

# The Concept of Affect Logic: An Integrative Psycho-Socio-Biological Approach to Understanding and Treatment of Schizophrenia

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IN THIS ARTICLE, the psycho-socio-biologically integrative concept of affect-logic, and its relevance for a comprehensive understanding and therapy of schizophrenia, is briefly presented. This concept has been developed by the author over the past 20 years, on the basis of the literature, of clinical experience and his own research into long-term evolution, rehabilitation, effects of milieu-therapy, and nonlinear evolutionary dynamics of the illness. It postulates, basically, that fundamental affective states (or emotions, feelings, moods) are continuously and inseparably linked to all cognitive functioning (or "thinking" and "logic" in a broad sense), and that affects have essential organizing and integrating effects on cognition. Schizophrenia is understood as an altered mode of affective-cognitive interaction based, possibly, on disturbed (loosened) affective-cognitive connections. This hypothesis leads to: 1) an integrative psycho-socio-biological model of long-term evolution of the illness; 2) a new understanding of psychopathological core phenomena such as ambivalence, incoherence, and emotional flattening; 3) an innovative therapeutic approach based on an emotion-relaxing milieu and style of care; and 4) the hypothesis that schizophrenia could basically be an affective (and not a cognitive) disease, of another kind than mania or melancholia, however.

Since the classical descriptions by Kraepelin (1896) and Bleuler (1911) of the psychotic condition we now call schizophrenia, this enigmatic disorder continues to represent one of the most puzzling unsolved problems in the whole field of medicine. Even though many biological, social, and psychological factors which influence its etiology and course have been detected during the last decades – among

them genetic, perinatal, and biochemical factors, disturbed rearing conditions and confusing familial communication patterns, high expressed emotions, socio-economic and cultural conditions (references see below) – no predominant single "cause" of the multitude of psychotic phenomena has so far been identified, nor has an adequate theoretical framework emerged which would convincingly link

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This paper is based on a lecture at the XIth International Symposium for the Psychotherapy of Schizophrenia, Washington DC, June 12–16, 1994

the scattered pieces of biological and psychosocial knowledge together.

A certain progress was made, however, when George Engel (1977) proposed his biological-psychosocial model of human functioning. Other models specifically adapted to schizophrenia promoted an integration of biological and psychosocial approaches—among them the information processing model (Chapman and Chapman 1973), the stimulus-window model (Wing 1975), the vulnerability model (Zubin and Spring 1977), and the stress-diathesis-model (Gottesman and Shields 1978). Remaining mostly too general or partial, and additive or summative rather than truly integrative, in the sense of explaining how specific psychodynamical, sociodynamical, and biological factors actually interact, none of them gained general recognition, with the exception, perhaps, of Zubin's and Spring's vulnerability model, which will be addressed below.

During the last 10 to 15 years, the basic knowledge on psychosocial-biological interactions has remarkably increased, however. At least three fundamental phenomena, or mechanisms, functioning as "psychosocial-biological mediators" (Ciompi 1989) have been described. First is the mechanism of neuroplasticity (the fact that activated synaptic connections are neurophysiologically reinforced and dendritic growth is stimulated by repeated action, whereas inactivated connections are weakened—a mechanism which is the neurophysiological basis of all learning and memory, and provides a crucial common point of impact for both biological and psychosocial influences, cf. Haracz 1984, Changeux and Konishi 1987). Second is the notion of stress, with its simultaneously biological, intrapersonal, and interpersonal aspects (Seyle 1946, Levi 1973). Third is the notion of affects, with its simultaneous intrapersonal-subjective, social and biological points of impact, and its crucial organizing and integrating effects on cognitive functions that are explained below (Zajonc 1980, 1984; Ciompi 1982/1988, 1991a; Lazarus 1982, 1991; Leventhal and Scherer 1987; Izard 1977, 1993a).

In the concept of affect-logic which is to be presented in this paper, these three biological-psychosocial mediators and their interactions play a central role. Integrated into a comprehensive psycho-sociobiological model of the psyche, with special relevance to schizophrenia, they provide an empirically grounded theoretical link between a wide range of phenomena on all three levels mentioned. The concept of affect logic was first proposed by this author in a book written in German (Ciompi 1982, English translation 1988) and further developed since (Ciompi 1986, 1991a, b, 1994). It is based on empirical research in long-term evolution, psychopathology, and rehabilitation of schizophrenia (Bleuler 1978; Tsuang, Woolson, and Fleming 1979; Ciompi, Dauwalder, and Agué 1979; Ciompi 1980, 1988b; Huber, Gross, and Schuttler 1980; Harding et al. 1987a, 1987b; McGlashan 1988; Marneros et al. 1988), in therapeutic effects of an emotionally relaxing therapeutic setting and style of care (Mosher and Menn 1978; Ciompi et al. 1992a, b, 1993a, b), and on a theoretical approach focused on affective-cognitive interactions, which integrates central elements of Piaget's genetic epistemology (Piaget 1977a, b) with current psychoanalytical (Kernberg 1976, 1980, 1990), psychological (Zajonc 1980, 1984; Lazarus 1982, 1991; Izard 1977, 1993a, b) and biological (Derryberry and Tucker 1992; McNeal 1993; Davis 1994) findings. The overall theoretical framework is system theoretic (Bertalanffy 1950; Miller 1975), including current notions on self organization and nonlinear (chaostheoretical) dynamics of complex systems far from equilibrium (Prigogine et al. 1983; Haken 1982, 1990; Ciompi 1996; Tschacher et al. 1992, 1996; Ciompi 1996).

In the following paper, the basic notions of the concept of affect-logic will first be briefly presented. Secondly, its relations to schizophrenia will be outlined. Thirdly, some of its main practical implications will be summarized.

#### BASIC ELEMENTS OF AFFECT-LOGIC

The term "affect-logic" is a not entirely satisfactory transposition into English of

an appropriate German neologism meaning, simultaneously and with equal weight, "the logic of affectivity" and "the affectivity of logic." It points to the—certainly not new but, we believe, in its far-reaching consequences not yet adequately understood—central postulate that affects (or feelings and emotions) on one side, and cognitive functions (or thinking and logic) on the other side, are continually and systematically interacting in all normal and in most pathological mental functions. Affects are operationally defined as global psychosomatic states of variable duration and degree of consciousness, with corresponding psychomotor and (perhaps) expressive behavior. As even indifference, apathy, or the more relaxed "neutral" mood of everyday behavior correspond to a specific emotional "tuning" of body and mind, it is impossible not to be in a certain affective state. Cognitions, on the other side, are defined as the perception and further elaboration of sensory differences. And "logic," finally, is understood in the general sense of "the way cognitive elements are linked together"—a broad definition which conduces to the notion of different kinds of logics, or modes of cognitive functioning, in different affective states (see below).

According to the concept of affect logic, the enormous variety of normal and pathological mental phenomena can be understood, on a formal level, as the result of specific patterns of complementary interactions between two fundamentally different but obligatorily linked biological systems. The first is a cognitive and ultimately quantifying one, which is primarily based on perception and on further processing of sensory informations (that is differences). The second is an affective and qualifying one which provides these cognitions (and the relations between them) with specific emotional connotations, by linking them with different affective states. Corresponding affective, cognitive, and behavioral elements are systematically connected through repetitive actions and experiences; they are integrated into functional "programs for

feeling, thinking and behaving" (or "affective-cognitive-behavioral systems of reference"), which eventually form the essential "building blocks" of the psyche, both on elementary and on complex levels. A simple example is an acquired reflex of the type "burnt children fear the fire" (a German proverb), a complex one is a transference reaction pattern in the psychoanalytical sense (e.g. an anxious-aggressive behaviour against all father figures). Self-representations and object-representations, as described by psychoanalysts such as Jacobson (1965), Mahler (1968), and Kernberg (1976, 1980), can thus be understood as complex supraordinated "feeling-thinking-behaving-programs" generated through action (which mainly corresponds, here, to interpersonal communication). Actually, the whole psyche (or the "psychic apparatus", as Freud preferred to say) appears as a complex hierarchy of functionally integrated affective-cognitive behavioral "programs," which represent a condensation of past action, and provide, simultaneously, the relevant basis for all future perception and action in similar contexts.

The conceptualization of affect logic is strongly supported by basic neuroanatomical and neurophysiological research. Recently detected rich ascending and descending connections between limbic and paralimbic structures, which generate and regulate emotions on the one hand, and, neocortex, thalamus, and hypothalamus on the other hand, provide the neuronal basis for continuous interactions between emotions, cognitions, sensorimotor activity, and hormonal tuning of the whole body (Panksepp 1982, 1991; Gainotti 1989; Derryberry and Tucker 1992; Le Doux 1993; McNeal 1993; Schore 1994). Of particular interest is the discovery of direct connections between thalamus and amygdalae, allowing for emotional emergency reactions to sensory inputs without previous high-level cognitive processing (LeDoux 1989, 1993). Different genetically rooted affect-organized neuronal systems, with operationally integrated cognitive, affective, sensori-

motor, and hormonal-vegetative components, have been identified, or are on the way to being identified, during the last 10–15 years; among them a so-called reward-system characterized by pleasant feelings (Routtenberg 1978), an anger-aggression system, a fear-anxiety system, and a panic system (Panksepp 1982, 1991; Ploog 1989, 1992). These systems have privileged relations to certain neurotransmitters: the so-called reward-system to endorphine, the anxiety-panic system to dopamine, the anger-aggressivity system to noradrenaline, and the sadness-depression system to serotonin (Ploog 1989). The well known projections of the relevant neurotransmitter systems toward distant brain areas provide a functional basis for the postulated far-reaching effects of emotions. By the already described phenomenon of neuronal plasticity, complex context-specific functional circuits (or “programs”) based on action – that is, experience – are generated throughout life. Here, too, all the available evidence (especially conditioned reflexes and other learning phenomena) speaks for the assumption that relevant emotional components (and corresponding humoral reactions) are functionally associated with context-specific cognitive and behavioral patterns. Other biological findings concerning emotion-dependent information processing, learning, and memory, will be presented below. Furthermore, an extended body of evidence shows that endorphines, related to positive emotions between mother and child during early childhood, contribute to the maturation of limbo-frontal connections that are eventually of paramount importance for binding patterns and social communication in general (Schore 1994). These findings also support the idea, developed elsewhere (Ciompi 1991a), that the hypothesis of an obligatory “emotional imprint” in cognitive structures would furnish an explanation of practically all affective-cognitive interactions postulated by affect logic. Among these are the systematic organizing and integrating effects of emotions on cognitions, presented in the next para-

graph. In addition, as cognitive information processing and affective components become increasingly observable (e.g. by neuro-imaging or by spectralelectroencephalographic methods—see below), the following seven hypotheses of increasing specificity may be proposed for further neurobiological and neuropsychological research (Ciompi 1991a).

- affective processes are always coupled with cognitive processes, and vice versa
- different affective states correspond to different functional states of the brain, characterised by different modes of information processing
- specific affects tend to be related to specific cognitive contents, and vice versa, forming functional affective-cognitive systems
- affects and their respective neurophysiological equivalents are involved in the storage of cognitive information
- affects and their respective neurophysiological equivalents are involved in the mobilization of stored cognitive information
- in specific affective states, specific cognitive contents tend to be mobilized
- affects and their respective neurophysiological equivalents are capable of integrating extended neuronal systems into operational entities which regulate context-specific feelings, thoughts, and behaviour.

Affect-logic, furthermore, postulates that affects have not only major energizing, that is, motivating and mobilizing, effects on cognitions, as claimed by Piaget (1981) and other authors, but also fundamental organizing and integrating functions mediated through, at least, the following five mechanisms (Ciompi 1989, 1991a; quite similar theses have recently been advanced by Izard 1993b).

Firstly, the focus of attention is continuously conditioned by specific emotional states. These have a decisive influence on selection and linkage of cognitive stimuli. Affective-specific types of thinking and

"logic" in the above mentioned sense are therefore generated by different emotional states. In addition to conventional forms of logic, which are linked to an average state of relaxation, there also exists a specific "fear-logic", "anger-logic", "sadness-logic", "happiness-logic", etc.

Secondly, storage and remobilization of cognitive material is state-dependent for the same reasons. This is already obvious (and largely exploited in advertising) in everyday experience. Cognitive information without a specific emotional connotation is hardly noticed nor stored, and state-specific memories are remobilized in corresponding moods. State-dependent learning and memory has actually been detected by spectral electroencephalographic research showing, for example, significantly different types of information processing in the state of wake, sleep, dream, psychosis, trance, and drug-induced states (Koukkou et al. 1983, 1986). Five different global cerebral states, corresponding to five so-called basic emotions (interest, fear, aggressivity, sadness, and joy), have been made out by the same method (Machleidt et al. 1989; Machleidt 1992). Affect-specific memorization with integrative functions of affects has also been demonstrated by experimental work with drug-induced or hypnosis-induced emotions. Cognitively very heterogenous events scattered over the whole life, but characterized by common affective connotations (such as shame, rage, or pleasure) were remembered "en bloc" in corresponding emotional states (Grof 1975).

Thirdly, an affect-specific cognitive hierarchy is generated by activating affect-congruent cognitions and suppressing non-specific ones. In a fearful situation caused by a fire, for instance, all other cognitive stimuli and preoccupations, except those directed on salvation, are eliminated. It is obvious that this mechanism has a high survival value. More subtle mechanisms of the same type are, however, also at work in less dramatic situations. Even in scientific work, for instance, focalization of attention, as well as

remobilization and storage of memory material, are continually directed and conditioned by specific underlying states with clear emotional connotations, e.g. interest, ambition, or competition. In all kinds of defense mechanisms in the psychoanalytic sense, too, affect specific organizational effects (selection, repression, negation, projection, particular ways of connecting cognitions, etc.) are at work.

Fourth, coherence and continuity of cognitive experience are created, both cross-sectionally (synchronically) and over time (diachronically), by connecting cognitive material having common affective qualities. This mechanism, too, has high survival value, because it increases the probability of activating context-appropriate cognitions and behaviors, and eliminating inappropriate ones.

Fifth, emotional factors also play an important role in reorganizing cognitive material on higher levels of abstraction, according to the concept of affect logic. In Piaget's (1977a, b) phenomenon of "majorizing equilibration," as he calls this process, it is obvious (although neglected by Piaget himself) that unpleasant feelings caused by contradictions or inconsistencies furnish the needed energy for looking for new solutions (a term with clear emotional connotations) which, when found, are immediately linked with pleasant feelings. More adequate (easier going, more economical) thinking is pleasant because it is tension-reducing. Eventually, different cognitive elements characterized by similar pleasant feelings are linked together, and combined into cognitive structures of progressively higher orders of abstraction (e.g. a new sequence of reasoning, a new theory, or overall hypothesis).

Thus, common pleasant and unpleasant feelings literally guide and connect relevant cognitive elements and disconnect irrelevant ones, and these initially intense and quite conscious feelings (which are stored together with the corresponding cognitions) will eventually continue to manifest themselves in what Freud has called "pleasure of function"—an often hardly conscious positive mood which ac-

companies all easy going mental (and also psycho-motor) activities. On the other hand, strongly unpleasant feelings (anger, aggressiveness, sadness, or fear) are immediately activated when automatized cognitive paradigm are suddenly questioned and disturbed by contradictory evidence.

All these affective-cognitive interactions may be mutually reinforcing, i.e. circular. They are by no means observed only on the individual level, but also on the collective level. Affects are highly contagious, and thus create common global patterns of feeling-thinking-behaving in couples, groups, and even in whole nations. Extreme examples are collective hysteria, panic, aggressiveness, or enthusiasm. Goal-directed common actions without common feelings are practically impossible, and a common emotional "tuning" is the most important precondition for cognitively successful communication. Affects thus create coherence and continuity of cognitive experience, not only on the individual level, but also on the social level. Collective storage and mobilization of mnemonic material is also highly influenced by basic emotions, as demonstrated by the reactivation of emotionally loaded collective memories (e.g. of injustices or triumphs) by nationalistic groups in appropriate emotional states. Both on the individual and on the social level, affects have hence very similar mobilizing, energizing, organizing, and integrating effects on cognitive material. A somewhat similar thesis has already been advanced by Collins (1981).

#### PSYCHOPATHOLOGIC IMPLICATIONS

Affect-logic has implications in several domains of psychopathology. Only those concerning schizophrenia shall be highlighted here. They include, mainly, the following four domains. Firstly, affect-logic leads to a psycho-socio-biologically integrative model of long-term evolution of schizophrenia in three phases which is centered on a modified version of the

vulnerability hypothesis. Secondly, it deepens the understanding of psychopathologic core-phenomena such as ambivalence, incoherence, or emotional flattening. Thirdly, it generates new hypotheses concerning the role of nonlinear dynamics in short-term and long-term evolution of the illness. And finally, it leads to innovative therapeutic approaches.

The psycho-socio-biological model of long-term evolution of schizophrenia in three phases (Ciompi 1982/1988a, 1988b) (cf. Fig. 1) integrates basic notions of affect logic (especially the concept of integrated feeling-thinking-behaving programs, generated through experience, but also affected by genetic and other biological factors, as basic "building-blocks" of the psyche) with essential findings of the research in schizophrenia, especially with the discovery of a great diversity of long-term courses by recent longitudinal studies (among them our own), and of numerous biological, psychosocial, and therapeutic or rehabilitative factors which are influencing these courses (see below).

During a first premorbid phase, which lasts from conception until the outbreak of psychosis, interacting biological and psychosocial factors known for increasing the statistical risk of psychosis (heredity, perinatal traumata—cf. Gottesman and Shields 1978; Kringlen 1986; Shapiro 1993; severe developmental discontinuities—cf. Mednick, Schulsinger, and Schulsinger 1975; Parnas, Teasdale, and Schulsinger 1985; confusing communication patterns or other family-related factors—see Singer et al. 1978; Tienari et al. 1985) create a specific vulnerability (Zubin and Spring 1977; Ciompi 1982/1988; Nuechterlein and Dawson 1984). By neural plasticity, all these influences are biologically encoded in the complex hierarchy of feeling-thinking-behaving programs mentioned above. Biologically rooted neuropsychological deficiencies, as well as severe interpersonal-relational discontinuities and conflicting or confusing communications, obviously result in a lack of clarity and operational stability/flexibility—and hence in reduced functional per-

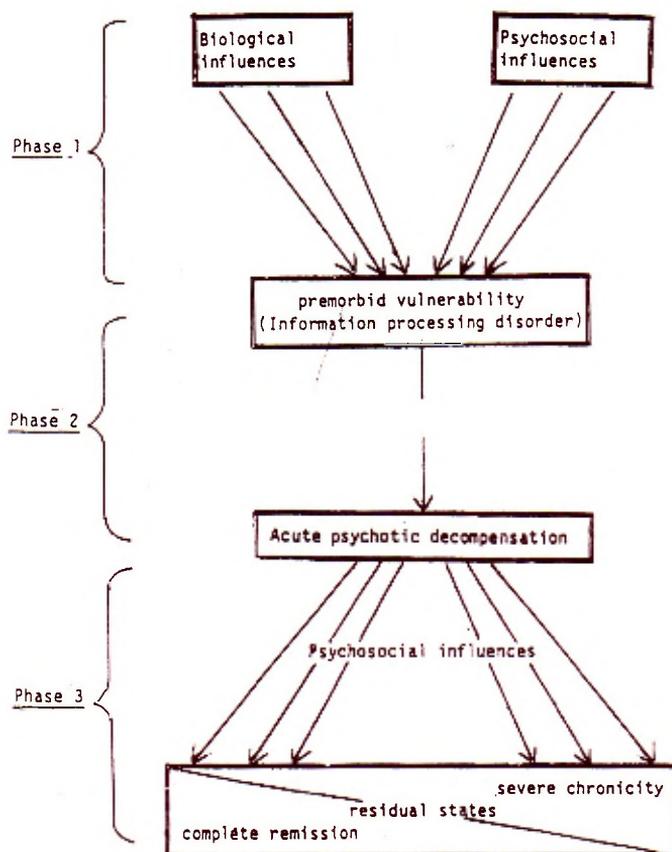


Figure 1  
Three-phase-model of schizophrenia (Ciompi 1982/1988)

formances—in important affective-cognitive connections, such as those linking specific affects to parental images and self-image (object-representations and self-representations in the psychoanalytical sense), to relevant peer-images, or to the representations of important environments, activities, and technical objects. As will be further discussed below, the main characteristic of the schizophrenogenic vulnerability may therefore consist of a particular lability in affective-cognitive connections, which crucially reduces information processing capacity, or stress tolerance, with particularly negative consequences in the vital domains mentioned above.

During the second phase, which corre-

sponds to acute psychotic decompensation, increasing emotional tensions created by additional non-specific biological and/or psychosocial stressors (e.g. hormonal changings, drug abuse, or leaving home, mating, child-birth, etc.) gradually overtax this vulnerable coping system. At a critical point of tension (which corresponds to a typical bifurcation in chaotic-theoretical terms, see below), overall patterns of affective-cognitive functioning are, more or less suddenly, forced into a radically different global regime, (e.g. a paranoid, hebephreniform, or catatoniform pattern) corresponding to psychosis.

During the third phase, long-term evolution—which is much more variable than traditionally assumed—strikingly con-

## AFFECT LOGIC AND SCHIZOPHRENIA

gruent affective, cognitive, and behavioral changes toward restriction and other negative symptoms take place (which speak again for the postulated affective-cognitive integration and will be analysed in the next paragraph). According to our model, the great diversity of possible evolutions observed between recurrent acute relapses, continuous evolutions, and mild or severe, stable or unstable residual states, is mainly determined by variable interactions between a great number of biological and psychosocial factors which have been identified for influencing long-term course. Among these are interacting genetic and environmental factors determining premorbid social adaptation, personality structure, and vulnerability (Tienari et al. 1985; Kringlen 1986; Ciompi et al. 1979; Ciompi 1980, 1988b; McGlashan 1988), familial communication patterns (Singer et al. 1978) and "expressed emotions" (Leff et al. 1982; Kavanagh 1992), socio-economical and cultural conditions (WHO 1979; Sartorius et al. 1987), institutional milieu and care system (Wing and Brown 1970), and therapeutic and preventive interventions. The concept of affect-logic provides the theoretical framework for integrating all these seemingly heterogeneous influences under one common denominator: they all have their point of impact on the described feeling-thinking-behaving programs, and therefore their neuronal substratum is modified, labilized, or stabilized by the various influencing factors.

Turning now to specific psychopathologic manifestations, these organizing and integrating functions of affects on cognition contribute to explain the striking parallelism which exists between affective and cognitive aspects in schizophrenic core-phenomena like ambivalence, incoherence, or emotional flattening. In ambivalence, for instance, both feelings and thoughts (and behavior as well) become highly unstable and finally discontinuous. In chronic residual states characterized by negative symptoms such as retreat, apathy, and emotional flattening, both affectivity and cognition are, in con-

trast, highly restricted and leveled. Even these apparently stable states—which may be understood as biological and/or psychological counterregulations against the painful lability of the acute phases—can, however, slowly change (intensify or vanish) in the long run. But recurrent acute reactivations show that an underlying emotional-cognitive lability and oversensitivity remains present.

On the basis of these clinical observations, and the notion of organizing and integrating effects of underlying affective states, the hypothesis arises that the typically schizophrenic thinking disorders could be related to a primarily affective disorder, with secondary effects on cognitive functions, namely to the already mentioned lability, or inconsistency, of affective-cognitive connections in acute conditions, and a counterregulatory over-stability in chronic conditions. In other words, not only melancholia and mania, but schizophrenia as well, may actually be a basically affective rather than a cognitive disease. This idea is also supported by recent EEG-research focused on the role of emotions in schizophrenia, which shows the predominant role played by underlying conscious or unconscious anxiety (Machleidt, 1989, 1992), and by increasing evidence for anatomical and functional defects in the limbic and paralimbic areas of schizophrenics (Bogerts 1985; Buchsbaum 1990; Shapiro 1993; Davis 1994). Additional clinical evidence, such as cognitive-emotional lability, parathymia, and incoherence, manifesting itself mainly during the initial phases of the illness, speaks for the same hypothesis. Already, Eugen Bleuler (1911) emphasized a particular loosening of affective-cognitive connections in schizophrenia, and this phenomenon could well represent a central element of the still enigmatic schizophrenogenic vulnerability. Simultaneously, specific differences between mania, depression, and schizophrenia thus become evident. In mania and melancholia, affective-cognitive connections are not too loose and unstable, but, on the contrary (at least temporarily), too rigid and unilat-

eral in opposite directions. In mania, all cognitive functions are rigidly connected to euphoric affects, and in melancholia to depressed ones. Again, thinking and behavior are also globally distorted in the same direction.

Finally, the proposed notion of the energizing, organizing, and integrating functions of affects on cognitions, and their importance in the generation of operational affective-cognitive systems of reference, leads to an innovative chaostheoretical interpretation of the short-term and long-term dynamics of schizophrenia. Chaos theory (and also its more recent development, complexity theory) offers new explanations for sudden nonlinear phase transitions, irregular short-term and long-term evolutions, and big effects triggered by minimal causes (the so called "butterfly-effects") appearing under critical conditions in dynamic systems that are driven far from equilibrium by a continuous input of energy. At a critical point, a globally changed pattern of energy distribution may emerge (a new "attractor", or "dissipative structure" in the sense of Prigogine and Stengers 1983). If affects, with their energizing and simultaneously organizing and integrating effects on cognitive components, are considered as major energy vectors in mental and neuronal systems, then psychotic patterns of functioning can be understood as globally modified patterns of energy distribution – that is, affect distribution and affect organization – among available cognitions, appearing at critical bifurcation points under the influence of gradual overtaxation (Ciompi 1982/1988, 1991b, 1996). Such phase transitions are favoured, according to the chaostheoretical concept of synergetics proposed by Haken (1982, 1990), by critical modifications of so-called control parameters (basic conditions). Clinically, as well as theoretically, it seems very likely that unspecific emotional tensions (such as those created in a vulnerable individual, e.g. by "high expressed emotions", or by other psychosocial or biological stressors) function in mental systems as relevant control parameters which, when modified to a criti-

cal point, are capable of provoking a nonlinear shift to psychosis. Furthermore, at this unstable point of transition, formerly peripheral cognitive elements (e.g. subliminal thoughts and perceptions, or occasional delusional phantasies) may begin to act as so-called order parameters (formerly marginal structural elements which can suddenly become dominant) that eventually "enslave" (as Haken calls it) the overall dynamics of the evolving dynamic system.

Clinical phenomena at the beginning of psychotic decompensations actually show close analogies to nonlinear processes, as described by chaos theory. Particularly striking is the sudden switching of the overall feeling-thinking-behaving patterns toward a new global regime that we call psychosis. The final switch to it may occur under the influence of a minimal but critical input (e.g. a critical word, a glimpse, a colored spot, a particular idea), which eventually "enslaves" the whole field of mental functioning. Rapid ("ambivalent") changes between opposite ways of feeling, thinking, and behaving may correspond to typical so-called fluctuations, preceding bifurcations in chaostheoretical terms. Other phenomena supporting a chaos-theoretical interpretation are the unforeseeable ("chaotic") dynamical patterns of short-term and long-term evolutions, reflecting psychotic exacerbations and remissions. Quite similar ideas have also been advanced by Globus et al. (1993), closely similar evolutionary dynamics to our observed long-term evolution have been produced by an appropriate computer-model (Schiepek and Schoppek 1992), and the first empirical and mathematical evidence for typically chaotic dynamics in psychotic evolutions has been detected by our research group (Ambühl, Dünki, and Ciompi 1992; Tschacher et al. 1997; Ciompi 1996).

#### THERAPEUTIC CONSEQUENCES

Details on a major practical application of the proposed concepts, namely our now 13-year-long pilot-project, "Soteria Berne,"

have already been presented at the last two International Symposia on the Psychotherapy of Schizophrenia (Ciompi et al. 1992b, 1993a). Therefore, only some summarizing information concerning this project will be given here. One important consequence of the proposed hypotheses concerning the fundamental organizing and integrating functions of affects on cognition is a new emphasis on the basic emotional atmosphere of therapeutic settings, interpersonal approaches, and treatment methods in general. Partly replicating—and also partly modifying—a first Soteria-House experience realized on other conceptual bases by Mosher and Menn (1978) in San Francisco, we were actually able to show that, in a therapeutic setting and style of care especially focused on anxiety reduction, emotional relaxation, interpersonal support, and protection from affective-cognitive overstimulation, psychotic symptoms can disappear within weeks, with no or only minimal neuroleptic medication. Comparable two-year results concerning psychopathology, relapse rate, working, and housing situation were obtained with three to five times lower global doses of neuroleptics than in a carefully matched control population treated with conventional methods (Ciompi et al. 1993b). The significantly more relaxed and supportive emotional atmosphere of the therapeutic environment and style (as measured by a German version of the Ward Atmosphere Scale by Moos, 1974) was interpreted as a crucial control parameter in the above mentioned sense, favouring return to normal cognitive functioning and respectively decreasing the probability of psychotic functioning in vulnerable individuals, thanks to the favorable organizing and integrating effects of feelings of confidence, acceptance, and security which were systematically built up and stabilized over weeks and months.

The similarity of the therapeutic effects of neuroleptics and of a therapeutic setting especially designed for emotional relaxation is an additional argument in favor of the hypothesis, based on the concept of affect logic, that schizophrenia

may basically be an affective disease of a particular kind, and that the primary impact of neuroleptics may be on the emotion-regulating limbic-paralimbic system, with only secondary effects on cognitive functioning. This interpretation is further supported by a controlled study by Hodel and Brenner (1996), where the basic emotional atmosphere turned out to be more important for improving the cognitive functions of schizophrenics than the specific cognitive training methods.

### CONCLUSIONS

In summary, in affect-logic theory, the psyche is understood as a complex hierarchy of functionally integrated affective-cognitive systems of reference (or feeling-thinking-behaving programs), generated through action, which store in their structure relevant past experiences—among them important interpersonal relations. Their neurophysiological substratum are corresponding neuronal pathways, modeled by neuronal plasticity. These “programs” function as a matrix for all further information processing and coping. Simultaneously, they are the essential point of impact for both biological and environmental influences of all kind. As affects play a primary role in mobilizing, organizing, and integrating cognitive functions, both in normal and in pathologic conditions, schizophrenic thought disorganization, in particular, could be a secondary effect of primary affective (limbic, paralimbic, or limbo-frontal) disorders and tensions. The emotional quality of therapeutic settings and proceedings may therefore be an essential, but so far rather neglected, therapeutic variable.

By establishing a theoretical link between a wide range of psychopathologic, psychodynamic, and neurobiologic phenomena relevant for schizophrenia which have not been sufficiently connected so far, the concept of affect logic leads to an interactive psycho-socio-biological evolutionary model of schizophrenia in three phases, to a new interpretation of the central but still enigmatic notion of schizo-

phrenic vulnerability, and to innovative therapeutic approaches, with special emphasis on the emotional atmosphere of therapeutic settings and methods. Furthermore, it generates a chaos-theoretical hypothesis of the underlying evolutionary dynamics of the illness that conduces to a new dynamic understanding of pathogenetic processes with interesting therapeutic (and also preventive) consequences. A

number of testable hypotheses concerning its basic assumptions have been formulated above (Ciompi 1991a).

We conclude, finally, that the concepts of affect logic seem capable of furnishing a useful theoretical framework for further research, both in affective-cognitive interactions, and in the interactions between biological, psychological, and social variables in schizophrenia.

## REFERENCES

- AMBUHL, B., DÜNKI, R. M., and CIOMPI, L. Dynamical systems and the development of schizophrenic symptoms. In: W. Tschacher, G. Schiepek, and E. J. Brunner, eds. *Self-Organization and Clinical Psychology*. Springer, Series in Synergetics, 1992, pp. 195-203.
- BERTALANFFY, L. An outline of general systems theory. *British Journal of Philosophic Science* (1950) 1:134-165.
- BLEULER, E. Dementia praecox oder die Gruppe der Schizophrenien. In: G. Aschaffenburg, ed., *Handbuch der Psychiatrie, spezieller Teil*, 4. Abt. 1. Hälfte., Deuticke, Leipzig 1911.
- BLEULER, M. *The Schizophrenic Disorders. Long-Term Patient and Family Studies*. Yale University Press, 1978.
- BOGERTS, B. Schizophrenien als Erkrankungen des limbischen Systems. In: G. Huber, ed., *Basisstadien endogener Psychosen und das Borderline-Problem*. Schattauer, Stuttgart 1985.
- BUCHSBAUM, M. S. Frontal lobes, basal ganglia, temporal lobes—three sites for schizophrenia? *Schizophrenia Bulletin* (1990) 16:377-378.
- CHANGEUX, J. P., KONISHI, M. *The Neuronal and Molecular Bases of Learning*. Wiley, 1987.
- CHAPMAN, L. J., and CHAPMAN, J. P. *Disordered Thought in Schizophrenia*. Appleton-Century-Crofts, 1973.
- CIOMPI, L. Catamnestic long-term studies on the course of life of schizophrenics. *Schizophrenia Bulletin* (1980) 6:606-618.
- CIOMPI, L. Affektlogik. Ueber die Struktur der Psyche und ihre Entwicklung. Ein Beitrag zur Schizophrenieforschung. Klett-Cotta, 1982/*The Psyche and Schizophrenia. The Bond Between Affect and Logic*. Harvard University Press, 1988a.
- CIOMPI, L. Zur Integration von Fühlen und Denken im Licht der "Affektlogik". Die Psyche als Teil eines autopoietischen Systems. In: Kisker, K. P., Lauter, H., Meyer, J.-E., Müller, C., Strömgen, E., eds., *Psychiatrie der Gegenwart*, Bd 1, Springer, Berlin-Heidelberg-New York-Tokyo 1986, pp. 373-410.
- CIOMPI, L. Learning from outcome studies. Toward a comprehensive biological-psychological understanding of schizophrenia. *Schizophrenia Research* (1988b) 1:373-384.
- CIOMPI, L. The dynamics of complex biological-psychosocial systems. Four fundamental psychobiological mediators in the long-term evolution of schizophrenia. *British Journal of Psychiatry* (1989) 155:15-21.
- CIOMPI, L. Affects as central organising and integrating factors. A new psychosocial/biological model of the psyche. *British Journal of Psychiatry* (1991a) 159:97-105.
- CIOMPI, L. Affect logic and schizophrenia. In C. Eggers, ed., *Schizophrenia and youth*. Springer, 1991b.
- CIOMPI, L. Affect logic: an integrative model of the psyche and its relations to schizophrenia. *British Journal of Psychiatry* (1994) 164:51-55.
- CIOMPI, L. Non-linear dynamics of complex systems: The chaos-theoretical approach to schizophrenia. In H. D. Brenner, W. Böker, and R. Genner, eds., *Towards a Comprehensive Therapy of Schizophrenia*. Hoegaerave & Huber, 1996, pp 18-31.
- CIOMPI, L., DAUWALDER, H. P., AGUÉ, C. Ein Forschungsprogramm zur Rehabilitation psychisch Kranker. III. Längsschnittuntersuchung zum Rehabilitationserfolg und zur Prognostik., *Nervenarzt* (1979) 50:366-378.
- CIOMPI, L., DAUWALDER, H. P., MAIER, CH., AEBI, W., TRÜTSCH, K., KUPPER, Z., and RUTISHAUSER, CH. The pilot project "Soteria Berne". Clinical experiences and results. *British Journal of Psychiatry* (1992a) 161: 145-153.
- CIOMPI, L., DAUWALDER, H. P., AEBI, E., TRÜTSCH, K., and KUPPER, Z. A new approach of acute schizophrenia. Further result of the pilot-project "Soteria Berne". In: A. Werbart and J. Cullberg eds., *Psychotherapy of Schizophrenia: Facilitating and Obstructive Factors*. Scandinavian University Press, 1992b, pp. 95-109.
- CIOMPI, L., MAIER, CH., DAUWALDER, H. P., and AEBI, E. An integrative biological-psychosocial evolutionary model of schizophrenia and its therapeutic consequences: First results of the pilot project "Soteria Berne". In: G. Benedetti and P. M. Furlan, eds., *Psychotherapy of Schizophrenia*. Hogrefe & Huber Publ., 1993a, pp. 319-333.
- CIOMPI, L., KUPPER, Z., AEBI, E., DAUWALDER, H. P., HUBSCHMID, T., TRÜTSCH, K., and RUTISHAUSER, CH. The pilot project "Soteria Berne" for the treatment of acute schizophrenics. II. Results of a comparative prospective study over 2 years. *Der Nervenarzt* (1993b) 64:440-450.

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- COLLINS, R. On the microfoundations of macrosociology. *American Journal of Sociology* (1981) 86: 984-1014.
- DAVIS, M. The role of the amygdala in emotional learning. *International Review of Neurobiology* (1994) 36:225-266.
- DERRYBERRY, D., and TUCKER, D. M. Neural mechanisms of emotion. *Journal of Consulting and Clinical Psychology* (1992) 60:329-338.
- ENGEL, G. L. The need for a new medical model: a challenge for biomedicine. *Science* (1977) 196:129-136.
- GAINOTTI, G. Features of emotional behaviour relevant to neurobiology and theories of emotions. In: G. Gainotti and C. Caltagirone, eds., *Emotions and the Dual Brain*. Springer, 1989, pp. 9-27.
- GLOBUS, G. G., and ARPAIA, J. P. Psychiatry and the new dynamics. *Biologic Psychiatry* (1994) 35: 352-364.
- GOTTESMAN, J., and SHIELDS, J. A critical review of recent adoption, twin, and family studies on schizophrenia: Behavioural genetics perspectives. *Schizophrenia Bulletin* (1978) 2:360-398.
- GROF, S. *Realms of the Human Inconscious*. Viking, 1975.
- HAKEN, H. *Evolution of Order and Chaos*. Springer, 1982.
- HAKEN, H. *Synergetics. An Introduction*. Springer, 1990.
- HARACZ, J. L. A neuronal plasticity hypothesis of schizophrenia. *Neuroscience and Biobehavioral Review* (1984) 8: 55-71.
- HARDING, C. M., BROOKS, G. W., ASHIKAGA, T., STRAUSS, J. S., and BREIER, A. The Vermont longitudinal study of persons with severe mental illness. I. Methodology, study sample, and overall status 32 years later. *American Journal of Psychiatry* (1987a) 144:716-726.
- HARDING, C. M., BROOKS, G. W., ASHIKAGA, T., STRAUSS, J. S., and BREIER, A. The Vermont longitudinal study of persons with severe mental illness. II. Long-term outcome of subjects who retrospectively met DSM-III criteria for schizophrenia. *American Journal of Psychiatry* (1987b) 144: 727-737.
- HODEL, B., and BRENNER, H. D. A new development in integrated psychological therapy for schizophrenic patients (IPT): First results of emotional management training. In: Brenner, H.-D., Böker, W., Genner, R. eds., *Toward a comprehensive therapy of schizophrenia*. Hogrefe & Huber, 1977, pp. 118-134.
- HUBER, G., GROSS, G., SCHÜTTLER, R. Longitudinal studies of schizophrenic patients. *Schizophrenia Bulletin* (1980) 6:592-605.
- IZARD, C. E. *Human emotions*. Plenum Press, 1977.
- IZARD, C. E. Four systems for emotion activation: cognitive and non-cognitive processes. *Psychological Review* (1993a) 100:68-90.
- IZARD, C. E. Organizational and motivational functions of discrete emotions. In M. Lewis and J. Haviland, eds., *Handbook of Emotion*. Guilford Press, (1993b), pp. 631-641.
- JACOBSON, E. *The Self and the Object World*. Hogarth Press, 1965.
- KAVANAGH, D. J. Recent developments in expressed emotion and schizophrenia. *British Journal of Psychiatry* (1992) 160:601-620.
- KERNBERG, O. *Object Relations Theory and Clinical Psychoanalysis*. Jason Aronson, 1976.
- KERNBERG, O. *Internal World and External Reality*. Jason Aronson, 1980.
- KERNBERG, O. New perspectives in psychoanalytic affect theory. In: *Emotion. Theory, Research, and Experience*. Academic Press, 1990, pp. 115-131.
- KOUKKOU, M., and LEHMANN, D. Dreaming: the functional state-shift hypothesis. A neuropsychophysiological mode. *British Journal of Psychiatry* (1983) 142:221-231.
- KOUKKOU, M., and MANSKE, W. Functional states of the brain and schizophrenic states of behaviour. In: C. Shagass, R. C. Josiassen, and R. A. Roemer, eds., *Brain Electrical Potentials and Psychopathology*. Elsevier Science Publishing, 1986, pp. 91-114.
- KRAEPELIN, E. *Lehrbuch der Psychiatrie*. 5. Auflage, Barth, Leipzig, 1896.
- KRINGLEN, E. Genetic studies of schizophrenia. In: G. D. Burrows, T. Norman, and G. Rubinstein, eds., *Handbook of Studies on Schizophrenia. Part I: Epidemiology, Aetiology and Clinical Features*. Elsevier, 1986, pp. 45-49.
- LAZARUS, R. S. Thoughts on the relations between emotion and cognition. *The American Psychologist* (1982) 37:1019-1024.
- LAZARUS, R. S. Cognition and motivation in emotion. *The American Psychologist* (1991) 46:352-367.
- LEDoux, J. E. Cognitive-emotional interaction in the brain. *Cognition and Emotion* (1989) 3:267-289.
- LEDoux, J. E. Emotional networks in the brain. In: Lewis, M., and Haviland, J. M., eds., *Handbook of emotions*. Guilford Press, 1993, 109-118.
- LEFF, J. P., KUIPERS, L., BERKOWITZ, R., EBERLEIN-VRIES, R., and STURGEON, D. A controlled trial of social intervention in the families of schizophrenic patients. *British Journal of Psychiatry* (1982) 141:121-134.
- LEVENTHAL, H., and SCHERER, K. The relationship of emotion to cognition: A functional approach to a semantic controversy. *Cognition and Emotion* (1987) 1:3-28.
- LEVI, L. *Stress and Distress in Response to Psychosocial Stimuli*. Humana, 1973.
- MACHLEIDT, W. Typology of functional psychosis - A new model on basic emotions. In F. P. Ferrero, A. E. Haynal, and N. Sartorius, eds., *Schizophrenia and Affective Psychoses. Nosology in Contemporary Psychiatry*. John Libbey CIC, 1992, pp. 97-104.
- MACHLEIDT, W., GUTJAHR, L., and MÜGEE, A. *Grundgefühle. Phänomenologie Psychodynamik EEG-Spektralanalytik*. Springer, 1989.
- MAHLER, M. S. *On Human Symbiosis and the Vicissitudes of Individuation. Vol I: Infantile Psychosis*. International Universities Press, 1968.
- MARNEROS, A., DEISTER, A., ROHDE, A., JÜNEMANN, H., and FIMMERS, R. Long-term course of

- schizoaffective disorders. *Psychiatric and Neurological Sciences* (1988) 237:264-290.
- MCGLASHAN, T. H. A selective review of recent North American long-term followup studies of schizophrenia. *Schizophrenia Bulletin* (1988) 14: 515-542.
- MCNEAL, P. Cerebral evolution of emotion. In M. Levine and J. M. Haviland, eds., *Handbook of Emotions*. Guilford Press, 1993, pp. 67-83.
- MEDNICK, S. A., SCHULSINGER, F., and SCHULSINGER, H. Schizophrenia in children of schizophrenic mothers. In W. Davis, ed., *Childhood Personality and Psychopathology. Current Topics*. Wiley, 1975.
- MILLER, J. G. General systems theory. In A. M. Freedman, H. J. Kaplan and B. J. Sadock, eds., *Comprehensive Textbook of Psychiatry*. William & Wilkins, 1975.
- MOOS, R. *Evaluating Treatment Environments. A Social Ecological Approach*. Wiley, 1974.
- MOSHER, L. R., and MENN, A. J. Community residential treatment for schizophrenia: two-year follow-up data. *Hospital and Community Psychiatry* (1978) 29:715-723.
- NUECHTERLEIN, K. H., and DAWSON, M. E. A heuristic vulnerability/stress model of schizophrenic episodes. *Schizophrenia Bulletin* (1984) 10:300-312.
- PANKSEPP, J. Toward a general psychobiological theory of emotions. *Behavioral and Brain Sciences* (1982) 5:407-467.
- PANKSEPP, J. Affective neuroscience: A conceptual framework for the neurobiological study of emotions. In K. T. Strongman, ed., *International Review of Studies on Emotion*, Vol. I., John Wiley & Sons, 1991, pp. 59-99.
- PARNAS, J., TEASDALE, T. W., and SCHULSINGER, F. Institutional rearing and diagnostic outcome in children of schizophrenic mothers: A prospective high risk study. *Archives of General Psychiatry* (1985) 42:762-769.
- PIAGET, J. *The Development of Thought: Equilibration of Cognitive Structure*. Viking Press, 1977a.
- PIAGET, J. *The Essential Piaget*. H. von Gruber and J. Voneche, eds., Basic Books, 1977b.
- PIAGET, J. Intelligence and affectivity. Their relationship during child development. In T. A. Brown and C. E. Kaegi, eds., *Annual Review Monograph*. University of California Press, 1981.
- PLOOG, D. Human neuroethology of emotion. *Progress of Neurology, Psychopharmacology, and Biological Psychiatry* (1989) 13:15-22.
- PLOOG, D. Ethological foundation of biological psychiatry. In H. M. Emrich and M. Wiegand, eds., *Integrative Biological Psychiatry*. Springer, 1992, pp. 3-35.
- PRIGOGINE, I., and STENGERS, I. *Order Out of Chaos*. Heinemann, 1983.
- ROUTTENBERG, A. The reward system of the brain. *Scientific American* (1978) 239:122-131.
- SARTORIUS, N., JABLENSKY, A., ERNBERG, G., LEFF, J., KORTEN, A., and GULBINAT, W. Course of schizophrenia in different countries: Some results of a WHO international comparative 5-year follow-study. In: H. Häfner, W. F. Gattaz and W. Janzarik, eds., *Search for the Causes of Schizophrenia*. Springer, 1987, pp. 107-113.
- SELYE, H. The general adaptation syndrome and the diseases of adaptation. *Journal of Clinical Endocrinology* (1946) 6:117.
- SCHIEPEK, G., and SCHOPPEK, W. Synergetik in der Psychiatrie: Simulation schizophrener Verläufe auf der Grundlage nicht-linearer Differenzengleichungen. *Systeme* (1992) 6:22-57.
- SCHORE, A. N. *Affect Regulation and the Origin of the Self. The Neurobiology of Emotional Development*. Lawrence Erlbaum Associates, Publ, 1994.
- SHAPIRO, R. M. Regional neuropathology in schizophrenia. Where are we? Where are we going? *Schizophrenia Research* (1993) 10:187-239.
- SINGER, M. T., WYNNE, L. C., and TOOHEY, B. A. Communication disorders in the families of schizophrenics. In L. C. Wynne, R. L. Cromwell, and Matthysse, S., eds., *The Nature of Schizophrenia*. Wiley, 1978.
- TIENARI, P., SORRI, A., LATHI, I., NAURALA, M., WAHLBERG, K. E., POHOJOLA, J., and MORING, J. Interaction of genetic and psychosocial factors in schizophrenia. *Acta Psychiatrica Scandinavica* (1985) 71:19-30.
- TSCHACHER, W., SCHIEPEK, G., and BRUNNER, E. *J. Self-Organization and Clinical Psychology. Empirical Approaches to Synergetics in Psychology*. Springer, 1992.
- TSCHACHER, W., SCHEIER, CHR., and HASHIMOTO, Y. Dynamical analysis of schizophrenia courses. *Biological Psychiatry*. (1997) 41:428-437.
- TSUANG, M. T., WOOLSON, R. F., and FLEMING, J. A. Long-term outcome of major psychoses: I. Schizophrenia and affective disorders compared with psychiatrically symptom-free surgical conditions. *Archives of General Psychiatry* (1979) 39: 1295-1301.
- WHO. *Schizophrenia: An International Follow-Up Study*. Wiley, 1979.
- WING, J. K. Impairments in schizophrenia. In R. Wirt, G. Winokur, and M. Roff, eds., *Life History Research in Psychopathology*, Vol IV. University of Minnesota Press, 1975.
- WING, J. K., and BROWN, G. W. *Institutionalism and Schizophrenia*. Cambridge University Press, 1970.
- ZAJONC, R. B. Feeling and thinking: preferences need no inferences. *The American Psychologist* (1980) 35:151-175.
- ZAJONC, R. B. On the primacy of affect. *The American Psychologist* (1984) 39: 117-124.
- ZUBIN, J., and SPRING, B. Vulnerability: A new view of schizophrenia. *Journal of Abnormal Psychology* (1977) 86:103-123.