The march of self-reference

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Abstract *Focuses on the issue of increasing environmental and societal complexity, and its effects on the individual, especially visible in the increase of self-reference (the commonalities between man, animals and machines). Distinguishes three meanings of self-reference and discusses the interrelationships between self-reference, alienation, and growing societal complexity: states that, especially in the last few decades of this secular age, there has been increasing incidence of self-reference. Also discusses the relationship between self-reference, constructivism, and modern brain research. Asserts that the march of self-reference is likely to continue, but that it will change in character.*

1. Introduction: what is self-reference?

In many papers we have dealt with increasing environmental and societal complexity and its effects on a societal level (Geyer, 1978, 1990, 1991, 1992, 1994, 1998) [1]. Here we will deal with the other side of the problem: its effects on the individual, especially visible in the increase of self-reference and its pros and cons.

The phenomenon of self-reference is assumed to be typical of human beings, both on the individual and the group level, although recent work with apes seems to open up the possibility that they too may have some degree of self-reference. Nevertheless, self-reference – at least in the sense used here – is not a concept in first-order cybernetics, which – as Norbert Wiener so explicitly stressed – concerns itself with the commonalities between man, animals and machines, rather than with the differences between them.

Three meanings of self-reference may be distinguished in this respect:

(1) the "neutral" meaning, which is used also and especially in first-order cybernetics, and is also applicable to non-biological systems, where "self-referencing control" indicates that any changes in the state of a system are dependent upon the state of that system at a previous moment, like birth rate being dependent upon population size;

(2) the "biological" meaning, where senses and a memory are the minimum requirements, and where a self-referential system can be defined as a system that contains information and knowledge about itself, that is, its

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own state, structure, and processes; for, e.g. human beings (Geyer and van der Zouwen, 1988);

(3) the "stronger" second-order cybernetics meaning used here, where the system – whether an individual or a social system – collects information about its own functioning, which in turn can influence that functioning; minimal requirements in this case are self-observation, self-reflection and some degree of freedom of action.

One of the main characteristics of social systems as well as individual systems, distinguishing them from many other systems, is indeed their potential for self-referentiality in the latter sense. Concretely, this means not only that the self-knowledge accumulated by the individual in turn affects both his structure and modus operandi, but it also implies – as especially stressed by constructivism – that in self-referential systems like individuals and social systems, feedback loops exist between parts of external reality on the one hand, and models and theories about these parts of reality on the other hand. To a large extent, both individuals and collectivities indeed produce their own world.

While constructivism, as an explanatory paradigm, is focused on individuals, it is certainly valid for social systems as well. Concretely, whenever social scientists systematically accumulate new knowledge about the structure and functions of their society, or about subgroups within that society, and when they subsequently make that knowledge known, through their publications or sometimes even through the mass media – in principle also to those to whom that knowledge pertains – the consequence often is that such knowledge will be invalidated, because the research subjects may react to this knowledge in such a way that the analyses or forecasts made by the social scientists are falsified. In this respect, social systems are different from many other systems, including (most?) biological ones. There is a clearly two-sided relationship between self-knowledge of the system on the one hand, and the behavior and structure of that system on the other hand.

Biological systems, like social systems, admittedly do show goal-oriented behavior of actors, self-organization, self-reproduction, adaptation and learning. But it is only psychological and social systems that arrive systematically, by means of experiment and reflection, at knowledge about their own structure and operating procedures, with the obvious aim to improve these. This holds true on the micro-level of the individual, as in psychoanalysis or other self-referential activities, and on the macro-level of world society, as in planning international trade or optimal distribution of available resources.

For social scientists, the consequences of self-referentiality are interesting not only for gaining an insight in the functioning of social systems, but also for the methodology and epistemology used to study them. There is a paradox here: as stated above, the accumulation of knowledge often leads to a utilization of that knowledge – both by the social scientists and the objects of

their research – which may change or even invalidate the validity of that knowledge (Geyer and van der Zouwen, 1988; Henshel, 1990). It is maintained here that this paradox is interesting as well for psychologists, and exists also at the individual level where the individual not only constructs his world, but also continually reconstructs it. This can be seen in "normal life", but is especially visible in several forms of individual therapy, where old self-knowledge is invalidated by new – though not necessarily always better – self-knowledge.

The usual examples of self-referential behavior in social science consist of self-fulfilling and self-defeating prophecies. Henshel (1990) for example, has studied *serial* self-fulfilling prophecies, where the accuracy of earlier predictions, themselves influenced by the self-fulfilling mechanism, impacts upon the accuracy of the subsequent predictions. In much of empirical social science research. However, self-referential behavior does not loom large – which is rather amazing in view of its supposedly being an essential characteristic of individual human functioning. In this case the research methodology used may be an issue: survey research, where people are asked what they think or feel, offers little opportunity to bring out self-referential behavior, while depth interviews, which concentrate more on the "why" than the "what" of people's opinions have a better chance to elicit self-referential remarks in this respect.

2. Interrelationships between self-reference, alienation, and growing societal complexity

Just like many other phenomena that form part of the individual's continuous interaction loop with the environment –, e.g. perception – self-reference is ultimately action-oriented. Simply stated, it amounts to "think before you act". IBM had slogans in the 1960s: "Think! It may be a new experience!" and "Thinking is hard work, and there is a tendency to avoid it". The more complex the environment, the more one has to think if one wants to act effectively. In the following, we hope to argue that there is a correlation between self-reference, alienation, and growing societal complexity, possibly with alienation as an intervening "booster" variable: to the extent that societal complexity induces feelings of alienation that are not felt as inevitable, one has to try and discover a way out. Self-referential activities like self-observation and self-reflection may be helpful for a process of de-alienation in this respect. According to Luhmann's thesis, the perceived increase of environmental complexity can only be reduced and made manageable by an increase in internal complexity, which is the result of a chain of self-referential processes; it is after all the individual who subjectively experiences environmental complexity, and has to relate to it in one way or another. Self-reference aids in this process of building up internal complexity, made necessary by increasing environmental complexity.

One may distinguish several types of alienation along different dimensions. Alienation is certainly not a unitary phenomenon, although the common denominator is a separation that is considered undesirable – whether from nature, God, the means of production, one's ideology (Arthur Koestler's *The God that Failed*), one's kin or country, etc. First of all, according to the type of alienation felt, there are the types distinguished by Seeman: powerlessness, meaninglessness, normlessness, social isolation, cultural estrangement, and self-estrangement. Secondly, according to the source of the alienation, one may distinguish: ontological alienation (inevitable alienation, inherent in human life), Marxist alienation (ultimately caused by lack of control over the means of production, usually with powerlessness and meaninglessness as most important components), and psychiatric alienation (caused by traumatizing or neuroticizing early-life experiences, and often especially characterized by feelings of self-estrangement). Finally a distinction that is most relevant here is the one between interpersonal alienation and societal alienation.

2.1 Interaction with the direct-interpersonal environment

Ideally, unalienated interaction with the direct-interpersonal environment (primary group members) neither requires nor stimulates self-reference, but demands involvement and immediacy rather than planning and internal simulation of alternative courses of action. It requires involvement with the interaction partner as someone who is basically different from oneself, and who remains a source of often unexpected variety in spite of whatever complexity reduction one may have accomplished already. On the perception or input side, it demands being concentrated in the here-and-now on listening carefully, on trying to receive the other's message as it is intended, and whatever it may consist of. On the activity or output side, it implies feeling free to act or react spontaneously, i.e. to send the message one really wants to send, without feeling overly constrained or even manipulated by the other's (supposed) expectations and demands.

Due to the shorter "cycling time" of interpersonal as opposed to societal interaction – the government only answers after a few weeks, if at all, the interaction partner does so immediately – it indeed implies immediacy rather than planning. Ideally, interpersonal interaction should also be immediate in the sense that it is not overly determined by either the unassimilated lessons from the individual's past (defense mechanisms, stereotypes, anxieties, deficiency needs, and other forms of learned behavior that may have been useful once, but are presently dysfunctional) or his perceptions about the future (a relative absence of goals and plans, at least to the extent that these include manipulative designs on the interaction partner). This ideal depiction of unalienated interpersonal interaction comes close to what Buber (1970) has

termed an "I – Thou relationship" or what Maslow (1962) has called a capacity for "B(eing)-cognition" as opposed to "D(efficiency need)-cognition", or what Berne (1964) has defined as "game-free" interaction.

Once this immediacy is lost, self-reference enters the picture: probabilistic and future-oriented planning will replace discrete and here-and-now involvement, and one would enter Laing *et al.* (1966) "spiral of reciprocal perspectives": "I think that you think that I think…", etc. This can be also highly involving, but usually in a more antagonistic and alienated way, as, e.g. the well-known prisoner's dilemma demonstrates. Nevertheless, most interpersonal communication does not have to be all that immediate and game-free in order to still be reasonably unalienated. However, the ideal description of unalienated interpersonal interaction presented earlier points out one of the underlying dilemmas of communication:

- if one wants to transmit a message that will be understood, there is a limit to the degree of spontaneous, immediate, and unalienated expression one can engage in; the message then has to be "digitalized", entailing a considerable reduction of complexity compared to what one wants to express;
- if, on the other hand, a maximum of such spontaneous, immediate expression of what one feels or thinks is one's main goal, one has to forget about being understood, and should have reached the level where one does not mind this.

2.2 Interaction with the societal environment

Unalienated interaction with the societal environment demands almost the opposite traits as those described for unalienated interaction with the interpersonal environment. Here, one is generally confronted with large-scale societal processes, structures, and institutions, or with individuals acting on their behalf. Very often, the societal environment comes close to being an input-environment that exerts pressure, but offers extremely limited possibilities for feedback. If the individual's feedback is to be effective at all under these circumstances, he has to engage in planning: i.e. to increase his internal complexity in order to have at least a chance to somewhat match the complexity of his environment.

Planning, amongst others, maximizes the chance that the individual's output to his societal environment will be effective, i.e. in Skinnerian terms, it will result for him in a better punishment–reward ratio in the near (or not so near) future; rewards in the more distant future, however, run the risk of not being perceived as rewards anymore. Human individuals are not too different from their canine counterparts in this respect: punish or reward a dog the day after, and he will just stare at you uncomprehendingly, but will not engage in a

learning curve. Nevertheless, just as involvement is a prime prerequisite in interaction with systems of roughly equal internal complexity (one's fellow human beings), planning is generally required for successful interaction with systems of greater internal complexity: societal systems. Since having adequate control over one's environment becomes more difficult with increasing environmental complexity, a certain structuring of one's existence, in the sense of a self- referential planning strategy, becomes especially important with respect to societal systems.

This is in line with Ashby's Law of Requisite Variety (1952, 1956): more (objective) environmental complexity means that one (subjectively) construes one's environment as being filled with more objects, with more attributes, and especially more interactions between them. An individual with the resulting high degree of internal complexity can obviously produce more variety for his environment than an individual with a lower internal complexity.

2.3 Interpersonal versus societal alienation

The relevance of these environmental distinctions between interpersonal and societal environment for alienation theory, and for explaining increasing self-reference in complex modern societies, should become clear now:

- people are differentially equipped to deal with societal complexity, largely as a result of their prior socialization (including formal education), that did or did not provide them with the tools needed to build up their internal complexity;
- they are differentially located in the societal structure, in positions that potentially enable them to a greater or lesser degree to engage in societal complexity reduction if they want to;
- depending on their concrete position within this societal structure, they spend a smaller or larger portion of their time actually dealing with societal complexity; even if one has both the requisite knowledge basis and an adequate power position to engage in societal complexity reduction, one still does not necessarily have to use that knowledge.

Now, we hypothesize that alienation towards the interpersonal environment and alienation towards the societal environment tend to be inversely related.

2.3.1 Interpersonal alienation. Many of those who have developed a high capacity for dealing with societal complexity (amongst others: the educated, the intellectuals), especially when they make much use of this capacity in their daily lives (the "organization men", the managers and planners) tend to generalize their "planning attitudes", probably due to the visible success of the

associated operating procedures in the societal sphere, to encompass their interpersonal contacts. As a result, they may become interpersonally alienated, and often see simple interpersonal relations as more complex than they actually are. They are insufficiently involved in the present, because they cannot drop the habit of constantly thinking and planning ahead, which they had to develop in a series of self-referential activities, trying to reduce environmental complexity, and constantly redefining their own position with regard to this environmental complexity. They tend to be strongly represented among those who stimulate and run economic globalization processes.

2.3.2 Societal alienation. Conversely, many of those who have a low capacity for dealing with environmental complexity (the uneducated, amongst others), especially when their low position in complex hierarchical structures does not require much planning regarding their wider societal environment (e.g. the unskilled), on the contrary tend to generalize their "involvement attitudes" to include their societal interaction loops.

Unlike the first group, they do not dehumanize their interpersonal relations, but on the contrary tend to "anthropomorphize" their societal interactions: large-scale societal, economic or political issues there by become oversimplified. Unfortunately, this group represents a large part of the votes in a television democracy and is consequently being manipulated by many political parties and their media advisers, who produce simplistic 30 s sound bites in order to attract votes. US president Bush is almost a 30 s sound bite all by himself: he is at his best when expressing simple thoughts about complex problems in short, simple, staccato sentences. The societally alienated indeed tend to see complex societal relations as less complex than they actually are. They are, in direct opposition to the first group, insufficiently involved in the future, not because they cannot kick the habit of being involved in the here-and-now, but because they never needed to be sufficiently self-referential to develop the "broad-sight" and "long-sight" (Elias, 1939) that characterizes the interpersonally alienated.

Thus, the two groups are not entirely symmetrical opposites: the interpersonally alienated do have an experience in interpersonal interaction – though overgrown by later acquired "planning subroutines"; the societally alienated never developed a sufficient sophistication in societal interaction in the first place. They suffer from a societal alienation that is, paradoxically, characterized by withdrawal, apathy and non-participation – in short: by non-involvement with wider societal structures. They are the alienated described in much of the empirical alienation studies: all the frustrated, underprivileged minorities – low on income, power, education, status, etc. – who together form the manipulated majority in a society where the ability to handle the complexities of the societal environment guarantees top positions in all the intercorrelated hierarchies.

3. The accelerating increase of self-reference throughout history

There has been a development of increasing self-reference over time – at least in the Western world. It has been there almost since the beginning of humanity, and can be considered to start with the Adam and Eve myth. They were thrown out of paradise – presumably a state of unreflected bliss – towards increasing and inevitable ontological alienation, by "eating from the tree of knowledge". In other words: by assimilating growing environmental complexity, which as a corollary implies a buildup of internal complexity, in return for loss of innocence. The myth of Faust is pretty much the same: a pact with the devil in return for knowledge.

Self-reference in the biological meaning defined above (i.e. with senses and a memory as minimum requirements, and with a self-referential system that contains information and knowledge about itself, that is, its own state, structure, and processes), though having language as a prerequisite, is not limited to humans. While language is a prerequisite, the ability to speak is not. Experiments with chimpanzees (e.g. the famous case of Washoe [2]) have demonstrated that chimpanzees are able to learn a sign language with a considerable vocabulary, and can learn to refer to themselves and express their intentions and even emotions. However, self-reference in its stronger second-order cybernetics meaning is a typical human phenomenon. Here, the individual collects information about its own functioning, usually in an effort to improve it relative to some goals, which in turn influences that functioning.

Self-reference among humans has experienced several accelerations in the course of history, though these accelerations may seem terribly slow compared to the present pace of change. Oral history undoubtedly already provided occasions for identification and self-projection over and above direct interpersonal contacts. So did the Greek plays of antiquity, which basically made one think: "where do I stand, and why do I choose that particular position?" In antiquity, self-reference was still more or less limited. On a societal scale it was limited to philosophers who analyzed and criticized their society and often paid for it with their lives, like Socrates. On an individual scale it was limited to monks and hermits who sought personal bliss and equilibrium through meditation – often in the isolated, low-stimulus environment of monasteries located in uninhabited desert or mountain areas that approached the hallucinatory effects of sensory deprivation experiments, and produced many of the world's great religions (!).

Possibilities for self-reference increased considerably with the invention of the alphabet, initially only used by a small elite, and later with the invention of the printing press, which caused the subsequent wide distribution of books, with especially novels offering possibilities for identification, comparison of one's own position with that of others, and thus self-reference. This resulting large-scale availability of books extended the horizons of those who could read, and also increased the pressure to learn to read, in order to be "with it". The

industrial revolution, which required an increasingly skilled labor force,moreover necessitated a minimal reading ability for large parts of the population. Thus, the acceleration of environmental complexity caused by the 19th century industrial revolution resulted in improved chances for – or pressure towards – self-reference.

Obviously, in a situation of rapidly growing environmental complexity, there is always a time lag between the amount of that complexity and people's adaptation to it. Increasingly, individuals cannot keep up with the pace of societal developments. For example, psychoanalysis came into being towards the end of the 19th century as a rather elitist therapy for the "unhappy few", and – in spite of the accelerating effects of two World Wars – up till the late 1940's largely concentrated on identity problems: "Who am I, and how and why did I become this way?" Obviously, such questions are only relevant in a society that is still relatively stable, and are posed by people who are only starting to be aware of the complexity of their environment, and assume that there is only one answer to it: one single monolithic identity which, if found, will allow them to react adequately to the outside world.

The acceleration of societal change and increasing complexity after World War II shattered this illusion. Sartre was one of the first, in 1944, to stress the inevitability of the individual taking his own and to a large degree arbitrary decisions. Man is alone with his choices, nobody else is responsible. In the 1950s and 1960s, psychoanalysis was soon complemented by literally hundreds of other forms of therapy, many of them reflecting the increased speed of a society on the move. Behavioral therapy is a case in point. Freud, more or less stuck as a Jew in relatively stable if not stagnant pre-WWI antisemitic Vienna, tried to explain the similar position of his patients and made an effort to provide them with some maneuvering room by increasing their self-knowledge, knowing fully well that most of them could not change their actual position in life, but only the way they looked at that position. Skinner, on the other hand, as an American member of a highly mobile immigrant society where the sky seemed to be the limit, developed behaviorism. What else can one do, arriving as a new immigrant in Ellis Island, entering a new and completely unknown continent, and striving to be successful there, but try out different behaviors and discover which ones are punished and which ones are rewarded?

In the last decades, the inexorable march of increasing self-reference has continued. The advent of the secular age, and its accompanying loss of a religious belief in a God who was still an authoritarian though being a father contributed even further to this process of accelerated self-reference. At least in the first half of the last century this belief in a God who set the rules of the game had the relative advantage of providing superficial but authoritative answers which made one not to think any further. However, when fathers lost their old-fashioned authority in the last few decades, and became "democratic", so did (the image of) God. Both seemed to have become pretty helpless in just a few

decades. Pronouncements like "God is dead", and feminist slogans like "I have seen God and she was black" were not of much help either. Neither was Sartre's insistence on the individual's responsibility for his choices, as these choices turned out to be relatively arbitrary because one never has all the facts at one's disposal that are needed to base one's choices upon, let alone that one can be aware of all the interrelationships between these facts. This awareness of the futility and arbitrariness of important life decisions that used to be firmly grounded in god-given rules [3] gave rise to scientific forms of self-reference, like simulation under the assumption of different, alternative scenarios, and decision theory, especially decision-taking under conditions of uncertainty and/or information overload. One of the most recent forms of extreme self-reference is perhaps constructivism, which as Kjellman (1999, 2000) has suggested gave everyone his "priverse", or private and subjective universe.

In the meantime, with the gradual disappearance of the stricter forms of unquestioning religious obedience in the Western world, there has been a growing pressure to not only question the existence of God, but to indeed question oneself: i.e. to engage in different forms of self-reference, stimulated by a steady flow of "how to" books that stimulate the individual to look at himself, analyze himself and evaluate his own position on several "fronts". This has been accompanied by a proliferation of all kinds of "therapies", to such an extent that present-day society has been characterized as the "therapeutic society". It might just as well be called the "self-referential society", as it is driven by questions like "Why am I like this?", "Why do I act like this?", "What is my position in my family, my country, my job, the world at large?"

On the level of individual self-reference, the game is not played anymore exclusively by psychiatrists, psychoanalysts and psychologists, but the need for "self-reference gurus" has apparently grown to such proportions that many other helping professions have crystallized around this original group – admittedly many, though certainly not all of them, quacks from a scientific viewpoint. Courses in self-awareness, body awareness, neurolinguistic programming, Gestalt therapy, etc. have been prepared. We are not even speaking here yet of semi-religious sects which try to fill the gap caused by the disappearance of the official religions and to ground the individual lacking direction in a universe he does not understand anymore – some of them innocuous like Hare Krishna, some nastier like those around the reverend Moon, Ron Hubbard, and the like. And it is definitely a mistake to assume that only individuals with personal problems or disoriented youth are drawn into this self-reference vortex.

Even in industry, no hard-boiled top manager worth his mettle has escaped when subjected to a sensitivity training. Many multinationals hire "prophets" – often directly under the CEO and freed from the usual tasks of production, marketing, planning, etc. – who develop alternative scenarios for the long-range development of these industries that count with possible future

problems. At the plastics firm Dupont, for example, one such prophet developed the idea of injecting tracer molecules in otherwise indistinguishable different kinds of plastics to facilitate their recognition with a view to future recycling. Even smaller firms, unsure of their identity and their future chances in increasingly volatile international markets, hire modern therapists – management consultants – to develop their production and marketing policy, restructure their organization, and improve their image or create a new one. Even government bureaucracies, confronted with public criticism, wonder what they have done wrong and how they should improve their efficiency; their performance too is increasingly screened by large consulting firms.

We have indeed witnessed the proliferation of an "industry" that promotes both individual and societal self-reference, in reaction to the growing complexity of the environment which both individuals and society as a whole have to deal with. On the level of societal self-reference, it is obvious that most of the social sciences try to fulfill this self-referencing role for society as a whole, with varying degrees of success.

Of course it remains to be seen to what extent this increase of self-reference, driven by the continued increase of environmental complexity, will continue in the society of the future, as the history of the last millennium seems to suggest. Or will feedbacks originate at a certain level and pose limits to both? Whether one is an individual, an institution, a multinational, or a government bureaucracy, one surely cannot "mindfuck" all day, but has to act and take more or less random decisions in conditions where a sufficient amount of adequate information is sorely lacking.

4. The relationship between self-reference, constructivism, and modern brain research

4.1 Introduction

It is assumed here that limits to self-reference will become apparent soon, in spite of the continuing pressure towards increasing self-reference exercised by our rapidly complexifying environment. One may think in this respect of two sets of related reasons.

(1) *Disappearance of the self as a "unified whole"*: partly this is due to a time lag, because self-reference, at least in the sense of reference to the totality of one's self – whatever that may be – is still somewhat based on a desire for a specific and overarching identity. However, in contrast to supposedly simpler earlier times, one cannot pretend to grasp the totality of the world anymore, but can at best sample it. Nor can one grasp the totality of one's self – no matter how many gurus one follows. When talking about self-reference, there is indeed one obvious question one should ask: what is the self one refers to? One thing has become clear since the 1940s when psychiatrists were still mainly confronted by

clients looked for their "real selves", for a hidden, but fixed and "objectively" existing identity they wanted to uncover with the help of the therapist: such a fixed identity does not exist, and has probably never existed.

(2) *Emergence of loosely correlated "subroutines"*: on the other hand, the same complexifying environment, which causes people's desire to define their own position in the middle of all this complexity, is the booster behind self-referential processes, and has its own inbuilt feedback: in modern hypercomplex societies, most people increasingly develop a set of loosely correlated and multi-faceted selves, different sides of their personality being stimulated by different situations. This is the reality in much of the urbanized Western world, although it is deplored by some schools of thought that long back in the good old days it did not seem to get over the "fragmentation of the self", like post-modernism. And indeed, adequately functioning in such a complex environment – which is largely produced, after all, by the cumulative and collective self-reference of many generations – implies the necessity to develop loosely correlated and semi-autonomous "subroutines" for dealing with the different aspects of this complexity. The future may therefore see a prevalence of increasingly "modular" personalities, with different subroutines more or less automatically dealing with separate situations or aspects of life. To an extent people still have a "real self" under these conditions, it is certainly not the fixed and "objectively existing" identity alluded to above, but rather this self can be considered as the coordinating agent between these subroutines, deciding – often very quickly – which one is to be used in which circumstances. Often there is indeed a need to react quickly by employing these semi-autonomous subroutines, rather than engage at ease in laborious and time-consuming self-reference.

Nevertheless, a different and more modest kind of self-reference is still needed. This is a kind not any more prompted by the "large questions" like "who am I?", "how did I come to be that way?", "what do I *really* want out of life?", etc. The driving force behind this less pretentious type of self-reference can rather be formulated as: "how can I improve my functioning and come a bit closer to my intermediate goals in a number of areas by taking small incremental steps?"

This is in line with recent developments in two different but related fields: **constructivism** and **recent brain research**, which have more in common than one would think at first sight. Both stress that life is a trial and error process, whereby more or less adequate models of the environment are constructed, and continually reconstructed in interaction with stimuli from the outside world. Information is not objectively "out there", but it is produced by individuals interacting with their environment, as a result of a cumulative set

of ultimately subjective choices. Such choices are based on many factors like genetic endowment, the totality of previous experience, and the way that has been interpreted and is continually reinterpreted, thus leading to "theories" that are used to again subjectively – and perhaps even wrongly – interpret new experience. Thus, in spite of that fact that at first sight individuals are apparently being socialized in specific patterns of culture (or nowadays: subculture!), at a closer look it becomes evident that individuals tend to develop their own highly subjective and often even "deviant" image of the world around them.

4.2 Constructivism

This is one of the core ideas of constructivism, a good overview of which was presented by Kjellman (1999, 2000) during our Panticosa conference. It is summarized as follows.

Constructivism is in line with the post-Newtonian worldview, which rejects the Cartesian dualism between mind and body, and stresses the ultimate subjectivity of experience. All that one can really claim to know, by direct access, are the phenomena of one's mind. The infant's mind starts out with nothing but fuzzy and confusing initial perceptual impressions, from which it manages to build – in a trial and error process reminiscent of Pribram's (1971) TOTE (test-operate-test-exit) model – a set of mental constructs used to interpret events in the environment. In that sense, everybody is a theoretician. Koestler (1967) already rejected mind-body dualism in his book *The Ghost in the Machine*: there is no ghost in the machine, nor an objective map of existing reality. The traditional systems approach can actually be turned around. It is not the individual who is a black box to itself, rather, it is the outside world, whose workings the growing individual gradually discovers, which is a black box for the individual. The mind does not carry an internal representation of an "objectively existing" world outside, as artificial intelligence assumes. The mind IS the world, the only one to which one has privileged access, and everyone constructs his or her own world – what Kjellman calls a "priverse" or private universe – by outward projection of the sense impressions received, rather than by mapping a replica of an "objectively" existing outside world in one's mind as often assumed.

The mind can at best be sure that there must be some world outside, by the sheer fact that it receives signals. It actively organizes these into conceptual constructs that fit or explain the images arising in it. Such constructs are subsequently confirmed or modified by recursive cognition or interpersonal recursive communication. The mind has to make sure that these signals emanate from the outside world, and are not self-produced, as in the hallucinations produced by sensory deprivation experiments.

Constructivism has implications for learning: information is not to be found in the external world, but it is constructed by the individual's (subjective)

knowledge base in interaction with the perceptual "clues from out there". Learning – and even observation of these "clues from out there" – is thus very much theory-dependent, and can be considered as the self-organization of knowledge. The static and dynamic features of phenomena are learnt by an action-based recursive process, the epistemic loop. The later fast recognition of familiar phenomena is realized by "cognitive resonance", a process provoking our recognition capability by the identification of some simple perceptual tokens that allow for a fast, decentralized and near-automated recognition, thus bypassing and unburdening the central awareness. Obviously, such a fast recognition is necessary in many situations where fast action needs to be taken by well-functioning submodules which trigger a learnt reactive behavior, while there is no time for the mind to engage in relatively slow self-referential processes, which ideally should yield a complete and coherent image of the world outside and one's own position in it. An extreme example of such a submodule may be the biologically programmed neural reflex, as well as "flight or fight" reactions. The situation in modern complex society is not that much different from the much simpler situation in the animal kingdom. As Kjellman stressed: "real-world reactions must be made very fast – before the predator catches you, or before your prey gets away from you."

The above is in line with what was said at the start of this paragraph about the increasing emergence of multi-faceted modular personalities. Both self-reference and the emergence of modular personalities are caused by the pressures of an already hypercomplex and still further complexifying environment. On the one hand, one needs to keep some sense of internal unity and define one's own position in the middle of all this environmental stimulation, or even: over stimulation. On the other hand, one needs to react adequately, and often very fast, to a multitude of different stimuli, and has to develop semi-independent subroutines to do so.

It seems we now live in a transitional period, where on the one hand this need – and even desire – for a certain unity of mind which coordinates all these proliferating subroutines is all the greater, while on the other hand adequate interaction with the different aspects of an ever more complex and differentiated environment demands the development of loosely correlated subroutines that make a unity of mind seem an illusory goal. Minsky's (1988) *The Society of Mind* presents an excellent overview of the development of such semi-automated subroutines, while Varela and others, on the contrary, combine recent outcomes of brain research with a holistic Buddhist philosophy Varela *et al.* (1993).

Whether one opts for Minsky's view or Varela's view, it certainly seems to be a period now in which increasing number of people are becoming convinced of the relative arbitrariness and ultimate subjectivity of their world view. This is the case because in present-day multi-group society one comes in contact with an increasing variety of totally different people, socialized in often totally

different (sub)cultures. Before the advent of the multi-group society socialization in a more or less common culture tended to hide the subjectivity of the individual's worldview. Such a worldview – or rather "theory" about the world and one's own position in it – is determined by, and indeed subjectively constructed from, a series of experiences, perceptions, and interpretations that could have been otherwise, and that lead to a series of conscious or unconscious decisions or even non-decisions that co-determine the further subjective choices one makes in several respects: one's career, life style, convictions, stereotypes, etc. This Markov chain of experiences, interpretations of these experiences, and subsequent decisions or non-decisions makes it indeed inevitable that every individual has his own "priverse". Obviously, it is not accidental that constructivism, with its stress on the individual's uniqueness and subjectivity, has emerged in this transitional period, just like Freud and Skinner, mentioned before, were also typical products of their time and situation.

Evidently, one's universe has always been subjective; this just was not seen as a problem and was not stressed. Before our era, the Talmud said already "when a man dies, a whole universe dies", i.e. a unique and hyper-personal perspective on the universe disappears forever. Thus, the basic idea of constructivism is nothing new. But it is new in a scientific context, as a result of the gradual dismantling of the Newtonian image of the clockwork universe, with its linear causality and its objectively known environment. It has arisen at a time when an increasing chasm was felt between the objectively increasing complexity of the environment with its often impersonal or even virtual social relations, and the subjective feelings, associations, and images the individual has but can often barely express anymore, even to his or her intimates.

4.3 Brain research

Our honorary president, Walter Buckley, whom one might call the "father of sociocybernetics", has outlined a model of mind-brain interaction Buckley (1967, 1968, 2001). It stresses the continuous real-time generation and maintenance of consciousness and mental events in terms of the organism-environment interaction, or recursive loop (what Kjellman has called the epistemic loop), characteristic of organisms pursuing everyday life needs. This model is based on the outcomes of recent brain research, and in many respects comes quite close to the constructivist model outlined earlier. Buckley's conclusions were:

(1) "Adequate analysis must focus on the *total system of organism and environment as a complex ongoing dynamic whole*. And it is the whole organism that relates to the environment and to consciousness, which suggests that more consideration be given to the interaction of parts of the nervous system that involve the body: the limbic system involving

emotions and motivation, and the autonomic system which plays a role in regulating such parts of the body as the heart, intestines, glands, and hormones. These are all interrelated in a systemic manner and can affect conscious processes as well as the brain and behavior.The signal or information selection, transformations, or codings that occur at any stage in the ongoing system loop depend not only on prior events and processes in the system, but also on feedbacks from latent endpoints. As is well known in behavioral sciences, information attended to, or selected for, processing during activity is continually changing as a function of the ongoing intentions, decisions, and actions of the individual. Perception, as well as conception, is at best a continual sampling out of the extensive potential informational cues available in the external (or internal) environment. To include such things as emotions or needs, we need to emphasize the extensive network of efferent or proprioceptive nerves throughout the body, those that send signals back to the CNS about the states of different parts of the body, both external and internal. We could not even walk without constant feedback about the current states of the legs, body balance, and so on. This network is a necessary part of the larger dynamical system making up our sense of self, of others, and of the external world – that is, our consciousness.

(2) Thus *the total system*, when operating fully (sometimes parts of it are bypassed or truncated), *is* what can be referred to as *a transactional system*, with structure-changing (or morphogenic) as well as structure-preserving (morphostatic) capabilities (Buckley, 1967, 1968). What this means, among other things, is that knowledge is not passively and finally given merely through information input to the sensory apparatus, but rather is actively constructed and reconstructed through continual interchange between the individual and his or her physical and social environment. Cognitive, emotive, decisionmaking, and instrumental motor energy are also required to drive the system. Each of these subsystems contributes to the structuring and operation of the others.

(3) Consequently, the *classical philosophical approaches to epistemology*, which are often tacitly accepted, *are seriously incomplete and deficient*, focusing as each does on only one or two links and transformations of the total epistemic system outlined above. Since the information, hence meaning, in mapped signals is inherently relational, it becomes meaningless to ask what the "real world" is like in and of itself, apart from a knower. Hence, different types of knowers (e.g. aliens and higher animals with different mappings and relations to the world) would experience a very different "real world." And given the notion of information transmission as the preservation of pattern despite transformations, there is no question, in principle, about whether

endowed organisms can experience and know the external world with some degree of fidelity.

(4) *The mind* is not simply a passive receiver and recorder of incoming signals and sense data, but *actively contributes additional information and control* and helps to construct a particular framework or organization of the internal knowledge reference set that alone gives meaning to additional signals generated from without or from within (e.g., by thought or emotion). Additional information and knowledge structure are no doubt added, then, by the basic physiological structure of the organism, especially its peripheral, central, and autonomic nervous systems; by ongoing feedback from various phases of the total transaction of the organism as an open system adapting to or goal-seeking in its environment; and by the sociocultural processes, including language and other symboling, in which individuals and their information-processing activities are constantly embedded.

The model we have outlined certainly does not solve in any detail the central problem of the basic "mechanisms" underlying consciousness: just how it is that the components of the total process interrelate and help maintain subjective awareness and mental processes. The model does however suggest the organism–environment loop as fundamental to this mechanism. The job ahead is to map out the self-organizing structure and dynamic flow of those recursive processes in conjunction with continued progress in tracing the brain processes that take their place within the broader loop. It is essential to face up to the fact that our knowledge of the brain and the rest of the nervous system organization and dynamics and the way it functions is still meager, despite the dedicated years and decades spent by neuroscientists and neuropsychologists to map it out. In light of this fact, it seems prudent to keep an open mind about it; one should be prepared for serious surprises in the years ahead. The orientation needed is in the direction of the current movement toward a science of consciousness."

4.4 Self-reference, constructivism, and brain research

Now how do constructivism and brain research relate to self-reference? Constructivism indeed makes it likely that there is self-reference all the time, although it makes no explicit pronouncements in this respect. It is clear, however, that the individual, from infancy onward, constructs "theories" about the signals arriving from the outside world, and learns to construct an ego-boundary, distinguishing between what goes on inside and what happens outside – except in extreme cases, like the hallucinations mentioned above. As an alternative, these experiments indeed prove that there is, in Kjellman's words, an "epistemic loop", or, in Buckley description, a "transactional system": if the individual does not receive signals from the outside world for a while, and

the epistemic loop threatens to be broken, it has to produce its own signals to which it then ascribes informational content. The same is true for dreaming, drug-induced experiences, and other forms of "off-line functioning".

The theories the individual generates are added to and continually reconstructed during its lifetime. Especially when such theories do not work, and problems of some kind are encountered, or when a situation needs to be improved, it is likely that the individual will want to improve its functioning, and will engage in some self-observation, self-reflection, and reconnaissance of its degrees of freedom, in other words: in self-reference as we have defined it.

Modern multi-group societies, where the average individual comes increasingly in contact with others from different subcultures and even foreign cultures, with often completely different worldviews, probably promote a realization of the subjectivity of one's own world view. Were it not for understandable defense mechanisms against admitting, one's world view is merely subjective, everyone might end up being a constructivist in the long run. However, it is precisely such defense mechanisms that stimulate self-reference: one has to rationalize, and make clear to oneself why one's own subjective image of the world is preferable to the worldview of others.

The outcomes of brain research, as summarized above by Walter Buckley, point in much the same direction, although in this case as well self-reference is not explicitly mentioned, though self-reflection is. Buckley stresses even more than Kjellman does that the entire transactional system is concerned, and that it is certainly not the mind alone which produces a subjective image or "theory" about the environment. As he states at the start of his summary: "Adequate analysis must focus on the *total system of organism and environment as a complex ongoing dynamic whole.* And it is the whole organism that relates to the environment and to consciousness." Furthermore, in the course of his chapter he stresses:

> "Our emphasis in this chapter has been on sensation and perception, the sensory experience facet of consciousness, and the interface of the organism with the external environment. For the human organism, however, the inner cognitive processes – thought, problem solving, self-reflecting, and the like – are central: some physically challenged individuals have very limited sensory contact with the external world but nevertheless live rich and productive lives. These higher cognitive capabilities are made possible by sociolinguistic processes that began at least with early homo sapiens, and generate through the developmental socialization process a sociocultural human being. Any complete theory of consciousness will have to take into account this organism-social environment dynamic loop, and show how higher cognition and a sense of self is made possible by the intimate interaction of the organism with its sociocultural linguistic community. Such a theory exists in fundamental outline based on the work of George Herbert Mead, Chicago pragmatist and social psychologist, in the first third of the 20th century, as we mentioned earlier."

4.5 Will the march of self-reference continue?

Having examined the main premises of constructivism (Section 4.2), the most important results of recent brain research (Section 4.3), and the relationships of

both with self-reference (Section 4.4), we are now in the position to tackle this question, posed in the introduction (Section 4.1).

In line with Luhmann's thesis that reduction of environmental complexity implies a buildup of internal complexity, it seems likely that the more complex a society is, the more it exerts pressure on the average individual to develop a complex mind. Of course, even within complex societies, there will always be niches of relative simplicity where one can withdraw from the full impact of an overly complex environment, while most people are likely to develop defense mechanisms against fully realizing and reacting to societal complexity, as evident for example in political alienation. Nevertheless, on the whole one might say that *complex societies tend to produce complex minds*, or rather – in line with constructivism – the other way round: that they develop complex images of what they assume their environment to be, in reaction to being subjected to an extremely differentiated set of stimuli.

Now, one could perhaps distinguish stages in this process of increasingly rapid societal complexification, at least "phylogenetically" – and perhaps "ontogenetically" as well.

During the *first stage*, up to the early twentieth century, the individual's mind tended to keep pace more or less with the development of an undoubtedly already complexifying world.

The *second stage* included the two World Wars, each of which brought rapid advances in societal complexity, and lasted till about 1970. World War I already produced many technological innovations with social implications. Also, the world suddenly became larger and more international, the League of Nations was founded, and there were many cultural changes in the post-World War I period of the 1920s. The effects of World War II were even greater, if only due to its massive scale. Societal complexity had grown to such an extent that the buildup of internal complexity could not keep pace anymore with the outburst of societal complexity, and people started asking themselves: "where am I in the middle of all this?", and even more important: "*who* am I in the middle of all this?". As stated earlier, this was the period of the 1940-1960s when identity problems peaked in the waiting rooms of the psychiatrists and psychoanalysts, on the faulty premise that one lived in a monolithic culture that had a strong internal cohesion, and that one had likewise a monolithic identity one had perhaps lost sight of, but could rediscover if one searched long enough, perhaps with some professional help. One should not forget that this was also still the period when the hard sciences were based on the same faulty premise, and were seen as exact rather than probabilistic sciences. Within this Newtonian framework the idea was that, if one worked long and hard enough, one would discover the "objective" structure of the universe. This was a period when self-reference indeed meant reference to the totality of one's self – whatever that was supposed to be.

The *third stage* started around 1970. The aftershocks of this broken ideal brought a new generation to power. In the last three decades of the 20th century, with World War II and its aftermath of rebuilding and reconstruction far behind, and at least in the Western world a generally favorable economic climate, the sky was the limit. The generation of the student revolts of the late sixties in the US, France and Germany was convinced of having infinite possibilities for choice in most areas of life; the new and totally unexpected problem became how to choose one's lifestyle. Information overload, decisional squeeze and over choice became buzz words. Everything seemed possible in principle, and only dependent on what one "really" wanted – which one of course did not know anymore – and which facets of one's personality one cared to develop. Never before in world history had there been a generation so well-fed and well-educated, and yet so at a loss as to what to do. One of the least thought of and most fascinating aspects of this over choice is that the *percentage of unrealized individual possibilities increases with the perceived complexity of the environment,* and gives a diffuse sense of frustration, precisely at a time when self-realization and self-actualization became fashionable concepts. The drawbacks became soon apparent, and were stressed by post-modernism, which somewhat over-anxiously deplored the fractionalization of the self that characterizes the modern modular personality.

However, there is something very old-fashioned about post-modernism: it bemoans a situation that has not only become pretty commonplace, but is also irreversible, because a non-fractionalized self is not possible anymore under present conditions of environmental over stimulation from all sides. One cannot go back anymore to monolithic cultures in the present multi-group society, nor can one go back to a quest for one's unitary "real self", as in the 1950s when Horney (1950) distinguished between a "real self" and an "ideal self". Indeed, the stress is now on developing "subroutines" for functioning effectively in different areas of life, and self-reference has correspondingly become more limited. The ingredients are still the same: self-observation, self-reflection, and the discovery of some degree of freedom for action to further one's goals are still essential to help direct one's own functioning in a desired direction, but they now pertain more to the development of specific subroutines to handle selected aspects of life, rather than to the entire personality – a chimaera that has perhaps never existed, and if so only in simpler societies. One does not need to be schizophrenic to realize that the self can at best be considered as a coordinating agent between these subroutines.

Nevertheless, there will always be people who want to know who they are *in toto*, rather than partially, and want to have an overview of, and insight in, their entire personality which both encompasses and surpasses these subroutines. This is by definition an impossible and endless quest for an inside observer – and for an outside observer as well, who lacks the privileged access to the inside observer's mind: every new reflection changes the totality of what is in

one's mind, which is not a static structure, but a dynamic process, as Buckley has repeatedly stressed. Unfortunately, and at the other extreme, there will also always be people who do not care a damn about who they are, whether *in toto* or partially, and what they become.

Our future scenario is therefore that the march of self-reference is likely to continue, but that it will change in character. Self-reference will increasingly pertain to subroutines rather than to oneself "as a whole" – to parts of oneself, which is perhaps all there, since only the here-and-now really exists on the moving razor-sharp border between past and future, and consciousness cannot be all over the place at the same time. And our final recommendation is that simple systems courses should be taught at high school level.

Notes

1. Available at http://www.unizar.es/sociocybernetics/chen/felix.html, see also in Geyer (1978), Geyer (1990), Geyer (1991), Geyer (1992), Geyer (1994) and Geyer (1998).
2. Project Washoe started in 1966 and still continues. It includes the continuing study of Washoe and four other chimpanzees who have acquired AMESLAN (AMErican Sign LANguage) and use it among themselves. Washoe taught AMESLAN to her adopted baby, Loulis. Extensive literature can be found via the "Friends of Washoe" website at: http://www.cwu.edu/~cwuchci/washoe_friends.html.
3. Mel Brooks, in one of the episodes of his movie "History of the World" lets Moses stumble on the way down from Mt. Sinai while carrying three stone tablets with the fifteen commandments. He looses the upper one, which falls to smithereens, and says: "Well, ten left".

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