GENERAL ANTHROPOGENY

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Within the framework of an anthropogeny, it would be unfortunate to go straight to the properties of Homo's brain without first considering those of brains in general. First, because we would miss an essential articulation point between quadrumane primates and the upright primate. But also, we would neglect to observe the extent to which the characteristics of the mammalian-primatal brain underline and propel all hominid performances, from the humblest to the most sublime. What we call concepts, ideas, notions, languages, mathematics, logics, arts, metaphysics, are not merely conditioned but often virtually comprised in the general characteristics of the brain as such. There is nothing better than these characteristics to understand how Homo, albeit singular, remains an event of the Universe. And we shall start with those.

2A. The pre-hominid brain

It is not improper to say that a brain is a computer. Insofar as we immediately specify that it is quite an original computer.

2A1. A soft>>hard constructive information computer and a hard>>soft informational construction computer. Neuronic generation and growth. Experience. Passive conditioning (pavlovian) and operant conditioning (trial and error)

When comparing the human computer - the brain - to non-human computers or techniques, what first strikes in the latter is the distinction between the *hardware* on the one hand - meaning the engine - and the *software* on the other - meaning the information (programs and data) that circulates and organizes. Moreover, the mobile software is distinct from the fixed software. For example, the text that I am now writing can be modified without changing the program that supports it (WORD).

To the contrary, in the living computer that is the brain, the software, when it changes, transforms the hardware, transitively and sometimes in a stable manner. Since 1970, Kandel, who strongly differentiates short-term memory from long-term memory, identified this character through his studies on the learning process among the Aplysia, a Californian sea slug which experimental advantage is to have large neurons and few functions <*Principles of Neural Science* (PNS) 2d,817sq>. Kandel showed that new information acquired by the brain of the Aplysia consists in a physicochemical - thence physiological - and later on anatomical modification of the said brain. The biochemist now knows that short-term memory (minutes or hours) only supposes the covalent modification of pre-existing proteins, whereas long-term memory (days, weeks, years) demands the activation of neuronic genes, the synthesis of proteins and new neuronal connections in a veritable "molecular biology of cognition" (*Biochemistry*, Saunders College Publishing, 2ed, ch.31). The new connections comprise growths and multiplications (by division) of synapses, and sometimes even the creation of new neurons <R. July.01,20>. We could say that, in a brain, there is a **constructive information:** software>>hardware.

Inversely, the informational performances of a brain depend on the construction of the said brain, which is not fixed, and does not follow a pre-determined plan as with technical edifications, but results initially, and then constantly from a purely-biological construction with its risks. As we better known now for ten years or so, the neurons that make up a brain are differentiated a first time in the spinal cord where they are born; a second time in the journey that they follow to their location in the brain, particularly following nutritional competitions; and finally a third time in these sites, for new configuration and nutrition reasons <PNS,3d,886-944>. Thence, the initial biological construction of a brain, then its ulterior constructions due to various traumas, control its reception and elaboration of information. We can say that it is endowed with an **informational construction**, hardware>>software, just as we said it is endowed with a soft>>hard constructive information. Such an edification proves to be the most important "biological basis of individuality"; in clones this already contributes greatly to determine the distance between initial cloning and final identity.

Finally, we must consider that, in an organism with a brain, the biochemical information-construction machine, that constitutes the brain, is coupled with biochemical *energy machines*, the muscles, and *biochemical information gathering machines*, the sensors of sensory organs, which are both remarkably effective, rapid, and close to it. Indeed, as soon as an animal is a bit large, its brain shows two strips, sorts of internal headbands, one of which - at the back - receives the information from every part of the body whilst the other - at the front - closely located to the first and thus in a constant exchange of information with it, sends motor information to every part of the body. A brain is then a computer software>><< hardware acting on a host body and over an environment that it informs (etymologically, puts into form) and of which it is informed (put into form) following **passive conditioning** (Pavlovian learning) and **operant conditioning** (trial and error learning). With Mammals and Birds we find "mental cards" constructing themselves and even the learning of labyrinths, but we also find Cephalopods capable of acquiring behaviors that do not belong to the own life of their species, such as selecting between red and white balls, without any form of reward, through the mere observation of a previously-trained "demonstrator" <R.Jul.01,43, quoting *Nature* 1992>.

When we say that a brain is a computer gifted with experience, we must thus consider its character hard>><<soft and its extremely close ties with transforming-informing activities,

those of its host body and those of the milieu where this host body intervenes. **Experience** thus understood in the strong sense distinguishes so much the brain computer from technical computers of today that we can affirm that it is not a computer at all <R.April.98,109> or that it is a very special computer, both neuronic (neuronal, neural) and experimenting computer. We have adopted the second rhetoric as the most telling for an anthropogeny.

2A2. Neuronic representations

A peripheral nervous system, and particularly a central one, has another very efficient evolutionary property. It is punctuated by relays where the given is each time reformulated, represented (presented once again), until finally its information ensures the motor reactions appropriate to the survival and reproduction of the animal. These relays are simple glands (the root ganglion) or small organs (the thalamus), or cortical areas (areas 19, 20, 21, etc. of the visual brain of primates). In all these cases the "re-" of representation must be understood in its double sense of repetition and redistribution, like J.Z. Young strongly focused on it from 1964 in *A Model of The Brain* (Oxford).

2A2a. Their monotony and limited codes. Coding

These reiterated and reformulating presentations - or re-presentations - first strike because of their monotony. Indeed, any external stimulation, regardless of its quality, - visual, auditory, tactile, olfactory, gustatory, etc. - is subject from its reception by the sensor organ (retina for sight, organ of Corti for hearing) to a *transduction* that transforms it into neuronic impulses. However, the latter only know two states: resting potential / action potential; which means triggered/not triggered. 0/1. Yes/No.

What information can we then get on the outside world with such monotonous means? (a) There is the *isotopy* between the external stimuli, the peripheral neurons excited (for example in the retina), and the relays between nervous centers, which gives information on the configuration of the perceived objects. (b) There is the *number* of neurons excited by stimuli, which indicates the relative extent of external objects. (c) There is the *beginning* and the *end* of excitations by stimuli, giving the time and duration of action of external objects. (d) There is the *frequency* of excitations by the stimuli, which can indicate the force, i.e. intensity of external objects. (e) There is the *temporal configuration* of excitations, particularly their speed of attack and erasure, which also betrays the properties of the objects, for example bird songs.

This is what we call the codings of the nervous system. Our list is merely indicative. For an anthropogeny of the brain, there will be nothing more precious than completing it and grasping its system.

2A2b. Their accentuations: peaks, slopes, basins. Cleavages

In any event, a nervous system, for the very reason of its physiology, accentuates, which means reinforces the essential (the vital) and depresses the accessory of what it receives. For example, in the retina, from transduction, the most excited neurons become increasingly so, and the least excited even less so. Thus, the information distributes in peaks and slopes, forming perceptive basins of attraction. Without which, there would only be for the animal an indistinct and floating magma of impulsions, thus no prey, no partner for hunting or coitus, no identifiable habitat.

Computational models, such as those proposed by David Marr in *Vision* (Freeman, 1982) demonstrate well that, from relay to relay, a visual system must sample, eliminate and regroup amongst all the signals it has received in order to have "something" to be grasped, first from the "subjective" point of view of the organism (subject centered, or “at 2,5 dimensions”), then from the "objective" point of view of the perceived in the environment (object centered, or “at 3 dimensions”). For all this the brain is cleaving. And consequently cleaved.

2A2c. Neuronic synodies: perseveration, invariants, commutations. The animal self

The neuronic associations of the brain show themselves extraordinarily multi-directional, which means available to connections other than those where they are engaged in a first while. This is the case for every specimen of a species during its experience, and also in the entire species, where a group can acquire *ritualizations* (coupling, hunting, construction) so new that it one day becomes a new species (meaning specimens incapable of reproducing with those of the species they come from). This contrasts with the technical computers, where every microprocessor operates within the framework of its own logic, and does not change its logic, even when the calculation takes place in parallel.

In all species, cortical neurons are grouped in juxtaposed vertical carrots, each of which comprises a defined number of floors with neuronic arrivals and departures, amongst which some receive afferents and others send efferences, whilst others ensure feedback to the non-terminal relays (such as the thalamus), or with other areas of a similar quality (visual, auditory, tactile), or of various qualities. On the other hand, using its dendritic appendixes, each neuron depends on the contributions of other neurons that modulate its passage from resting potential to action potential according to innumerable stimulations and inhibitions, which are either reinforced or thwarted. Brains are therefore the location of what we shall call **neuronic synodies**, meaning sets of neurons that are sometimes close and sometimes very distant, homogeneous or heterogeneous and that, through all sorts of interactions, are activated or inactivated more or less together during one same perceptive and motor operation (synod, ôïdè, sun, concerting song).

Coherences (more or less cleaved) of these neuronic synodies allow understanding the **perseverations** (the "logics") of which an animal is capable throughout the deployment of a specific behavior such as eating, nesting, coupling, hunting; thus also of the perceptive invariants that it establishes on these occasions. This supposes the compatibilization of at least six basic factors traditionally recognized for each animal behavior: (1) stimuli-signals, (2) motor program, (3) drive, (4) impregnation, (5) "Pavlovian" conditioning (induction of an innate reaction by an acquired precursor stimulus), (6) "operant" conditioning (trial, punished error, rewarded success).

At the same time, synodic organization gives to understand the rapid commutations (switching) from one behavior to another, meaning the sliced deactivation of a synody and the sliced activation of another synody, the second decidedly relaying the first in a sometimes very short time. To convince oneself, it suffices to observe a dog going towards food, then a sexual partner, then a playfellow, then a thrown object, then fleeing a threat, then returning to its master, sometimes within a minute. Every time, the dog switches from a behavior with its six internal components (at least) to another behavior that also boasts six components (a least). Animal life is a suite of activated and deactivated synodies. We shall not lose sight of the extent to which perseveration (invariants) and commutation are correlative and make up the two inseparable aspects of the synodic organization of brains.

This allows understanding the setup of an animal *self*, which is something that can be observed in the relation between some birds and mammals with their own shadow. Synodic, accentuating, cleaving, and commutative, any somewhat complex brain is indeed driven - amongst the perceptions- motricities of the organism that it governs - to distinguish, accentuate, and stabilize progressively in a relative invariant all that belongs to this organism (**self**) and all that is exterior to it (**other**).

2A2d. The normalization of the perceived by the moved

We know, since 1960, thanks to the astonished discoveries of Hubel and Wiesel, that in the visual nervous system of mammals, the information conveying the form, color and movement are transmitted via independent channels; and that they do not add up anywhere in multi-sensory cells. On the other hand, the isotopy of neurons in visual relays is not always continuous. In the cat, while representations at first levels (V1) are continuous, those of superior levels (V2 and V3), are partly discontinuous; for example, to the suite abcdefghi in the stimulus and the first level of representation can correspond in a higher level the suite defabcghi <Cf Orban, *Neuronal Operation in the Visual Cortex*, Springer, 1984, p.41, exemplary work demonstrating the problematic of neurophysiology>.

However, despite this heterogeneity or discontinuity of nervous series serving as a basis for visual perception, cats catch their preys. It is because perceptive neuronic series are not only interconnected amongst themselves, but also interconnected with motor neuronic actions that inexorably respond to *continuous* series forming the prey, predator, partner and their reciprocal movements. Continuity or at least the normalization of motricity intervenes then probably during the (experienced) continuity of perception, despite the discontinuities of recording that support it. In vision, visual recordings seem to intersect from the first stages with tactile evaluations. For hearing, nervous efferences seem to go along the auditory relays to accentuate (tune) the vitally important afferences.

2A2e. The analogy and macrodigitality of a hybrid computer (not a computer at all)

The English language is perfectly suited to distinguish three forms of fundamental technical computers. (a) **Digital computers** solve problems in a suite of decisions 0/1 operating by exclusions in a closed inventory. (b) **Analogue computers** solve problems by miming data (logueïn, ana), for example in the form of an electrical or chemical circuit where some positions record the data of the problems and others the solution. (c) **Hybrid computers** combine both approaches.

Yet, in some ways, the nervous system works in the manner of an **analogue** computer. This is the case of a nervous relay miming a situation according to the different codings mentioned before: isotopy, number, frequency, etc. More generally, this is the case of any neuronic synody, which mobilizes multiple brain centers, - perceptive and motor, - in such a way that they correspond to an outside event sufficiently. Finally, it is true that if a neuron only experiences two stages (rest potential/action potential), each of its states is determined by its numerous dendrites receiving information from other neurons through as many synapses, each of which is the seat of innumerable inhibitions and excitations, which are often inhibitions of inhibitions; in such a way that each singular switch of a neuron is usually related with innumerable other states of other neurons. Thus, a brain is widely an analogue computer. Its properties even lead us to expect, as the perceptive and motor experience confirms, that it is the seat of static, kinetic, dynamic, and excited perceptive-motor field effects <7A-B-C-D> between multiple attractors, giving to the various data perceived and moved various global saliences and pregnances. We find mental maps of territories of feed in some mammals (squirrels), birds (chickadee), and simple insects (bees). And a map is analogue.

But a brain is also a **digital** computer. Firstly because, despite the complexity of their activators, its neurons switch monotonously between their rest and action potential 0/1 in what we could call a *microdigitality*. Then, in a so cleaved and cleaving set, synodies switch amongst themselves, like when the brain of a dog hesitates between food and a sexual partner, commuting several times from a synody to the other, in what we could call a *macrodigitality*.

In short, both analogue and digital, the brain has the resources of a **hybrid** computer, which gives it not only remarkable capacities of experience and adaptation in a defined environment, but also evolutionary capacities in a fluent environment. Here is the perfect opportunity to regret that in French, the term *Computer* is aged, while by its very etymology (putare, cum), it is the only one to designate the simple evaluation, computation, and estimation (putare) of an event, in an intensified and compact way. Whereas the word *calculator* is limited to the notion of calculation, and the word *ordinateur* (computer, in French) only covers digital (numeric) computers, leading many to forget - and sometimes ignore - that there are also analogue and hybrid computers. Moreover, *calculator* and *ordinateur* almost exclude field effects, whereas computer, far from excluding them, augurs that there are some.

2A2f. Spontaneous specialization and availability. Localized and modulated neuronic generations.

Many functions of an animal organism are controlled by one or several cerebral areas; the neurons of these different areas sometime have very different configurations, thus those of the cerebellum, with their many radiant ramifications, are completely singular; this is the cerebral specialization. But at the same time, the injury of an area often testifies that its neighboring neurons, or the corresponding neurons in the other hemisphere, can either remodel their functions or update within themselves potential functions to compensate the deficiencies. This is a new bioelectrochemical availability ignored by technical computers, and that contributes to make the representations of the cerebral computer capable of developing by experience <2A1>.

Furthermore, as we have already mentioned to illustrate the hard>>soft property of the cerebral computer <2A1>, adult brains go through veritable neuronic generations. This is the case for wounded cold-blooded animals; it is also the case for some male birds where cerebral neurons are created during the courtships to allow them to produce the songs that the females recognize, and that regress afterwards. Amongst Primates, we have just highlighted Homo's creations of neurons in the archaic centers - olfactory and hippocampus - and among the Macaque down to the cortex <Recherche, December 99, 8>. As these adaptations and generations do not - or not much - alter the continuity of some behaviors, - thus, from one season to the next the songs are at least globally maintained inside a species of birds, - these phenomena force us to specify the relations between "hard" and "soft" that we evoked earlier in learning (conditionings) <2A1>. Is it here too soon to suppose that some memories, including cartographic memory for insects and squirrels, probably only admit moderate (or nil?) renewals of the neurons supporting them? And that the education of new neurons and re-adaptation of existing ones, illustrates and supposes the very synodial character of neuronic functionings?

2A3. An exotropic and endotropic computer

When a lion hunts its prey or mates, the resources of its nervous system are polarized on the hunting or mating situation. This is what we formerly called "the relation circuit", and that we shall call *exotropic* circulation (turned to the outside). But the lion also sleeps and daydreams a lot; and then its brain, almost disconnected from its nervous system of relation, exploits its relays or areas so that its representations (and synodies) can circulate inside its brain without having to go through important external movements or even important exterior information. This is what we often call imagination, and that we shall call *endotropic* circulation.

Non-living technical computers, also, are exotropic and endotropic; they receive external information and are sometimes even coupled to servomechanisms, while at other times they elaborate already-received information in their internal circuits. But experience, which is proper to brains, as well as their internal open interconnectivity, their perseverations and commutations, their construction-information soft>>hard and hard>>soft invite brains to stay for a long time in their endotropic circulations and even to create veritable endotropic environments. There is a cerebral endotropia that will be confirmed by the following property.

2A4. A computer capable of regime and affects. The massive chemical modulations of synapses

An animal must sometimes undertake long and difficult behaviors requiring a sustained coordination. Thus, hunting, skinning, mating, nesting, guarding, fighting, fleeing.

It is therefore hardly surprising that brains were selected like bioelectrochemical computers capable of *regimes*, which are constant or cumulative or fluctuating or regressive according to the needs. In everyday language, we call some of these regimes, particularly when they persist, *affects*. The word defines well that these particular regimes do not have the function of producing themselves perceptions or motricities, but to assist and support them: afficiere, facere ad, provide with, putting in a certain state. With the possibility that in turn affects may put perception-motricity at the service of pleasure or displeasure that they comprise or that they are: several animals capable of stimulating their pleasure center (for example, using an electrode linked to a pedal) stimulate it indefinitely until they starve. The fact that there is no or little memory of the contents of affects, but only of their triggers, confirms this accompanying nature.

Thus the variation-selection of the biological evolution has forged, - directly above the cerebral trunk and the cerebellum charged with automatic motricities, but below the cortex in charge of commanded motricities - a limbic nervous center, widely responsible for emotional reactions. The latter controls *neuromediators* (neurotransmitters and hormones) acting upon the synapses to adapt some neuronic synodies to sustained performances that are focused such as mating and catching, or diffuse as rut and hunger.

Now is probably the time to note that one of the most remarkable properties of the cerebral computer is that it combines the different virtues of electrical conductions in the neurons and chemical conductions in synapses. Electrical conductions, i.e. the passage of rest potential to action potential, allow for simultaneously rapid and differentiated transmissions: each neuron and even each neuronic growth (dendrites and axon) can be triggered or at least stimulated one by one; whence perceptive and motor precisions sufficient for survival. Conversely, synaptic conductions intervening between neurons, or still between the last neuron of a motor series and a downstream organ such as a muscle, -which was the primary synaptic function from an evolution perspective? - is a chemical reaction, commanded by the change of electrical status of the neuron upstream. Yet, these chemical reactions can add the effects of a considerable number of chemical reactors that influence each other to provoke, in the transmission of a neuron to a neuron or from a neuron to an organ, reinforcements, attenuations, compensations, inhibitions of inhibitions of every kind. To such an extent that neuromediators can bathe quickly or slowly a considerable number of synaptic connections of neurons concerning one or several functions to activate or slow them down.

The chemical actions of neuromediators assuredly command affects, for example the gathering of all the energies of a cheetah when it sees an antelope, or the common kingfisher at the sight of a fish, or the male chimpanzee in front of a rival. But it is not impossible that by thematizing some groups of objects, by contributing to transform them into basins of attraction, these chemical actions should also intervene in the constitution of perceptive-motor neuronic synodies that we approached earlier. The modulation of local or general activity regimes by neuromediators is a cerebral performance as impressive as the perceptive-motor combination of analogy and macrodigitality.

2A5. Memory, memorization, re-memorization, memoration. Intelligence, sleep and dream. REM sleep

We commonly speak of computer memory. What we have seen indicates that this notion takes on multiple senses when approaching the bioelectrochemical computer, the brain, so that we need to distinguish at the very least: (full) memory, memorization, re-memorization, memoration.

We will then understand by the **(full) memory** of a brain at a specific moment, and more completely of a nervous system at a specific moment, *the state that it has, or even that it is*, at that specific moment, taking into account its construction and formation hard>>soft and soft>>hard.

A **memorization** will be a new inscription in the thus-understood memory-state. The experimental method first studied the easiest cases, some punctual memorizations, particularly in *Pavlovian learning* (liaison of a conditional stimulus, for example a ringing, to an unconditional stimulus, such as food or the sexual partner) and in *operant learning* (trial and error). But it should be pointed out that, because of the brain's reticularity, any learning and even any perception-motricity are almost always plural, i.e. they concern various sensations, motricities, affects, stimulations, controls, partnerships (of dominance and submission), sometimes because they immediately reach several neuronic synodies, and sometimes because when they reach a synody, they reach others through the connections that this synody has in its turn. Thus, memorizations are often immediately multi-sensorial, multi-dimensional and multi-temporal, even multi-affective, and giving resultants of attraction and repulsions in Hebb's motivational schema.

A **rememorization** will thus be a possibility to reactivate, to the profit of a defined aim-performance, an acquired element, but also any element that is part of a memory. In this sense, rememoring does not mean locating and extracting engrams from cerebral "shelving"; synodic engrams are not shelves: how, at the moment they are required for an aim-performance, would we know on which shelf to find them? And what would be that "we"? In fact, once a performance ~~that~~ has been put into action by stimuli (external or internal), it reactivates all the set of elements of the synody that represents it, commands it, and adjoins it in a perceptive-motor or affective manner with other synodies.

Memoration will be understood here as the endless work by which a brain elaborates or re-elaborates some of its synodies, re-accentuating or de-accentuating them, interconnecting or disconnecting them, cleaving or streamlining them, rendering them explicit or implicit in a veritable bioelectrochemical *digestion* or *compatibilization* that usually works by contagions and leaps. The results of this work are different after a second, a minute, an hour, a day, a month, a year, or several years. And the paths of memoration are as different as they are vital. (a) A synody that was penetrated by new information - and that was thus destabilized - progressively moves to a less unstable state, either inside itself, or in its contacts with related, sometimes distant, synodies. (b) Two or several synodies that mutually destabilize or call each other, elaborate themselves in such a way to form just one, or to create between them new cores, envelopes, resonances, interfaces <1A5h>. (c) A re-invigorated synody, and that initially was mostly part of another, takes more independence from it, or reaches autarchy. (d) Synodies that are not part of the same set may nevertheless come into in resonance as a result of a common hotbed of attraction, exotropic or endotropic, real or imagined, that has happened to them. (e) A trauma has perturbed perceptive or perceptive-motor synodies; they will need a short or long time to erase it or at least to situate it in the overall cerebral functioning. (f) A difficulty is present, thematized or underlying, clear or confuse; the synodies that this malaise activates/inactivates around it progressively or abruptly release a synodic compatibilization that is its solution. As we can see, if animal intelligence is the capacity of resolving difficulties, memoration plays a considerable role in it. Or perhaps intelligence is memoration taken in all its dimensions. Our current computers are equipped with memories, not memoration.

Thus understood, memoration is powerfully activated by **sleep**, that has at least a double function: organic detoxification by resting the entire organism, and informational detoxification and fixing by compatibilizing memoration. Indeed, sleep creates in the brain waves that are different from a state of wakefulness, and that lead us to make the difference between a **slow-wave sleep** and a **short-wave sleep**, the latter being called *REM sleep (rapid eye movement)* in English because the eyes agitate, and being known as *sommeil paradoxal* (paradoxical sleep) in French because it is the deepest in terms of muscular inertia and the richest (or more agitated) in terms of dreams. It was first noted that slow wave sleep mainly encouraged the memorations of explicit contents while short-wave sleep encouraged memorizations and memorations of implicit contents, which would be consistent with the fact that REM sleep is particularly suited to digest (gerere, dis) by re-synodization the more or less traumatic perception- motricities of previous days, particularly the last 24 hours. And finer analyses show that, in this respect, the various sequences of both types of sleep intervene at the same time as their specificity <R.July 01,30>.

2A6. Presence (apparition, phenomenality, presentiality) and physico-chemical "intimacies"

Some functionings of our brains, which are bioelectrochemical computers, are accompanied by a strange phenomenon. When they occur, the elements of the Universe not only function but also appear (parere, ad), become present (esse, prae). They are thus "conscious" (scrire, cum) as we say in the West since the late 18th century. Those "conscious" elements - or more precisely present, presentiated, presentialized, presentified elements - are for example: (a) exotropic or endotropic goals; (b) performances aimed at these goals; (c) states of the organism, such as the affects of pleasure, pain, fear, anger; (d) finally, a certain self (oneself) built through memory, memorizations, rememorizations, memoration between all the states of a same organism.

Since presence (presentiality) does not accompany the functionings of current technical computers, we can ask ourselves if it is not related to some anatomical and physiological "intimacies" characterizing the bioelectrochemical computer, the brain. Here are a number of theses, in no particular order:

(1) *Structural* intimacy of the soft>>hard constructive information and hard>>soft informational construction.

(2) *Textural* intimacy due to synodies of neurons that are both tight and multi-directional thanks to the dendrites and terminations of axons, and thanks also to the synapses between neurons.

(3) *Operative* intimacy of bioelectrochemical phenomena.

(4) *Spatial* (anatomic) intimacy of rapid, dense interconnections packed by billions in a few square centimeters or millimeters.

(5) *Temporal* intimacy (durative) of memoration <2A5>.

(6) *Intensive* intimacy of affects and awakenings carried out by neuromediators.

The thus defined *presence*, linked to certain external movements and also certain immobilities, was probably biologically reinforcing, and was thus selected, i.e. the cerebral functionings that this presence accompanies were selected <8A>. At least from the superior primates onwards.

2A7. The erasing of the neural support. The continuity of the perceived. The brain as interface between internal and external milieus

Two other characteristics of bioelectrochemical computers go hand in hand with presence (phenomenality) that go along with some of their functionings.

(a) Perception perceives the perceived and does not perceive the perceiver. It does not perceive the nervous system - particularly the brain - which supports it. We don't know how an optical nerve and a brain function if we do not go and look how they work from the outside, using various imageries, or by inserting electrodes. Indeed it is by this *silence of the canal*, as a hardware and a software, that the animal perceives a milieu, its milieu, and not its nervous system. The milieu of a sensitive organism is given to it *according* to a brain, on the *occasion* of a brain, not *in* a brain. Its milieu is *for* an organism insofar as its brain has a functional intimacy that goes hand in hand with presence (presentiality, phenomenality).

(b) The other character, which is coherent with the first, is the continuity of the perceived. Here is *a* burrow, *an* opening, *a* bottom, *some* roots emerging from the walls, *some* congeners sharing this territory, etc. To justify all these *contiguous units* in coordination, in spite of the disparity of nervous representations, and despite their topical intervals and inversions, we have already invoked the normalization of the perceived by the moved <2A2d>. To which we must now add the continuity and the totality that *presence* confers to all that it surrounds. Which allows us to conclude that an animal has *its* milieu, its *own* milieu. And that this animal *is* an interface between an exterior and interior milieu.

2A8. Intercerebrality

Then, there is a characteristic of brains that we must conclude with, because it concerns and supposes all others. It is the capacity of establishing itself not only in coordination but also in a sort of resonance with the brains of a same species, or even of a sub-species. The animal surprises by the ease with which it understands (prehendere, cum) in a split of second the intentions (tendere, in) of another (prehendere, cum). Put together, the brains of a same group add or multiply the productions of each separate one, with an important biological advantage. However, this phenomenon is limited: some finches have different songs depending on the shrub in which they live, and do not understand the songs of neighboring shrubs.

The basis of intercerebrality is solid. Even if the cerebral areas of two rats never have identical extensions, they will obey a same anatomical and physiological distribution. Every rat shares similar - or at least exchangeable - information on the milieu, congeners, and enemies. Above all, rats participate in a common experience that has constructed-informed for them a milieu, congeners, and their brains following the hard>>soft and soft>>hard construction-information proper to living brains. This does not prevent that, within a species, there are often (genetic) mutants for behaviors, even the most fundamental (sleep, phototropism, mating, etc.) as Seymour Benzer's team showed even for flies, which don't have a real brain, but only an extremely efficiently coordinated set of nervous ganglions <Recherche, Sept 1999, 26>.

2A9. The pre-hominid brain available to the standing position

Most of the aforementioned cerebral performances, particularly when combined, would benefit - one might already think - from being realized in transversalizing organisms <1A> endowed with globalizing senses <1C> inside a *woruld <1B>. There, these cerebral performances would have the occasion to exploit as best as possible their virtualities of accentuation, cleavage, commutation, invariance, analogy/macrodigitality, endotropy/exotropy, affect and regime, memoration, intelligence, presentiality, intercerebrality, etc. We could thus understand that, when the transversalizing position was made possible by the milieu and by the anatomy-physiology of some living specimens, the brains, where the cranial-facial anatomy allowed it or invited to it, selected this station and were selected by it in turn. Especially as the vertical referential is already very marked in visual and kinesthetic neuronic relays of mammals, and even more primate mammals <Orban, op. cit.>.

2B. The evolutionary pressures of straightening on the hominid brain

Once we have seen the characteristics of every brain as we have just done, an anthropogeny can point to the evolutionary selections that the straightening of the stature, the segmentarizing manipulation and the transversalization <1A> calling upon globalizing senses <1C> have had to exert on the volume and organization of primate brains. Selection due to a pressure, that of the environment, for instance the eastern African savannah, 3 million years ago. Or because of an organic availability, for example that of anatomic-physiological canalizations of cranial-facial contraction.

2B1. The development of balancing, smoothing and strategic (anticipative) hotbeds. The evolution of motions, not just movements

It is the cerebellum, hotbed for the smoothing of movements, that has most developed among Homo over the past 3 million years, pressed by the urgency of the subtle balance demanded by the standing position, transversalization, orthogonalization, laterality, and segmentarizing manipulation. Furthermore, the so-called base ganglions specialized themselves according to the needs of visual, manual, auditory tactics demanded by the nascent panoplies and protocols of technology and the tuned distances of the latter. The frontal lobe was intensely selected for its capacities to set up the anticipating strategies of movement for a walker-manipulator-explorer that was both frontalizing and rhythmical <1A5>.

Particularly, transversalizing and distanciating Homo had to select a brain ever-increasingly capable of appreciating in movements, the forces from which they proceed, which means calculating a dynamic from a cinematic, hence to perceive **motions** (in the English sense of musical theory) <15B5>. It will be anthropogenically enlightening to appreciate - more than we can today - the extent to which the perception of motions characterizes specifically Homo, or is already anticipated with Mammals and anterior Primates.

2B2. Neutralizing associative areas. Towards generalizing, abstractive, conceptualizing comparison. Intelligences and geniuses. Allostasis and the drive to explore. Multi-shaped memoration and problematic re-memoration. From experience to experimentation

The brain in general <2A> has shown us properties of accentuation and de-accentuation, thus also of direct and indirect neutralization; of cleavage (dissociation, separation); of spatial and temporal subordination; of facilitations and detours, etc. Selected by the body of transversalizing, orthogonalizing, lateralizing, presentive Homo, the animal brain had to become capable of comparisons, then progressively of meta-systems, and of metarepresentations that we shall sometimes call "ideas" or "concepts", even of meta-emotions that the French call sentiments. We can describe this phenomenon under three angles.

(A) Sensory areas developed or regressed in Homo so that the characteristics of five senses adapted to its survival in its milieu could be put in place <1C>. Today, a good example is given by the development of the pyramidal neurons of the hippocampus for London taxi drivers, from whom considerable spatial awareness capacities are required; we can speak of soft>>hard constructive information <2A1>. Inversely, an example of hard>>soft informational construction is perhaps exemplified by Einstein's brain, who had an almost pathological structure of a cerebral area related to the perception of motions <2B1> where he excelled, as he has said on numerous occasions <Recherche, Dec 1999, 30-47>.

(B) The task of synodic neuronal reorganization that we have called memoration <2A5> has considerably expanded in Homo, particularly following the development of REM sleep. Through the experience of liquids this type of work gives emergence to liquids as such, then the meta-representation of liquids, versus solidity versus volatility. Similarly, through the experience of recipients, the family *of* recipients, then the phenomenon of *the* "recipiency". Finally, in solid or solidity, the edged, the breakable, the separable, separation/fusion, etc. This is what certain philosophies will one day call, according to their cultures, *abstractions* (trahere, ex), *concepts* (capere, cum), *ideas* (eidos, stable visualizable figures). And concomitantly, since the transversalizing primate is dealing with things-performance-in-situation-in-the-circumstance-on-a-horizon <1B3>, its neutralizations-comparisons will lead it to handle things-performances independently from their situations; situations independently from their circumstance; circumstances independently from their horizon. And conversely, horizons independently from circumstances, circumstances independently from situations, situations independently from performing things. It is probably early on that hominid specimens started to have a factual memory, an abstractive memory, a circumstantial memory, in extremely varying proportions according to each.

(C) We shall then ask ourselves if the generalization-neutralization-comparison and soon the judgement, modelization, meta-systematization that the human brain is now capable of, have supposed functions and areas of the brain truly novel or have simply supposed small or large specializations of archaic functions. It is true that, very often, these were developments of available virtualities, like we find in the hominid adaptation of the five senses. But when they appeared, in the left hemisphere, the so called Broca and Wernicke's "localizations", which are decisive in emitting or receiving language, it did suppose true evolutionary innovations, or at least evolutionary developments equal to revolution. The same applies to the frontal lobe. It is important for Primates, and even for superior Mammals, at the service of their *tactics*, particularly hunting. In Homo, the frontal lobe will experience a revolutionary growth no longer at the mere service of simple *tactics*, but for veritable *strategies* allowed, called even, by their transversalizing, orthogonalizing, lateralizing stature. And it is not impossible that the distinction of factual, circumstantial, abstractive memories that Homo enjoys involves the use of, apart from the original areas of language, hotbeds of connections that we have still not really identified, for example cognitive memory capable of variations of angles.

In this sense, the hominid brain, which is neutralizing and generalizing, became capable of **hominid intelligence** in its various forms: (a) of immediate or differed solution of problems (balleïn, pro, throwing before); (b) of grasping, integration and modulation of viewpoints and invariants; (c) of blurry thoughts; (d) of diffuse perception that there is an error in a system or sub-system that is part of the panoplies and protocols of a given brain; (e) of change of referential by which intelligence becomes what we sometimes call **genius**. And this is the occasion to note that instead of using the singular for referring to intelligence or genius, we should speak of genius**es** and intelligence**s** in the plural. As it is question of myriad of different performances, both in groups but also inside each specimen, and still, according to ages and moods and according to the themes to which it is confronted.

A useful example of the relations between memorations and intelligences (or geniuses) is given by the practice of detailed music <15>. For it is often that a musician, after having encountered a theme, does not immediately reproduce it, but only does so months or even years later. Yet, he usually notes that for each of these reproductions separated in time, the theme reappears differently, made easier, re-accentuated, re-cleaved or de-cleaved, comprising new matching - internal or external - without any exterior work and thus making the interior work of memoration palpable. Whence recurrent traumatic dreams (such as dreams of a bombing or accident) are the opposite example, since in that case the initial information proved too perturbing or massive to be assimilated by this cerebral digestion called memoration.

All these characteristics of hominid brain invite us to introduce the word **allostasis**. As we have noted for the past 50 years, superior primates show a drive to explore, which means creating or at least exploiting some unbalances, contrasting with maneuvers aiming at compensating homeostatically an interior or exterior solicitation. The primatal drive to exploration had to increase rapidly for Homo, an upright animal endowed with a neutralizing-comparative brain and capable of endotropic prefiguration of thing-performance, situation, and horizon.

We understand then that, apart from *experience*, Homo's brain will be predisposed to *experimentation*, which does not content with doing something unexpected and to record it when it is reinforcing, or to eliminate it when it is diverting, as in operating conditioning <2A1>, but does provoke (vocare, pro) the unexpected in a manner that is systematic, interactive, usual, in a trial-and-error learning that has become reduplicative and distanciating, meta-systemic. The French says *experimenting on* and the English to *experiment with*.

And we shall not be surprised that rememorizations <2A5> are more problematic for Homo than for animals. For the latter - except accidentally - the central neuronic synodies of behavior naively and infallibly recalls the other synodies necessary to that behavior. Whilst for Homo, some synodic coherences can be troubled by a mismatch of situation, circumstance, or even accident <1B3>, during a geographic or social shift, accidental or neurotic. The traveler arriving in an unsettling location can for a time - sometimes long - no longer remember some of his/her most familiar knowledge. Just as well as his/her synodic coherences can briskly come back into place if their whole articulation reappears once the traveler returns home, or can become once again available through a close articulation if the traveler feels "at home" after several days spent in his/her holiday house.

2B3. Smoothed affects. From emotions to sentiments

The standing position allowed global and comparative grasping that went hand in hand with a rather neutralizing and generalizing cerebral regime. At the same time, it made Homo more vulnerable to physical and perceptive-motor physical aggressions, thereby multiplying destructive affects for him.

For these two reasons, Homo has had an evolutionary advantage to have a brain that smoothed sufficiently the violent and rostral impetus (*impetus* in Latin and *Hormé* in Greek) of animality. This is what was obtained from the selection of new neuromediators (neurotransmitters and hormones) moderating or modulating the reactions of his brain synapses, but also by new affective-perceptive-motor interconnections that were less fixing, more generalizing between synodies, areas, and between areas and synodies. In French, the words "Neutralization" and "Neutralize" cover both this notional and emotional smoothing. So, for Homo, *emotions* - the etymology of which expresses violence and brutality (movere, ex) - organized partially into *sentiments*, the etymology of which expresses fluidity and constancy (sentire, sentimentum). Affective neutralization must have started to be selected rather early on, as it was required by technical production, even the most elementary. Scientific production will take it to its extreme.

Already, animality invited us to note the part of emotion in perception-motricity, in memorizations and rememorization, and therefore also in the work of memoration and intelligence. For the past fifty years, brain surgery (lobotomies), then cerebral imagery, have confirmed that for Homo, affective stimuli are of two forms, sometimes linked to the midbrain, which is the headquarters of archaic emotions, sometimes linked to the frontal lobe, which contributes to organize these emotions into sentiments, sometimes both at once. This is exemplified in cases where a traumatic scene triggers others in a chain reaction. Everything then occurs as if the activation of a liaison cortex X >> midbrain X led to a reactivation of liaisons midbrain X >> cortex X-Y-Z. The result being more emotional or sentimental after the completion of the journey.

2B4. The reinforcement of endotropia and floating attention

The neutralizing comparison of perception and the smoothing of affects could only encourage, along the exotropic cerebral circulations <2A3>, the endotropic cerebral circulations already present in animality (the lion's dream). And, by the disconnection of emergencies, stimulate floating attention, which bears a variety of solutions (intelligence) and changes of referential (genius) <2B2>.

The various relations that it practices between endotropy and exotropy will become one of the most typical traits of each hominid specimen and the main theme of the troubles and successes of its ethos <26>. According to their dosage, rate; their quality or type; their rhythmical alternations; their centering and de-centering. For instance, some people can spend a considerable part of their time to endotropy whilst maintaining a strong exotropic centering; which would be a favorable condition to major genius, such as Goethe or Newton. (We shall not confuse exotropy and endotropy with extroversion and introversion, which are rather blurry species of character dispositions).

Even if it is obvious, it is not useless to recall that the endotropic cerebral work mostly or absolutely depends on the internal simulations of external events. Already in the animal, but thematically, and sometimes systematically for Homo, in daydreaming <6B>. By which the philosophical intuition, mythical ecstasy, scientific or technical discovery, artistic creation and madness all cohabit. And understand each other.

2B5. REM sleep and thematized de-sleeping

We can then see in Homo the increased role of sleep, which his/her performances of builder of shelters allowed him to protect increasingly well and to make it sufficiently continuous to protect its phases of REM sleep, with its over-activated memoration (bioelectrochemical digestion). Indeed, the standing position means that hominid specimens are particularly exposed to traumas, sometimes emotional but mainly perceptive, during their diurnal live. Thus, the memoration of sleep, especially REM sleep, is not too much to assimilate such traumas synodically. On the other hand, the over-activated memoration of REM sleep, which is agitating and re-organizing, could only be selected in a species whose survival depends so tightly from its intelligence (resolving problems), and sometimes genius (change of referential).

However, we shall specify that the power of REM sleep can only truly be understood if we couple it with the de-sleeping (frank or partial awakening) that sometimes follows it, this moment of free associations and constructions so favorable not only to produce solutions to problems and changes of referential, but also to harvest and gather them. Descartes constantly experienced this, as did Valéry: "As soon as I've emerged from the sands <deep sleep>, I take admirable steps in the steps of my reason". It is in the de-sleeping that follows REM sleep that Freud's neurotic patient produces these diverted accomplishments of repressed desires that will manifest themselves through his dreams as he tells them and thus builds them in his cure. Everywhere we have seen Homo interpret his narrated dreams (his dreams in a state of de-sleeping) in an attempt to understand his past, present and future.

2B6. The fact of the lateralization of hemispheres and the hypothesis of their specialization according to analogy and macrodigitality

Transversalization, manual segmentarization and the development of globalizing senses must have favored perceptive-motor cerebral operations which, while continuing to work *by analogy*, as they did during earlier animality, were able to pick out and handle elements by successive exclusions in closed sets, namely the panoplies and protocols of technique, and therefore to proceed *digitally* or better still, *macrodigitally <2A2e>*.

Now, the studies performed on hominid brains over the past fifty years have demonstrated that functions that seem rather **analogizing** preferentially activate the right hemisphere: for example, the abstract visual patterns, perspective drawing, spatial localization (map), the emergence from a labyrinth (Brenda Milner, Montreal), recognizing a melody, recognizing the emotions of others and their adaptation to a situation, gestures of resignation, premonitory anguish, panic. Conversely, language, with its **macrodigitalizing** operations (phonemic, semantic, syntactic oppositions) mostly relies on the left hemisphere: Wernicke's area for its recognition, Broca's area for its emission. The same would apply to the mathematical function (A.R. Luria) and technical constructions with successive decisions: the orientation of the facets of the *chopping tools* (rough tools obtained by hitting the flint or quartz by following their fault lines) seems to show that 2,35 million years ago, Homo habilis (even Paranthropus) usually held its axing tool in the right hand <PP. 98>.

A famous experience carried out by Edith Kaplan dramatically summarizes this specialization, at least as far as sight-motricity is concerned. Subjects whose two hemispheres were surgically isolated (by sectioning the cerebral colossal commissure, particularly the corpus callosum) are asked to reproduce abstract patterns, using white and red blocks, for example a red strip crossing a white square using only the left hand, which is mainly controlled by the right hemisphere, and using only the right hand, which is mainly controlled by the left hemisphere. In both cases, the construction produced is false, but in the first one it indicates a globalizing (analogizing) perception-motricity; in the second, it shows a perception- motricity working by oppositions, or even by successive categorizations (macro-digitalizing).

Could we then say that the brain is, at least, a hybrid computer <2A2e> combining as tightly as possible the resources of analogy and macrodigitality all the way down to the repartition of the prevalent tasks of its hemispheres? If we could confirm that musicians defining tones in relation from one to the other mostly mobilize their right hemisphere, and that the listeners who have the so-called "absolute" hearing, which recognizes the frequency of an isolated tone, mostly mobilize their left hemisphere, the question posed would show its relevance.

Paleoanthropologists note the apparition during Homo's evolution of transformations of the dura matter of the left hemisphere, suggesting blood activations and thus new functions in certain areas. It is not excluded and is even realistic that these new functions concerned language, and even anteriorly the technical discriminations (this AND that, this OR that, this IF that) that have progressively called for and supported language <17A>. In such a way that the left hemisphere appears today as *more* macrodigitalizing, the right hemisphere as *more* analogizing. Or rather, the right hemisphere would have simply remained analogizing, since it is analogy that was the key instrument of earlier animality, and developed macrodigitality is an innovation that followed hominid transversalization and neutralization.

In any case, we shall not forget that the hominid brain is capable of inter-hemispheric compensations after traumas. Which demonstrates rather well the neuronic versatility that we already mentioned above for the brain in general <2A2f>. And also how, in this singular computer, specific functions remain close to general functions or, more precisely, how they specialize general functions. Thus, if in the majority of hominid specimens, precise, macrodigitalizing grasping are done with the right hand, controlled by the left brain, and if some gestures of evasive resignation are done with the left hand, controlled by the right hemisphere, this does not mean that there are not some very highly efficient left-handed persons and that they are generally more efficient than right-handed persons in many areas. The corpus callosum that, along with other commissures, exchanges some information between the hemispheres plays a considerable role in all this. It is currently being studied extensively, but not without difficulty, because of its multi shaped interactions.

2B7. A gendered brain

Many years ago already, anatomical studies on corpses showed that the hominid females' corpus callosum was wider dorsally. This would indicate more intense inter-hemispheric exchanges, or at least original ones in some areas. In the same vein, the recent progress accomplished in the area of cerebral imagery have shown that there is in women a greater activation of areas in both hemispheres, or a brain that works more symmetrically, at least for some activities. This is consistent with the fact that traumas having taken place in the language centers of the left hemisphere during accidents are compensated quicker in females. The areas of orgasm are partially different and, as it would seem, more numerous. Thus, it could be that the female brain would usually define less abstractive and abrupt ruptures with its environments, and even with earlier animality, than the male brain. Leading to strengths and weaknesses for each sex, but a sufficient combined performance of the two for the survival of the species.

Assuredly, this polarity was not selected only by the standing position, since already Homo's difficult and prolonged education required a severe organic and cerebral specialization of mothers <3C1>. But the standing and transversalizing position, as it made the complementariness of the two sexes evident <3D1>, had to reinforce the sexual, cerebral and physical differentiations to the advantage of reciprocal semiotic stimulations profitable to the species. Particularly, the ostensible differences between feminine and masculine would have exerted, in hominin groups, an evolutionary pressure regulatory of intercerebrality <2B9>.

2B8. A brain with contrasted successive performances. Learning by experience and learning by rules

For hominid brains, ages comprise differences that are even more salient than that of the sexes. An anthropogeny will note at least two notable revolutions in the area of language. (a) First revolution: the infant's brain, between 1 and 3 years of age, after a phase of extremely wide reception and production of sounds, becomes tightly coded on the phrasing and the phonemes of the dialect of its milieu and concomitantly on the logic, topology, cybernetics of its milieu in a mixture of narrowing and increasing power. (b) Second revolution: the adolescent goes from childhood, during which s/he was capable of very quickly build spontaneous dialects and logics (so called maternal) through interaction, to an adult state where s/he has to learn languages and logics by rules and explanations. The animal also undergoes critical maturing stages in its cerebral development (the bird becomes deaf, the cat becomes blind if they are deprived of sounds and sights at certain specific moments of their development), but not with this character of techno-semiotic revolutions inducing techno-semiotic fertilities.

Cerebral imaging seems to have recently established that the cerebral centers concerned by learning of primary dialects (mother tongues) are not those concerned by the learning of secondary dialects, the foreign languages. This would confirm that there are two levels of cerebral coding. The first, native or naive, would constitute the very own knowledge of the person acquiring it, as a kind of inside knowledge, providing it with what Chomsky called speaker competence and Wittgenstein called logic <20B, 24B1>. It would be more a question of construction (struere, cum) than of learning (prehendere, ad). And a second coding - scholar this time - after adolescence, where the learner, already coded linguistically, could only learn by rules (phonematic, semantic, syntactic), in a knowledge from the outside, without ever acquiring an instinctive knowledge.

This specific case would suggest a general distinction between two types of neuronic synodies, the ones that we could call *infrastructure* and the others *supra structure*. The brain of a musician who has just started playing instruments that are exotic to her/him, and that of a painter starting to paint according to the codes of another cultural area would perhaps show differences of localizations similar to that of primary and secondary dialects? The answers to this question will one day enlighten the relations between primary cerebral construction and (ulterior) cerebral work.

2B9. Simultaneously hypnotic and distanciating intercerebrality

We had already noted intercerebrality in animal species <2A8>, by which each singular brain is in very quick and more or less wide connection with one or several others, whether it be for hunting, spoils, or mating purposes. In Homo, this property could only have been powerfully reinforced by the endless passage of "things" (causes) from hand-to-hand, generally through transversalization. So much so, that hominid intercerebrality can extend as far as hypnosis, this singular situation where an agent, through attitudes or vocal calls, commands one or more agents what they could not command themselves to do. Alongside hypnosis, which is an extreme and rare case, there are innumerable semi-hypnosis that play a regulating role in the daily lives of techno-semiotic groups. The collective laughter is in this sense as enlightening as lynching, popular meetings or the ecstatic communion of a symphonic concert.

Correlatively, the reinforced intercerebrality invites hominid groups to distinguish themselves clearly from each other by giving way to the emergences of oppositions we/others in ethnic groups: sexes, tribes, religions <28>. It is also responsible for the constant proliferation of sub-groups <3E>. Finally, it creates, within singular specimens, an entire theatre of internal instances and roles that are more or less designated and materialized, right down to visual and sound apparitions (voices) maintained sometimes by distancing from the group and sometimes by fusion with it <3B, 3E>. For this purpose, Homo had to be an animal apt to diversely viable psychosis and neurosis very early on. Here, technical systems are as important as semiotic systems; Internet is currently giving hominid intercerebrality unexpected dimensions and intensities.

2B10. Orchestrated tensions and commutations. Field effects. The thematized presence. The hominid self. Mania and depression

Earlier on, we observed the rapidity and ease with which a dog goes from a goal to another, thus from one entire behavior to the next. We wanted to illustrate in this way switching at work between neuronic synodies of any brain <2A2c>. This frequency and rapidity are far more remarkable in Homo.

They are indispensable because of the multiplicity of elements, which, for the standing position, make up the technical, semiotic, social environment. The Hominid brain is capable to do this because of its great number of neurons, but also because the elements it treats are often reduced to very light exotropic signs (images, words), or even to lighter endotropic signs (concepts, notions). Which allows it to switch between dozens of eventualities merely skimmed in a few seconds.

Sometimes, instead of commuting straightforwardly from one neuronic synody to another, Homo's brain has to activate several at the same time, under the action of multiple attractors that are not necessarily compatible between them. Everything then occurs as though a field is established - a basin of attraction in which the effects of the various attractors compatibilize - into what we shall call here *field effects* <7A-E>. They are already found in higher primates, but become essential in hominid specimens that exploit and cultivate them to useful ends, such as the fecundity of thinking in a blurry manner when assessing a complicated situation, but also to pleasurable ends, particularly in the artistic <27D1>, love <27D2>, belief <27D3>, mystical <27F1> life.

Taken between rapid commutations and various field effects, the hominid brain is then susceptible of *states of presence* (apparitionality, phenomenality, presentiality) that not only accompany some behaviors as in animality <2A6>, but that are often thematized and even maintained for themselves, with pleasure, with enjoyment. Presence, subtly or violently exalted, certainly intervenes in Homo in the horizon, which forms for him the limit, both concluding and opening, of the thing-performance-in-situation-in-the-circumstance-over-a-horizon <1B3>.

In this point, we can list the various aspects of the **hominid self.** (a) At the beginning, it has the characteristics of the animal *self* <2A2c>, this way in which a somewhat complex brain is led, by its synodies, cleavages, commutations, field effects, to progressively distinguish - as a relative invariant -what belongs to the organism that it governs and the rest, what is exterior to its organism. (b) In Homo, the *self* gains still in salience and pregnance as a result of the firm distributions of the technically segmented environment, the situation versus the situs, the technosemiotic socius, the enemy, etc. (c) Finally, the hominid *self* is further exalted by the thematization of the presence (presentiality) that characterizes Homo; from which the invariance of the self and the present of the presence mutually reinforce each other, and sometimes even give the sentiment, on the occasion of some thematized field effects, that they engender mutually (like in the "strong liberty" felt by the classic western conscience <8D>). In any event, in every culture we find relatively marked phenomena responding to *I*, *Mine*, *My*, different from *Others*, *You*, *We*, *Them*, *Their*, etc.

The dimensions of hominid cerebral work that we have just covered are both sufficiently diverse and heterogeneous enough, - neuronic commutations, field effects, thematized presence, "free" self, etc. - for us to understand that their compatibilization supposes the recourse to the **rhythm**, with its 8 aspects <1A5>. Rhythm is fragile <26B2>. Its disturbances mean that mania, where the motor regime becomes excessive, or depression, where it is insufficient, are exemplary, even connatural diseases of Homo.

2C. A cerebral anatomy expressing globalization. The hypothesis of the prolonged foetalization (neoteny). Brain and evolution. The brain as destiny and choice

Since the Renaissance, when Homo became resolutely anatomist, but already when it started trepanning and eating the brains of its enemies, ancestors and infants, Homo has been struck by the remarkable anatomy of its brain, whose convolutions seem not only numerous and clearly differentiated by its deep furrows, but still strangely gathered, put together, centered around spinal entrances evoking differentiated, integrated, integrating, distanciating functions. Today's neurophysiology reinforced this admiration, as testify the scientific and fantastic illustrations of *The Amazing Brain* <Chatto and Windus, London, 1985>. The cerebral imaging that allows following – in real time – the activations of the regions concerned by the various hominid functions further reinforces this admiration.

However, at the same time it makes Homo appear in the Universe, the Hominid brain immerses him in it too. We could not stress enough that Homo’s brain simply modulates virtualities of the animal brain dating back to Reptiles at the very least: the carrot disposition of cortical neurons; in these carrots, the constant tiering of entrances and exits; bioelectrochemical properties that only specify the electrical polarizations of cells in general, etc. Compared with the primate brain, the hominid brain does not really create new areas, but increases, decreases, interconnects differently areas that have already been constituted or outlined. It does this according to the selections called for by the standing position, the transversalization, the manipulation (handling), the neutralization. Even the quantities are not extraordinary, as it is only a question of doubling or tripling the volume of the anterior primatal brain. Humility lesson. But first comprehension perhaps too that, in a surprising number of cases, Homo's theoretical operations - right down to the most abstract mathematics, logics, physics and biology - correspond to the ways of being and doing of the Universe <19H>. Precisely because Homo's brain, like its body, is a state-moment of Universe.

We must still note that the adaptations added by the hominid revolution to the primate brain did not only result from progressive selections and adaptations of software>>hardware kind, in the vocabulary used earlier <2A1>, but supposed an anatomical-physiological event, which has made speak sometimes of *prolonged foetalization* or *prematurity of birth*, or still, *neoteny*. These various expressions refer to the same fact, thematized and vulgarized by Haeckel since the late 19th century, by which gestation gives the monkey its specialized configuration of the face and the skull at a very early stage, while in Homo foetus, gestation is delayed, allowing for an evolutionary availability. We would owe to this availability a progressive craniofacial contraction from which a vertical face eventually emerges, along with a median occipital hole, a hemispheric brain around this hole, in a cranial box that is also hemispheric. The same delaying and the same availability would have allowed Homo's brain to take advantage of the apparition of possible and more or less revolutionary "configuration genes".

We can see the evolutionary advantages of this delaying and its results. (a) The possibility of a brain that is voluminous compared to the volume of the body, and which above all is distributed in an orchestral manner around its inputs and outputs. (b) A sufficient compatibilization, thanks to the "premature" birth, between this increased brain and maternal hips that do not need to be so wide that it would compromise the mother's strolling and biped running in a species that must rely on its fleeing speed. (c) The avoidance of constraining specializations of the head (as in earlier animals, such as the polar bear's ice-breaking head) or, which is the same thing, maintaining physiological and anatomical availabilities favorable to open and changing learning according to the biotypes. (d) A delay in motricity requiring prolonged education and the boosting of perceptions and anticipation behaviors <3C1>.

However, recent studies on metamorphic animals, like some salamanders, show that delayed foetalization can result from a modification in a very small number (two or three) of configuration genes (sometimes called architect genes); whence the particular attention that some paleoanthropologists give to the rare genes separating Homo and today's Chimpanzee. Some, for example, wonder whether a small mutation appearing in a primate male would not have been enough to make it dominating to the extent that, seeing the strength of domination in pre-Chimpanzees, it would have caused it to pass on this character to its horde, becoming dominating itself <1A>. Even if we do not follow these drastic scenarios in details or as a whole, they could point to something fundamental in Homo's advent.

Everything that we have just seen allows us to understand that we are starting to say <Edelman, R.sept00,109> that the following sets of knowledge enlighten each other: (a) the evolution of brains through phylogenesis, epigenesis, everyday life, (b) The evolution of species in general, (c) The immunity mechanisms of organisms. Everywhere, indeed, we find the same Darwinian characteristics of intense variations and rigorous selection, of *ante factum* chance and *post factum* efficient coordination (adaptation). Everywhere, we can speak of a multi-factorial evolutionism, event-driven, with functional bifurcations (jumps) < 21G3>.

Two major facts have confirmed this over the past century: firstly, the way in which all three major hominid races (or sub-species) rapidly acceded to all areas of knowledge and practice, and secondly, the way in which both sexes, having an equal access to learning and circumstances, have proved capable of very similar performances in politics, science, technique, or nursing. Hominid brains are extraordinarily available systems, i.e. their efficiency derives from the relative simplicity and triviality of their elements (neurons, synapses, neuromediators) and of their functionings, particularly the hard>>soft and the soft>>hard constructions.

But at the same time an anthropogeny must remark that although Hominid brains are capable of infinitely varied **choices** [parti, in French], they are also enclosed in some **destinies**. Indeed, it is enough to totalize somewhat the cerebral mechanisms that we have just approached to foresee several characteristics of the ethics of <25> Homo, both as a specimen and as a group. For example: objectivations and inventiveness, but also rigidities and inconstancies, incommunicability, switching, confusion, subjectivation. There would therefore be a great psychological and social advantage to provide a list as exhaustive as possible of the cerebral characteristics that, in Homo, determine its destinies, at least transitory. We would note for instance: the perceptive reinforcement of the prevalent and the weakening of the non-prevalent, neutralization (abstraction, generalization), the endless and tight crossing of the perceptive and the emotive, the multiplicity of concordant and discordant memories, synodic cleavages that go hand in hand with synodic commutations, ~~the~~ friendly and enemy intercerebrality, memoration as neuronic digestion, mode and de-mode, etc. But there would also be a great disadvantage in closing too quickly relatively open systems. Let us therefore leave to the following chapters the task of enlightening and enumerate directly and indirectly the mechanisms, choices and destinies of the hominid brain. At least, as it has worked until today.

SITUATION 2

This chapter does not comprise new concepts, and there's not one of its affirmations that cannot be verified by the reader, who will be able to check, nuance and complete them through the monumental Principles of Neural Sciences, *published and updated every five years or so by forty teachers of the Columbia University, under the leadership of Kandel, Schwartz and Jessel* (4th edition, McGraw-Hill, 2000). *The only originality lies in the arrangement of the materials, and in some insistences useful to an anthropogeny. Thus, on the information hard>>soft, soft>>hard, which transforms a brain into a computer capable of experience. Or still, on the articulation between the hominid brain and the animal brain, which enables us to better situate Homo's brain performances that would otherwise seem mysterious or prestigious, whereas they fall in the direct line of biological potentialities. More specifically, those concerning neutralizations-comparisons-generalizations, accentuations, indexations, affective charges and discharges (purifications), field effects, presentiality, etc. Our knowledge on the brain, without being complete, has become so important that it is now inconceivable for an author to step forward on the path of human sciences without previously stating the general conception that he draws for the brainwork.*

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