



# The Self: a Processual Gestalt

WOLFGANG TSCHACHER

Psychiatry Services, University of Berne, Laupenstrasse 49, CH-3010 Berne, Switzerland

and

OTTO E. RÖSSLER

Division of Theoretical Chemistry, University of Tübingen, Auf der Morgenstelle 8,  
D-72076 Tübingen, Germany

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**Abstract**—The psychological self is often treated as a mental structure which enables a person to act individually and consciously. In our view, the self can only be kept non-paradoxical if it is seen as a process with homeostatic attributes. We therefore discuss a self concept derived from the theory of complex dynamical systems. The dynamical perspective makes us lay an emphasis on the recursion implicated by the operator 'self' marking the application of cognition to cognition. We argue that from this recursive dynamics the self arises as a processual gestalt via self-organization. We can then link our concept of self to psychological observations which show that the self is maintained by a rhythmical series of calibrating events (self-reflections and social interactions). Implications for psychopathology (schizophrenia theory) and interpersonal relationships (transference, love) are outlined. Copyright © 1996 Elsevier Science Ltd.

## INTRODUCTION

To begin with, 'self' is just a word. It occurs in all human languages to signify not a fixed entity or substance, but an operator. This operator makes sense only in connection with a logical predicate.

In psychological usage, this is different: the concept of 'self' is applied to a personalized mental structure accessible to introspection. The concept is used interchangeably or closely related to many other concepts: ego, consciousness, proprium, mind etc. [1–4]. Our discussion of the self will refer mainly to what James calls the 'spiritual self' or ego rather than to the more general concept of 'social self' (i.e., the sum of social roles a person may take). We also put aside the 'material self', the physical things that constitute a shell of privacy. In short, we are concerned here with the psychological self. We will discuss the question of how the operator 'self' may elucidate the psychological concept 'self'.

We will follow an approach based on dynamical systems theory. A general dynamical model of the self may enable us to formulate hypotheses on the evolution, on the maintenance, and on disorders of the self. Significant sections of self evolution can be observed when self-consciousness emerges in the course of psychological development, but also in the course of a psychotic episode.

In approaching these topics in an introspective (endopsychological) way, we may gradually develop a feeling of the strangeness of the concept 'self'. At first sight, there is nothing peculiar about being oneself; this appears to be self-evident and tautological. What

could be more familiar to ourselves than our selves? Nothing seems more evident than the existence of one's own consciousness. This familiarity is intuitively and spontaneously manifest as it serves as the background of everyday behaviour and thought. Many philosophical systems (e.g. the philosophies of Descartes and Hegel) assume this evidence to be a valid and inarguable starting point for further investigation. But the seeming self-evidence can be easily disturbed—by reflection.

We may recognize that the self is obviously the only object in our world which at the same time is a subject (or has been right before this reflection). Who is 'I' as soon as I think about myself? Is my identity represented by the self, as has been felt the instant before? Or is 'I' the subject which came into being the moment it cogitated on the self? In moments of metacognition, the self is split up into subject and object; careful contemplation of this phenomenon encounters the problem of infinite regress [5]. Yet soon after this dissociation, the subject-object unity is established once more.

During 'unphilosophical', everyday life we would not consider these processes as strange. Strangely, we are not disturbed by the accompanying logical paradoxes (impossible topological objects [6]). Quite to the contrary, we assume the logical 'monster' (in the sense of Mandelbrot [7]) of the self to be central in fostering identity.

Consequently, one might argue that there was no reason to make the self a problem, were it not for those individuals who experience their selves in a very problematic way. Many schizophrenic persons do not seem to be quite as indulgent with themselves—as far as their selves are concerned—as we are. They would report states of depersonalization, of dissolution and fragmentation of identity; as children do, they would ask themselves difficult questions like, "If I am the one looking into the mirror, who is the other one in the mirror?" [8, 9].

### THE FRAMEWORK FOR FORMALIZING THE SELF

How may we proceed in trying to cast these introspectively accessible peculiarities into formal terms? From the point of view of logic, being aware of oneself implies a recursive relation. Let us remember that, in general, recursions are a source of complicated phenomena: in mathematical structures as well as in cybernetic feedback loops, they have a property of producing various kinds of homeostases like, for instance, chaotic attractors. Paradoxes and logical 'binds' also stem from recursive patterns [10]. Likewise, there is a 'hidden relation' [11] of epistemological limits like Gödel's theorem of incompleteness and Heisenberg's uncertainty relation in that we find a method applied to itself (logic to logic, or measurement to measurement, respectively). The common denominator is that we deal with an endo-view of a system [12].

The self in awareness of itself operates in a way where it is subject as well as object of the operation [13]. In other words, when the self starts to contemplate itself it will create a set which includes itself as an element of the set. Whitehead and Russell [14] could show that sets of this kind may result in logical contradictions, in paradoxes. Thus, is the self a paradox?

There are three possible strategies to 'deparadoxify' this recursive situation. The first has been mentioned as the differentiation of the self into the subject 'I' and the object 'me' (after James) at the moment of self-reflection. This separation must in principle proceed in an endless, self-similar nested manner (see Fig. 1). In some rare cases we can observe such a dissociation of I and me; still, we will not reach a plausible explanation of the continuity and 'self-evidence' of the self in this way.

The second strategy is to prohibit the mixing of different logical levels in scientific statements. This path was chosen by Whitehead and Russell, but reminds us of 'solutions'

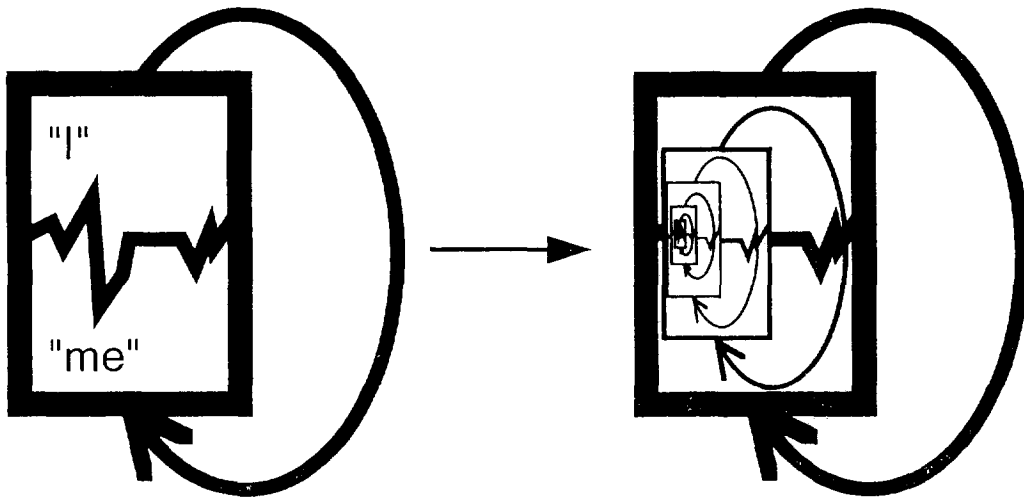


Fig. 1. Infinite regress of self-reflection.

in the manner of behaviourism which once declared the study of cognition to be unscientific in general.

We will therefore turn to a third strategy; it is based on the introduction of a new dimension, namely, time. If we apply this strategy to the problem of 'cognition on cognition' we may untangle the logical bind by viewing meta-cognition no longer as synchronous but as a process. The differentiation is no longer a differentiation of subject and object, as above, but a differentiation in time.

Thus, as a first result of our study we may conclude that there seems to be only one way of making the self a non-paradoxical phenomenon—the self cannot be conceived of as a mental 'structure', or 'entity', which may become 'aware of itself', but as a process within the cognitive system. Furthermore, we will show that the self is not an arbitrary process, but a processual gestalt, i.e., a pattern emerging spontaneously in the course of cognition.

The formal model of recursion differentiated in time is a dynamical system. Mathematically, a dynamical system can be defined as a differential equation [15]:

$$\dot{\mathbf{x}}(t) = F_{\mu}(\mathbf{x}(t)) \quad \text{for } \mathbf{x} \in \mathcal{R}^m. \quad (1)$$

Here  $\mathbf{x}$  symbolizes the vector of  $m$  state variables of a system. The function  $F_{\mu}$  describes the temporal evolution of  $\mathbf{x}$ , dependent on external control parameters  $\mu$  (the system's environment). Formal algorithms of the kind of (1) can be viewed as a continuous application of a computation to a computation.

The state and evolution of variables  $\mathbf{x}$  can be visualized as points and curves (trajectories) in an  $m$ -dimensional space  $\mathcal{R}^m$ , if an initial condition  $\mathbf{x}_0$  is chosen. This space is called a state space or phase space. The dynamics of the system can then be described geometrically [16].

Many naturally occurring dynamical systems show homeostatic behaviour, i.e., a confined set of states results after some transient time if the system is started from many or all initial conditions. This set is called the attractor of the system of equation (1). This dynamics can be described by ergodic measures which are typical invariants of a system. One such measure is the dimension of an attractor; if, for example, all trajectories of an  $m$ -dimensional system end up in one point (i.e., all the system's variables approach fixed values), we speak of a fixed point, an attractor of dimension 0. More complicated equilibria are characterized by attractors of higher dimensionality which may be non-integer ('fractal').

Thus, we may now try to translate the psychological considerations of the introduction of this paper into dynamical terms.

The mental phenomenon called the self is assumed to be a result of the processing of a dynamical system. Characteristic of the self is its homeostatic attribute—the self produces order (the experience of ‘identity’) in the face of a huge complexity of environmental information and internal cognitive events. It therefore makes sense to consider the self as an attractor of the complex cognitive system.<sup>†</sup> The idiosyncratic character of the self can be viewed as its dynamical form or pattern—the self emerges as a processual gestalt from the cognitive system (Fig. 2).

Considering the self as homeostatic puts an emphasis on information reducing aspects. Furthermore, we know that the self is active in two respects: first, the self creates novel information (contents of consciousness); second, as an individual’s perceived centre of action and behaviour it influences its environment which in turn contributes to its emergence. Thus it follows that the cognitive attractor ‘self’ generates and reduces information. One class of attractors—chaotic and hyperchaotic attractors—possess this quality of simultaneously compressing and inflating phase space, which can be seen as an analogue for the double-faced information processing of the psyche. The second point above underlines the fact that the self must be seen as an example of a processual gestalt which is itself in permanent change, since there are interactions between the emergent gestalt and the control parameters (the environment of the dynamical system). Therefore, the self is non-stationary, in permanent evolution.

Thus, we have reached the following conclusions.

- (1) The self evolves if cognition is applied to cognition, i.e., if an individual cogitates on his or her own cognitions;
- (2) the self as the ‘identity’ of an individual is an attractor (a ‘processual gestalt’) which results from this process;
- (3) the self is maintained by recursions.

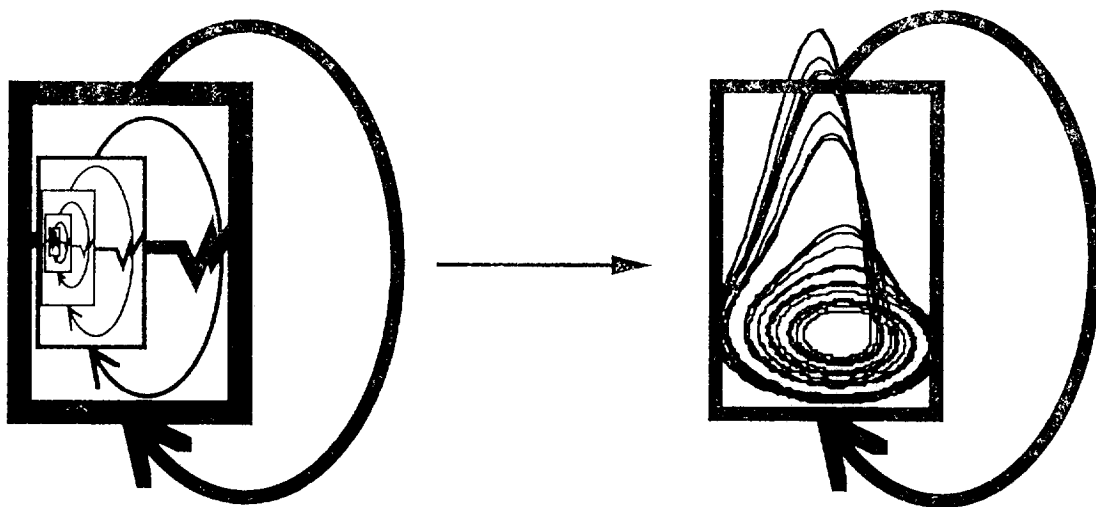


Fig. 2. Scheme of the self as a processual gestalt (symbolized here by a chaotic attractor) resulting from temporal ‘deparadoxification’ of self-reference.

<sup>†</sup>We define ‘cognitive’ such that the term also encompasses emotional parts of the psyche.

## THE DYNAMICS OF THE SELF

After having conceptualized the self as the result of a dynamical system within cognition, we may conceive of attributes and functions of the self in a new way. We will proceed by formulating several working hypotheses in dynamical terminology.

### *Evolution of the self*

Let us consider the ontogenetic development of the self, which may be understood as a gradual process of 'self self-organization'. The evolution of the self is self-organized<sup>†</sup>, since no explicit blueprint of the self seems feasible; neither a biological-genetic matrix nor social role assignments alone suffice to determine the self. We rather consider the genetic disposition as well as the social environment as control parameters of the developing self. Self development is seen as cognitive pattern formation with social and biological constraints; this applies similarly to the development of other schemata [17, 18]. Characteristically, the development of the self proceeds unconsciously.

Seen from the biological side, there is an interaction of neuronal pre-wiring with stimuli from the social and physical environment. Neuronal cell assemblies become adapted and functional by self-organization and selection; irrelevant neurons and synapses decay while new interconnections grow [19, 20]. The self is always acquired: it emerges from biosocial interaction [21].

Social constraints seem to be essential as far as can be observed: interaction with other individuals of one's own species is a prerequisite for self-consciousness to develop. Social deprivation, for example, renders chimpanzees incapable of recognizing themselves in a mirror [22]: without the other, there is no own.

The cognitive pattern 'self' in early phases of its development is an attractor which is structurally unstable. In a first phase of insecure identity this attractor can only function under favourable circumstances, in a facilitating environment [23]. One may assume several coexisting attractors in an emerging 'identity landscape' which are approached when differing settings of control parameters are active. Among the local minima in the landscape, there may be dysfunctional attractors which imply disorders of identity. We know from observations in children that such attractors are occupied in the normal development of the self as well. Little children after language acquisition tend to confound 'me' and 'you'; they may over-identify with other individuals. Local minima may be reactivated at a later time, as for instance during transference phenomena in psychotherapeutic settings etc. We regard the development of the self as a path in a bifurcating system of possible biographies (the irreversibility of self-organizing systems [24]).

Seen from the point of view of developmental psychology, it is essential how the child differentiates from his or her mother and/or father in the course of self evolution. Mahler's [25] theory has been quite influential in this respect by stating a sequence of steps from 'primary autism' to a 'symbiotic phase' and, eventually, to increasing differentiation. In psychoanalytical literature we find explicit assumptions of how a child is gradually driven out of the unconditional hypothesis of 'all is me' into the hypothesis that 'others exist' (mother and father). Recently, researchers like Stern [26] and others have revised the notion of the autistic child considerably by acknowledging the baby's active contributions to establish social relationships [28]. This is acknowledged by the notion of a processual gestalt self which also generates information.

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<sup>†</sup>'Self-organization' is understood as a technical term [27].

Thus, it is central to self development to discover the other, the 'you' (cf. the development of ultraperspective [29]). In ontogenesis, the growing relatedness to other individuals and the emergence of the self are mirror images of each other. In free parlance, one might express this by saying that love unfolds the self.

Thus we can add this item to the list of summaries above.

(4) The development of the self is driven by social interaction.

### *Maintaining the self*

We have claimed that the self is an attractor gained by a recursive procedure in social personality development. To use a traditional psychological concept, we examined the gestalt attributes of the self process. As in other permanent cognitive structures, the stability of the self rests on two factors

- (i) on a dynamical dissipative process which becomes established in a complex system via symmetry breakings and which thereby creates a finite-dimensional macro system (homeostatic stability); and
- (ii) on structural stability caused by exercise and learning: metaphorically speaking, the attractor has been 'engraved' into its substrate, it has produced a 'skeleton' or 'sediments' [30].

Thus, the homeostatic processual gestalts recursively exert an influence upon environmental variables such that these in turn contribute to the maintenance of the gestalts ('encrustation' according to Bischof [31]).

The flexibility and adaptability of the self speaks to the fact that its stability is not generated by structure alone (is not neurally pre-wired). Encrustation must be kept below a certain value to not threaten the adaptability of the self attractor. One may figure the self as a topological structure in the sense of Lewin [32], with fluid regions (see (i)) and with boundaries and barriers (see (ii)).<sup>†</sup>

Thus, structure is not sufficient to maintain the self. The self has to be activated in certain intervals to remain stable. We term this activity 'calibration'. Calibration of the self in everyday conscious experience preserves the attracting attributes, the characteristic patterns of personality. First, calibration takes place during episodes of conscious self-reflexion. Such episodes are remarkably rare in everyday cognition; human individuals seem to function well in an 'automatic' manner for extended periods of time.

Second, there is a calibrating effect in other than self-reflexive cognitions. Social interaction and social bonding also relate recursively to one's own personality, one's emotion and behaviour via a partner in an interaction. Reflecting oneself in the self of the other person helps stabilize one's self (Fig. 3). Social self-calibration is affected by empathy, compassion, and love (and even, in an indirect manner, by their negative counterparts).<sup>‡</sup>

The necessity to maintain the self can be deduced from detrimental effects of blocked self-calibration: as is well-known, stimulus deprivation, social isolation, induced long deep sleep, torture and traumata may induce (generally, reversible) reactions of depersonalization and may even cause psychotic states. We may observe a fading of the 'self attractor', especially in individuals with a previously developed 'structural instability' of the attractor.

<sup>†</sup>Mann [6] locates this object on a 4D Möbius strip.

<sup>‡</sup>Psychotherapy therefore can calibrate the self in a two-fold way, by stimulating the patient to introspect, and by the therapeutic alliance as such.

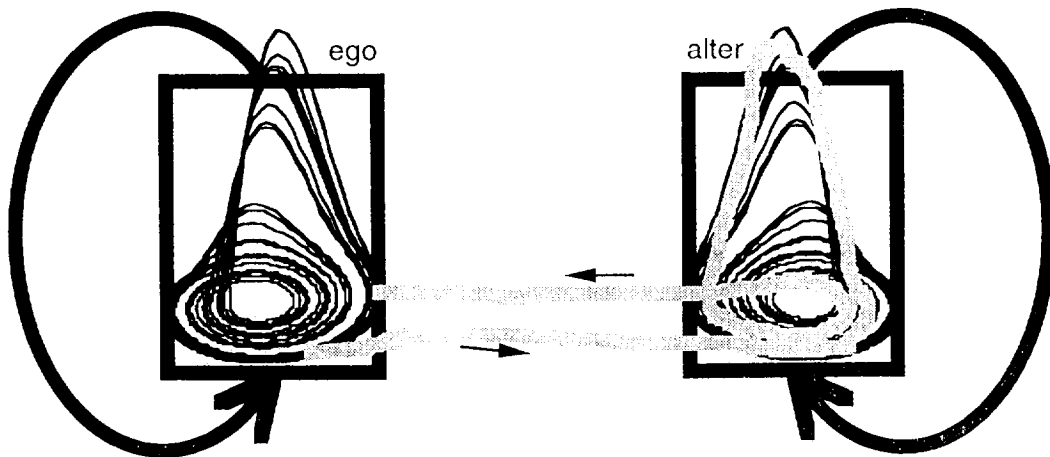


Fig. 3. Scheme of social calibration of the self.

Thus, an interruption of the self process caused by diverse external agents may convergently lead to effects of self impairment.

These effects are found also in circumstances connotated positively like trance states and so-called 'flow' experiences [33]: in concentrating on a restricted stimulus field or an activity which demands exclusion of all unrelated cognition, feelings of 'self oblivion' and changes of the perception of time usually occur after a certain period of time. Flow reduces self-consciousness by enhancing consciousness of action. In the context of play and sports these dissociative states are perceived as rewarding. Therefore breaks of the self process are tolerated and even helpful if they last for some limited overseeable period.

An interesting consequence of this strain of thought concerns the physiological necessity of sleep; since sleep should also interrupt calibration, why is it not detrimental to the maintenance of the self? It follows that dreams may serve a function in this respect. Thus, new light is thrown on the question of why we dream: dreams contribute to self calibration.

The optimal duration of intervals between calibrations may be between one and two hours. This estimation is derived from the intervals between REM activity in sleep and from the average duration of flow experiences. In general, the necessity for calibrating the self makes the course of waking time rhythmical. Monotonous tasks have to be segmented by pauses; otherwise vigilance (i.e., the consciousness and awareness of a working person) decreases, learning and efficiency during work is reduced.

### THE SELF IN SCHIZOPHRENIA

The disorders of the self comprise various psychopathological phenomena like, to mention just a few, dissociation, multiple personalities, familial enmeshment, disturbed body image in anorexia nervosa. Sacks [34], for example, impressively describes the consequences of a confabulatory Korsakov syndrome for the self. Forced by his permanent amnesia, this patient incessantly re-creates himself and his world. Sacks concludes: "Each of us is a singular narrative, which is constructed continually, unconsciously, by, through, and in us—through our perceptions, our feelings, our thoughts, our actions; . . .". This is congruent with our notion of the self seen as a process ('narrative') which self-organizes into specific patterns.

In the following we will continue to apply our concepts to the psychiatric disorder of schizophrenia which is characterized by a variety of severe changes of the self. Several (not

mutually exclusive) possibilities of conceptualizing schizophrenic symptoms are given on the basis of our assumptions.

(1) Schizophrenics cannot deparadoxify self-references.

The process of subject-object differentiation (the self split up into 'I' and 'me') has been described as a logically and philosophically nontrivial event of everyday occurrence. In introspection, the dividing line between subject and object appears to close again after self-reflexion so that the 'default state' of automatic integrated behaviour without self-reflexion is re-established: the processual gestalt of the self has been calibrated.

What would be the effect of not being able to engage in the mentioned strategy of differentiation in time? Obviously, a rapid fragmentation<sup>†</sup> of the cognitive system should begin which would hinder the evolving processual gestalt. Those functions which can only be upheld by an integrated and whole self, as for example keeping apart self from other, would be lost in the long run. Under certain circumstances, an enforced protracted subject-object differentiation after self-reflexive cognitions should be a means of generating schizophrenia-like symptoms of depersonalization. A first hypothesis about the self of schizophrenic persons might claim that they cannot deparadoxify the recursive process of 'cognition about cognition' in a temporal way (i.e., by non-conscious dynamics). A certain sensitivity of schizophrenic persons regarding paradox messages and mixed levels of reference, as stated by double bind theory [35], seems compatible with this notion.

(2) The structural parts of the processual gestalt 'self' are diffuse.

Jaynes [36] finds in schizophrenic persons a decay of 'self-qua-analogue' (i.e., the inner metaphor a person has of him or herself); this would lead to a loss of personal boundaries, and also to a more intensive 'In-der-Welt-Sein' (being-in-the-world).<sup>‡</sup> Schizophrenics' selves are vulnerable: their self attractors are endangered at least in the intervals between calibrations. Need for external structure corresponds with a lack of self structure, especially of the mentioned 'sedimented' parts.

A general functional deficiency of cognitive attractors is reported by schizophrenia research [37]. Not only is the self deficiently structured but so are gestalts of sensory perception. During a psychotic episode, cognitive pattern formation changes in a characteristic manner; in a prepsychotic state a general loss of meaningfulness is reported ('Gestaltverlust', derealization after Conrad [38]; see also [39]). Sometimes there is a shift of meaning to previously unnoticed details. These derealization processes of prodromal states are often followed next by the self-organized formation of delusional and bizarre meaning. This changed and once again coherent world of delusion is less flexible than the 'normal' reconstruction of reality; the world is built into delusional beliefs rather than the opposite way (which may be considered nonpsychotic). The 'productive' breakthrough to a coherent delusional system into which the self is moulded often appears psychologically as a radical new solution of a conflict which became increasingly more acute and could no longer be coped with by negative symptoms [40]. Delusional contents are bizarre especially if the self appears as a gestalt in a delusionally distorted way. The experience of depersonalization at the onset of psychosis is perceived as extremely threatening; the psychotic person may render him or herself being somebody else, being dead, being a machine etc. At any rate, a coherent processual gestalt has evolved once again. In

<sup>†</sup>Probably measurable by an increase of degrees of freedom in certain areas of the brain reflecting the larger number of active cell assemblies [46, 47].

<sup>‡</sup>Which occurs also during "flow", but with opposite-sign affectivity.



longitudinal studies of schizophrenia courses, we obtain results congruent with this notion: nonlinear processes of low dimensionality are found in ratings of psychoticity [41, 42].

(3) Social calibration of the self is or has been insufficient.

Psychoanalytic theory views an impairment of interactional processes at the 'narcissistic' stage as responsible for a weakening of the ego, and for a later 'break-through' of psychotic contents. The interaction with schizophrenic persons gives many clues to the point that changes in social behaviour are central to psychotic functioning. One such peculiarity can be linked to a loss of boundaries and to the weakening of the self: schizophrenic persons can easily transcend their own perspective, they are able to overly identify with the other, to fuse with persons they interact with. It appears as if the 'way back' to their own selves may get barred; for psychotic persons, social 'pacing' no longer fosters self calibration (Fig. 4). A consistent refusal of social contacts, which is characteristic of some psychotic persons, is compatible with the hypothesis of a loss of boundaries: the other is dangerous if the own self is habitually endangered. Both fusion and withdrawal have in common that social calibration of the self is inactivated, so that in a vicious cycle the vulnerable self eventually becomes dysfunctional.

We may formalize a social system by two coupled dynamical systems of the type of autonomous optimizers [43]. A system of this kind may move from an autistic state into an 'altistic' state by passing a symmetry breaking point (an 'interactional bifurcation'); this locomotion lays the foundation for rational and moral behaviour [29]. At the same time, the bifurcation is the crystalizing kernel of self development. Then there may be a third functional state of the self which would be psychosis consistent in itself. Psychosis would not only be viewed as leaving behind the autistic stage in an impaired or insufficient way, but as an original solution of 'self sacrifice', i.e., a processual gestalt. If psychosis is understood as consistent self sacrifice, it would be a getting lost in rudimentary love (i.e., fusion without re-entering the own self). Quantitative findings mentioned above, which posit that schizophrenia may be a dynamical disease rather than a stochastic phenomenon, are in line with this interpretation.

Psychotherapy of psychotic states is known to be difficult. Therapists prefer to protect themselves against psychotic violations of boundaries and therefore work structuredly and rigidly (with a psychoeducative stance). The experiences of an alternative treatment of schizophrenia [44] advise that authentic empathy and compassion are necessary and helpful

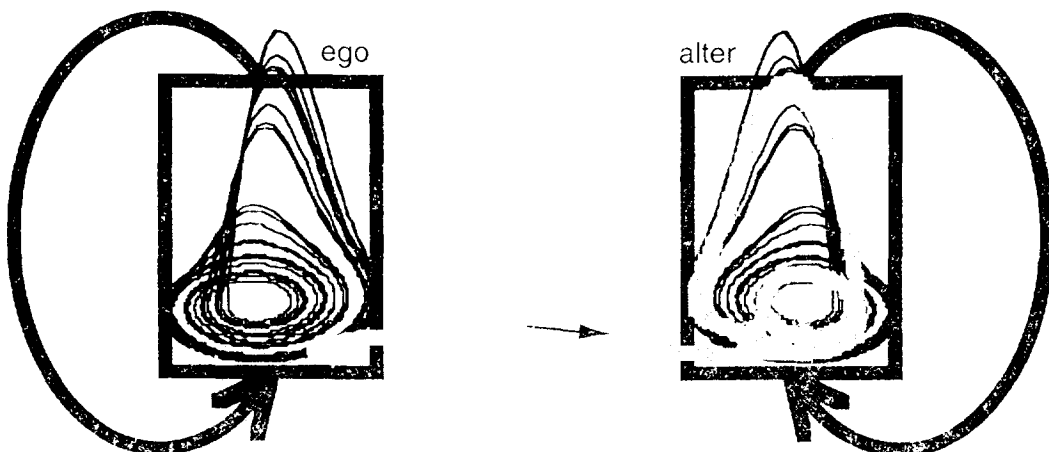


Fig. 4. Scheme of psychotic fusion.

in the psychotherapy of psychotic disorders. This corroborates our assumption that a reconstitution of the self may be affected by social calibration (maybe even re-parenting). Empathy would then be the possible re-entry from self sacrifice.

### DISCUSSION

We have collected phenomenological arguments speaking in favour of the self as a processual gestalt, i.e., a kind of equilibrium evolving in the psyche. The psyche is conceptualized as a complex dynamical system in which the attractors unfold by self-organization. Consequently, the self is less a 'mental structure' than a processual gestalt which needs regular calibrating episodes for its maintenance. Two classes of such episodes can be distinguished: first, self-reflexive introspection and second, experiencing one's reflection in social interaction. Many findings support the thesis that the second plays a central role in the ontogenetic development of the self. Both have in common the self-referential application of cognition to cognition.

Self development proceeds from an infant's social competences to conscious functioning in social interaction. Self-consciousness grows out of the experience of interpersonal relationship: the self becomes logically unavoidable, because there is another being in whom the infant views his or her mirror-image. The infant must be capable of getting involved in interaction and also of letting alone a partner. This dual step is important also for the self-conscious adult in providing the calibration necessary to maintain individuality. Love may be defined along these lines: love is an attribute of a system of two individuals who mutually couple this dual process (of being reflected and letting go) with rewarding affects. Love is a mutual game of distance regulations which centres around the social synchronization of secluding and opening up oneself (Fig. 5). One of its functions is maintaining the interactants' selves.

A quite similar game comes into existence in a system of mutual transference—psychotherapy. Psychotherapy differs from love relationships in that the goal-orientation of the therapy terminates the interaction as soon as a joint meta-level of meaning is established. Empirically, we can monitor this by changes of complexity in the course of psychotherapy [45]. We assume the final decrease of complexity in the therapeutic transactions we observed is an indication of the therapy system having self-organized into a more ordered state. The emerging interpersonal gestalt is the 'solution' therapy can offer. From the

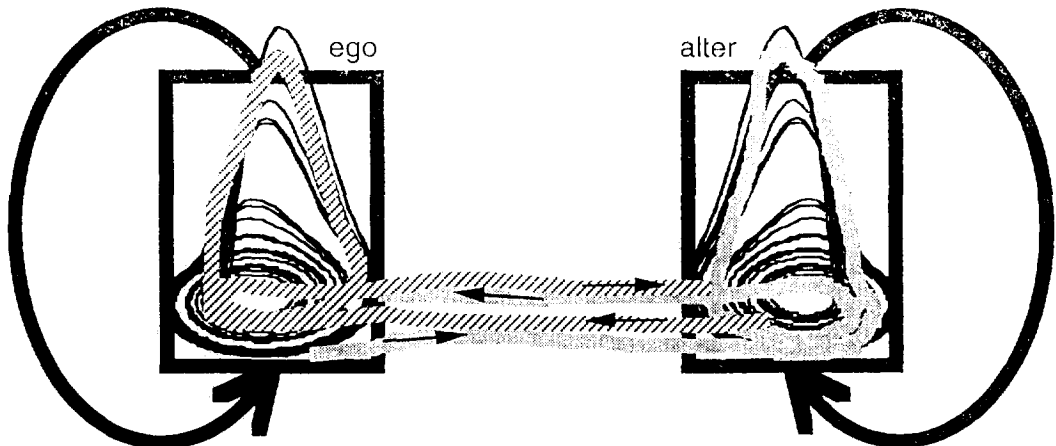


Fig. 5. Scheme of love: mutual social calibration.

perspective of systems theory, this phenomenon closely parallels the evolution of the self. The difference is that the processual gestalts in the two cases evolve on different system levels.

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