THE GREAT SIN OF OMISSION IN BRAIN RESEARCH

A radical, new approach towards the uniqueness of man's consciousness

by

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Introduction

If you want to get a grasp of how important the phenomenon consciousness is deemed in brain research, you do not need to study the publications on the subject – a mere look at the jackets of a great number of the books on the subject will do to prove the point. Let me give you a taste taken from a work of an eminent authority.

> "Consciousness is one of the last great unresolved enigmas of science – and certainly the greatest of biology." (Jacket of Christoph Koch's „Bewusstsein – ein neurobiologisches Rätsel", Spektrum Akademischer Verlag, 2005)

One should assume that if the phenomenon consciousness is such a riddle, somebody should first of all make a documentation of what this phenomenen is exactly and what is so mysterious about it!? Both points are still unclear.

Secondly, there should be by far more questions than answers to this great enigma of neuro-science. In fact, there are far more answers than questions – however rather various and contradictory ones (depending on who gives them). Let us have a look at a quite representative statement by Gerhard Roth, who seems to shape the general opinion up and down our country:

> "It seems plausible to assume that not only us human beings but also apes, dogs, cats etc. are able to think, that they likewise possess spirit and consciousness." (Das Gehirn und seine Wirklichkeit, page 63, Frankfurt a. M. 1995)

If this is true, one wonders, however, which mental qualities are still there to distinguish man. Our consciousness obviously can't do the job! At least Roth explains to us with a number of variations what he means by this:

> "A characteristic form of my consciousness concerns my self-identity: with everything I do and experience I usually have the feeling that it is I who am doing and experiencing something, that I am awake and aware of it." (same book, page 192)

According to this, consciousness is characterised by being awake and sensation of oneself. In Roth's eyes consciousness seems to be composed of a number of states. Thus Roth reaches his central concept:

> "Apart from the awareness of one's own self-identity and the deliberate control of one's actions, there is a further form of consciousness which is targeted at certain interior or exterior events like perceiving, thinking, feeling, remembering or imagining. Within this context, consciousness is closely connected or maybe even identical with focus." (same book, page 193)

Conclusion: Sensation of oneself and being awake are part of consciousness; virtually identical with this is being able to focus. In this aspect, apes, dogs and cats are probably superior to humans. In his next book Roth even goes so far as to claim that

> "For the brain consciousness is a state that should be avoided as far as possible and only be used in an emergency." (Gerhard Roth: Fühlen, Denken, Handeln. Frankfurt a.M., page 231)

Having heard that consciousness manifests itself in sensing oneself, being awake and focused on oneself, we now learn that it "should only be used in an emergency". However, what Roth does not tell us is how man should act without being awake and focused – whether consciously or non- consciously. The greatest enigma of biology seems to be quite irrelevant in Roth's works. At first consciousness was identified with all sorts of mental states, but then it was suddenly deemed useful only in a state of emergency. What a paradox!

Another attempt at an explanation was made by Wolf Singer, the second doyen of brain research.

> "My suggestion now is ... that it is only this ... dialogue between brains that can convey the additional experience of being an autonomus entity which is able to make subjective experiences, decide independently and initiate actions and is conscious of itself as an individual." (in: "Selbst und Gehirn", Paderborn 2000, page 339).

One wonders, however: Is it not self-evident obviously, that Singer is using this interhuman dialogue to turn an implicit achievement of consciousness into its explanation?

These few samples prove sufficiently that it has been preferred to use the term only to fill the very same concept at random, instead of examining the characteristics of a state that we perceive as conscious. The latter is the path I want to follow in this essay.

1
Only The Human Mind Manifests A Radical Difference Of The Basic Mode Of Being Conscious Versus Being Non-Conscious

Until this very day the majority of the brain researchers has failed to recognise a radical difference between animal and human consciousness. What is even worse: in all the media the proximity between the animal and the human mind is emphasised. This is mainly due to the fact that nobody bothers to make a consequent distinction between the form or mode of consciousness, on the one hand, and the substance and functions of consciousness on the other hand (e.g. perception, attention, memory, learning, reflection etc.). How does this manifest

itself?

Let us, for simplicity's sake, confine ourselves to the simplest function: sensual perception. Anybody who observes themselves, particularly any brain researcher, knows that virtually every perception – be it of objects, colours, motion, sounds, even multifactorial events – can occur both consciously and non-consciously. (Just think of intoxicated persons, sleepwalkers or athletes and artists.) Nevertheless, both forms or modes are more or less explicitly attributed to man and animal equally. However, there are only a few higher species (chimps, dolphins) that can be proven to have weak signs of consciousness of their own self which may be on the developmental level of a two-year-old child.

All the more astonishing is the fact that these two basic and – as I can anticipate – opposed modes of perception have never been strictly separated, not to mention analysed exactly by the brain researchers. (I am referring to G. Roth, W. Singer, G. Edelmann, C. Koch, A. Damasio etc.) On the contrary, the concept of consciousness has been so widely interpreted and vaguely applied that it has become more or less identical with the mind altogether. Moreover, these two basic modes – conscious and non-conscious in which dichotomy a specific mental functions can appear in man – have been permanently mingled just because of this vague approach. Or – to change the perspective: In the nondescript concept of consciousness the difference between substance of consciousness and mode of consciousness has been lost. Consequently, a precise distinction has not been made between: WHAT (do I perceive attentively, by remembering, by learning, through reflection) and HOW (do I perceive this substance consciously or non-conciously or both simultaneously?)

What we are talking about here is the sin of omission committed by brain research as such; for a precise analysis of these two modes is the indispensable key to understanding consciousness and along with it the essence of being human – which is diametrically opposed to that of an animal. All the far-reaching cultural and civilisational capacities of the human mind – like the Self, the ability of thinking , the language, the free will, the cognitive faculty, the imagination as well as cooperative action – can only be basically explained in its extraordinary manner in man, if this distinction is made. I would like now to sketch the core of this hypothesis.

2
The Alleged Proximity Between Man And Animal

It is the common doctrine that man and animal merely differ quantitatively in their mental characteristics like perception, attention, memory and their capacity for learning and reflecting. All these mental qualities are conveniently, but extremely imprecisely, subsumed under the concept of consciousness. This common doctrine has been supported by the – seemingly – great similarity between the human and the animal brain. There is no doubt about this: due to evolution the brain structure in man and chimp is rather similar – from the brain stem via the mesencephalum and the cerebellum to the diencephalum and cerebrum. Also certain sections like the basal ganglia or the limbic system as well as the amygdala, hippocampus and thalamus etc. exist in an analogous way as functional units in both man and chimps. Since in addition the cerebrum along with the frontal lobe, the associative and senso-motoric areas plus the occipital lobe are widely similarly structured, the fallacy is close at hand that human and animal brains might be very similar indeed and the differences in their performances only quantitatively measurable.

The crowning glory to this superficial conclusion has so far been the discovery that man and ape differ by no more than one per cent in their genetic make-up. That a vast part of the genetic make-up has been deciphered, but that its function is still unclear does not seem to matter to these people. Neither has it occurred to them that minor changes in crucial places can have dramatic consequences. As far as they are concerned, the proximity between animal and man has remained evident.

On these premises they reached the conclusion that they could neglect the fact that the human brain is relatively larger than the animal brain in proportion to the body weight. Neither did they consider the higher density of neurons, the more differentiated distribution of functions and the greater depth of processing. Is it therefore possible to accept the widely spread claim that the transition between man and animal is not clear at all and that man’s proximity to the animal – particularly their apish relatives – is to be rated far higher than their distance? By no means, unless one continues to ignore a contradiction within the worn down thinking patterns, a contradiction in itself which I want to unveil in the next chapter.

3
The Discrepancy Between Man And Animal Must Be Rooted In The Brain

We take for granted the fundamental achievements of brain research, particularly during the twentieth century. It is based on the understanding of the functionality of the nerve cell as an elementary unit of each brain up to the image-producing tomographic technology of the present time.

Between all the human mental phenomena – from the most simple perception to spiritual phantasmagoria, from the simple logical conclusion and the most modest creative idea to the solution of the most complex differential equation and the creativity of artistic geniuses – Briefly: between any expression of the mind and any accompanying activity of the brain there is always and necessarily an immediate correlation. There are no mental achievements of whichever nature – even if they are seemingly transcendental or metaphysical – unless the brain interferes in a specific way.

Any humesian scepticism towards this reciprocal correlation is refuted daily by clinical and experimental experience, because practically every mental achievement fails or is disrupted, if the corresponding parts, structures or areas of or within the brain are destroyed or damaged. With this the dualism between body and spirit that was rampant until Eccles and Popper has been refuted once and for all – except for a few stubborn ideologists.

To all intents and purposes the mainstream of brain research should have seen how absurd that position is. How could mankind have performed such an inconceivable cultural and civilisational development since the artefacts of the cro-magnon-humans at the latest (roughly 40,000 years ago), whereas the chimps with a largely identical disposition of the brain still live more or less exactly in the same way as they did 40,000 or even 400,000 years ago? Briefly: the civilisational achievements of man and ape, which require corresponding mental achievements, are worlds apart! The activities of brain and mind are mutually dependent – and yet there is not supposed to be a crucial anatomical and functional difference between man's and ape's brains? This simply does not fit!

4
Man’s Exceptional Position Cannot Be “Explained” In Terms Of The Symptoms: Language, Intelligence And Social Behaviour

So far brain research has avoided taking a precise position in this tricky dilemma. What it seems to have forgotten is the alleged substantial similarity in the brain anatomy of man and ape. Instead of doing scientific research it has merely claimed that nobody seriously denies that man differs from the apes in two essential characteristics which ultimately ensure his civilisational superiority: that is, for one, man's far more complex and flexible language and secondly his incontestably much higher intelligence. Recently, the idea has been favoured that social life and man's unique communication have led to his civilisational achievements. *(See Wolf Singer and also Onur Güntürkün in Spektrum der Wissenschaft 11 2008)*

The superficiality of so-called explanations is obvious. Although they are right in claiming that language is a typical, but exterior and manifest phenomenon, however, by itself, it can by no means explain the crucial difference between man and animal. The difference – among other things – only becomes manifest in it. For language merely is the last link in the mental structure of man, a crude, though very valuable tool for the conveyance of human thinking. It is the human thinking that appears as language, not the other way round. Although great intellectuals like Wilhelm von Humboldt and Ludwig Wittgenstein adhered to the latter notion and many present-day mainstream philosophers and neuro-linguists thoughtlessly parrot them, a very simple self-observation will prove the real correlation. As anybody can immediately verify, man is able to think in a precise, complex and carefully considered way without actually using his language, but on the other hand it is impossible to speak in a precise, complex and carefully considered way without thinking at the same time. Or, to put it even more conclusively: human beings who, due to a stroke, have partially or completely lost their ability to speak are in no way impaired in their ability to think.

Therefore language – whether it be spoken or written – is not the origin of our thoughts but their means of transport. Anything of importance we have to say has long before been shaped in a yet to be explained interplay of conscious and non-conscious thinking. Language by itself does not think, it only stimulates thinking retrospectively. Of course every language shapes the speaker's conception of the world. Nevertheless even that mainly happens in hindsight. What is far more efficient and powerful in shaping the

world is man's thinking and acting. This simple and yet basic truth is proved by the fact that evolutionary theory, theory of relativity, quantum mechanics, genetics and philosophy can be described and understood in any language. The same is true to a great extent for epic prose and to a far lesser extent even for poetry. It is man's exceptional capacity for and way of thinking that constitutes his essence. Language only transports this thinking in a less complex and precise way. To put it metaphorically: language is the currency of thinking.

Even more evident is the "explanation" of the difference between man and animal as a pseudo-explanation. It is a mere tautology: man discovers electromagnetism, illuminates the nature of light, develops the combustion engine etc. – and we call that an intellectual achievement. And what helps him accomplish it? His intelligence. By what can it be seen? By the discovery of electromagnetism etc. In other words: these people "explain" man's civilisational achievements by randomly sticking adhesive labels with the inscription "intelligent" on anything they want to explain. It is only fitting within this context that, after decades of debate, the intelligence researchers have still not reached an agreement about what intelligence actually consists of. They just want to sell descriptions of various signs of intelligence as their "explanation". Thus the core problem has remained unresolved, although it involves the very questions science has to ask: How, by what means and why has human thinking performed the well-known civilisational feats? In any case, it is not primarily by language that man has accomplished them, and "intelligence" just furnishes him with a handy term.

Let us finally examine the latest explanation that uses man's social competence. It is obviously based on human language as its premise. Language in turn is rooted in thinking, as we have just illustrated – it is an exceptional capacity that doesn't need to be described but explained. Social communication and cooperation therefore very quickly prove to be mere sequel phenomena. They can by no means explain man's ability to think and use language creatively. In view of this shallow argumentation the banal question imposes itself why it has never occurred to the chimps with their so similar brain to communicate with one another ever more substantially. (Well, they are probably cleverer than us!) In any way, some people should have dug a bit deeper.

5
The Mode Conscious Does Not Depend On Mental Substance

Criticism of the wrong explanations of man's exceptional position has at least led to man's invisible characteristic that has turned him into what he is: his particular way of thinking. But what exactly defines this particularity, if we don't want to be fobbed off again with man's yet to be explained capacity for reflection, abstraction, analysis, imagination etc.?

Let us remember the results of the previous chapters: For decades the entire brain research has used the blanket-term of "consciousness" for defining certain functions of the mind (e.g. perception, attention, memory, learning, reflection etc.) which we share with higher animals. Although various researchers have recently somewhat casually come up with the concepts "conscious" and "non-conscious", none of them has ever made it clear that in man all these particular mental functions are performed both consciously and non-consciously, but in the animal practically only non-concsiously.

What emerges from this simple fact? The obvious observation that the states of the conscious and non-conscious cannot be particular functions like the sensual perception etc., but must constitute a general mental state or mode. Therefore consciousness can only be a particular way of perceiving, being attentive, remembering, learning, reflecting etc. – not everything, but whatever enables man to move forward. Whoever wants to comprehend what it is that makes human consciousness stand out independently of what a person may be aware of in particular must understand the difference in the essences of the conscious and non-conscious modes.

Strangely enough, the mainstream of the brain researchers has occasionally (more or less successfully) striven to describe what it is exactly that defines the state of the non-conscious in man and in the animal. Their endeavours have led to descriptions like "zombielike", "intuitively", "automatlike" etc., but, that's about it. No need to complain here, what is disconcerting, however, is the fact that they conversely have not cared to examine the exceptional mode of conscious. Instead the majority of the well-recognised brain researchers have once again equated the general mode of conscious with very particular mental function occurring in man as well as in animals. Thus particular substance elements of consciousness (the perception of colours or sounds for example) have once again been undiscriminatingly mingled with the general way that happens (consciously or non-consciously).

6
Consciousness' Peculiar Ways Of Appearing

So by taking this kind of approach the scientists have missed the Archimedian point of the consciousness complex. They should only have bothered to observe this peculiar mode of the conscious and examine it closely. An extensive continuous comparison of conscious and non-conscious might well have led to these results:

If we are conscious of something – a perception for example – then it is in front of our "Inner Eye", our Self, and we are its masters – for an indefinite period – contrary to exterior influence. Then we can know that we are perceiving, that we are attentive, that we are learning – the animal in contrast cannot do all that. Although man and animal perceive the same thing in principle – maybe a landscape, an interior or a person, man's conscious perception has, other than the non-conscious one, a revolutionary new quality: what is being perceived is in the mode of permanent availability to man. Even though the image of the "Inner Eye" every now and then crops up in the established brain research – e.g. in Wolf Singer but also Gerhard Roth and Christof Koch; nobody has seen this as an occasion to analyse the peculiarity of this state separately. (Before I go on, let me first state that the conscious and non-conscious thinking processes have only for demonstration's sake been clearly separated, although in reality they of course mutually influence each other in a permanent fluctuation, continually merging into each other, shimmering in a hazy distance – from dream to trance, thence to numbness and through semi-consciousness and ultimately to alertness.)

All these characteristics of the conscious are in stark contrast to the non-conscious. Principally the following rule can be held true: non-conscious perceptions (e.g. while doing sports), non-conscious memory matter (childhood experiences that are suddenly remembered again), non-conscious thinking processes (e.g. spontaneous ideas during a conversation) are not available to us. We know nothing about them – exactly this is what defines the non-conscious – and only experience them indirectly. Therefore they are neither in front of our "Inner Eye" nor we are aware of them at any time not to mention permanently. But fortunately we become aware of some results of non-conscious processes that manifest themselves (e.g. spontaneous ideas, sudden memories, unexpected temperature changes, peculiar sounds or movements etc.). Thus partial results of an inaccessible, non-conscious process enter our consciousness.

What is so peculiar about consciousness is therefore that our Self has

parts of the non-conscious mental processes at its permanent disposition – this being a capability the animal does not have. The enigma of consciousness is consequently: What enables our brain to maintain such a relative autonomy?

First of all we can safely assume: before we become aware of a fragment of something non-conscious, unknown to us a complex searching process must have taken place. Everybody knows this baffling phenomenon: We rack our brains for minutes, hours or even days with a problem, endlessly discuss all its factors and implications and just cannot crack it. At some point eventually – we may have given up long before – the solution of an old, distant problem suddenly occcurs to us out of the blue, while we are doing something that has absolutely nothing to do with it (we may be running or shopping). This can only mean one thing: Unknown to us an intricate, unexplainable thinking process has done the job which our consciousness was overchallenged with. In former times this was called divine afflatus; today various forms of evidence indicate to us that a highly complex thinking process has been taking place without us being aware of it. How this non-conscious thinking must work in general will be examined in chapter 8.

Let us once again turn our attention to the conscious process of thinking and follow the way it works. So we are consciously looking at this result of our non-conscious thinking. It may have become clear to us how we have to structure a certain document. Now our conscious thinking concentrates on the minor implications of the basic problem we have just solved. Which font size, which formatting, how many paragraphs? etc. These questions are answered by our conscious thinking, and it does not need to follow any hidden intricate paths. It does so for example by weighing two factors, by making a decision that necessarily leads to a consequential decision, by following a chain from A to B and C etc., by abandoning a partial solution and substituting it by two logical conclusions and so forth.

Which separate features of the conscious process of thinking do we therefore need to establish? Each partial step can be conscious. We are acutely aware of each partial result. We are also aware of the steps we make to connect or separate two things. Concerning most of the highly complex processes or states we deliberately carry out very simple and reduced procedures or construct readily comprehensible models. We operate with more or less clearly defined, with ideal factors. We proceed very slowly and step by step. We are aware of complex factors and processes per se and as entities – irreducible qualities. We can picture them by dissecting them and dismantling them into more or less manageable elemental parts or processes.

However, one elemental feature of conscious thinking is still missing. I

said earlier: We are conscious of something, we consciously think this or that. And above I mentioned the image of the "Inner Eye". We always ascribe to consciousness the existence of a Self that perceives and thinks consciously. The majority of the brain researchers therefore used the concept of „Self-conciousness" or "consciousness of the Self". Some of them went so far as to proclaim this the solution to the enigma of consciousness, whereas others, like Gerhard Roth, without further ado declared it to be an illusion. According to Wolf Singer's hypothesis, man has attained consciousness because the human Self can master particularly rich and diverse substance matters by dialogue. Regrettably, however, the state of being "conscious" isn't the result of psychological phenomena or functions, instead it is a clearly distinguishable state or mode of its own. What distinguishes us, is not what we achieve with our mind, but how we do it. It is only this extraordinary HOW that helps us attain new and rich mental substance.

And just by the way: animals also have a Self. Their behaviour proves this in many ways, even if they are not conscious of it. Quite the reverse makes sense: in order to be human, a being must have the ability to become conscious of their mental substance. And the substance of a person's Self and one's individual history are merely particular, individual thought substance among so many other possible forms of thought substance. (For clarity's sake I will from now on talk about "awareness", as this term gets closer to the concept of the mental mode, whereas the established brain researchers use consciousness again and again to describe the substance of awareness.) Let us put the fundamental difference between non-conscious and conscious thinking in a nutshell:

7
The Contrary Ways Of Conscious And Non-Conscious Thinking

If we compare and sum up the above-mentioned symptoms of the surface of non-conscious as opposed to conscious thinking, we are bound to reach the following conclusions:

Non-conscious thinking is highly complex and is performed in a primarily self-regulated way from bottom upward; conscious thinking, in contrast, is primarily steered from top to bottom and only knows simple steps. (This new, potentially dominant feed back process arises because a Self also becomes partially conscious.)

Since non-conscious thinking is based on permanently changing

neuronal patterns, it cannot provide us with unequivocal evidence; conscious thinking on the other hand uses measurable quantities which can be converted into clear results.

Hence non-conscious thinking has no prescribed target, but it seeks a "target" (attractor, see below). Conscious thinking does know a precise aim, which has been set autonomously and is pursued in a linear way for the first time in the evolution of life.

Non-conscious thinking evolutionises extremely fast on the informational level because it works in parallel motions, i.e. several processes are executed at the same time; conscious thinking handles the tasks it has been set consecutively – step by step – and is therefore very slow.

As a consequence non-conscious thinking must be permanently active in an alert state, and its processes can hardly be influenced by awareness; the conscious thinking conversely can be stopped randomly, varied, repeated, checked, corrected, diverted and restarted from the original point of departure.

Non-conscious thinking furnishes unlimited new thinking matter – more or less, lures us towards new, but also old trails, creates unpredictable associations; conscious thinking on the other hand drives crude stakes into the ground, dissects surprisingly new thinking matter, defines mentally anticipated paths and aims, lets itself be stimulated anew again and again by non-conscious thinking and thus enters a permanent, creative, relationship and interaction with it. (Here a comparison imposes itself on us: the non-conscious with all its features resembles complex systems, the conscious resembles classical mechanics.)

8
The Interaction Of Self Regulation And Control During The Process Of Thinking

The interplay and the contrary modes of conscious and non-conscious become clearest during the act of speaking. Some people may be able to start talking without having thought about it before, but generally all human beings make a sort of plan about what they are going to say – if it is to be supposed to be more or less meaningful. Contrary to a concept (subliminally spread all over the brain research), thinking and speaking do by no means coincide. In fact, just a little self-observation is required to gain some insights into an illuminating interplay between conscious and non-conscious

thinking which later crystallises in spoken language.

The conscious thought does not make any prescriptions about how the sentences have to be formulated in detail. It only sets the frame for the topic and the gist of what our language must formulate. It is not seldom that we become aware of a thought-fragment while we are speaking (e.g. “this narration has to be short” or “I want to emphasise a particular aspect of the book”). It is rather more seldom that an even more specific thought accompanies the onset of our act of speaking (for example: “I must mention three events by all means” or “at this decisive point I must emphasise the author’s style”). In truth most conscious thoughts are far from being formulated as precisely as the examples I have written. On the contrary we are just conscious of a clue, and in most cases we deal with mere conglomerates of meaning, vague associations, hazy contours of thoughts etc. which guide or push our thoughts into a particular direction.

It is therefore the direction-finding interplay between conscious and non-conscious thinking, between reason and feeling, between intellect and fantasy, which supplies us with a result of spoken language that can be more or less solidly worded. To what extent the formulations depend on the respective shares of conscious and non-conscious thinking can be clearly seen, if we begin to record in writing what we first thought and then said. As a rule the weight of the conscious immediately increases, as we tend to control, criticise or change the perspective.

How do the words occur to us? Not always are we conscious of a central term which usually represents the tendency of the thought: e.g. USA – Obama, financial crisis – risks, school system – training of teachers) etc. We do not even consciously reflect about all the terms that accompany them, the construction of the sentences and the grammar (whether past or present, reflexive or non-reflexive verbs etc.), and still less plan them ahead. On the contrary, we invent them spontaneously – sometimes more, sometimes less aptly, sometimes erroneously. It is not rare for us to be rather perplexed afterwards (but now conscious) at what almost forgotten words have come to our mind or what effective formulations we have managed. It is not language that has inspired us with all this, but it is our non-conscious thinking whose results we suddenly become aware of.

How does this non-conscious thinking work – it encompasses all nuances between strict reason and the vaguest of feelings; how does it make these mostly adequate, surprising and even fascinating results come off? In the sphere of awareness we would have brooded over the fitting expressions for ages, and in spite of all our efforts some creative developments of thoughts might still have remained in the dark. Without digging deeply in the anatomy of the brain or the interplay between functional areas, we can take

for granted that the brain is a hyper complex system. Within this system with its 100 hundred billion neurons and its 10,000 dendrites per neuron we have trillions of potential combinations. In any case we are dealing with flexible neural patterns that in turn interact with innumerable other patterns. (The so-called Halle-Berry-recognition neurons merely act as triggers.) How can words, thoughts and memories manifest themselves in such a complex and seemingly even chaotic system – and at that often highly efficiently?

There are two totally different hyper complex systems we know fairly well, and which are also of fundamental importance: the evolution of life and the development of the economy. (Of course there are lots of highly complex sub-systems, like the immunity system, traffic, demography etc. – practically all systems are complex.) Nobody controls them, nobody rules over them, man only partially interferes more or less successfully (e.g. breeding of animals or plants, policies of central banks). The essence – or basic mode – of these processes and thus of the development of all highly complex systems is rooted in self-regulation, from which self-organisation, self-governance and self-development derive. This means that the degree of order can increase.

These process forms are the result of a permanent interaction of many elements which in biological evolution are made up by the genetic outfit, the phenotypes, the biotope, the habitat, the climate, the geographic situation etc. Concerning the economic development the most essential elements are the constitution of the state, the trade partners, the various competitors, the state of technology, the infrastructure. Time and again these multiple interrelations of mostly ambivalent factors amount to chaotic phases whose results cannot be predicted: Will the polar bear survive or will it not? Will the bank collapse or will it not? In systems as complex as these there aren't any unambivalent cause-and-effect-interrelations or strictly determined processes. Therefore, the processes can be predicted neither in detail nor in the middle term. Nevertheless highly complex processes such as these tend to seek states of balance, the so-called attractors, which constitute a more or less probable result: a constant population density, an equilibrium of supply and demand. (*Attractor: A state of relative stability which absorb dynamic systems in the long term.)*

What can all this teach us about the highly complex system of the brain? The brain is obviously in a permanent process, it permanently perceives, learns, forgets and therefore permanently changes. For a start it cannot work according to a simple cause-and-effect-principle and neither can it store any unambivalent information in easily definable pigeon-holes. Since even any simple perception is complex, it cannot be recorded unambiguously once and for all. On the contrary, it activates already existing or similar neuron

patterns, reinforcing or weakening parts of them during this process. As practically every perception consists of elements – like shape (straight or bent etc.), colour, texture, motion, sound, smell, tactility – which have been experienced many times before, a checkpoint attractor is usually reached very quickly in order to maintain a state of balance. Even so the respective attractor (e.g. for house, street, car, dog, tree ...) is selected out of a great number of very similar patterns. During the process of non-conscious perception each checkpoint attractor, i.e. every single element of the perception, is immediately absorbed by the highly dynamic process of the continuous stream of perception. Analogically, the same is true for the functions of attention, memory, learning and reflection.

The highly dynamic system of conscious thinking is rather more complicated. In its case the checkpoint attractors of perception, attention etc. are merely material for further processing. The checkpoint attractors, whose counterparts are stable neuronal patterns, are no longer replaced by continuous perception, attention etc., but generate a highly dynamic interaction with memory substance, memorised learning results, experiences and above all the the line of thought. This is even more a non-linear process which already in its beginnings reaches a small degree of autonomy. During this non-conscious process of thinking states of balance attained after turbulences and chaos no longer manifest themselves as checkpoint attractors, but as boundary cycles and chaos attractors, which then assume a function as guidance and steering factors. Again it has to be stressed that these attractors of non-conscious thinking are neither linear nor deterministic and are not achieved via cause-and-effect-sequence but via preliminary results of a dynamic non-linear process of selection of more or less strongly activated neuronal patterns. Therefore the fantastic achievements of non-conscious thinking are also the result of micro evolution of mere information that selects neuronal attractors. The brain simultaneously handles a vast amount of processes of interaction – hence the incredible results. Briefly: The non-conscious primarily proceeds in self-ruling and self-organising patterns.

Conscious thinking processes on the other hand can be controlled by a conscious Self and work in total contrast to their non-conscious counterparts. Why? Only partial results of non-conscious thinking can become conscious. As such, however, they are at the disposition of the conscious part of the Self – one might say they are positioned in front of its thinking-mirror. This is only possible if such results of non-conscious thinking are detached from highly complex processes and retain their relative autonomy. Only then can these partial results be successively linked and arranged anew by the conscious Self. Only in a state of relative autonomy can stable neuronal

information patterns or respectively substance of thinking be specifically guided and focussed. Conscious thinking processes like these are no longer evolutionary-accidental by nature, but linear, they know cause and effect and reach exactly verifiable results.

So in man there is on the one hand the interaction between myriads of neuronal patterns in the non-conscious sphere, and in addition we have the interaction between self-regulating processes within the non-conscious sphere and the control by conscious thinking. I mentioned this interaction of conscious and non-conscious thinking, when I introduced the topic of language. However this interaction occurs whenever we are conscious of something: in sport, while we are involved in any manual labour, artistic activity or in traffic, while we are reflecting about anything ... As there is not enough space to analyse each interaction specifically, a few generally valid points will have to suffice.

At the beginning of this chapter we saw the extraordinary efficiency and capability of highly complex self-regulating processes on an non-conscious level. However, as we can observe in animals and even toddlers, they are often not target-oriented enough – for human purposes at least. And exactly this is the starting point for man's awareness. It continuously steers, checks, corrects, interrupts, renews all sorts of non-conscious processes which become conscious to man as their results. Due to this newly arisen awareness a revolutionarily new process of interaction sets in: the fantastic neuronal selection and optimisation performances of the non-conscious – partially becoming conscious as intuition, idea, imagination, inkling etc. – now enter into a permanent interaction with conscious targets, control commands, corrections, repetitions etc. Although conscious thinking is rather awkward and slow, it connects with non-conscious thinking and thus forms an extremely flexible, target-oriented and therefore far superior entity.

In sports we optimise our automatisms by specifically practising a stroke, a position or a motion; in household chores or craftsmanship we optimise our effects by planning ahead, taking into account our experience and by continuously modifying our conscious coordination; even when we are involved in artistic activities, we do not leave everything to intuition but use our targets or ideas to steer them more or less consciously into a desired direction; in road traffic automatisms are directed by conscious rules far more strictly than in sport; when we reflect, phases of wordlessly letting things go continuously alternate with phases when words or set linguistical pieces gradually become conscious, while at the same time the targets become more and more dominant until we are fully aware of a particularly thought or even a verbalised sentence.

Briefly: the disadvantages of purely non-conscious thinking and hence

spontaneous acting – vagueness and unpredictability – as well as the downsides of purely conscious thinking – slowness and coarseness – turn into a permanent interaction of non-conscious thinking and acting, which leads to fantastic advantages. The respective weaknesses compensate one another. The non-conscious thinking brings forth creative solutions in a flash, our awareness on the other hand steers them towards certain aims, while the whole process can be permanently controlled, conducted, interrupted and redirected. Briefly: this very form of interaction is used consciously – it becomes autonomous – and it allows for an openness never seen before. It is precisely the reciprocal effects of the intuitive thinking process and our awareness along with its capacity to look ahead or backwards at any time that enables us with a creativity of cooperative thinking.

Nevertheless we are still faced with the crucial question: Which are the neurophysiological structures that enable us to become conscious of neuronal patterns or attractors?

9
The Emergence Of The Neuronal Attractors'Autonomy Manifests Itself In Conscious Thinking

As we have seen, the non-conscious sphere as a complete entity – with its flood of perceptions and its thinking process – can never become conscious. It is a platform for highly complex and highly dynamic processes of interaction performed at an extremely high speed. A conscious Self would never be able to handle such a vast amount of information. Therefore, only those neuronal patterns become conscious which consolidate and turn into attractors. Just a tiny part of the non-conscious achievements becomes conscious. This miniscule part, however, is quite a bit, for it triggers off a revolution in human thinking. How do these patterns become conscious? By escaping from the stream of the non-conscious and becoming relatively autonomous. And how is that possible?

We are dealing here with a well-known, but far too much neglected phenomenon of many, if not all highly complex systems, that inherent factors become independent. In the same way the informational pattern became "independent" during the process of the evolution of life. This informational pattern of the physiological characteristics and the elementary behaviour of an organism exists in the shape of the hereditary substance (DNA). As a consequence the organism is not only changed temporarily in a

direct way by the contact or clash with the exterior world, but also permanently, in an indirect way, because this contact effects an alteration (mutation) in its information memory, the DNA. Since this information code is available in its independent shape, a whole arsenal of incidental and yet directed variation possibilities has arisen, which otherwise would not exist, not to mention the variety of its dosages. Above all, changes can now happen completely independently of the environment. Originally the hereditary molecule (DNS / RNA), plasma and cell wall were practically one and the same. The more sophisticated and specialised the organism became the more autonomous the hereditary substance proved to be.

Let's have a look at the other prime example – the development of the economy. As long as we only deal with simple subsistence economies at the beginning of the human community (hunting, collecting, the origins of agriculture), goods don't exist; so there is no value of goods either, although all the ingredients are already on hand: the usefulness of the products as well as the time and energy that haven been spent on making them. As soon as agricultural activity yields a steady surplus that exceeds the subsistence level, this surplus is traded more and more regularly and the products turn into goods.

Now the invisible characteristics that were originally part of the product (working hours and energy) come to the fore as separate elements of the goods value. A so far hidden inherent feature of the products becomes a means of the exchange purpose. The exchange acts increase proportionately to the growth of the supply of goods, and along with them the market expands. As a consequence of this process of segmentation the value invisibly inherent to the goods imposes itself between two acts of exchange as an independent entity and assumes the shape of money. If this process is continued only a little bit, the value metamorphoses from a mere means of exchange to a purpose in its own right, i.e. to increase the trader's gain. And by the time it is in the hand of the money trader, money becomes totally autonomous, because for purely formal reasons money now seems to breed more money, profit. And this autonomisation is even further enhanced by the increase of the division of labour, the ensuing industrial profits, then the banks' gains, the proceeds of the financial capital and ultimately the profits gained by gambling on the stock exchange.

In the meantime, stockmarket crashes, financial collapses and economic recessions have sufficiently demonstrated that any autonomisation can only be be relative. The seemingly detached sphere of the securities cannot exist without the real economy, i.e. agricultural production, workmanship or industrial output, for in the long run the increases of profits and productivity have to be aligned.

This fundamental restriction is, of course, also true for the substance of the human awareness: its transition to independence from its source, the non-conscious sphere, can never be absolute. However, the relative autonomy of a part of the neuronal attractors – stable patterns, which the non-conscious thinking process provides, helps man experience a phenomenon never seen before: he becomes conscious of a small, but important part of his non-conscious perceptions and thinking processes. Why? Because at the same time an essential part of his highly complex, non-conscious image of himself becomes relatively autonomous. A conscious part-self emerges – virtually a duplication – which permits man to become aware of all the perceptions and results of his thinking processes, even those that go beyond the perceptions and results in front of his "Inner Eye", as if he could see them in a mirror.

Above all, one thing must be held – and it constitutes the unbridgeable gap between man and animal: This state of being aware permits man in spite of the limits of his slow and somewhat clumsy awareness to steer all his non-conscious, mental and physical performances into a certain direction and subject them to any kind of control. This is not the place to examine the potential of the radically new performances man's thinking has made possible. One thing should have become clear, however. We are dealing with a combination of two thinking processes: the specific performances of the non-conscious with the contrary achievements of the conscious, in other words, of an "above" with a "below". This combination of the self-regulating and the conscious thinking processes, which are the first of their kind that are able to take over control autonomously, must also stimulate a totally new way of thinking and accordingly establish new results. Because: non-conscious, self-regulating and deliberately steering thinking stimulate and correct one another. Again there is not enough space to discuss this interaction in the light of its various aspects. Its essential characteristic has to be emphasised, however. Man's outstanding creativity and intelligence, which have proved to be inexhaustible until this very day, can only be explained consistently through the highly variable interplay between conscious and non-conscious thinking. What is more: this contradictory unity can be weighted very differently. Plus: the relative autonomy of his awareness permits man to dissect every process of thinking and acting as critically and long as pleases him. The non-conscious sphere may seem to be powerful, but potentially it is now kept on a tight rein by the conscious.

A crucial question still remains to be answered. What is it that facilitates this relative autonomy of some parts of the non-conscious, which manifests itself in the phenomenon of awareness? Within the frame of this essay it is only possible to sketch the outlines of the answer. The cerebrum's capacity for steering and planning has kept increasing in the course of the evolution

from vertebrae to mammals and up to man. Starting with lungfish through treeshrews and culminating in the first primates it served to further a continuously enhanced mobility and flexibility. Then the hominids' cooperative and communicative strength demanded more and more differentiated processing of perception and behaviour. The first result of all of this was that the paths between the brain stem and the cerebellum became longer and more convoluted, which on the other hand impeded processing the stimuli. Secondly the specialised brain nucleus such as hippocampus, thalamus, basal ganglia, the limbic system etc. became more differentiated. Thirdly the multiple processing of incoming and stored information and along with that the depth of processing were enhanced. All this can be shown clearly in the overproportional enlargement of the association fields in the human cerebrum.

This ever-increasing differentiation of the whole brain complex goes hand in hand with an increasing multiple processing of information. A certain degree of complexity in turn leads to a relative autonomy of a substantial part of the neuronal attractors, which are the results of self-regulating processes. And this is what man experiences as awareness.

10
Evidence For The Autonomy Of Awareness

Until this very day brain research has been thoughtlessly putting awareness on the same level as the whole range of mental functions and substance, thus preventing the precise comprehension of the awareness-mode, which distinguishes man. In order to bring this ill-fated confusion of the manifold forms of awareness substance to an end I'd like to refer to a number of remarkable phenomena which convincingly demonstrate that the peculiar mode of the conscious has nothing whatsoever to do with any mental functions or substance. Their indivisible link solely consists in the fact that awareness is there to process all functions and mental substance (which also the higher animals dispose of) in a uniquely human manner.

It is only this conscious way of dealing with things that enables man to shape and reshape with his mind particular aspects of his perception, attention, memory and his reflection independently of stimuli from his environment and even the world within him. And he can do all that on the levels of his emotions, his reason, his intellect and his imagination. No animal can be conscious of anything in the same way as man is. The difference we are talking about here is not of a gradual, but of a radical,

unbridgeable nature. The following facts will prove that man's "Inner Eye" is to a large extent independent of any mental substance.

Let us start with the most banal fact. Again and again this or that expert on the subject claims that awareness emerges as a result of some specific perceptions, grows in proportion to the attention it is given or does not occur until a new problem arises. Obviously none of those researchers has observed himself. All of us have experienced situations like lying in a meadow, totally relaxed and not worrying about anything. To even further immerse in ourselves we may have closed our eyes. We hear, see and think "nothing". Nevertheless we are still aware of ourselves and of the world around us. So we stay "aware" even if we wind down our perceptions and our thinking to the lowest possible minimum. The mode awareness cannot exist as a purely abstract phenomenon, of course. It will always be chained to some substance – at least rudimentarily, for its function is to make us conscious of substance. However, the farthest-going reduction of substance makes it clear to us that the mode of awareness is a separate general potential and cannot be equated with particular mental substance and functions. With this, a further characteristic of awareness becomes evident: awareness creates a potentiality, a possibility, a readiness to think and do anything, whatever it may be. It serves to shape all possible kinds of mental functions and thus steer them.

The fact of the matter manifests itself even more distinctly in the clinical field. Practically all serious damages of the cerebrum – the primary senso-motoric fields, the association cortex, the prefrontal cortex, the occipital lobe, the hippocampus etc. – entail more or less serious functional disturbances, awareness, however, survives. This has been convincingly shown by the textbook example of the American chief blaster Phineas Gage. In an accident an iron bar shattered parts of his prefrontal cortex and several association fields. This effected mainly a change in his personality and in his control of his behaviour – in other words: very specific qualities. However, in no way did he lose his awareness as a general characteristic. This means that awareness is not located in particular areas of the brain but must be a structural characteristic of the whole cerebrum at the least.

In conclusion I'd like to cite some seemingly remote evidence for the autonomous character of awareness. In persons suffering from senile dementia the cognitive faculties and memory may decline, their awareness, however, remains intact. It is only when Alzheimer's destroys a person's memory, that their awareness is extinguished. As we have seen, awareness must encompass the substance of a Self to enable the Self to use this singular mode.

All this goes to prove: Man's awareness is in no way related to any

specific perception of substance and mental functions. On the contrary, his awareness is a general, relatively autonomous mode that permits him to shape and reshape all his mental functions and elements, which is an ability that has never before been possible. It is this partially autonomous process of steering through awareness which vests the fantastic intuition and playful creativity of the non-conscious with its ever-increasing and increasable efficiency and quality unattainable to animals.

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Summary: The extent of the functional differentiation of the human cerebrum implicates the relative autonomy of a substantial part of mental substance. Man experiences this as his awareness. When the potentials of man's awareness have been understood, his essence and aim of development will reveal themselves.

It is not curiosity, which is shared by all higher animals, but man's unique awareness that can pull down all the barriers in the way of his potential cognitive faculties.

It is the fruits of a cooperatively used awareness that move man ever farther away from the animal. Man is leaving the biological evolution and has already begun to shape a cultural one.

It is man's awareness that creates ways and means to lead mankind through various disasters to a new civilisational unity.

On the other hand, awareness is also becoming a tool to disenchant biological man and thus leave behind the present step of the general evolution of matter.

(A critical discussion of the existing brain researchers' versions of consciousness and a detailed explanation of the perceptions expounded in this essay can be read in my book ***"Bewusstsein – Der Abgrund zwischen Mensch und Tier" "Consciousness – the abyss between humans and animals")***