, the study of trauma and hysteria as a mental pathology was of grave importance, as conditions of hysteria that had a psychic etiology, were being treated as physical diseases, and hysterics were having their bodies mutilated by different surgical procedures. Of the many people that Charcot influenced two are of special importance to the psychological concept of trauma and this thesis, Freud and Janet.

5.1.1 Freud and trauma, from the seduction theory to psychoanalysis

Freud´s early pre-psychoanalytical theory of trauma and hysteria, which after he had died came to be called the *seduction theory* (Triplett, 2004), though it was to be repudiated by him not that much later than he proposed it, today stands out as an important part of his work (Herman, 1992; Leys 2000). It has commonly happened that modern theorists of trauma who have criticized the seduction theory, have had the misunderstood notion that this theory was a simple causal theory, i.e. that a single traumatic event leaves an imprint on the psyche and later causes hysteria (Moussaieff, 1984; Leys, 2000). Freud´s focus though, was not always solely on a single traumatic event happening to then haunt the memory. Certain kinds of events did have this directly traumatizing effect. But besides that, the concept to Freud also covered a phenomenon which consisted of a dialectic

relationship between two or more different events, none of which by themselves created the hysterical trauma conditions (Freud, 1896; Leys, 2000):

> We have learned that no hysterical symptom can arise from a real experience alone, but that in every case the memory of earlier experiences awakened in association to it plays a part in causing the symptom (Freud, 1896, p. 197).

The experiences Freud had in the early days of his practice, most probably due to the particular clients that the historical and cultural conditions presented, led Freud to some shocking discoveries. From those he came to the following conclusion: that childhood sexual experiences were inevitably the only etiological explanations of hysteria (Freud, 1896). In *The Aetiology of Hysteria* Freud (1896) presents his and other people´s analytical evidence of this and writes:

> Sexual experiences in childhood consisting in stimulation of the genitals, coitus-like acts, and so on, must therefore be recognized, in the last analysis, as being the traumas which lead to a hysterical reaction to events at puberty and to the development of hysterical symptoms (Freud, 1896, p. 206).

As mentioned however, it was not always the case that the experience was at first a traumatic experience, leaving a traumatic imprint on the psyche. This was restricted to the cases where the child´s genitals were directly stimulated (Holt, 2002). Most cases however did not include the memory of such an event. Freud concluded that the cause of the hysteria in such cases was the awakening of a memory of a childhood sexual experience by a current event of sexual desire in adulthood. Only then recovering and understanding its traumatic meaning (Leys, 2000). In such trauma lies not a simple causal relation of; traumatic event → trauma, but a dialectical conflict; event → traumatic interpretation through current event → trauma.

Freud abandoned his seduction theory in 1897, after refusing to accept that the world could be in such a poor condition concerning men´s treatment of women, not the least father´s treatment of their daughters (Herman, 1992). This also meant a split with his mentor after Charcot, Josef Breuer (Mollon, 2012). The repression of conflict hereafter became the main ingredient in Freud´s theory of hysteria, which he now explained as the result of the delayed memory of sexual desire accessed through adulthood interpretation (Leys, 2000). He now added that this then had resulted in his clients *making up fantasies* of childhood abuse, as a way of bearing the thought of having had childhood sexual desire (Freud, 1900.). Freud revised his early texts, and by 1925 all nuances of trauma and assault were removed (Triplett, 2004). The classic Breuer & Freud (1893) work *Studies on Hysteria* became just Freud (1925) as he released his revised version in 1925; all contribution from Breuer was removed and extensive footnotes was put in.

On the way to the full development of psychoanalysis, the occurrence of post world war one trauma conditions in veteran soldiers, had again confronted Freud with trauma as a direct result of certain event, after all it did seem clear that these cases was a result of the experiences of war (Leys, 2000; Van der Kolk, Weisaeth & Van der Hart, 1996). He thus felt it necessary to include this in his theory, as the specific situation of war not having anything to do with the psychic trauma seemed too unlikely (ibid.). The terrors of war he explained broke down a protective shield and binding mechanism which brought on regressive conditions to primordial conditions which implicated an unbinding of the self (Leys, 2000). Freud was left with a dual theory of trauma: the theory of intra-psychic conflict of drives and ego, and the unbearable emotion war trauma (Van der Kolk et al, 1996). He never really got these ideas fully integrated. He was close however, almost finding a way to implement his psychosexual ideas to the explanation of war neuroses in finding conflict between sexual drives and reactions of war neurosis. This path led him to posit the existence of the death drive, which was unleashed by the breakage of the protective shield, in *Beyond the Pleasure Principle* (Freud, 1920/1955; Leys, 2000; Young, 1995; Van der Kolk, 2007).

5.1.2 Pierre Janet: the dissociationist school

There was agreement between Janet and Freud up until 1897 when Freud started to change his ideas. In the period when Freud was making his transition to psychoanalysis from 1897 to 1914 the two embarked in an open argument, among other things about the specific sexual content of psychoanalysis (Brown & Van der Hart, 1998).

To Janet hysteria was what he called “an illness of the personal synthesis”. By this he meant a lack of ability to integrate parts of personal experience to the life narrative, an inability emerging out of a kind of mental depression (lowered mental efficiency) (Janet, 1901; Van der Hart & Dorahy, 2009). Ha saw trauma as one possible etiological factor leading to this dissociative mechanism. Strong vehement emotions of the traumatic experience did not sufficiently match the existing patterns of the mind, and thus could not be integrated into personal awareness (Van der Kolk, 2007). Instead it would linger as a subconscious traumatic memory system, what Janet called a “fixed idea”, and the person being, so to speak, stuck on it, led to the inability to integrate new experiences (ibid.). Janet´s notion of an idea is not that of a mere memory, it is a psycho-biological complex system, i.e. a system of thoughts, affects, sensations, behaviors, and memories (Van der Hart, Nijenhuis & Steele, 2006). Though not the only possible source the emotions inherent in trauma were a major source of this breakdown of integration, and Janet actually called them

primary fixed ideas indicating their importance over other possible fixed ideas (Van der Hart & Dorahy, 2009).

In his descriptions of memory, Janet stands out as a complex systems theorist before his time. Memory he explains is a highly complex function, a complex non-decomposable system, with many components in which some change may happen, as indeed it does in dynamic systems, and with any change to any component it may indirectly change all the others (Janet, 1901). At a lecture at Harvard Janet describes memory in a way that any complex network scientist of today would be proud of:

> An idea, the memory of an event, for instance, the thought of a ferocious animal, the thought of a mother's death, — all these form groups of psychological facts closely connected with one another; they are certain kinds of systems comprising all sorts of pictures and all sorts of tendencies to certain movements, but with a strong unity. These systems in our minds have their strength and their law of development that are peculiar to them. They have also a great tendency to development when they are not kept within bounds by another power… Each point is connected with the others, so one cannot excite the first without giving birth to the second, and the entire system has a tendency to develop itself to the utmost. But at the same time in healthy minds these systems pertaining to each idea are connected with an infinitely wider system of which they are only a part, —the system of our entire consciousness, of our entire individuality… Normally, in good health, the little system must be connected with the large one, and must in great part depend on it. Generally the partial system remains subject to the laws of the total system: it is called up only when the whole consciousness is willing, and within the limits in which this consciousness allows it (Janet, 1907, p. 40).

In good health individual memory systems, or ideas, are integrated with other memory systems, and is constrained by what in complexity theory terms can be called order parameters. The breach of this system, however, was proposed by Janet to be commonly seen in the patients at the Salpêtrière (Janet, 1901). Modern neuro-science of neural memory networks and memory research in psychology corroborates Janet´s notion of memory (Siegel, 2003). Normal human memory to Janet emerges from the mental action of creating an autobiographical narrative. Trauma consists of having experiences that cannot be integrated in the construction of the narrative. Noting that memory was an active construction process, Janet pointed out that even calling the fixed idea a memory may be problematic:

> One who retains a fixed idea of a happening cannot be said to have a “memory” of the happening. It is only for convenience that we speak of it as a “traumatic memory”. The subject is often incapable of making with regard to the event the recital which we speak of as a (narrative) memory; and yet he remains confronted by a difficult situation in which he has not

> been able to play a satisfactory part, one to which his adaptation has been imperfect (in: Leys, 2000, p. 111).

That Janet did find that images and words haunted his hysterical patients had some form of resemblance justified calling it a memory, cf. the above quote.

5.1.3 Freud´s psychoanalysis and the disappearance of Janetian traumatheory

There were always small disputes between Freud and Janet, even in the days of the teamwork of Breuer and Freud. In those days, Freud pointed out that the main difference between him and Janet was that Janet just as Charcot had a focus on hysteria being inherited (Herman, 1992). This however could appear to be somewhat of a straw man, as Janet was never as dogmatic about this as Charcot. Janet did acknowledge that vulnerability could exist, e.g. physical ill health and exhaustion, but he regarded the vehement emotions of traumatic experience, or other possible induced etiological factors in play (e.g. hypnosis), the primary cause (Janet, 1907; Van der Hart & Dorahy, 2007, 2009). Considering that Freud was the one who always tended towards, and indeed ended up proposing, that hysteria was a purely internal conflict, denying notions of trauma, this might seem even stranger. One might speculate that Freud had the ambition to somehow outcompete Janet, and likewise Janet the ambition to outcompete Freud (Herman, 1992). Such speculation aside, it is common knowledge that Freud, whether he intended to or not, succeeded in this; psychoanalysis became the leading paradigm in psychology and psychiatry until at least the 1950´s, at the expense of Janet, who lived to see his work and theory be forgotten (Herman, 1992; Van der Kolk, 2007).

An important difference between the two theories concerning trauma is closely tied to the notions of dissociation and repression, which though being subtle, is almost defining of the dispute. Freud had become opponent to Janet´s theory that hysteria arises from vehement emotions that create a depressed condition inhibiting integration of experience (Van der Hart et al, 2006). Instead he his notions of sexual and aggressive conflicts (e.g. in the oedipal crisis) promoted a mechanism of active repression (Freud, 1900). Freud dropped all notions of Janetian trauma theory, which also meant an almost complete lack of the concept of dissociation in psychoanalysis during its first century (Bromberg, 2009). Freud´s repudiation of trauma theory was motivated by a refusal to believe that traumatic experience, e.g. sexual assault, could be so widespread, and to an extent also the cultural historical political context (Herman, 1992). But he was also motivated by the same problem that has haunted not only him, but the entire historical discourse on trauma, namely that of the patients lack of confidence in the reality of their memories, their inability to remember, and the reconstructed nature of the retrieved memory (Leys, 2000).

5.2 Shell shock: the neuroses of war

After having disappeared from discourse, the topic of trauma reemerged with World War I. Many soldiers showed symptoms alike to hysteria: uncontrollable weeping and screaming, memory loss, physical paralysis, and lack of responsiveness (Herman, 1992). Charles Myers, who was the first psychologist to examine the phenomenon, attributed the symptoms to concussive effects of exploding shells, thereof the name "shell shock" (ibid.). In the surrounding discourse alluding to cowardice and shirking, ascribing organic causes was popular as it was a mediating honorable solution in which the soldier could keep his self-respect. Also to the satisfaction of doctors they stayed clear of initiating disciplinary actions against "deserting cowards", and not least, also the military authorities could keep their belief in previously brave soldiers (Van der Kolk, 2007). But even soldiers who had never seen close combat or any other physical trauma showed the condition (Herman, 1992; Van der Kolk, 2007), and a turn to psychoanalysis and the old method of hypnotic cathartic was made concerning the traumatized war conditions by a small group of British and French doctors (Leys, 2000). This inevitably reopened the debate over the role of sexuality in the production of hysteria. The physicians treating the war traumas were skeptic about Freud´s notion of hidden childhood sexual desires, however much they believed in catharsis (ibid.).

In France where suggestibility had become the main paradigm, the major view was focused on simulation and that war trauma was a disease of the will. Treatment consisted of physiological exercises so painful that the traumatized soldiers preferred the front-line. Thus, they were considered cured (Van der Kolk et al, 1996). Another group of psychiatrists argued that the traumatized soldiers were at best inferior beings, and at worst cowards and malingerers who were not deserving of therapeutic intervention (Herman, 1992). This group did not promote anything as humane as catharsis. The most prominent proponent of the view, Lewis Yealland, wrote a thesis on the subject, *Hysterical Disorders of Warfare*, in which shaming, threats, and punishment are proposed treatments. The conditions of mutism, sensory loss, and motor paralysis, were even given the treatment of electrical shock (ibid.)! A German school arguing for the faulty nature and moral of traumatized soldiers was founded by leading psychiatrist, Bonhoffer. He considered it a matter of social illness. He saw all the 142 cases that he had as consisting of especially weak individuals who were only sick due to the secondary gain of getting compensation (van der Kolk, 2007).

A more humane view was held by Abram Kardiner, a psychoanalyst who had been in analysis with Freud himself. At the beginning of World War II he released his book *The Traumatic Neuroses of War.* His approach had insights in line with Janet´s studies on hysteria (Herman, 1992).

Because trauma largely had disappeared from the discourse again after World War I, even though Kardiner´s work was available, the same initial mistakes were made during World War II. The same methods of quick intervention at the front that had proven useful during World War I were soon instated though (ibid.). Thus, the treatment of war trauma had re-invented itself again, and soon after World War II had ended it disappeared again. The returned soldiers from World War II became neglected, and minimal functionality was the recovery standard (ibid.).

5.3 Making trauma official: diagnostic systems and trauma

The latest reappearance of psychological trauma as a field of study happened with the emergence of many cases of traumatic neuroses among Vietnam veterans. An awareness of the domestic violence and trauma that was impinged on women and children emerged at the same time (Leys, 2000). This had previously been a much neglected area of research (Van der Kolk et al, 1996). It culminated in the construction of the official psychiatric diagnosis of posttraumatic stress disorder (PTSD), which after many committee meetings and presentations at the conventions of the APA appeared in the DSM III in 1980 (Van der Kolk et al, 1996; Young, 1995).

The DSM III manifested a movement in psychiatry towards having an a-theoretical and purely phenomenological descriptive system of diagnosing (Nemiah, 1998). This was a way of meeting discussions of etiological uncertainty that had emerged in the different contexts in which the diagnostic system was being used (Mirzamani, 2006); the previous versions had been very psychoanalytically inspired and could thus be seen as biased (Nemiah, 1998).

New about the diagnosis of PTSD was that it had trauma as a directly defining factor (McNally, 2004), in the DSM II trauma had only been slightly mentioned in connection with “adult adjustment reactions” (Mirzamani, 2006). Adjustment disorders still appear up to this day in the DSM 5 and ICD 10. The stressor can be of any severity in adjustment disorders (APA, 2013; WHO, 2010).

The PTSD diagnosis focused mainly on intrusive memories of events, and the old diagnosis of hysteria in all its diverse manifestations was split apart in a whole range of disorders (Nemiah, 1998; Cardeña & Nijenhuis, 2001).The mental symptoms including amnesia, fugue states, and multiple personalities, were assigned to the category of dissociative disorders, while all the sensorimotor symptoms were allocated to the category of somatoform disorders (ibid.).

5.3.1 The DSM IV

The symptoms of hysteria, traumatic neurosis, and shell shock remained partly represented in the PTSD diagnosis in the DSM IV (van der Kolk, 2003), as in the DSM III the trauma reactions were still further split up into dissociative and somatoform disorders (APA, 2000).

The DSM IV defines posttraumatic stress as a reaction to certain extreme and traumatizing events, specifically to those that involve actual or threatened death or serious injury, adding the somewhat vague subtext: or other threats to ones physical integrity (ibid.). Also defining of the traumatic event in the DSM IV is the subjective experience of it. The person´s response to the event must involve intense fear, helplessness, or horror (or in children, the response must involve disorganized or agitated behavior) (ibid.). One could argue however, that in emphasizing certain events, a significant focus has been put on the outside world concerning the meaning of the concept of trauma.

A change that was made from the DSM III to the DSM IV was due to the recognition of the cruelties happening in the world. In the DSM III the traumatic event was classified as being outside the range of usual experience. This was changed when it was realized that experiences such as domestic violence, rape, combat, torture, and earthquakes, were not outside the range of usual experience in certain contexts, e.g. war zones (Chu, 2011; McNally, 2004). Instead it was agreed that in trauma there would have to be a reference to the subjective experience being one that instill helplessness and terror (ibid.).

5.3.2. Current conceptions: DSM 5 and ICD 10-version for 2010

The trauma reactions that belonged to hysteria (Janet, 1901), traumatic neurosis, and shell shock are still split up in the DSM 5; the diagnoses are now those of PTSD, dissociative disorders, somatic symptom and related disorders, and borderline personality disorder (APA, 2013). The defining features of the trauma have changed some. The criteria are now: Exposure to actual or threatening death, serious injury, or sexual violence in one (or more) of the following ways: 1) directly experiencing the traumatic event(s). 2) Witnessing, in person, the event(s) as it occurred to others. 3) Learning that the traumatic event(s) occurred to a close family member or close friend. In cases of actual or threatened death of a family member or friend, the event(s) must have been violent or accidental. 4) Experiencing repeated or extreme exposure to aversive details of the traumatic event(s) (APA, 2013). There is no reference to the subjective experience of the event in the important Criterion A description of the traumatic stressor anymore. Thereby, though it is mentioned in the diagnostic features that negative mood states as for instance fear or guilt may occur beginning or worsening at the exposure to the event, the trauma concept has gone through a complete change. The concept now seems destined to drift more and more towards meaning a certain event, as in for instance an election, which is an election however it is perceived by the voter.

In the ICD 10 the diagnosis of PTSD is section F 43.1. The description here is not so different that that of the DSM. In the ICD 10 PTSD arises as a delayed or protracted response to a stressful event or situation (of either brief or long duration) of an exceptionally threatening or catastrophic nature, which is likely to cause pervasive distress in almost anyone (WHO, 2010). Thus, the trauma is tied to certain exceptionally threatening or catastrophic events which almost anyone would find distressing. In the ICD 10 there is still some focus on the subjective experience, though it seems a little less explicit in the ICD 10 than it was in the DSM IV, as it is pointed out that almost everyone would find it distressing. In the DCM IV there is a bit more openness to individual responses, as it is said that it is a requirement for an experience to involve intense fear, helplessness, or horror, to be a trauma. It does not, however, express that this has to be experienced as such to anyone else. It is interesting to see, if all reference to subjective experience will be removed from the ICD 11, when it is released in 2015. This is not unthinkable, as the DSM and the ICD have been harmonized in their developments, and the codes of the ICD are used in the DSM (APA, 2013).

5.4 Section summary

After having disappeared and reappeared on and off until the seventies the concept of trauma was finally given a real significant and lasting importance with the construction of the diagnosis of posttraumatic stress disorder (PTSD), which was included in the DSM 3 in 1980 (Young, 1995). A gradual change of the concept was finally manifested in the newly published DSM 5, where the reference to emotional reaction as defining what a traumatic event is, has been removed (APA, 2013). In the following I will speak of the traumatic event in reference to the DSM 5 criteria, and when I want to include specific subjective aspects I will speak of traumatic experience.

6. The circular view of the complex cognitive systems

Before going on with building the enactive self state model, in this short section I want to distinguish clearly the traditional linear approach to a cognitive/mental system from the circular causal approach of complexity theory and the enactive approach. This circular view is foundational of how experience emerges in the human mind according to these two approaches. The description in this section works as an introduction to the approach of the model that I will build in the next section.

6.1 Circularity vs. linearity in cognitive theory

Complexity theory and the enactive approach, presents a break with the traditional linear information processing theory of the mind. The linear view of cognition was initially inspired by the use of the computer as a metaphor for the mind: information comes in (and turned into neural signals), information is manipulated (perceived, remembered, reasoned about), and an output is produced (overt behavior) (Hollis et al, 2009). The complexity of perceiving, remembering, and thinking in the traditional view is seen as linear hierarchies of functional components, each of which solving a simpler part of cognition. At the highest level are the executive functions that order and give instructions to the individual independent sub-components (ibid.). This is the core assumption of modular approaches to cognition. The dynamics inside each component independently decides its interaction with other components, thus the name component-dominant has been given to this view (Van Orden, Holden & Turvey, 2003). There are some problems with the computer metaphor, for instance, the ease of computers in performing multi-digit multiplications and the exceeding difficulty of this for humans, not to mention self-navigation which is easy even for a crawling infant and impossibility of a computer (Hollis et al, 2009). Plenty of critiques have been made of the computer metaphor and I will not attend this here.

When applying complexity theory to cognitive psychology, the notion of linear independent serial processes is replaced by circular causality and interdependence in self-organizing emergent phenomena (Van Orden et al, 2003). This view of cognition can be called interaction-dominant as opposed to the linear component dominant view of cognition as independent processes. In the interaction dominant view component processes change each other´s dynamics in interaction, which can be likened to a multiplication table of interactions; behavior emerges out of interdependent processes, and the component processes are inextricably combined (ibid.).

The traditional approach with its dual linear input and output flow´s ends up ends up in proposing a line of continuing linear causal chains of stimulus → response, i.e., a stimulus starts the chain (e.g. activation of receptors, transmission by serial synapses to cortex, integration with memory, selection of a motor pattern, descending transmission to motor neurons, and activation of muscles) (Freeman, 1999). Awareness occurs at some point in the chain, and meaning and emotion are attached to the response. In such linear causality no effect can precede or occur simultaneously with its cause, and each effect eventually becomes a cause (ibid.). This is a view of cognition as a *heteronymous system*, rather than an *autonomous* system with self-organizing and self-controlling dynamics as seen in complexity theory that sees cognition as a flow of patterns of activity that mutually and simultaneously influence each other, having no clear start or end point (Thompson, 2007).

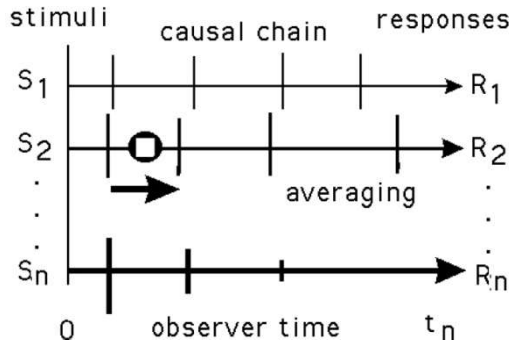


Fig. 6 linear view of cognition. From*: Freeman (1999).*

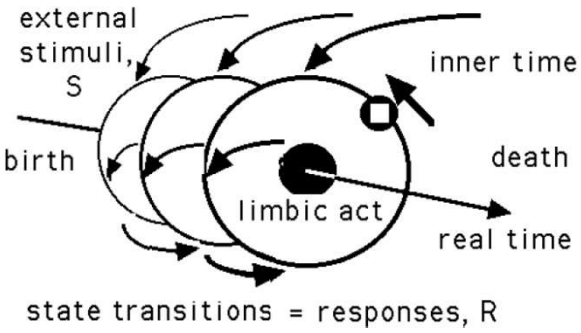


Fig. 7 Circular view of cognition. *From: Freeman* (1999).

A circular causality view of cognition like this is the foundation for the view as a cognitive agent as dynamic action in the world is fundamental for the enactive approach. Intentional acting in the world becomes action-perception cycles as illustrated in figure 6 (Freeman, 1999). Perception is the outcome of a preceding action and the condition for a following action (ibid.). Cognition in dynamic action contains an anticipatory mechanism that compensates for the self-induced changes to the sensory inflow that happens through the agent being active; it sensitizes the sensory systems to anticipated stimuli from the action. This has been called: re-afference, corollary discharge, focused arousal, and pre-afference (ibid.). Pre-afference was initially found as a mechanism that supplement motor actions with corollary discharges, i.e., a kind of copy of the efferent action signals that is sent to sensory cortices, hereby signaling that the impeding sensations are self generated (Sperry, 1950). In its most simple form this mechanism functions as an indicator to suppress perceptions of self-generated actions, as apparent in how we cannot tickle ourselves (Ford

& Mathalon, 2005). As it will become clear the next section the anticipation of pre-afference mechanisms are central to the model.

6.2 Summary

This short section had the aim of presenting the circular causal co-emergence of cognitive and perceptual processes, which is central to the concept of embodied intentional action, a foundation for the model. The model will finally be presented in the next section.

7. The enactive self state analysis model

In this section I will finally present the model I have developed. It is a framework by which I hope to use the insight from complexity theory and the enactive approach to organize the many parts of the traumatic experience and the dynamics that may follow such. As mentioned in the introduction, two clinical theories have contributed to it; these theories are those of Pierre Janet and relational psychoanalysis.

7.1 Self states

A starting point for building the model introduces the concept of dissociation to psychoanalysis, as has been done in relational psychoanalysis (Bromberg, 2009). Here it is important to recognize the difference between Freud´s repression and Janet´s dissociation. The concept of repression as it is used in the mainstream psychological discourse of today signifies a mechanism that works on a deep unconscious level. A dissociated state on the other hand is a mental complex outside consciousness that has a unity of its own. The Freudian notion of repressed conflict takes place in an unconscious part of the unitary personality, and cannot in its repressed form be made available to conscious awareness. The Janetian notion of dissociation works on a non-conscious level, i.e., that under the right conditions a dissociated complex can be experienced directly, and may possibly be integrated in awareness (e.g. conditions of automatic writing, hypnosis, interactions with alter identities in cases of dissociative identity disorder (DID), etc.) (Braude, 2009; Janet, 1901). The mainstream notion of repression as being a repository mechanism that functions and keeps conflict in the unconscious was introduced by Anna Freud. She did this while also introducing the concept of suppression as the conscious counterpart to repression; this is a conceptualization that is also used in mainstream psychological discourse (Erdelyi, 2006). Sigmund Freud himself used the concepts of repression and suppression interchangeably. He insisted on the unity of the mental life across the unconscious – pre-conscious – unconscious continuum, thus repression as a unitary mechanism was the same both on a conscious and an unconscious level (ibid.). In the model I want to have the possibility of utilizing the concept of traumatic dissociation while maintaining the notions of conflict and repression. A way for psychoanalysis to move towards integrating the concept of dissociation is to move away from Freud´s unitary model towards a view of the mind consisting of multiple more or less integrated self-states. This is an approach taken by more recently developed relational psychodynamic theory (Bromberg, 1994, 2009).

The view of the mind as inherently relational, consisting of multiple self states, is very compatible with the enactive approach. The enactive approach finds that there is a range of enacted self-states tied to different situated experiences. These are linked together phenomenally through a fundamental sense of self (Varela et al, 1991). The enactive approach proposes that the sense of self is an implication of embodiment, constituted by the regulatory and affective processes of the organism. The regulation of the organism happens mainly in the connection of the autonomous nervous system to the body, linking neural processes to internal organs and viscera (Thompson & Varela, 2001). In these connections between the autonomous nervous system and the limbic system in the brain, which are associated with basic emotional states, together with connections between nuclei in the brain-stem that regulate homeostasis and nuclei that regulate sleep, wakefulness, and arousal, lies the proposed important embodied foundations for the sense of being a sentient self (Thompson & Varela, 2001; Cosmelli & Thompson, 2010; Damazio, 2010).

7.2 A coherent self

The integration of self-states is not solely a matter of the dynamics emerging from this foundational sentient feeling of self. It happens on multiple levels of coupling of the brain, body, and environment divisions; i.e., from large-scale neural networks to body environment couplings and social interactions in cultures (Thompson, 2007). As such self states cannot analytically be located within the scull or even within the body. This is not to suggest that consciousness is not biologically founded, just that the dynamics of the mind cannot be reduced to this understanding (Gapenne, 2010; Thompson, 2007). There are many environmental control parameters involved in the enaction of self-states (from gravity to diets and interpersonal relationships), and further, there are wide ranging order parameters over this span too. As it was described in section 4.3 the sense making process does not solely belong to individual persons, it is constrained by social interactions (which may be enriching, elaborating and educational) (De Jaegher & Di Paolo, 2007).

Janet´s narrative memory, I propose, describes an emergent process of circular causal processes between these levels. It gives the sense of continuity, coherence, and self-awareness (Janet, 1901; van der Hart et al, 2006). It is as an order parameter that functions as an integrating mechanism. The degree of adaptability and flexibility of this narrative, order parameter, has a constraining effect on which further enacted reality can be integrated. The narrative is closely connected in circular causal processes to emotions, which are considered in the enactive approach as prototype whole body processes that mobilize and coordinate virtually every aspect of the organism (Thompson, 2007).

As mentioned earlier, humans encounters with the world is inherently meaningful. We are natural sense makers by reference to our self-producing constituents (Di Paolo, 2005). The meaning inherent in embodied action is experienced as a whole body emotional state. Bodily arousal and emotion is not a mere reaction to a subject's evaluation of a situation; it is the situated embodied sense making of the organism (Colombetti, 2010).

The narrative being a more or less coherent contextual story means that the phenomena or ideas in the narrative derive meaning from the whole, and that experiences derive meaning from it as much as the contextual event that is experienced. It is a highly complex elaboration of the fundamental affect and regulation of the body mentioned in 7.1 in association with the fundamental sense of self (e.g. Thompson & Varela, 2001). Van der Hart et al (2006), talks about the concept of action systems. These are systems dedicated to maintaining the organism and living adaptively. They are inborn psycho-biological systems; however, they are epigenetic and plastic. Actions systems also have a minimum level of complexity, encompassing their own goals, motivations, and related action tendencies. I propose to consider action systems subcomponents of autopoietic processes of different self-state that make autonomous self-production a more complex personal identity.

Stern´s (1985) pioneering research found that it can be expected that an integrative narrative process becomes truly verbal by the second year of life, and that narrative autobiographical memory develops the ability to integrate states of mind over time. This is a human form of higher order consciousness that allows the mind to go beyond the here and now. It emerges from the same neural changes that lead to language (Edelman & Tononi, 2000). The enactive approach and relational psychoanalysis both emphasize the relational nature of the human mind, and all the higher order forms of the mind just mentioned is developed in emphatic relations with other people, all through life, in social sense making. This is what is described in section 4.2.

I propose to follow the self state model of relational psychoanalysis (Bromberg, 1994), but to maintain ideas of Freud´s unity model in the description of individual self states. Self states then, in my conception, are above a certain level of complexity and are whole body systems with unconscious bodily processes in which conflict may reside. This rudimentary circular causal self model of self action system, emotion and narrative is part of the foundation of the remaining study of the thesis. This leaves open the possibility of states being more or less integrated over time and in extreme cases of dissociation as in DID different states may be enacted at the same time showing dissociative phenomena.

7.3 The self states a landscape of attraction

Each self state has its own attractor and basin. In complexity theory terms; the mind is a dynamic landscape of attractors and repellors that gets built under the variable conditions in the individual´s history of coupling to her environment (Varela et al, 1991; Freeman, 2000). In accordance with the enactive approach, I propose that we do not just think of this landscape of attractors as brain, or even brain-body, dynamics, but rather as patterns of behavioral dynamics that reaches beyond the organism (Varela et 1991). The enaction of self states, among those of traumatic experience and posttraumatic conditions, is always mediated by the coupling to the world, and thus, through the collective meaning structures of the world: tools, language, computers, people, etc. (Gapenne, 2010). This part of self state attractors is directly observable from a third person view. Further, irrespective of the self-state of a given moment, the environment may contain basins of numeral other attractors with the potential to induce a state-change. The size of such a basin relies on the strength of the attractor (Kelso, 1995). The switches between attractors are linked to attractor strength, basin size, and the size of fluctuations around the current attractor (Kelso, 1995; Freeman, 1999). The level of narrative and emotional identity can be seen as an attractor with a basin in its own right integrating the experiences that come within its basin. Further, depending on the level of integration, I propose that the mind moves towards meta stability; the very healthy person will be moving close towards meta stability in most situations. The multiple self-states of a healthy individual will be well integrated by the life narrative shaped autobiographical memory (Van der Hart et al, 2006). Bromberg (1994), calls the integration of self-states in healthy individuals, the ability to *stand in the spaces* between realities, without losing any of them, feeling like oneself while being many.

7.4 Genes and the model

Where are genes in the model? When applying a holistic view to any psychopathology a certain area of science seem to require mention, genetics. Many genetic determinants have been proposed as etiological reasons why not everyone exposed to a traumatic event develops posttraumatic conditions as posttraumatic stress and dissociative conditions (Becker-Blease, Deater-Deckard, Eley, Freyd, Stevenson & Plomin, 2004; Todd, Müller, Lee, Robertson, Eaton, Freeman, Palombo, Levine & Anderson, 2013). The usual explanatory framework is the vulnerability-stress or diathesis-stress model in which a (traumatic) stressful event combined with an underlying biological vulnerability increase the risk of posttraumatic psychopathology (Belsky & Pluess, 2009a; Roth & Champagne, 2012).

That genetics cannot stand alone is largely acknowledged today, and even within this area of molecular biology itself the specific field of epigenetics has showed that gene expression is influenced by a wide range of factors, including environmental features (Lewontin, 1992; Roth & Champagne, 2012; Rutter, Moffitt & Caspi, 2006). Still the nature – nurture debate does have some persistence with proponents at each end of the spectrum. Popular evolutionary psychologists lean towards genetic determinism (Buss, 2007), while poststructuralist theories such as social constructionism refuse to talk about such hard ontological facts (Gergen & Gergen, 2004). The enactive approach moves beyond this dichotomous thinking. The enactive approach does not consider genes inconsequential, it does, however, support the claim that genes are a small part of a very complex system (Strohman, 2002), which requires more information to function than just the amino acids that constitutes our DNA (Thompson, 2007). It is normal jargon to say that DNA/RNA "codes" for proteins, this however is a reduced view to a specific sequence of the overall circular causality of the dynamic process of protein synthesis, a process with many intervening and necessary causal steps. Proteins may arise from a DNA/RNA "reading" process, but this process cannot happen without proteins there in the first place (ibid.). Further, the DNA "writing" and "reading" processes must be properly situated within the intracellular environment, but this environment is a result of those very processes (ibid.). In complexity terms, it looks as if the role of the genes is not to construct or drive, but rather, to act as specific constraints on self-organization (Kelso, 1995), a self-organization inherent to embodied action. Interesting meta-analyses and new studies have been done recently that question the diathesis stress model, finding that "vulnerability genes" may be better conceptualized as "plasticity genes" (Belsky & Pluess, 2009b).

7.5 The Model

I will now present the model. It illustrates enaction as I have presented it as a complex system, and as I mentioned its actual purpose is capturing and making clear at least some of the complexity of enacting experience. Enaction comes together in intentional action and the arrows indicate circular causal processes. As it can easily be seen here there are no linear causal chains in the model. This reflects the complexity theoretic insight that there are no real linear causal chains in the emergence of the human mind (Freeman, 1999). What the model does is to illustrate co-evolution of self states and experience in intentional embodied action. Experience emerges out of intentional action and as an order parameter it also constrains intentional action. Although it has been though to apply the specific case of traumatic experience it is a model that can be allied to any experience. The thought

is that it can be used as a framework for analyzing an experience. As mentioned, a model will always be a reduction of reality, and even though this is a model with the purpose of capturing complexity, it could never be as complex as reality. It has, however, been scientifically proven that using a model most always gets better results than when not doing so (model course). I picture that the model can be used by clinicians as a tool to keep in hand in initial clarification and progressively during a course of therapy to locate conflicting processes in enaction of experience. Having the model present has the effect of keeping in mind all the aspects of it, like remembering that there are aspects to focus on other than just the processes that are going on inside the person. The model looks like this:

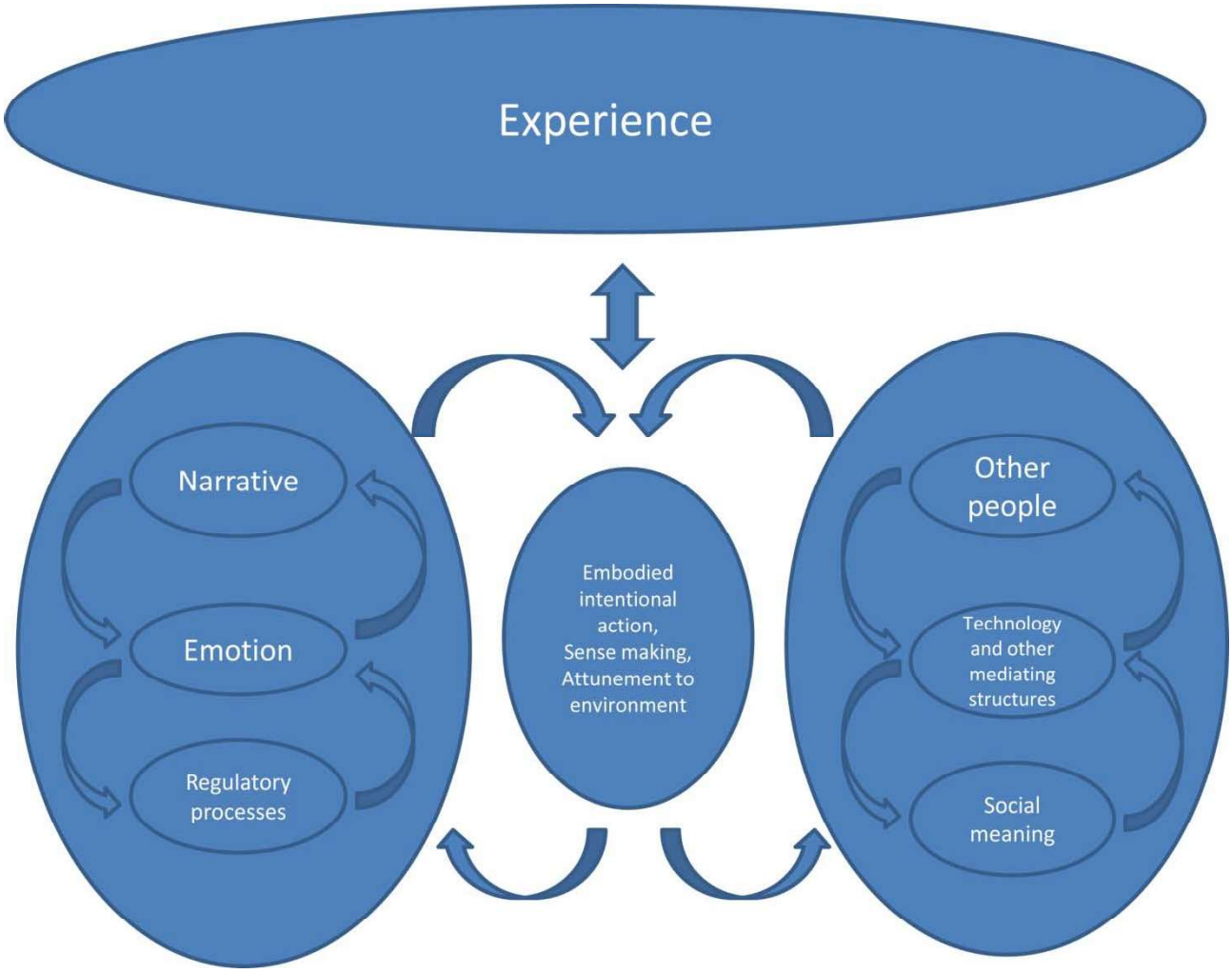


Fig. 8 The enactive self state model.

8. Dynamics of traumatic events and experiences

As I mentioned in 5.3.2, the concept of trauma is drifting towards being part of a certain events without reference to experience (APA, 2013). This has inspired me to take a closer look at these two distinctions, the traumatic event and the traumatic experience. The model is well suited to clarify this separation of event and experience. What I am looking for in this section, more than particular qualitative descriptions of very specific experiences, is general characteristics of the dynamic complexity that can be used with the model as analytic tools across situations.

8.1 The traumatic event

Traumatic events, as they must involve at least one person enacting her experience of it by a system of social meaning, contain at least a minimal relation to a social system, the characteristics of which may have decisive effect on how traumatic events are experienced (e.g. social support, violent neighborhood, cultural beliefs, etc.) (Tracy, Cerdá & Galea, 2012). Traumatic events can be roughly divided by the size of the social systems involved. Two groups can be made: 1) mass traumatic events: wars (subsystems here: prisoner of war, torture), large terrorist attacks, natural or human made disasters involving many people, etc. 2) individual and small group traumatic events: physical assault and threat thereof (e.g. robbery or mugging), sexual violence (e.g. rape or date rape), kidnapping and hostage situations, etc. The interactions in these social systems, like the enaction of people´s worlds in general, are mediated by whatever conditions structure the event (Gapenne, 2010). As was pointed out by Heidegger, most of these are in some aspects social (Zahavi, 2001). Even natural disasters may become endowed with social meaning beyond meaning a mere natural threat to living conditions (e.g. religious belief).

Mass traumatic events are usually mediated by a complex environment of artifacts specially made for the event. In war for example, there is a whole technology specifically made for this event (Altmann, 2009). Natural disasters have a mediating technology too. It differs from war technology, of course, in the sense that they mediate natural forces that in some way disturb human social systems, endangering lives and property of people (Sproles, 2009). Oversimplified you could say that the two types of technology differ in the sense that the one event has technology that creates destruction, and the other has technology that tries to prevent or help against it (Altmann, 2009).

The smaller events are of a more direct and individual nature. In a situation of rape involving from two to a small group of people, the event in which the traumatic experience is enacted is a more intimate social system. As a sub-system though, this system be stronger or looser connected to

its larger system (Tracy et al, 2012). If the rape is gang related in a poor neighborhood this may be a well integrated event in the larger social system, and is not an experience out of the usual (ibid.). If on the other hand the case is that of a father abusing his children the system will be a much closed system only very loosely coupled to the larger system in which it is embedded. Possible mediating artifacts, in a more closed systems way, will tend to derive their mediating meaning of trauma from the event itself (e.g. a certain perfume worn by a rapist that derives traumatic meaning in the experience of the rape) (Cameron, 1994).

8.2 The traumatic experience

In the enactive approach the specific coupling of body, shaped by a personal history, to environment is a collective variable making experience unique to each individual (Varela et al, 1991). This adds to the already relative nature of the concept of a traumatic event (it is different what is life threatening to different people, e.g. more situations will be life threatening to a child than a commando soldier), the individual subjective coloring of what is experienced as traumatic (e.g. a suicide bomber may experience certain death as rewarding and pleasant).

The properties of an event emerges in social systems as meaning structures, again, following Heidegger and Husserl, social meaning structures (Zahavi, 2001). These meaning structures are state parameters that may all potentially function as control and order parameters in aspects of the emergence of traumatic experiences (e.g., weapons of war, violent family relations). The particular patterns that emerge on the level of the social system are collective meaning structures, and the experience is shaped in the dynamic coordination of the person to these (Di Paolo & De Jaegher, 2012). Both the people and objects (e.g. technology, weapons, architecture, etc.) are part of shaping these dynamics; in a war, for instance, the kinds of weapons used are directly involved in shaping the dynamics of the experience, mind, and perception (Bærentsen, 1989; Gapenne, 2010; Warnier, 2011).

In complexity research time is a central variable, as what is measured is always change over time (Bertenthal, 2007). In the measurement, and mathematical analysis, some structures will be mainly slow variable that can be considered constants (Simon, 1973), but still have an indisputable and immediate potential effect, for instance gravity, a true constant, will pull you down if you fall over a cliff. Others will be faster variables that couple with the constants (ibid.). In my study being inspired by the enactive approach I have found the actual subjective experience of temporality and

how this is related to embodied intentional action in objective[6] world time interesting. Psychologists all the way back to James (1890), and before that philosophers, have considered time the primary context through which humans make sense of their experience, and is the cognitive organizer (Zimbardo, 1999). A whole range of alterations of temporal perceptions that have been called temporal disintegrations have been identified in traumatized individuals (Herman, 1992; Holman & Silver, 1998). The analysis of this range, I think, can be grounded in the notions of implicit time and explicit time (Fuchs, 2011). Implicit time is when time subjectively disappears as a person is completely absorbed in action, what popularly has come to be known as "flow" (Nakamura & Csikszentmihalyi, 2002). A phenomenological analysis of this finds that this state happens when the body attunement to the environment is completely synchronized (Fuchs, 2011). As a sufficient desynchronization of the body to environment attunement happens time becomes explicit. The future becomes "not yet" and is now experienced as a kind awaiting or maybe even longing for. A gap appears between the present and something irretrievably lost; the past is brought to consciousness as "no more" (ibid.). Experiencing implicit time is closely associated with a certain relationship the subject characterized by a feeling of meaningfulness and "flow", which positive psychologist refer to as vital engagement (Nakumara, 2001). I propose that this may not be a solely "positive" concept, and may be a potentially fundamental control parameter of the traumatic experience, the narrowing of the temporal focus to the traumatic event may even be adaptive, as it may enhance the ability to cope with the situation at hand (Holman & Silver, 1998). So this control parameter is not objective world time, nor subjective time, but the gradient that emerges when the dynamics of each meet, in the form of body attunement synchronization-process (Fuchs, 2011). Holman & Silver (1998) actually found that the temporal orientation at the moment of the actual experience has great effect on the nature of the posttraumatic condition. Large samples of adult victims of childhood incest, Vietnam War veterans, and residents of 2 California communities devastated by fires showed that temporal disintegration in the experience in which time is isolated from past and future, as in implicit time, was associated with a high degree subsequent distress (Holman & Silver, 1998). More concretely this is connected to the attunement of the body through a fundamental mechanism of anticipation by which we adapt to and make sense of the world.

8.3 Intentional action: anticipation and the emerging sense of time

To get a closer sense of this importance of the attunement of the body and subjective time in traumatic experience, it is necessary to take a closer look at the complex system in which it

[6] I am staying away philosophical debates and Einstein´s theory of general relativity here.

emerges, intentional embodied action. Intentional embodied action is the active striving towards and acting in the world mentioned in section 4.2. In the enactive approach this is the necessary foundation for creating meaning. We can divide intentional action into three stages, though it is of course a circular process: 1) we create goal for future states towards which we direct action. 2) We experience the consequences of our actions and create meaning. 3) We learn from our actions (Freeman, 2000a). This is illustrated in the multi level model in fig. 8 showing the system of intentional action. It is made by Walter Freeman (1999), built upon knowledge collected in his 50 years in medicine, philosophy and neuropsychiatry. The model shows the emergence of embodied intentional action as five circular causal interconnected loops over brain, body and environment (Freeman, 1999). The model is centered on the limbic system, a brain area especially associated with emotion to which intentional action is strongly associated (Freeman, 2000b).

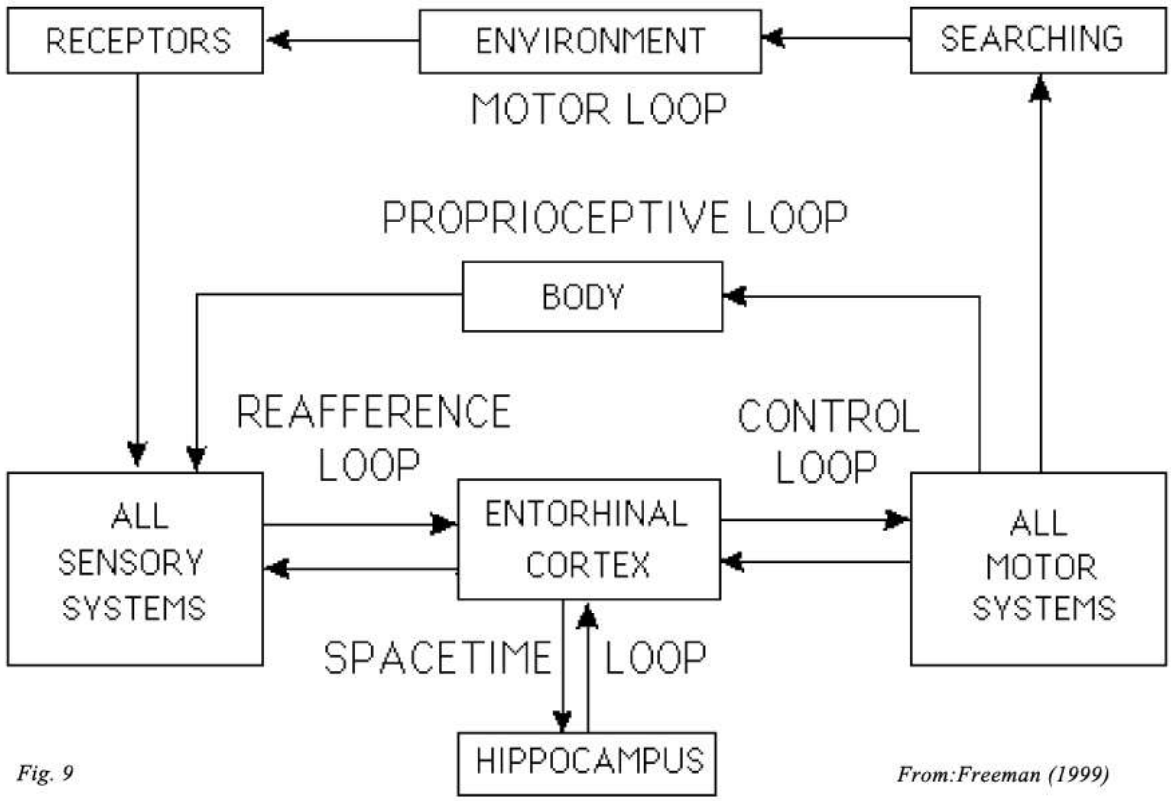


Fig. 9 *From:Freeman (1999)*

At the global level is the organism-environment *motor loop*, consisting of the sensorimotor circuit from motor action in and through the environment back to the resulting sensory stimulation of the movement. Attention and expectancy is involved here as directed arousal and searching. The *proprioceptive loop* stays within the body; it still travels outside the brain though. Its pathways spans from sensory receptors in muscles and joints to the spinal cord, cerebellum, thalamus, and

somatosensory cortex. The rest of the loops stay within the brain. All sensory input converges in the entorhinal cortex, which is the chief source of input for the hippocampus. Most entorhinal output goes to the hippocampus which serves as a source of centrifugal input to all of the primary sensory cortices. When an environmental stimulus arrive the activated receptors sends pulses to the sensory cortex, inducing a nonlinear self-organizing pattern out of which emerges meaning specific to the autopoietic process of the organism. This is an endogenous and active process, not a passive representation. The emerging meaning reflects the individual´s history, state of expectancy, and the context (Freeman, 1999; Thompson, 2007). The activity of the model is both feedforward and feedback: The forward flow consists of the microscopic activity of brain subsystems that command embodied action, and the back flow consists of the macroscopic order parameter that by circular causality regulates and holds or releases the activity of the subsystems (ibid.). Motivating forward flow of the intentional action are embodied processes of emotions and the feedback flow is constituted by awareness, the matching of pre-afference (mentioned in 6.1) and action. The preafference mechanism works by anticipatory corollary discharges biasing the attractor landscapes of the cortices, a bias that occlude certain basins of attraction to conform to the goals emerging through the limbic system (Freeman, 2000a). The pre-afference loops in the brain, updates the sensory cortices to expect incipient action; it does so by sensitizing the sensory cortices with neuro-modulators, which in complexity terms makes attractor basins larger and prepared for anticipated action outcome (ibid.). In intentional action we direct our attention, to only parts of a world that is infinitely beyond our limited power of creating meaning, in this, intentional action is the ultimate filtering mechanism (Freeman, 2000a). Preafference contributes to the filtering process with the automatic process of matching corollary discharge and the actual sensory consequence of the executed act (sensory reafference), which allows us to unconsciously recognize and disregard sensations resulting from our own actions (Mathalon & Ford, 2008). The experience of subjective time is determined by these processes; it is the perception of the self in action, through the preafference mechanism, that provides the structure and content to the concepts of continuity, contiguity, duration, temporal order, cause, and effect (Freeman, 2008). This makes embodiment essential for the perception of time, it emerges out of the kinesthetic sense of intentional action. Janet´s notion that a depressed[7] state caused by vehement emotions might cause lack of ability to integrate experience (Janet, 1901), corresponds to the notion that when intentionality is working well it allow us to take in just as much as we can handle and no more, but in states of fatigue or

[7] It is important that Janet did not man depression in the sense we do today; Janet means a lowered mental efficiency.

mental derangement, where it does not, people take in more than they can handle and suffer disintegration (Freeman, 2000a). Disintegration of the system of intentional action and the experience of continuous time in traumatic experience caused by vehement emotions is very compatible the enactive approach´s notion that emotions are a form of integration of experience through meaning. It connects the autopoietic process with the complex environment of meaning structures. I have found that a line of studies in emotion research has been enlightening in the further study of this aspect of implicit time emerging in traumatic experience. This is work studying the phenomenon of emotions as a kind of integrating mechanism known as response coherence (Sze, Gyurak, Yuan & Levenson, 2010).

8.4 Subjective experiences of time and emotions

It should be mentioned that the empirical studies of response coherence have been somewhat inconclusive (Barrett, 2006). Some studies support the notion (Ekman, Davidson, & Friesen, 1990; Ekman, Friesen, & Ancoli, 1980; Mauss et al., 2005), and others do not (Buck, 1977; Fernandez-Dols, Sanchez, Carrera, & Ruiz-Belda, 1997; Fridlund, 1991; Jakobs, Mansteaed, & Fischer, 2001; Mauss, Wilhelm & Gross, 2004). Response coherence is the notion that emotions organize and synchronize different response systems, and thus, in experiencing strong emotion, our subjective, behavioral, and physiological responses track each other more closely than when we are at rest (Sze et al, 2010). This can be conceptualized as the attunement of the body to some optimal relation of body to environment out of which implicit time may emerge. In the model of intentional action, response coherence may be conceptualized as the notion that the convergence of emotion and pre-afferent induced sensitivity couples to form the gradient of body attunement, out of which subjective time emerges. In perfect attunement and implicit time experience there is a completely optimal sensitivity of the sensory cortices to the complex social meaning structures of the traumatic event, and out of this emerges a temporal quality of experience that in some way defines the posttraumatic condition (Holman & Silver, 1998). Combining these notions, the pre-afferent anticipation process is manifested in ongoing embodied meaning expressed as emotions, i.e., preafference pathways are experienced as the adaptive meaning of emotion-cognition self-organization (Freeman, 2000b). When emotions are vehement and events are dangerous and traumatic the optimal sensitivity may become very high, i.e., strong emotions make the basins of attraction in the sensory parts of the cortex. In this way, the well documented sensitivity that may occur as a result of stress condition, such as hyper vigilance and startle reactions (Klorman,

Cicchetti, Thatcher & Ison, 2003), make sense as adaptive actions in the model. Given the model these are adaptive conditions that sharpen perception and action by correct anticipation through positive feedback making the complex system generally more sensitive. In the enactive model a vehement emotion is not just a heightened physical arousal that is incompatible with narrative understanding; it is a meaning structure that is particularly vivid in the embodied intentional action. I propose that conflicts with other meaning structures may appear particularly strong in such vividness. There are different dynamic levels of the emotion-cognition self-organization of the model; in traumatic experience a quick immediate emotional interpretation affects a more or less sensitive landscape of attractors. The dynamics between the levels may work in different circular ways, in the attunement of the body to the environment and objective time the personal history and autopoietic identity is essential in the shaping of the experience. This can be conceptualized as different time scales of sense making to which we turn next.

8.5 Dynamics of emotion and meaning conflict in traumatic experience

As a traumatic event containing some aspect in conflict with the maintenance of a persons autopoietic identity (APA, 2013), except for maybe in life threatening disease, by definition traumatic experience involves conflict on the global level of the motor loop fig. 9. In the model the global dynamics constrain other level dynamics and intentional action in such a way that conflict emerges on other levels and the coherence of time is broken. Further, out of these dynamics emerges potentially lasting painful experience such as PTSD and dissociative disorders (xxxxxxx). In the enactive self state model an experience of conflict is an experience of conflicting meaning structures that emerges from emotion-cognition self-organization and is experienced as part of the global life narrative. The narrative is an expression of the way in which a person plans to realize or enact the autopoietic life trajectory, and emotions are an essential part of the adaptive monitoring of autopoietic identity, they provide meaning to coordinate action in the world by (Colombetti, 2010). Because there are multiple ways in which the system is able to maintain the self-organizing autopoietic process it is disposable to conflicting sub-processes (Di Paolo, 2005). This means that the narrative has potential for internal conflict (Haidt, 2006). Comprehensive analysis of life narratives have shown that these always derive around different goals (Bruner, 2004), by the proposed model it is not inconceivable that these goals may be in conflict with one another. Emotions and narrative are circularly entangled in the model; they co-emerge and constrain each other. Combining the model of intentional action and the enactive self state model we can establish

that emotions are central control parameters in the changes between self states. Emotions thus become active goal oriented embodied actions towards maintaining ones autopoietic identity, which is a notion quite different than the classical commonsense notions of emotions as being passive reactions and passions (Scherer, 2001; Slaby, Paskaleva & Stephan, 2013).

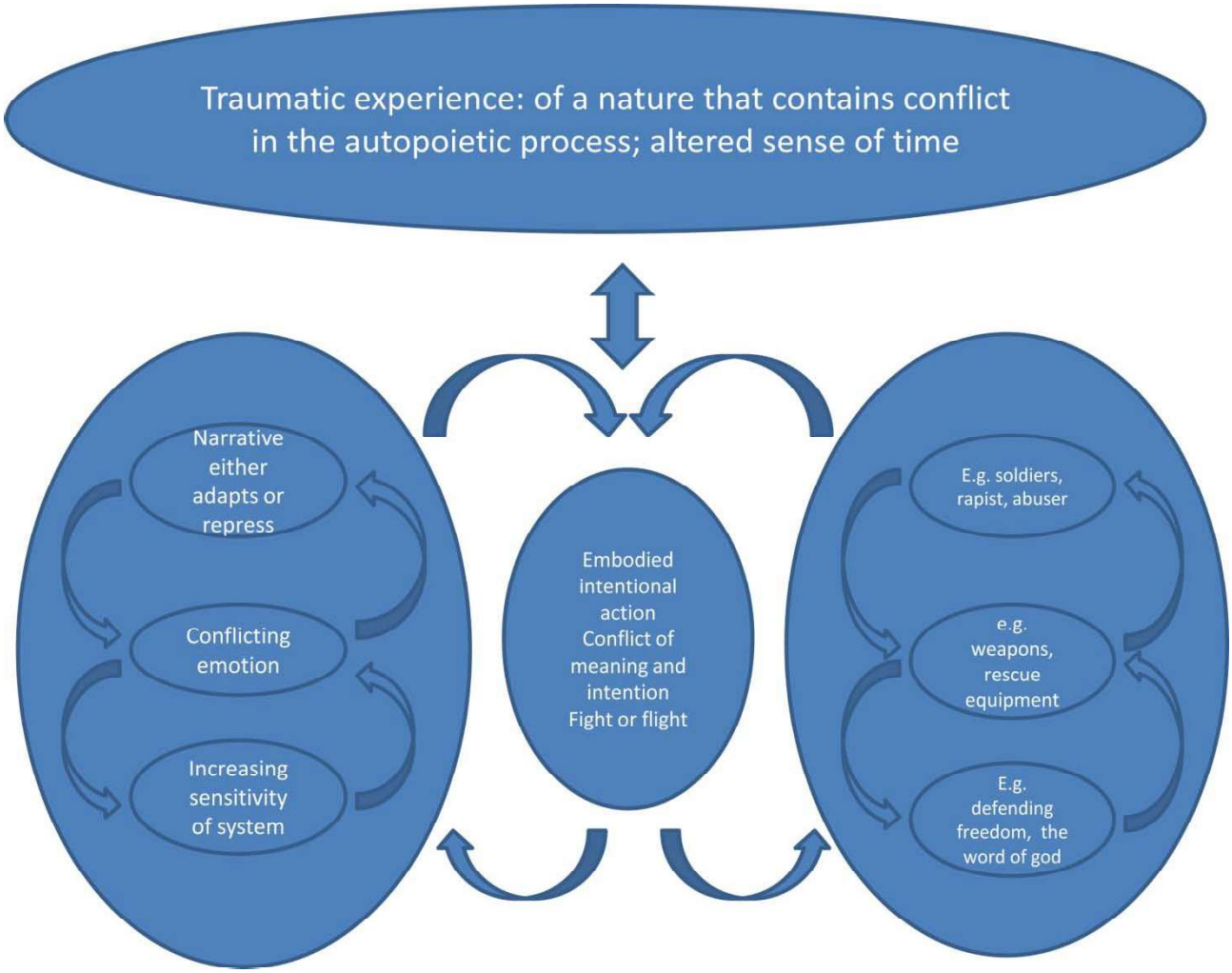
Three timescales have been proposed as useful when considering the enactive approach to emotion-cognition self-organization of meaning: 1) micro-dynamics of emotions (seconds or minutes), 2) meso-dynamics of moods (hours or days), and 3) the macro-dynamics of personality (months or years) (Thompson, 2007). In traumatic experience these are levels between which conflict and dissociation may potentially be possible in many ways. On the fast *micro level* timescale of emotions emerges an *emotional interpretation*, which is a rapid convergence of a cognitive interpretation or appraisal and an emotional state (e.g. happiness, anger, fear, shame, etc.). Both modify each other while being constrained by the global form of their coupling (ibid.). Emotional interpretations emerge as a perturbation to the current state happens. This may be any sensory event, a perceptual or cognitive event (e.g. an image, association, memory, etc.), or a change in arousal, anything that induces positive feedback relations in this self-organizing coupling of cognition-emotion (Lewis, 2005). During this period of self-amplification through positive feedback the person´s emotional state is very sensitive and even small deviations may be rapidly amplified (ibid.). In this period a conflict of meanings may be thought to create very disturbing dynamics. Quickly after the perturbation and the amplification through positive feedback, the state stabilizes through negative feedback and the entrainment by the global form, and thus, a momentary emotional interpretation is established. A bifurcation to a new attractor has happened (ibid.), as will be looked at later, a conflict could possibly create a multi stable state of more attractors emerging at the same time, a state of dissociation. Out of this micro level process of action *in* the world emerges the intention for acting *on* the world (Freeman, 2000b; Thompson, 2007). The *meso level* of *mood* is the continuity of emotions and appraisal. Moods are attractor landscapes, and emotional interpretations are the attractors of this landscape. It is always present as a background for the transient emotional interpretations. Where the emergent meaning of the emotional interpretation was intention to act on the world, in the mood it is an enduring *emotional orientation* (Thompson, 2007). Unlike the intention to act, which dissipates with action, the emotional engagement may persist if for instance action is not ensued or if the action fails (ibid.). The last level, the *macro level* of personality development, is the formation of lasting interpretation-emotion habits specific to different situations. This level is explicitly interpersonal, and as an order parameter it both emerges

from and constrains moods and emotional interpretations. The development of it is involves permanent long-lasting alterations to the emotion-cognition state space (ibid.). As already mentioned, emotions are an adaptive monitoring of the autopoietic process, and in the model. This becomes evident in posttraumatic conditions, when conflict between different time scales of emotion may lead to dynamics incoherent with the personal narrative. These conflicts emerges from the history of maintaining autopoietic processes (ibid.). Even when personal embodied meaning is well attuned to and coherent with meaning structures of traumatic events, e.g., as a soldier is to war technology and combat, the meaning structures of the narrative life story and the whole emotion-cognition state space, it appears from the evidence of several wars, may conflict with the experience (Herman, 1992). With such conflict the integrating mechanism of temporal experience breaks down and the dimensions of experience and behavior becomes dissociated (Slaby et al, 2013).

8.6 A model analysis

In an enactive self state model analysis the parameters can be put in relation to each other. They converge in the central analytical point of embodied intentional action out of which emerges particular experiences in traumatic events. A fundamental expression of traumatic experience, as well as all experience, I proposed to be subjective temporal orientation. Experience of time according to the thesis is a central organizer of the life narrative (Zimbardo, 1999). I also proposed that conflict over different levels of intentional action as an etiological reason for the disintegration of the embodied kinesthetic system fundamental for the experience of time. Using the model a glimpse of practical utility starts to show, which is that it makes clear aspects of traumatic experience of which raising awareness may be essential in a healing process. The model helps to not lose focus on this. This will be elaborated in section 10 about treatment. Plotting the details of this analysis to the model would look something like fig. 10. I see this as a very deep and fundamental analysis; in a course of therapy other more specific preceding analyses may be made.

Fig. 10



8.7 Summary

Traumatic events are of different complexity and the enacted meaning in the experience of such an event is in part dependent on the complex environment of mediating structures. As a person attunes herself to environmental conditions, as mentioned, a measurable temporal gradient of body attunement emerges. In the next section we shall see that this gradient is closely related to sensitivity and anticipation (Freeman, 2008).

9. Posttraumatic stress and dissociative conditions as embodied action

Having presented the model, the aim is now to get an insight into aspects of how the disturbing dynamics enacted in traumatic events are maintained in embodied intentional action. The focus is a look at the continued moment to moment emergence of posttraumatic stress and dissociative conditions. Emotions function as control parameters leading the person through the temporal integration of experience. This makes the body particularly important in the analysis. It is the movement of the whole body in the social world that is the lowest unit of reduction. The empirical studies on which I will base this closer study come to a large extent from basic research that I wish to apply to the clinical setting of the thesis.

9.1 Embodied emotion in conflict

The notion of state changes induced by emotions that are actually embodied actions puts a holistic view on change processes. The control parameter that drives the traumatic experience, emotions, is a non-reducible property of the whole system of intentional action. Thus, following the enactive self state model the bodily actions in the world become a central focus point in the study of continued painful posttraumatic conditions. The relation between emotion and bodily reactions has been discussed since the James-Lange theory was proposed in the 1880´s (Scherer, 2001). The James-Lange theory independently developed by William James and Carl Lange has been referred to as a *peripheral position* (ibid.). It holds that upon experiencing an event bodily changes specific to the event happens, upon which the person discovers the inherent emotion to these (James, 1884). As James (1884) put it: "My thesis.. is that *the bodily changes follow directly the* PERCEPTION *of the exciting fact, and that our feeling of the same changes as they occur* is *the emotion*". Thus, we do not cry because we are sad, we are sad because we cry (ibid.). The perhaps most famous emotion theory of all, *the Schachter-Singer theory of emotion* (Scherer, 2001), holds that there are not enough differentiated patterns of physiological changes to account for the great variety of moods and emotions. Thus, it holds that it is the cognitive interpretation of a nonspecific bodily arousal that creates the emotion (Schachter & Singer, 1962). It was one of the first cognitive theories of emotion (Scherer, 2001). It represents a stance in emotion theory, *attribution theories*, in which the body does participate in emotion, however, only in this indirect way (Colombetti, 2007). A type of theory that has become maybe the most mainstream today, *appraisal theory*, holds that the emotion is the pure result of a cognitive evaluation, an appraisal (e.g. to appraise something as dangerous brings about fear) (Scherer, 2001). The bodily arousal and emotion as a byproduct of appraisal is

not attributed any causal power (Colombetti, 2010). A paradigmatic example is found in Lazarus´ (1966, 2001) appraisal theory: after an initial appraisal creates an emotion a second cognitive and disembodied process reappraises the situation, often correcting the first appraisal and changing the emotion (Lazarus, 1966). In spite of the difference in theories, empirical research from a wide variety of sources does support that body awareness and sensations play a central role in emotion (Sze et al, 2010). The findings I mentioned that show that the neural circuitry that links whole body processes and emotion is one source (Damasio, 2010). In a famous study by Hohmann (1966) adult males with spinal cord injuries that disrupted afferent visceral feedback caused notable changes in emotional experience. Studies like the one mentioned earlier about holding the pencil between lips and teeth and sitting upright or not too corroborate the notion (Koch, 2011). There are many studies showing the causal effect of body on which specific emotion emerges in a situation (Sze et al, 2010).

Applying appraisal theory to studies of posttraumatic conditions the maintenance of stress is a result of cognitive reappraisals continuously regulating emotion and thereby maintaining the embodied side effect of stress (Lang, Kotchoubey, Frick, Spitzer, Grabe & Barnow, 2012). The enactive self state model holds that posttraumatic stress conditions are self states and the as mentioned are whole body intentional states, which means that the whole body enacts the states from moment to moment. It is not a matter of the maintenance of the condition through cognitive appraisals. Rather it is matter of embodied intentional actions in the intersubjective space of the world. Emotions are control parameters in the self-organization autopoietic process of embodied intentional action from which traumatic stress emerges. The circular causal self-organizing processes proposed here are different from the linear view that pervades the traditional approaches (Freeman[8], 2000b; Thompson, 2007). In the enactive self state model the perceptual, emotional, and cognitive processes are all entangled. The self-organization process involves the entire neuraxis of brain stem, limbic areas, superior cortex and visceral and motor processes of the body as it moves in the world (ibid.). They are part of the molecular communication between nervous system, endocrine system, and immune system out of which the stress response emerges (Sapolsky, 2004). When a dissociated state emerges in the traumatic experience due to the breakdown of the normal integration mechanism of intentional action and the integrating mechanism experienced as time, this state too is a whole body intentional system of a certain degree of complexity (Edelman & Tononi, 2000). This fits the Janetian notion of dissociation (Janet, 1901) used in an enactive embodied

[8] Freeman generally likes to speak of his approach as a pragmatist approach.

framework. In dissociative identity (DID) disorder, the most obvious case of dissociation, the embodiment of the dissociated state is most clear (Van der Hart et al, 2006). Research from neuroscience shows how lack of integration of large scale neural networks may create independent functional clusters of neurons, especially clear in the thalamocortical systems (Tononi & Edelman, 2000). Depending of their complexity their connection with whole body network of the sense of self will decide their level of independence, in a range that may be thought to span from intruding thoughts and voices (Moskowitz, Read, Farrelly, Rudegeair & Williams, 2009) to complete fragmentation of the personality in DID (Van der Hart et al, 2006). Following the model, the embodied processes of traumatic experience manifests not only in cognitive strategies to cope with the conflicting meaning structures and emotions, it results in strategies of embodied action. To illustrate this I turn not to certain studies of perception and memory and a particular related active emotion regulation strategy.

9.3 The regulation of the conflict: how traumatic experience is maintained

When emotional conflict happens a regulating process is initiated, this is called emotion regulation by emotion researchers (Gross, Sheppes & Urry, 2011). Emotion regulation models also include a number of strategies, such as voluntary distraction of attention, situation selection, and rumination (ibid.). Emotion regulation refers to processes, conscious and non-conscious, that influence the emotions we have, when we have them, and how we experience and express them (Gross, 2001; Gross et al, 2011). This conceptualization blends well with notions of emotions as passive reactive passions that must be controlled. It does not blend so well with the enactive self state model. An enactive view makes the separation of emotion regulation and emotions difficult, doing so, however, does appear to have heuristic value (Todd, Cunningham, Anderson & Thompson, 2012). In the last part of this analysis I am interested in, to the extent what space is left will allow me, showing how active mechanisms maintain the dynamics set in action by the traumatic experience in intentional embodied action. To highlight this notion I will present an interesting new concept of emotion regulation, one that is expressed in embodied intentional action. This is the proposed possibility that selective attention processes to affectively salient stimuli – referred to as *affect-biased attention* – may be a form of emotion regulation (Todd et al, 2012). These are selective attention processes by which sensory systems are tuned to favor certain categories of affectively salient stimuli before they are encountered (ibid.). This notion fits well the intentional action view of the enactive self state model and the anticipatory mechanism of the pre-afferent pathways

(Freeman, 2000a). Affect-biased attention refers to a pre-tuning of sensory systems so that certain categories of affectively salient stimuli are perceived over others. The regulatory role that it plays consists of the biasing of perception towards certain types of positive or negative stimuli, habitual affect-biased attention may modulate emotional responses to stressful events (Todd et al, 2012). For instance, one's visual filters are pre-tuned to see more happy faces relative to angry faces in a crowd. If so one may be less likely to experience feelings of negative affect and heightened physiological arousal in a stressful situation than if one's attention is habitually biased towards negative expressions (ibid.). Research shows that it seems that affect-biased attention is shaped so called *affective control settings*, which is habitual mental sets built on previous experience with what is motivationally relevant in given contexts (ibid.). In the model this consists of a history of sensitizing the anticipation of certain meaning structures that are particularly clear in an interpersonal space. The emotional salience of the meaning to which the affective control settings become sensitive is found in the embodied meaning of social systems, i.e., it is an aspect of the participatory sense making that is fundamental to human nature according to the enactive approach (Di Paolo & De Jaegher, 20012). Having become very sensitive to meaning that is experienced in traumatic events dissociation may occur. This would be a result of experience of implicit time emerging and experience not becoming integrating in a narrative discursive meaning may maintain posttraumatic conditions (Bromberg, 2009). The relational psychoanalytical approach that was part of the inspiration for the model would hold that traumatic emotional experience remains unprocessed symbolically, and makes the person vulnerable to its return, thus developing a kind of anticipatory system maintaining dissociation (ibid.). In the model this can be explained as the anticipation of meaning structures to which the preafference mechanism has increased sensitivity, with the purpose, however, not of integrating it, but by active emotion regulation mechanisms to isolate or repress them. With this the connectedness of the system decreases and it will move towards chaotic states where very small perturbations may create vast outcomes. I propose that this leads to a certain quality of perception in intentional embodied action that leads to the continued active directing of attention away from aspects of reality, and to a persistent posttraumatic memory flooding. This is tied to how vivid an event is perceived, which I further connect to emotions as control parameters in the next section.

9.4 The posttraumatic maintenance of stress and dissociation in intentional action

The phenomena of being flooded by emotional memories that seem so vivid that they are being relived, is a central aspect of posttraumatic stress disorder which is a painful and common

posttraumatic stress condition (APA, 2013). This is a relieving that is experienced as implicit time. In the DSM 5 these phenomena have actually been considered dissociative of nature and a dissociative sub-category has been added (ibid.). To illuminate the intentional nature of this a certain character of perception in relation to memories that has been found in cognitive neuroscience can be mentioned. This line of research is about the perceptual vividness of experience and the memory of experience (Sharot, Martorella, Delgado & Phelps, 2007). It has been relatively well established that experiences including strong emotions are remembered more clearly and vivid. This phenomenon has been studied in research about what has become known as "flashbulb" memories. This line of research goes as far as to a study about how well people remembered when they learned that President Lincoln had died (ibid.). It has been found that the vividness of memories is directly correlated with the vividness of the perception when the event was experienced (Todd, Talmi, Schmitz, Susskind & Anderson, 2012). Concerning posttraumatic stress and later dissociation I propose that this may link to how intentional action in the actual experience decides how the following posttraumatic dynamics will continue. Continuing the analysis of emotions as control parameters of traumatic experience the relationship between emotions and perceptual vividness in experience can be studied. The vividness of perception ties directly to anticipation and response coherence. Evidence has been found for a significant effect of emotional salience on perceptual vividness (ibid.). In short, strength of emotion equals strength of perceptual vividness. Given the enactive notion of emotions this connects the embodied action of a traumatic experience directly to memory. By diagnostic criteria memory is central to conditions of posttraumatic stress and dissociative disorders. In PTSD intrusive memories are central, and in dissociative disorders fragmentations of memory may be complete (APA, 2013). The insights of the connection of perceptual vividness and vividness of memory brings puts an active aspect on the intrusive memories of PTSD. The vividness of perception in the model is tied to preafferent anticipation, which converges with personal meaning and how it is a factor in anticipation. The implication of this is that it may not be an effect of the sheer strength of emotions, as in the level of fear that causes the vividness of later intrusive memories; the attunement to the situation too has an effect on this. In this thought a highly trained soldier may be in a highly attuned condition, though not actually affected that much by for instance fear. By sheer attunement to the event this soldier may precedingly have highly vivid intrusive memories after the violent event. A new line of research has emerged on what is called sensory processing sensitivity (Aron, Aron & Jagiellowicz, 2012). Sensory processing sensitivity denotes an innate trait of the level at which sensory

perceptions are processed (ibid.). In combination with the results showing that perceptual vividness has a direct effect on memory encoding, may shed light on why some people may be more prone to posttraumatic intrusive memories Certain people with a certain genotype has characteristic of being highly sensitive (Belsky & Pluess, 2009). These people are what Aron (1999) calls highly sensitive persons. They have more vivid perceptions than others, a vividness that may become exceptionally clear under the influence of a vehement emotion. In this sense the trait of sensitivity could be associated with anticipation mechanism that in a circular fashion may increase sensitivity, stress and cause dissociation. The important thing here is that there is a possible innate trait that possible affects the experience that emerges from embodied intentional action, and may contribute to an understanding of why people react differently to traumatic events. The thesis does not leave space for going further into this, though there are many aspects of this to study further.

9.5 summary

The aim of this section has been to illuminate how posttraumatic stress and dissociative conditions can be described as ongoing experience that emerges in moment to moment embodied intentional action. This has just touched upon small aspects of the complexity of intentional action, but hopefully it illuminates some of the thoughts about embodied intentional action that lies behind the enactive self state model. By embodied movement in the world of meaning structures we create an anticipation of the world, to which we may become very sensitive. Consequently, people may develop conflict and dissociation.

10. Conclusion

In this thesis the aim has been to present a model that gives a view of experience as an emergent phenomenon that emerges as holistic meaning structures in intentional action in a world that is connected in multilevel complex ways. I have tried at least, to apply this holistic view to posttraumatic stress and dissociative conditions, and to provide insight to how the dynamic processes that initiate them are maintained. In the first sections I gave a presentation of the foundational insights of complexity theory that are the ideas behind building the model. This entailed a scientific philosophical discussion of whether emergent phenomena can really be talked of. This is of essential importance for the model I built, as it is a model of experience as an emergent phenomenon. In the discussion it was shown how the right conceptualization indeed does validate the concept of emergence. After this concepts of the framework that was to be used in the analysis and building of the model was presented.

After this the enactive approach was presented. This is the theory that really connects complexity with sciences of the mind in the thesis. The enactive approach is a theory that is built upon complexity theory so the connection is not difficult. It is central to this theory that the mind cannot be reduced to the brain, but must be understood in the dynamics of brain, body and world. Besides the notions of complexity an enactive view applies systems theoretical notions of its own that are derived from the conceptualization of autopoietic systems. This applies a further theoretical foundation for the model and the specific notion that the world emerges as holistic meaning structures.

To make the further progress from the enactive approach into the clinical domain of traumatic experience inspiration was found in Janetian trauma theory and relational psychoanalysis. This inspiration was also fundamental for the creation of the model. After having built the model it was applied in an analysis of traumatic experience, which found central aspects that may be proposed to connect stress and dissociation. As the last finishing section was made a small theoretical analysis based on empirical results from basic research to show how embodied intentional action may be found to be a common starting point for posttraumatic conditions.

What have not been touched upon to a significant extent are the implications of the model, and the theory and empirical investigations behind it, for treatment. This is an important and interesting discussion, and there are indeed implications of the model for therapy. The embodied and interpersonal nature of human experience on which the model builds provides a view of change processes on which therapy can be built (Koch & Fischman, 2011). Being heavily inspired by

continental European phenomenology a psychotherapeutic tradition that is close to the model already exists; this is gestalt therapy (Hostrup, 2009). Making conscious embodied intentional action that has become non-conscious also fits with the mindfulness inspired work with trauma sufferers of Daniel Siegel (2010). The enactive approach and the enactive model built here may contribute to work already done in these traditions, as well as other forms of therapy. The enactive model has much knowledge to contribute to therapy about the interpersonal and embodied processes of therein (Koch & Fischman, 2012). In this thesis, however, the space did not allow this subject, as it would require more space than is due for this project to do it justice. This is not just a choice as the model itself had to be presented satisfactorily first. It was made clear though, that a thought with the model was that it may be used as an analytical tool in the therapeutic context. By using this model as a common ground a future study that could be interesting is the extent to which it may function as a uniting factor. This however is just interesting speculation for now.

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