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The Idea that Changed the World[1]

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What is the precise property that distinguishes man from other animals?

The question has ancient philosophical provenience (the featherless biped), but several sciences as well as scientific misunderstandings depend to this day on the choice of answer to this simple question. Is it the ability to speak which makes us differ from other species — like Noam Chomsky claims — or is it the ability to form cultural institutions? Is it a decisive jump in intelligence conceived of as information processing, is it consciousness — which would imply that other animals are consciousless automata, or is it self-consciousness and the possibility of reflection?

A widespread and easy way to tackle these questions is to see all these differences as interdependent, so that language, society, consciousness and so on constitute one decisive difference defining humanity. The problem in such a solution is that animals then, in contradistinction, become rather simple creatures, even more limited than Cartesian automata.

It is this arche-question which is attacked in neuroscientist and anthropologist Terrence Deacon's "The Symbolic Mind", shortly after publication already an instant classic. Deacon challenges the combination of Chomskyan linguistics and Artificial Intelligence — the MIT myth of human intelligence. Chomsky's crucial idea in generative grammar was, of course, that early linguistic learning in children between birth and 3 years' age involves a grammatical competence of a huge dimension which seems impossible without a large innate component. We must, according to him, possess an innate universal grammar, a language module in the brain — a module completely missing in other higher species including apes. To this idea, the research in Artificial Intelligence has added its well-known "functionalist hypothesis": brain and thought are equivalent to hardware and software, respectively, so that the linguistic module corresponds to an innate piece of computer architecture which connects physical symbols in the brain with the surrounding world. Language learning thus becomes a specification task, tuning this general program to match the more specific software rules of a given natural language. Consciousness might, according to this view, be a simple consequence of such brain programs becoming sufficiently large and complex.

This complex of ideas in linguistics and computer research is what Deacon challenges in this major treatise with roots in his own double or triple base in

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[1] Review of Terrence Deacon's book *The Symbolic Mind: The Co-evolution of Language and the Brain*, New York: Norton, 1997.

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philosophy, neurology, and anthropology. As a consequence, the voluminous book falls in three parts. The first part investigates the conditions for the presence of symbols in general, as we for instance know them from the words of natural languages. The idea that words acquire meaning and reference from "pairing" them with actually occurring phenomena in the world is unallowably naive, and against it, Deacon invokes the semiotics of Charles Peirce. As is well-known, Peirce distinguishes in his second triad of sign types three subtypes — icons, indices, and symbols, referring to their object by virtue of similarity, causality, and habit, respectively. The crucial argument against the naive idea of the symbol is the hierarchical architecture of the symbol in Peirce's theory. Icons, indices, and symbols are not three independent sign types on equal footing, quite on the contrary. Symbols are only possible as signs of habit because they are built from the simpler sign types icons and indices. Icons are the most simple signs and are prerequisite to any form for recognition of resemblance or similarity — and hence for any form for predicative meaning in the higher sign types. Indices constitute the presupposition for any sign to connect to actual phenomena in the surrounding world (smoke as a sign for fire, e.g.). Only on the basis of these two classes of signs — which are well-known in many higher and maybe even lower species — is the jump to symbols conceivable. Symbols are constructed by the indexical connection of two whole classes of icons, in the world and in the sign itself, respectively. In the spoken word example, this analysis refers to the expression of the word being a type, subsuming a whole range of possible pronunciations interconnected via similarity. This forms the first class of icons, and it is in turn connected via the well-known (mostly) arbitrary, indexical link to the word's content, constituting the other class of icons, in so far as the meaning of the word is not one thing but a whole class of possible phenomena, again interconnected via similarity. Thus, symbols requires not only icons, but typical icons incarnated in tokens, both on the expression and the content side of the linguistic sign. This stable double structure makes it possible for the reference of the symbol to actual phenomena to be bracketed if necessary. This property makes possible the characteristically substitute world built from symbols which enables us to reason about relations in the world by merely thinking in general symbols. We so to speak keep the sign's relation to an actual outer world in brackets while reasoning — and after reasoning we can reinstall the necessary indices and icons in order to reconnect it to the aspects of the world needed in the situation.

On the basis of this rendering of Peirce's semiotics, the basic problem for Deacon becomes: how is a jump from a mere icon-and-index-consciousness and to a symbol-consciousness possible? This leads into an empirical investigation into the differences between the human brain and the higher primates' brains. His main intuition is that the Chomskyan idea of a grammar module is decidedly wrong. The general idea of an increase of computing capacity as characteristic for the human brain might be correct, but in any case insufficient to explain the human brain. Nothing in PET-scannings of complicated linguistic tasks point towards the existence of a separate grammar module in the brain in parallel to e.g. the single

senses' modules, and Deacon's alternative must built on the fact that our brain remains essentially an ape brain built for ape logic. Language must use and sophisticate competences already at hand in the ape brain. His PET-scannings seem to point to the fact, that during performance of relatively demanding linguistic tasks, the brain activates widely distributed parts in the cortex as well as lower parts of the brain, including the cerebellum. This points to the idea, that the general ability to symbol formation must be substituted for the grammar module — symbol formation not taking place in any isolated symbol module. Instead, Deacon's numerous PET-scannings point to the fact that the processing of language takes place in an intimate connection to sensory input and motoric output on one side — and with large and diffuse parts of cortex on the other. The human brain's large cortex is thus decisive for the symbolic "jump" into an abstract, symbolic semantics separated from the more sensory-motor close icons and indices. But our large cortex does not owe all its might to its size, but also to its complicated architecture, Deacon argues. The brain is so complex that it is far from possible to specify all details in its architecture genetically, and even if mutations in the specific group of genes governing the formation of dorsal, prefrontal brain must be picked out as responsible for the transition from ape brain to human brain, then the precise system of connections in the brain is only developed in a trial-and-error growth competition between neurons taking place during embryological development and terminating only in the first years after birth. This "neuronal Darwinism" inspired by Gerald Edelman implies that neurons in different parts of the brain and the central nervous system sends out axons and dendrites in many different directions (even the connections between the medulla and the body's organs have this character), and the connections not working perish while the effective ones survive. Deacon's main hypothesis now claims that our large cortex establishes connections to a much larger part of the brain than is the case in ape brains. Its influence reaches the thalamus, even the cerebellum and its centers for automatized actions (which are activated in phonological understanding and responding). This, to Deacon, is our condition of possibility to learn and automatize new knowledge as well as our fast and automatic understanding of phonology and syntax. The role of the cortex is thus not only to be a large, semantic association network, but also to be an instrument, integrating a whole range of lower brain functions that remain separated in other species.

Deacon's deliberations on these issues are far more detailed than what may be reproduced here, and they generally have the character of hypotheses guiding further research rather than established facts. Still, their arguments against the MIT Chomsky-AI myth seem very strong. Not that Deacon is against the perspectives of making artificial intelligence, only that it will require other capacities than ordinarily supposed. The quantitative maximizing of information processing will not, in this perspective, lead to intelligence, rather the ability to perform the "symbolic jump" from icono-indexical reasoning only and to symbolic reasoning now seems to be the decisive intelligence prerequisite.

At this point, Deacon is optimistic, maybe even exceedingly so: he claims that an ordinary portable computer may possess sufficient processing capacity, just provided it becomes "sentient", that is, acquires an adaptive sensibility prerequisite to more elaborate conscious states. But even if there are several problems in this (what is more precisely "sentience"), the core of the argument remains that it need not be a human privilege to have access to the "symbolic jump". Chimpanzees may for instance be able to do the crucial jump, cf. the well-known experiment with sign language (of course, chimps cannot speak for vocal tract anatomical reasons, but this has nothing to do with symbol abilities).The symbol ability seems to be undoubtedly present in the famous case of Kanzi, the chimp baby which, hanging on its mother's back, learned the sign language experimenters tried in vain to teach its mother. Maybe even other higher animals may perform the crucial "jump" as well — and the central point here is that nascent symbol use may be practical for some limited purposes but does not in any way have to be particularly intelligent. The dawning use of symbols may rather look like the so-called Williams' Syndrome with low IQ on the borderline to mental disability and a low degree of understanding — but with a surprisingly elaborated linguistic ability and a pathological obsession with social relations. This implies that in Deacon's analysis, the symbolic jump is characterized by a specific problem: primitive symbol systems can not, in fact, imply very many functional improvements, so why evolve them? Especially because the crucial abstraction needed in the change from icono-indexical consciousness and to symbol consciousness must imply a partial de-learning of otherwise useful icon-index reflexes.

This is the point in the argument where Deacon substitutes the anthropologist's outfit for the neurologist's. He now asks: which events in human prehistory may have released this symbolic jump? The much-discussed issue of "Baldwinist" evolution is taken as a conceptual starting point. The American psychologist James Mark Baldwin from around 1900 put forward the idea that the non-genetically-determined behavior and habits of a species may in fact influence back on its genetic evolution. Not, of course, by the Lamarckian route of direct influence of behavior on the genes, but via the detour of behavior determining which features of the organism are selected. Especially properties tied to social behavior in social animals are apt to be caught in Baldwinian feedback. If you live, e.g., in a group of pre-humans having begun to speak, then there will be a strong selection pressure towards speaking abilities. Individuals without this ability may be supposed to perish, and brains favorable towards speech will evolve at comparatively great speed. This is what makes Deacon state the counterintuitive claim that symbols and language are ideas which change the brain. When first having become effective, they constitute a feedback-loop with the selection of those individuals best equipped to use them. This Baldwinian principle might offend orthodox Neo-Darwinists claiming that before speaking begins, all neural prerequisites to speaking must be selected for other, non-linguistic reasons — but in fact, there is no necessary opposition between the

Darwinist doxa and the Baldwinian appendix. Baldwinism adds to Darwinism a sort of idealism claiming that even if biological evolution takes place due to a random trial-and-error search algorithm — its findings may not be random but rather ideal structures not being a mere product of the searching. Structures like symbols and language hence play the role of attractors in the phase space of evolution, one might add. In this respect, Deacon's Baldwinism parallels claims by theoretic biologist Stuart Kauffman pointing to the necessary preexistence of order in nature providing able material for selection to work on. Given this conceptual modification of Darwinism, still Deacon lacks his candidate for the event that gave rise to the symbolic jump and started the beneficent Baldwinian circle.

Here, he ventures into that herostratically notorious quagmire of the anthropological origin of language. One sane consequence of Baldwinism is that when first the fast circle between symbol use and selection is running, then all the good reasons man has invented for language's birth (understanding, hunting, cooperation, social control, use of tools, etc. etc.) become equally strengthened by the existence of language. Thence they may take place as equally valid sub reasons for the happy evolution of language in the interaction between brain and language evolution. But still, what kick started the circle in the first place?

Here, Deacon's explanation is, as it must be at our present level of knowledge, speculative, and even more so than the first two thirds of the volume. The basic outlines of his answer follows sociobiological reasoning. The genetic interest of males is to fertilize as many women as possible — and the genetic interest of females, on the other hand, is to cling to the man being able to provide food in the difficult nursing period. But why can't the women just provide for themselves by gathering? Deacon's speculative idea here is that man's partial evolution towards a carnivorous animal is a key to the question. Nursing women are unable to hunt, so she has to rely on the stone age *Männerbund* to return home with meat supply. On the other hand, the hunting band often has to stay away for many days' hunt, and how will the gene-pool-anxious hunter know that his woman has not been unfaithful while he was away? It will be a genetic blind alley to feed upon someone else's genetic offspring. The solution to these asymmetrical needs (meat supply and faithfulness) is of course marriage and the institution of elementary kinship structures. But the stability of marriage and social institutions in general requires symbols. It is easy impressionistically to expand on these ideas: the proud father by the garden grill and the steaks *bleu* presented at dating dinners can be understood in a new light, just as vegetarian feminists who consequently try to emancipate themselves from the meat exchanges with patriarch society.

It is by no means impossible that Deacon's anthropological speculation catches parts of the truth, but until further empirical evidence it remains a suggestion among many others as to the ignition of the symbol spiral and the following origin of language and society.

But the semiotic and neurological parts of Deacon's synthesis need not be touched by the more speculative character of his anthropological sketches. The symbol and its partial separation from worldly reference is naturally connected to

the possibility of imagining other, counterfactual, possible worlds in addition to the actual one — and for this reason it is easy to see the symbol as the condition of possibility for myth, fiction, literature, and science. This part of Deacon's construction seems a fertile ground for further work, even if there seems to be certain problems with the symbol concept inherited from Peirce. Deacon does not reflect on the fact that the specific type of symbols called arguments have a crucial dependence on diagrams in Peirce: the idea that the efficient symbol implies an intuitive and manipulable sketch of its object. In Deacon's rendering of Peirce, it becomes difficult to understand why the symbol is in fact so efficacious a vehicle for thought. Its separation from reality—the indexical connection between two groups of icons—is one basic reason, but another is the fact that the diagram permits a rational manipulation and experiment with small sketch like models of aspects of the world and hence provides the possibility for rational argumentation[3].

This does not, however, shake Deacon's central point in invoking the Peircean symbol concept. More difficult is the question that, given this Peircean symbol, many more animals than Deacon's few examples seem to possess symbol abilities. As simple a case as Pavlovian conditioning by reinforcement in fact seems to meet Deacon's rendering of Peircean symbolicity: the bell ringing referring to eating is, in fact, a habit involving one icon group (different but similar bells) indexically connected to another icon group (different but similar meals). But is it a symbol? Peirce the pan-semiotician would undoubtedly agree; Deacon probably not so. But it is hard to see that rather simple examples of biological habits do not meet Deacon's own symbol definition, and it is an open question whether higher animals have access to argument's privileged type of symbol. If Peirce is right in placing symbolic activity on a far lower level in biology, then the relevant jump somewhere in Homo Habilis's dark past on the African steppes might call for a more detailed description than as the mere jump into symbol use. It might have to do with a certain diagrammatic ability to link symbols in stable chains of arguments which can be grasped in one glance; it might have to do with what Peirce calls "hypostatic abstraction", the procedure that makes of a predicate a new subject ready to be investigated in the ongoing argumentative process.

Deacon's book is thus less a treatise of solutions than it is a catalogue of ideas, some of them doubtful, some of them good, some of them brilliant. It is not exceedingly well-written, in many cases more complicated than necessary and with repetitions not only serving pedagogical purposes. But all in all, the book may prove a milestone in the ongoing integration of human, social, and natural science problems today scattered far apart in different institutions. Its argument against simple ape-human transformation explanations are strong, as is its case against the MIT myth; its reintroduction of Baldwinian evolution in social animals is well-argued and important; and its insistence on the necessity of the introduction of a much more complicated and plastic semiotic symbol concept in AI as well as in biological environments is more than welcome.

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[3] Cf. F. Stjernfelt "The Diagram as Centerpiece of a Peircean Epistemology", in *Transactions of the Charles S. Peirce Society*, forthcoming.