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Why Peirce matters: the symbol in Deacon's *Symbolic Species*

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Abstract

In "Why brains matter: an integrational perspective on *The Symbolic Species*" Cowley (2002) [Language Sciences 24, 73–95] suggests that Deacon pictures brains as being able to process words *qua* tokens, which he identifies as the theory's Achilles' heel. He goes on to argue that Deacon's thesis on the co-evolution of language and mind would benefit from an integrational approach. This paper argues that Cowley's criticism relies on an invalid understanding of Deacon's use the concept of "symbolic reference", which he appropriates from Peirce's semiotic. Peirce's analysis as well as Deacon's appropriation will be examined in detail. Consequently it will be argued that an integrationist reading would add very little to Deacon's core thesis.
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1. Introduction

In "Why brains matter, an integrational perspective on *The Symbolic Species*" Cowley (2002) criticises Terrence Deacon's co-evolutionary theory in his (1997) *The Symbolic Species. The co-evolution of language and the human brain* for ostensibly combining "an external model of grammar with an internal model of symbolic reference" (Cowley, 2002, p. 85). Cowley believes that this move leads to a tension in Deacon's overall thesis, which is that the human brain and language co-evolved. He argues that Deacon pictures brains as being

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able to process words *qua* tokens, which he identifies as the theory's Achilles heel (p. 74). Cowley goes on to suggest that the theory would benefit from an "integrational approach", where language is not taken to be an "internal" or "neurally-based" system of tokens, but something that is acquired and practised socially.[1] This paper will argue that Cowley's criticism is unfounded, as Deacon does *not* adopt a "token-realist" approach to language in the brain and that he, in fact, develops a viable theory for how language is embodied in the brain without recourse to positing an invalid inbuilt capacity for symbolic reference. In this reading it becomes unclear how an integrational reading would contribute to Deacon's theory.[2]

This paper will argue that Cowley seems to misconstrue Deacon's analysis of our capacity for symbolic thinking, confusing Deacon's use of the term "symbol" with the meaning traditionally applied to it in computational theories of mind. The key to Deacon's understanding of the human capacity for using symbols lies in his appropriation of Peirce's semiotic, which will be examined in detail. Cowley also seems to underestimate the role that language itself plays in establishing the capacity to think symbolically in humans. It is central to Deacon's thesis that brain activity is, in various aspects, inseparable from experience and language – precisely the contribution that an integrational approach is thought to make (Cowley, 2002, p. 73).

A brief overview will be given of Deacon's co-evolutionary theory, to orientate readers not familiar with Deacon's argument. Peirce's semiotic will be examined in the following section, and following that a section will be devoted to Deacon's appropriation of Peirce's analysis of reference. Thereafter the prominent role that Deacon attributes to language in establishing the capacity for symbolic reference in humans will examined, before finally some of Cowley's specific objections will be addressed in terms of the foregoing analyses.

2. The co-evolutionary theory of language and the brain

One of the central theses of Terrence Deacon's *The Symbolic Species. The co-evolution of language and the human brain* is that human language is an evolutionary anomaly (1997, p. 34).[3] Deacon does not take this to mean, however, that language is separate from the rest of our biological and neurological make-up. In other words, he does not see language as a freak mutation that happened produce an organism capable of creating and manipulating language (1997, p. 35). As the subtitle to his book suggests, he argues that language and the human brain co-evolved and that the influence of language has partly made (and makes) for the qualities of mind that we consider to be uniquely human.[4] Furthermore, the structure of

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[1] Cowley (2002, p. 73–74) describes the integrational view as holding that brain activity is inseparable from experience and language. The aim of such an approach would then be to explain how language "becomes insinuated with neural activity" in evolutionary and developmental real-time and it would examine how brains and bodies exert "biomechanical" constraints on language." In terms of this definition, Deacon's co-evolutionary thesis is an integrational approach to language and the brain.

[2] In fact, although the lack of space prohibits the development of the argument, it must be mentioned that the integrational approach seems to overemphasise the displacement principle of neuronal development and underestimates the argument for the influence of genetically-based brain structure and structure inherent to languages that Deacon (convincingly) develops.

[3] Deacon rejects (Chomsky, 1957) postulation of the existence of a Universal Grammar, essential to all human brains, as an example of recourse to a "freak mutation" theory in order to account for our linguistic abilities.

[4] Deacon gives the following minimal definition of language in the generic sense: "[language is] a mode of communication, involving combinatorial rules that comprise a system for representing synthetic logical relationships among the symbols (1997, p. 41).

our brains influenced the development of languages according to the principles of natural selection. He also sees the origin of human language as an entry point into the question of the logic linking cognitive functions to brain organisation. While there is continuity between human and nonhuman brains, Deacon insists that there is also a singular *discontinuity* that accounts for the fact that humans can learn and use (symbolic) language, while animals cannot (p. 13).[5]

One of the main differences that Deacon identifies between human language and other forms of communication is that human language is not a mode of communication only, but also an "outward expression of an unusual mode of thought – symbolic representation" (p. 22). With regard to this paper it is important to note that Deacon bases the assertion that other animals do not have access to symbolisation – and the virtual world that comes with it – on his contention that the ability to think symbolically is *not* innate, but *develops with the internalisation (learning) of the symbolic processes that underlie language*. Hence, only minds/brains with the ability to learn to communicate symbolically can think symbolically. An implication of this argument is that many theories on the evolution of the human brain have inverted the relationship between brain evolution and language evolution. It becomes possible that the supports that were thought to be prerequisites for the evolution of language – greater intelligence, articulatory abilities, etc. – may have been consequences, rather than causes, of language acquisition. In a sense, Deacon believes that language was "its own prime mover"; the author of "a co-evolved complex of adaptation arrayed around a single core semiotic innovation that was initially extremely difficult to acquire" (pp. 44–45). Modern (human) languages developed from the simpler (human) languages that must have existed in our prehistory, and as language became more complex, our brains followed suit. The crux of his argument is that, subsequent to "crossing the symbolic threshold", the brain gained the ability to interpret and create symbolic reference and the brain and language co-evolved to reach their present structures.

Cowley characterises Deacon's theory as clarifying how "in spite of biomechanical constraints, hominids developed the knack of using linguistic and cultural resources" (p. 75). It should be stressed that Deacon does not argue that humans developed this ability despite biomechanical constraints; the argument is that existing biomechanical constraints fundamentally influences the way in which this ability developed and contributed to the structure of language, which evolved in tandem with such constraints. Deacon's approach is fundamentally neo-Darwinian,[6] where the principle of natural selection "selects" randomly occurring *beneficial* variations in organisms, in that such

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[5] Deacon does identify human counterparts to animal communication in the form of social communication through gestures and facial expressions, which seem to be universal to human beings. He insists that these human forms of communication are something other than language, and not a sort of "language without words" (1997, p. 34).

[6] Neo-Darwinism refers to the synthesis between genetic theory as a theory of inheritance and natural selection as the mechanism that drives evolution, and is sometimes referred to as *synthetic theory* (Patterson, 1998, p. 234). Technically Deacon makes use of what is called "Baldwinian" evolutionary theory, but as he points out (1997, p. 322), "there is nothing non-Darwinian about the process". Baldwinian evolution emphasises how learning and behavioural flexibility can bias natural selection because individuals with such flexibility can modify the context of natural selection in favour of their own kin and offspring. The argument is that, with the context of adaptation changed, natural selection tends to replace flexible behaviour with genetic predispositions that are beneficial in the changed circumstances (pp. 322–326).

beneficial variations will cause that particular organism to survive for longer and produce more offspring than its fellows who lack such a variation (Darwin, 1985, p. 115). Deacon argues that humans as a species would have been faced with a particular communication "problem", which would eventually lead to the capacity for thinking symbolically. Beneficial variations would then constitute an enhanced capacity for symbolic thinking. Eventually, by means of natural selection, such beneficial variations would spread throughout the species, enhancing the species' ability to think symbolically. Deacon also makes the argument that language evolved in similar terms (what he (1997, p. 327) calls a "sort of cultural equivalent to natural selection), where variations in the language structure that lead to such a language being more easily learned, would cause the modified language to spread throughout the language-using population; more cumbersome forms would eventually disappear. Hence, not only did language evolve in response to constraints in the human brain, but the brain evolved in response to the requirements posed by language (Deacon, 1997, pp. 321–365). These evolutionary changes have to due with sensorimotor abilities however, and do not constitute anything akin to grammatical knowledge (pp. 328–334). In fact, his argument is, that "we each have had to learn ... symbolic correspondences from scratch" (p. 332).

It is important to highlight the extensive space that Deacon dedicates to language learning capacities in humans, as it is in terms of language-learning that Deacon explains how humans developed the capacity for symbolic thinking. His argument is that Baldwinian evolutionary processes are both the cause and consequence of learning biases. With regard to language–brain co-evolution he concludes (explicitly in contrast with Cowley's reading):

> ... only certain structural universal features of language could have become internalised as part of a "language instinct," and these turn out not to be those that are most often cited as the core of a Universal Grammar. Instead, the best candidates for innate language adaptations turn out to be some very general structural characteristics of the primary language medium itself, speech, and the computational demands this medium imposes when it comes to symbolic analysis. Whatever learning predispositions are responsible for the unprecedented human facility with language, they specifically cannot depend on innate *symbolic* information. No innate rules, no innate symbolic categories can be built in by evolution .... The noncorrelative nature of symbolic reference has cut language off from forces that shape biological evolution, and instead has shifted the burden of adaptation to a new level of information transmission (Deacon, 1997, p. 339).

Why then does Cowley read Deacon as holding that "we differ from other primates in having a neurally-based predisposition to use symbol-tokens" (Cowley, 2002, p. 75)? The answer seems to lie in Cowley's misconstrual of how Deacon employs the term *symbol*. Indeed, in a footnote (Cowley, 2002, p. 78) he accuses Deacon of using *symbol*, with "systematic ambiguity to refer to external entities and hypothetical internal tokens", and he likens this ambiguity that of Peirce in his use of the term in his (early) semiotic, which Deacon appropriates. Furthermore, Cowley seems to underestimate the role that Deacon accords to language-learning in establishing the ability to think symbolically in humans. This will be discussed in a further section, but first it is imperative that we gain a clear understanding of Deacon's conception of symbols. In order to do this, it is necessary to examine Peirce's analysis, which Deacon employs in his theory.

3. Peirce's contribution

Far from being consistently ambiguous on the subject, Peirce develops an interesting and on the whole convincing theory of symbols as a certain type of signs.[7] As mentioned, Deacon appropriates and adapts Peirce's semiotic in his analysis of the structure of signs, including their possible symbolic aspects. In accusing Peirce (and Deacon) of ''treating symbols as determinate entities that lack iconic/and or symbolic aspects'' (2002, p. 78) Cowley misrepresents an important aspect of Peirce's insightful analysis of the structure of reference. And if this aspect of Peirce's work is misunderstood, it is unlikely that the implications of Deacon's application of Peirce's essential insights can be appreciated. With his background in the natural sciences, Peirce was very aware of the constraints that the physical world places upon our experience of it, and was of the opinion that facts gained from such experience, should form the basis of our philosophical endeavours. One of his most valuable contributions in terms of our topic is his contention that a sign can only function within a greater system of signs, in that it can only acquire meaning *in relation* to other signs.

Peirce maintained that our knowledge, even knowledge that is apparently direct and intuitive, takes on the form of a hypothesis. The truth or falsity of such a hypothesis is something that is subsequently tested through experience. If our underlying assumption is correct, the object of our knowledge should behave as we expect it to; if incorrect, it won't (Peirce, 1965, Vol. V, pp. 135–147 (5.213–5.237)). Furthermore, he argued that whenever we know something, we primarily know it as something standing *in relation* to other things – we gain knowledge of things by relating and classifying them, something which cannot be done without acquiring signs of some sort. Hence, Peirce held that all knowledge relies on the ability to manipulate signs, and it is in the course of learning how to manipulate such signs that we are instilled with the ''first assumptions'' on which all our subsequent assumptions are based. It is the repeatability of the symbolic system of classifying and relating that allows for the intelligibility of the thoughts of others. Furthermore, our knowledge of our own minds as well as those of other people is derived from *outward* physical events, which communicate our own and other people's behaviour. Hence, we gain all the knowledge that we have of ourselves and the world from *signs* (Peirce, 1965, Vol. V, pp. 177–185 (5.294–5.309)).

In this understanding, making or reacting to signs is being ''engaged in being a mind'' (Gallie, 1966, p. 81). We can only know what we are thinking insofar as we are able to produce signs that present the conclusion of our thoughts, and insofar as we are able to defend that conclusion through the use of signs, communicating both with ourselves and with others (Peirce, 1965, Vol. II, pp. 14–17 (2.27)). Hence, Piece's assertion that ''all thinking is dialogic in form'' (Peirce, 1965, Vol. VI, p. 233 (6.338)). Such dialogue takes place in the form of the words (signs) that we assemble form a community of speakers. If the inferences that one draws from signs more or less correspond to those of a community of sign-users, there is a greater chance of those inferences being true. Furthermore, it is impossible for an individual to achieve knowledge outside of some form of language and community. Given that Peirce defines thought as the process where signs develop in

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[7] The distinction is important, neither Deacon nor Peirce use ''signs'' and ''symbols'' as equivalent terms. Symbols are one type of sign.

accordance with the laws of inference (pp. 169–170 [5.283–5.284]), he develops a semiotic (theory of signs) in an attempt to model the mechanisms behind thinking. It is his contention that the *mechanisms* (or logical structure) behind cognitive functions somehow mirror those that constitute signs, not that signs are represented by tokens in the brain.[8]

Peirce's famous definition of *sign* reads as follows:

> ... something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the *interpretant* of the first sign. The sign stands for something, its *object*. (1965, Vol. II, p. 135 [2.228]).

One of Peirce's most important insights, then, is the realisation that signification (meaning) is not based on a relation between two phenomena, the sign and its object, – an assumption that characterises the traditional approach within Western philosophy – but is always the result of a *triadic* relation. He believes all sign phenomena to have this general and distinctive characteristic (e.g. 1965, Vol. II, p. 135 [2.229]; 1965, Vol. II, p. 136 [2.230]). As we have seen, a sign is always something that stands for something *to somebody*; hence every sign has an *object* and an *interpretant*.[9] A sign is not a sign by virtue of some intrinsic characteristic; it can only function as a sign when it is *interpreted* as such. Hence, all sign phenomena are irreducibly constituted by a sign, an object, and an interpretant and meaning can only come about within the object-sign-interpretant interrelation.

The *object* is that which the sign refers to, while the *interpretant* is the process that enables one to infer reference from both the sign and its context, whatever that process may be.[10] Furthermore, this process of translation is continuous, where a sign stands in relation to both previous and future translations and forms a system of signs. An interpretant can always potentially function as a further sign, in a potentially endless series of interpretations. Peirce emphasises that every sign is essentially incomplete, and our competent understanding or use of a given sign is always a matter of degree (Short, 1996, p. 127). As such, the status of an interpretation of a sign mirrors that of any scientific hypothesis: it is always open to further questioning and testing and the accuracy of any given interpretation is determined by the context in which it takes place (Peirce, 1965, Vol. V, pp. 154–154 (5.262–5.263); pp. 170–174 (5.286–5.290); pp. 183–184 (5.305–5.307) pp. 300–302 (5.448n), among others).

In his semiotic, Peirce distinguishes between three categories of possible referential associations that characterise signs – those of *icon*, *index*, and *symbol*, and he uses these three categories to describe the formal relationship that can exist between signs and the objects that they represent, *for the interpreter*[11]:

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[8] Peirce never explains how this situation comes about, which Gallie (1966, p. 92) attributes to the fact that he lacked the historical imagination necessary for such a project, "like almost every other philosopher of the western tradition".

[9] See, for example, Peirce (1965, Vol. III, pp. 210–211 (3.360–3.361)).

[10] It is important to emphasise that interpretants should not be equated with rules of interpretation (cf. Liszka, 1990, p. 34). Short (1996, p. 511) believes this misunderstanding to be common and "a serious error". He speculates that the misunderstanding arises because Peirce's semiotic is often conflated with Saussure's (1916[1983]) "semiology" and he goes on to point out important differences between the two theories.

[11] cf. Peirce (1965, Vol. V, pp. 50–52 [5.73–5.76]) and (1965, Vol. III, pp. 211–214 [3.359–3.365]).

For an object or a sign to be an *icon* of something else, it needs to resemble that entity in some way.[12] Peirce sees the resembling characteristic as something that "naturally" belongs to the iconic sign, which it "would posses just the same though its object did not exist" (1965, Vol. V, p. 50 [5.73]). Religious icons or statues of mythic creatures are examples that one can think of in this regard. The objects of these entities might or might not exist, but their existence does not influence the shape or the accepted resemblance of their signs.

For an object or a sign to be an *index* of something else, it needs to be either causally related to, or spatio-temporally associated with, the thing of which it is an index.[13]

An index is relational by virtue of a characteristic that it would not posses if its object did not exist, but which it would continue to posses, whether it is interpreted or not (Peirce, 1965). A thermometer would be an archetypal example of an index – it indicates the temperature of its surroundings, to which it is related in time and space. It might cease conveying information if nobody where around to interpret its reading, but the thermometer would continue to function just the same.

For something to be a *symbol* of something else, the link between the two phenomena needs to be established by means of a convention, agreement, or code. A symbol does not need to be similar to its object, nor does it need any factual connection with it in order to function – *it fulfils its function only when interpreted* (1965, Vol. V, pp. 50–52 [5.73]). For Peirce, "[a]ll words, sentences, and other conventional signs are Symbols" (1965, Vol. II, p. 165 [2.292]). Hence, musical notation is an example of a system of symbols that represents the music it codifies. It is important to note that there is nothing necessary to the system we are accustomed to using; it came into being by means of convention.[14]

Contrary to Cowley's reading, Peirce holds that symbols develop out of other signs (especially icons) and can function as icons, indices, or symbols, depending on the context and the way in which they are interpreted. This is possible because there is nothing intrinsic to the sign that determines it reference. What distinguishes symbols from icons and indices is that their referential ability, and in fact their very existence, is based on convention and on the existence of a "mind" (in whatever form), which is privy to the particular convention, and can thus interpret, create, and manipulate symbols. Furthermore, the

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[12] Peirce calls signs that are iconic in the sense that they represent their objects by their similarity hypoicons (Peirce, 1965, Vol. II, p. 157 (2.275)). He further subdivides hypoicons into those that share qualities with their object (*images*), those that mirror the relationships between the parts of their object in their own make-up (*diagrams*), and those that represent a parallelism in something else (*metaphors*) (Peirce, 1965, Vol. II, p. 157 (2.277)).

[13] As a useful summary of Peirce's definition, Melrose (1995, p. 496) quotes the following extract from an article written by Peirce in Baldwin's Dictionary of Philosophy and Psychology (1902):

> Indices may be distinguished from other signs [...] by three characteristic marks: first, that they have no significant resemblance to their objects; second, that they refer to individuals, single units, single collections of units, or single continua; third, that they direct the attention of their objects by blind compulsion [...] Psychologically, the action of indices depends upon association by contiguity, and not upon association by resemblance or upon intellectual operations.

[14] Peirce sees "the symbol part of signs" as akin to what is usually meant by *concepts* (1965, Vol. II, p. 169 [2.302]).

meanings of symbols are constituted, and develop, within "use and experience". Hence, the meaning of a symbol is not constant – it changes and adapts over time.[15] There can be no such thing as an absolutely simple, self-sufficient, and universal conception – every conception is necessarily already related to other conceptions (Gallie, 1966, p. 48).[16] And to understand a sign (or a hypothesis) means knowing how to produce evidence for or against it; in other words, by working out its implications. According to Peirce, the sum of the possible practical consequences that can necessarily result from the truth of that conception constitute the entire meaning of the conception (1965, Vol. V, p. 6 [5.9]). Elsewhere Peirce defines meaning as the "entire intended general interpretant" of a given term, proposition, or argument (pp. 110–111 [5.179]).

Peirce is led to conclude that we do *not* have something like an image in our imagination of objects in the world. What we have is the consciousness that we will recognise something when we see it (1965, Vol. V, p. 181 [5.300]). He compares cognition to dreaming, where we might think that something is presented to consciousness in the form of a picture, while "it is really constructed from slight data by understanding" (p. 182 [5.303]). In trying to reconstruct and relate images that seemed to make sense while we were dreaming, we often need to add something that might not have been present in the dream in order to obtain some consistency which can aid us in relating the dream in some intelligible way. But he goes even further than cognition and argues that we have no images, even in perception (p. 182 [5.303]). One of the reasons that he gives for this assertion is that we are unaware of the blind spot near the middle of the retina. Peirce argues that the blind-spot-less picture that we "see" must be a construction of the mind, "at the suggestion of previous sensations" (Gallie, 1966.). Peirce proposes that these sensations are signs and argues that understanding could attain all the knowledge that we derive from outward sight, by reasoning from them. The image or representation that is thus formed cannot be absolutely determinate, given its "composite" character. As we have seen, our ability to distinguish between the real and unreal arises from the fact that we can correct ourselves, from finding a certain conception contradicted by experience.[17] In terms of verification, the real is that which would be confirmed independently of personal vagaries or idiosyncrasies in conception. From this, Peirce concludes that the meaning of symbols involves the notion of a community in its essence. As with hypotheses, the real will continue to be re-affirmed by the community, while the unreal would continue to be denied. Peirce holds that there is nothing to prevent us from knowing outward things as they really are, although we can never be absolutely certain of our own particular knowledge. In Peirce's understanding of the mind, there is no element of consciousness that does

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[15] Gallie (1966, p. 46) sees the realisation that every symbol – be it a word, a sentence, or a scientific formula – is essentially something that needs to be developed if it is to fulfil its proper function of expressing and communicating thought as Peirce's most fundamental philosophical insight.

[16] Such a relational understanding of meaning may give rise to objections that, if all signs and conceptions are defined in terms of further signs and conceptions, we are trapped in a self-referential circularity that renders definition meaningless. Gallie (1966, p. 48) maintains that Peirce's experience as a symbolic logician causes him to hold that all definitions are circular, to some degree. He goes on to distinguish between *viscously* circular definitions – where a definition refers to the very term that it is supposed to define – and inevitable, "innocent" circularity, where concepts are defined in terms of relational, correlate terms (e.g. greater and less). Because *all* conceptions are essentially relational and because there are no genuine conceptions, they can only be defined in terms of "their mutual implications".

[17] Also see 5.405–5.410 (1965, Vol. V, pp. 265–271) and 5.581 (404).

not have something corresponding to it in a word or sign and language is the sum total of the self (p. 189 [5.314]).

Thus, a close reading of Peirce's semiotic would suggest that he does not use the term symbol ''with systematic ambiguity'', and furthermore, that his conception of symbols serves to undermine a ''token-realist'' conception of reference. His singular insight is that reference (and therefore meaning) is triadically relational and essentially context-bound. It is this understanding that Deacon adopts when he appropriates Peirce's object-sign-interpretant trichotomy. With regard to Cowley's repeated criticism that Deacon employs a token-realism where language processing takes place by somehow mapping external grammar to inherent neurological language tokens (e.g. 2002, pp. 86–87), it seems that Cowley misses the implications of the Peircean *interpretant*. In fact, Cowley accuses Deacon of harking back to a Saussurean, dualistic view of language (p. 86). Yet, Deacon explicitly rejects this view of the structure of symbolic language (1997, p. 9). He wants a theory of reference that would not only account for the relatively low rate of correspondence between words and referents, but which would also enable us to distinguish between the rote understanding of words that a trained animal, or uncomprehending child would have, and, what he calls, the ''semantic'' understanding of a competent human language user. And as we have seen, he found such a theory of reference in Peirce's semiotic. In Deacon's words: ''The correspondence between words and objects is a secondary relationship, subordinate to a web of associative relationships'' (1997, p. 70).

4. Iconic, indexical and symbolic reference

Deacon appropriates Peirce's semiotic as a heuristic tool for conceiving of how the iconic and indexical interpretive competence – which he believes all sentient organisms possess – could have developed into the symbolic interpretative competence that human beings posses. As will be shown, the crucial factor in this evolutionary step is language. Deacon argues that human language is very different from animal communication and that this difference is crucial in explaining both human language and the cognitive structures that underlie it. The suggestion is that, because language is an unprecedented form of evolved communication, it would need a different problem-solving orientation than other forms of communication in order to learn it.

According to Deacon, an important cause of the misconception that animal communication is somehow equivalent to human language is rooted in certain misconceptions about reference (1997, p. 54). With anthropomorphic bias, the idea is established that a repertoire of calls within other species constitute the vocabulary of a sort of protolanguage. Once the possibility of an animal protolanguage has been postulated, it becomes tempting to infer a scenario where language evolves, with such a protolanguage of calls and gestures evolving into ''language proper'' – human language. This scenario depends on a consistent understanding of reference, meaning that the reference that applies to animal calls must be the same ''kind'' of reference as that which applies to words. It is precisely this assumption that Deacon tries to discredit. He speculates that the sort of reference that is applicable to words is a special case of reference – one to which a unique interpretive process is crucial.

In accordance with Peirce, Deacon holds that reference is not intrinsic to signs, but is something that is created in response to them – the result of an *interpretive cognitive action*, which can determine reference in different ways, as well as determine ''different references

for the same sign'' (pp. 62–63). He appropriates elements from Peirce's analysis to model three possible interpretive responses on the part of humans: ''Peirce recognised that *interpretants* can be not only of different degrees of complexity, but they can also be of categorically different kinds as well'' (p. 63). His argument is that differentiating between these cognitive responses holds the key to understanding our capacity for symbolic reference.

It is important to reiterate that Deacon's argument is not that our capacity for symbolic reference is inbuilt (cf. Cowley, 2002, p. 85). Deacon believes that the symbolic nature of human language requires interpretants over and above those required by other forms of reference (such as indexically interpreting the source of an odour, for example). These unique interpretants are the result of ''additional learning'', which has allowed for humans being able to produce them (p. 64).[18] Thus, the different possible interpretations of signs (iconic, indexical, symbolic) can be placed in a hierarchical order, where interpretative competence on the prior level is a *prerequisite* for a following level of interpretation. Thus, an organism would have to have the capacity to interpret signs iconically, before it would be able to have the capacity to interpret signs indexically. And an organism would have to have the capacity to interpret signs indexically, before it would be able to interpret them symbolically. Furthermore, when it comes to symbols, their referential possibilities are enhanced by the other symbols within the symbolic system, to which they are essentially linked. In terms of Peirce's analysis, a sign can be interpreted in any or all of these ways in principle. How it is interpreted depends on the capacity of the interpreter.

Note that this referential hierarchy is *not* simply based on an increase in complexity, but is built on the relationships between the different modes of reference. Thus, while one might be unable to grasp the symbolic reference of a sign, one might still be able interpret it as an index, or failing that, as an icon (p. 74). Learning to read and write, for example, can be described as ascending the referential competence hierarchy. Thus, according to Deacon's analysis, having the competence to interpret something symbolically depends upon having the competence to interpret a host of other relationships indexically, which in itself depends on the ability to interpret correlated relationships iconically. In other words, symbolic relationships are composed of the indexical relationships between sets of indices and indexical relationships are made up of the iconic relationships between sets of icons (Cowley, 2002, p. 74). And being able to interpret a sign symbolically depends

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[18] Deacon does *not* argue that reference is unique to human language. He understands it to be ''ubiquitous in animal communication'' (1997, p. 57). An example would be laughter, which Deacon describes as an innate human call. It need not be intentionally produced and it usually points to something, whether an internal state or the object that caused it. In Deacon's words, ''it points to a definite class of experiences that are deemed funny'' (Deacon, 1997, p. 57). In animal communication, alarm calls, etc. refer to their object in the way that laughter does, and not in the way that words do (Deacon, 1997, p. 57). Of course, forms of reference other than word–reference would lack the additional interpretants that Deacon envisages word–reference to have. Against this background, Deacon believes that it is possible to train almost any intelligent mammal to use a complicated sign system that is appropriate to its sensorimotor abilities. The individual would be trained to produce certain behaviours in response to certain stimuli and perhaps to use such stimuli reciprocally. Deacon believes that most animal communication is partially or wholly dependent upon the use of signs in this way, whether the signals used are learned and arbitrary (primates taught to manipulate signs), or innate and linked to a state of arousal (''natural'' animal communication) (1997, p. 66). He describes these kinds of communication as ''mechanical'' in that the suspicion always lingers that animals who use such forms of communication do not understand what they are ''saying''.

upon being able to master prior, and ''very different'' competences. In terms of this exposition, animal calls are indexical.

In explaining the human capacity for understanding signs symbolically then (without recourse to postulating the existence of an inbuilt Universal Grammar or an internal token system), one would have to start with explaining how iconic and indexical interpretations – which also occur in many other organisms – are possible. Deacon (p. 76) begins by asking what it is that makes iconic interpretation possible and he describes this interpretive step in negative terms: it is what we fail to do – the act of not making a distinction. In this view, iconic reference is the default interpretive position of living things – the interpretive process that takes place in all species with nervous systems when the production of new interpretants stops, whether due to lack of ability or lack of effort on the part of the interpreter. It is not on the basis of physical similarity that something iconically resembles something else, but on the basis of the interpretative process not differing from another interpretative process. In other words, the interpretive process that produces iconic reference is the process of basic *recognition* of the external world on the part of the organism. Iconic relationships are the most basic way in which things can be represented, and forms the basis for all other forms of representation.[19]

Interpreting indexical relationships follows on iconic interpretation. As mentioned earlier, indexicality requires connectedness (physical or temporal), or predictable co-occurrence. As with icons, the indexical relationship rests on the interpretive response to it. But, whereas iconicity can be a function of interpretive incompetence, indexical interpretation requires a certain interpretive ability (p. 77). Indexical association relies on a certain amount of learning. Deacon uses the example of the smell of smoke which indicates that something might be burning (Cowley, 2002, p. 77). Associating the smell of smoke and the likelihood of a fire is a learned association, arising from past experiences where the smell of smoke did indeed accompany a fire. The organism that makes this association should, on the basis of that association, be able to extrapolate that knowledge to novel situations. An important aspect of this argument is that such a basic indexical competence relies on the relationship between a set of *icons*. Having an indexical ability means being able to apply a given set of iconic relationships to a new situation. The memories of the smell of smoke shares similarities with both the current situation and with one another. Similar elements in these situations (smoke, fire, their co-occurrence) should point to the likelihood that a similar co-occurrence is probable in this situation.

Deacon's argument is, then, that the relationships that develop between iconic interpretive processes form the basis for associative learning, which forms the basis of indexical interpretations. The relationship is necessarily hierarchic, with iconic relationships being

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[19] Elsewhere (1997, pp. 455–456) Deacon describes iconic interpretative ability as the basic requirement for sentience. Sentient organisms (organisms with some form of brain or nervous system) must be able to represent the world to themselves in some way. In other words, a basic requirement is that they be capable of iconic and representational thought. Such organisms are also actively and spontaneously adaptive in response to their environment on the basis of information (e.g. aural; visual, etc.) received from the environment. Being able to form correlations between sets of iconic inputs constitutes learning. Learning is inherently an indexical process. All nervous systems support iconic and indexical representational processes; this is a basic prerequisite for adaptation. Deacon suspects that each living nervous system exhibits consciousness with respect to the iconic and indexical representations it can support (p. 499). He argues that a change in consciousness takes place when the transition is made from indexical to symbolic representation, and self-consciousness arises (also see Goodenough and Deacon, 2003).

a prerequisite for indexical reference, but not the other way around. The common sense idea of forming an association when an organism learns to pair a sound or image with something else is thus an indexical relationship, and it would seem that Cowley's (2002, p. 85, 86) conception of token–object pairing is an indexical, rather than a symbolic process. Furthermore, such a process comes about through experience and learning and hence cannot be said to rely on any form of innate "neural tokens".

In terms how such an interpretative process can manifest itself in the brain Deacon (2003, pp. 805–806) argues that the brain (and all nervous systems) receives an array off information, or signs, about its environment from various stimuli, as well as from the rest of the body in the form of indexical signs such as hormones and neurotransmitters. It integrates all of this information and oversees responses to it – a process which he terms brain-based awareness. Brain-based awareness is a primarily indexical process, in that a stimulus would trigger the synaptic connections in the brain with the neural pathways that encode previous memories of a similar stimulus, pathways that encode related emotional and instinctual valences, as well as learned association between the stimulus and ones related to its meaning. The triggered responses that are brought into indexical relation can be thought of as iconic.

The iconic and indexical interpretive processes have implicit inferential possibilities by virtue of their relation with other icons and indices, past and present, real and imaginary. According to Deacon, in the case of icons and indices, these are represented "by producing the perceptual and learned responses that would be produced if they were present" (p. 78). "In this sense mental processes are no less representational than external communicative processes, and communicative processes are no less mental in this regard" (Deacon, 2003, p. 78). The argument is that indexical relationships (physical and pragmatic relationships between objects, their signs, and their attributes) *ground* symbolic reference in experience (p. 271). Semantic features are predicted on these potential indexical associations. The same logic applies to symbolic interpretation, and as with indices, symbols are constituted by relationships among indices, and therefore among icons as well. But Deacon does not simply believe this relationship to be correlated to the first pairing.

In Deacon's (and Peirce's) hierarchy of reference, the referential relationships between words form a system of higher-order relationships that allows words to be *about* indexical relationships, rather than being indices. In his words: "Their indexical power is distributed, so to speak, in the relationships between words" (p. 88). Symbolic reference comes from the combinatorial possibilities in the system of words.[20] And words derive their meanings in context of other words, by systematically indicating other words. This is why Deacon makes the distinction between human and nonhuman language. An animal language typically consists of isolated "words" indexically paired to external objects or

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[20] In other words, the humans can use symbols (words) to refer to indexes and sets of indexes, and it can use syntax to indicate how words are related to one another (Deacon, 2003, p. 812). This means that not only can words function as straightforward signs, but most of them can be used to point to complex sets of indices that are connected by means of complex syntactical relationships. Through the use of a system of symbols (words) with a logic that does not rely on spatial–temporal correlation (indexical) for reference to be possible, a virtual "reality" is created. Everyone with access to the system of symbols and with the ability to think in symbolic terms, can engage in semiotic activity that is freed from iconic and indexical referential constraints. This allows for the conceptual or the abstract to have meaning, even in the absence of real-world antecedents (be it dragons or justice). Deacon goes on to argue that the human sense of self, or self-awareness is made possible by symbolic language in that it allows for self-reference as well (pp. 812–813).

events, and lacks the regularities that govern possible combinations of those signs (Deacon, 2003, p. 88). Human language consists of a syntactical system that governs the combinatorial possibilities of words, which gain meaning in terms of being employed within the system. The crucial point here, as we shall see, is that Deacon argues that we acquire such a "system of higher-order" relationships through learning language.

So, what Deacon is suggesting is that symbolic reference is a shift from associative reference and that the shift begins as a change in mnemonic strategy. "It is a way of offloading redundant details from working memory, by recognising a higher-order regularity in the mess of associations, a trick that can accomplish the same task [as indexical association] without having to hold all the details in mind" (p. 89). Instead of stimulus generalisation or learning-set generalisation, a new kind of generalisation is employed, namely, logical or categorical generalisation, which is embodied in the structure of language. The referential relationship at issue here is not one of the co-occurrence of stimuli, but one where new words are incorporated into the system in terms of their potential combinatorial roles. Being able to make such generalisations requires that the subject spots the regularities in the relationships between the words in the system. These regularities form patterns that serve as mnemonics to simplify the memory load. When such a system (a language) is available, it allows for a shift in mnemonic strategy from the indexical mode of representation to the symbolic (Deacon, 2003, p. 89).

5. The contribution from language

Deacon sees the source of this shift in mnemonic strategy in the evolutionary transition from nonsymbolic to symbolic communication in our prehistory. Of course, speculating on what precipitated such a transition will be largely speculative, and Deacon's explanation (cf. 1997, pp. 376–410) is the weakest part of his thesis. Pertinent to our purposes, however, is the role that Deacon envisages language to play in our symbolic capabilities: we learn to think symbolically when we learn language.

Theories that hold that, because of its complex structure, natural grammar should be nearly impossible to learn, usually understand "learning" in terms of logical induction, where a learner is faced with examples of grammatical sentences and derives general grammatical rules from their similarities. Such theorists then hold that it is almost impossible to inductively derive the rules of a language from the finite set of grammatical sentences that the learner would be exposed to (cf. for example Chomsky, 1975, p. 5; 1977, p. 18; 1986, p. xxvff). Deacon shows that this postulated logical problem in learning language is not analogous to the pragmatic problems that real language users face (1997, p. 128). Inductively deriving correct grammatical rules is not the only way of ascertaining which sentences will be unambiguous and which will not. There are many learning processes and that successful learning to a large extent depends on matching the appropriate learning process to the structure of the patterns that are to be learned. Deacon holds that symbolic relationships are difficult to learn, because of their structure. He argues that similar difficulties are posed by learning the logic of grammar and syntax, especially because "these facets of language are also surface expressions of the *deep web of symbolic relationships* [my emphasis]" (p. 128).

It is beyond the scope of this paper to discuss the various mechanisms that humans have developed that enable them to acquire language in any great detail. In short, children's ability to acquire language with relative ease at an age where they seem unable to learn many other things is a result of the counter-intuitive structure of symbolic language. Symbolic

relationships are quintessential examples of a system of highly distributed relationships that are only indirectly reflected in the correlative relationships between objects and symbols (1997, p. 128). Symbols can be interpreted when their coding onto the referential regularities of their indexical links to objects are understood. However, this coding cannot be discovered through the regularities of word-object associations, for example (an indexical relation). In order to learn a symbol system, one must be able to postpone commitment to the most immediately obvious (indexical) associations, in order to discover the less obvious, distributed relationships (patterns) between the symbols. If an organism is capable of spotting the embedded logic of these indirect correlations, it will be able to make the shift from "a direct indexical mnemonic strategy to an indirect symbolic one" (p. 136).

With the help of work done on neural networks (see Deacon, 1997, pp. 131–139) he shows that the learner who grasps the underlying structure, although at the cost of some of the detail, would be in a better position to grasp symbolic structure – hence the advantage that the immature brain has in acquiring language. Children's constrained learning abilities – young children have poor memories for detail, and are easily distracted and easily bored – force them to employ a "top-down" approach to language learning – they ignore many details and reconstruct the symbolic regularities or global patterns in the input presented to them (p. 139). The suggestion is that the grammatical and syntactic structures of most (successful) languages have been selected through evolution to compliment the constraints already existing in children's brains.

Thus, a logically complete system of relationships among a set of symbol tokens is necessary to form a basis in terms of which symbolic associations can be made. The difficulty is that symbolic function emerges from the system, and learning begins, as it were, prior to recognising the symbolic function in a sign or a set of signs. As Deacon puts it:

> To learn a first symbolic relationship requires holding a lot of associations in mind at once, while at the same time mentally sampling the potential combinatorial patterns hidden in their higher-order relationships. Even with a very small set of symbols, the number of possible combinations is immense, and so sorting out which combinations work and which don't requires sampling and remembering a large number of possibilities (p. 93).

The prior associations that will eventually be recoded into a symbolic system might require a great deal of time and effort, but the implicit pattern in the relationship between the indexical patterns that allows for the symbolic recoding itself must be discovered. Deacon describes the mental process involved as suppressing a learned set of associations, in favour of another, which is derived from them. First we need to learn the associations that will make up the system of symbolic relationships as individual indexical referential relationships. Then a shift in strategy needs to take place, where these learned associations are seen in terms of a derived, higher-order associative strategy and reorganised accordingly. Deacon depicts this learning strategy as an example of "insight learning" – the recoding of previously available, but unlinked fragments of information (p. 94). With the shift to symbolic associations, a kind of threshold effect is produced, where new items can be added to the growing system, with the minimum of associative learning. Such threshold effects can be seen in children's acquisition of language.

Deacon believes that children are born with an evolved predisposition to learn human language. The mere fact that all normal children raised in a particular society will learn the language of that society suggests that human brains are equipped for this function. But he

rejects Chomsky's theory of innate grammar (pp. 102–103).[21] Deacon's analysis does not support the view that knowledge of language is *a priori* present in the human brain. He argues that theories of innate grammar fail to provide neurological or evolutionary biological bases for their claims, and argues that Universal Grammar theories work with a restricted understanding of learning (learning as induction). He does not, however, believe that recognising the rich social context in which children acquire knowledge would be sufficient to account for children's ability to acquire language and the absence thereof in other species. He believes it is also telling that children's other learning abilities are still relatively restricted in the period when language-learning is optimal. From this he concludes that "some kind of prior preparation for language must be present" (p. 105). The solution that he offers for this puzzle is then that Chomsky inverts cause and effect in his analysis of the problem of language learning; the source of prior support for language acquisition does not lie inside the brain, but in language itself.

The co-adaptation of children's brains and language is not the only mechanism by means of which the brain and language have co-evolved. Deacon goes on to argue that significant modifications to the human brain over the course of evolution reflect the influence that language has had on the structure of the brain. These modifications enabled human beings to overcome the difficulties of acquiring the ability to think symbolically, through having created other innate biases in favour of acquiring symbolic abilities (also see Deacon, 2000, pp. 273–291). The enlargement of the prefrontal cortex with respect to posterior sensory and sub-cortical regions, for example, is partly responsible for the biased learning that enables humans to employ symbolic representation strategies (1997, p. 269). It aids in discovering token–token relationships, which can only be discovered by comparing their patterns of combination across many interactions with other speakers (p. 271). He identifies, and discusses in great detail, many more structures in the brain that interact in various ways in order to facilitate language functions.

With symbolic interpretation a referential shortcut is created in that it becomes possible to bypass the indexical intermediaries and use the relationships implicit in combinations of signs directly to refer to relationships between physical objects and events (p. 301). The more concrete and cumbersome indexical associations can be "unlearned", and the more efficient and powerful combinatorial logic of symbol relationships can provide mnemonic support for retrieving and reconstructing them when needed. Hence symbolic associations allow us to effectively ignore much of the vast web of word-object, word-word, and object-object indexical associations (p. 302). We are able to quickly determine which indexical associations are relevant and which are not in a particular instance. This allows for vastly accelerated language production and comprehension. In Deacon's words: "We become lightning calculators of reference" (p. 302). Symbolic representation allows for a vast amount of implicit knowledge. The combinatorial rules that make symbolic associations possible, means that it is not objects themselves that need to be encoded in memory, but only the way in which they can be related. This means that new symbols can be incorporated into the system which is already encoded and related to others, without the need for memorising co-occurring symbols or objects.

The important thing to keep in mind in this regard is that Deacon does not argue that brain structure mirrors language structure. He proposes that while language functions

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[21] Also see Deacon, 2003, pp. 111–139.

map onto brain functions, brain functions are likely to be organised according to a very different logic (p. 285).[22] Symbolic reference does not derive from anything particularly special about the brain, but from a special kind of relationship that can be constructed by it. Language functions should be thought of as composite behavioural products, or logically defined outcomes, as opposed to neural operations:

> Though words, as symbol tokens, may be encoded by specific sound patterns of visual inscriptions, the symbolic referential relationships are produced by a convergence of different neural codes from independent brain systems. Because they are symbolic, word comprehension and retrieval processes are the result of combinations of simpler associative processes in a number of quite separate domains, involving the recruitment of many separate brain regions. For this reason, they cannot be located in any single neural substrate; rather as each supportive representational relationship is brought to play in the process of producing or comprehending a word, each corresponding neural substrate is activated in different phases of the process (1997, p. 300).

6. Token-realism?

Against this background Cowley's criticism of "token-realism" can be examined more closely. He interprets Deacon as arguing that the brain is able to 'process words *qua* symbolic 'tokens''', which he considers the Achilles heel of the argument (2002, p. 73). He goes on to describe Deacon's position as holding that such symbolic 'tokens' belong to a private domain where referential interpretation "detaches from experience" (p. 73). In opposition to this position, Cowley suggests that the "split" between symbolic and nonsymbolic aspects of language is unnecessary and damaging to co-evolutionary theory. Firstly, it should be said that it is debatable whether "token" is the best term for referring to the information encoded in the brain that underlies symbolic reference, although Deacon does use the term occasionally (a more appropriate word, in the light of our discussion on Peirce, might be *interpretant*). However, one should not be mislead into understanding Deacon's use of the term as referring to a kind of one-to-one correspondence between mental entities (or words) and objects in the world. If anything, symbolic entities in his view are linked to one another in what can be termed "token–token" relationships, an argument which will be elaborated on shortly.

So, in his criticism, Cowley holds that brains do not embody "symbol-tokens" (p. 76). A few pages later (p. 78) he argues: "While not appealing to physical symbol systems, he [Deacon] takes language activity to use "internal" form-based networks that establish symbolic reference by linking tokens of determinate value." And later (p. 85): "Implicitly, to exploit this uniquely human resource [symbolic reference] words are conjured up, firstly, as internal tokens and, later, as elements that contribute to externally conditioned utterance acts." It is unclear how this "implicit" argument on Deacon's part can be construed from his extensive argument on language and the role that it plays in having developed and in developing the human capacity to think symbolically. Firstly, Cowley's reading

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[22] Hence, "There need not be any specific association between a brain region or connection and a class of linguistic operations, and there may even be alternative neurological means of achieving the same symbolic end ... the neural distribution of language functions need not parallel a linguistic analysis of those same functions" (Deacon, 1997, p. 286).

is an inversion of Deacon's argument – words are not "conjured up" as internal tokens; they are learned, and whether they can be considered to be 'tokens' is debatable. Neither "symbol-tokens" (interpretants), not "grammars" are internal in any sense other than that they are learned. If Cowley's objection is to the argument that interpretants are encoded in the brain in some way, it is difficult to see how one could get around this basic assumption. Surely the brain must represent information which it gleans from both internal and external sources in some way? It is also unclear why he sees interpretation here as being taken to depend on a perceptual process distinct from cognition, or what is meant by the accusation that Deacon falls into the trap of implying that brains and "not human bodies" are 'masters of symbolic reference' " (p. 90).

The crux of Cowley's objection seems to lie in his assumption that interpretation for Deacon is a process where utterances are neurologically mapped onto internal tokens (p. 86). He argues that this "split" vision relies on the assumption that there is context-free language and "pure" acts of symbolic reference. Cowley argues that this view jars with Deacon's own observations about the principle of displacement (Deacon, 1997, pp. 193–220) and brain-sculpting, in that "the referential comes to disengage from sensorimotor-based experience" in the "pure mapping between neurological tokens" (p. 86). Finally, he argues that inner-tokens are incompatible with "flexibly mind–world interaction and practices that are profoundly biosocial" (p. 86).

All of these objections suggest that Cowley misconstrues Deacon's concept of symbolic reference and the role that he sees language playing in symbolic reference. Deacon's argument is not that we know pure symbols (p. 87), nor is it that we posses pure representational knowledge. His argument does not imply that word-types must preexist learning (p. 87), or that we have determinate neural connections that embody tokens (p. 87). Furthermore, Deacon's theory already entails that "co-evolution primed us for the use of external symbols" (p. 87), "that brains are integral to social practice" (p. 87) that brains can develop "world-relevant flexibility" (p. 89), that brains "contextualize" (p. 89), that utterances cannot be "context-free" (p. 90), and that persons use neurally grounded capacities to contextualize experience by responding to events that in ways may influence further action" (p. 90).

As we have seen, Deacon distinguishes symbolic reference, from nonsymbolic reference, because the capacity for symbolic reference seems to be an evolutionary anomaly. He views it as a semiotic innovation that distinguishes human cognitive capacities from those of other sentient organisms (Deacon, 1997, p. 44). Language cannot be acquired by other creatures to any significant extent, because it has a unique feature: its ability to refer symbolically. (Animal systems of reference entail iconicity and indexicality – also present in human systems of communication other than language – but not symbolism). Hence, human language is essentially symbolic, and because of the benefits of language for social, group-living creatures, language exerted selection pressure on the subsequent evolution of the brain. On its part, the organisation of the brain exerted selection pressure on languages and both became more and more complex (p. 45). Hence, the human brain should reflect the influence of language-driven selection in its structure, while the structure of language should reflect the influence of brain-driven selection.

Language acquisition in human depends on nonlinguistic communication of all sorts, which support language. An important aspect of reference in general (as indicated by Peirce) is that there is nothing internal to a sign that determines its reference; reference (and signs) are rely on an interpretive process of some sort. Deacon argues that a critical part of such an interpretive process, though not the entire process takes place "in the head" (1997,

p. 63). Hence, interpretation is a function of some sort of general cognitive process. It is important to keep in mind that reference in general does not require a conscious concept or meaning to determine it (Deacon, 1997, p. 62). Different kinds of interpretive responses (interpretants) can produce different kinds of reference (p. 63). For example, sorts of interpretive response include mental imagery, bringing to mind a word with a related meaning, a behavioural act, or a feeling correlated with past experience of what is referred to. These are all interpretants that bring a word–reference relationship into being, and many of them can be present simultaneously (p. 64).

Deacon's argument is that features of communication such as learned associations, arbitrariness, reference, and transmission from one individual to another are not sufficient to define symbolic reference (p. 66). The symbolic basis of word meaning (although the interpretant of a word need not be symbolic) is mediated by generating other words at various levels of awareness (p. 64). This explains why abstract words which do not lend themselves to imagery produce interpretants that are just as meaningful as more concrete words that may elicit mental images. Furthermore, words such as ''that'' and ''which'' do not evoke ''meanings'' in the usual sense, but create expectations about the grammatical structure and can thus be considered to be functionally equivalent to nouns and verbs, for example. When it comes to larger narratives, a complicated mixture of interpretants is produced, which may be too complicated to evoke imagery, but which still have meaning. Nonlanguage reference (iconic and indexical) rely on a relatively stable correlation with what they refer to, which is not the case with words. Hence, Deacon argues, focussing on correspondence alone when one wants to account for reference, collapses a multilevel relationship into a simple mapping relationship (p. 70). The correspondence between words and objects is only a secondary relationship, which is subordinate to a complex ''web of associative relationships'' (p. 70).

As we saw, Peirce demonstrated that the differences between different modes of interpretation can be understood as different levels of interpretation, which are structured according to an iconic–indexical–symbolic hierarchy (cf. Section 4). A sign may be interpreted in terms of any one of these three forms of reference, although, in order to ascend the hierarchy, competence in the preceding form of reference is necessary. In the case of symbolic reference, iconic and indexical reference forms the basic infrastructure that makes symbolic reference possible. As we have seen, Deacon sees iconic reference as the default, the most basic general interpretive process – recognition (usually perceptual recognition, but not necessarily). Indexical reference entails iconic interpretation as its base, with the addition of the interpretive response where one thing seems to indicate another. The association between a word and what it represents can be indexical, where words derive their reference by being linked to unique contexts, objects, occasions, etc. (p. 80).

Symbols are constituted by relationships among indices. Whereas words can function in an indexical manner by referring to an external object, they have the added capacity to refer to one another. A word can retain its meaning without a sustained indexical relationship between it and what it refers to, because words are incorporated into specific individual relationships with all other words in a language. The way in which this mapping takes place is shared among users and breaks down if it ceases to be shared (p. 82). The referential relationship between words forms a system of higher-order relationships where words can be about indices, because their reference is gained from the context of being linked to other words in phrases and sentences (p. 83). These combinatorial possibilities result in the capacity for symbolic reference (which Deacon calls a token–token reference

system) (p. 88). Before we are able to make use of symbolic reference, we first have to discover the permissible combinatorial possibilities (through learning) (cf. Section 9). Being able to use a word in a novel context would indicate symbolic understanding. It is important to keep in mind that no word (or symbolic sign) can determine its own reference in isolation reference is the function of the hierarchic relationship between the level of indexical reference and token–token reference by virtue of recognising the abstract relationship between the two levels (p. 88).

Being able to gain such symbolic insight requires a system which indicates the combinatorial possibilities in the token–token reference system of words, which we find in the grammatical relationships in language. There is nothing internal about these grammatical relationships, Deacon is not advocating a variation on Chomsky's UG. He argues (1997, pp. 99–100)''

> The structure implicit in the symbol–symbol mapping is not present before symbolic reference, but comes into being and affects symbol combinations from the moment it is first constructed. The rules of combination that are implicit in this structure are discovered as novel combinations are progressively sampled. As a result, new rules may be discovered to be emergent requirements of encountering novel combinatorial problems, in much the same way as new mathematical laws are discovered to be implicit in novel manipulations of known operations.

In contrast to Cowley's contention (2002, p. 88), Deacon *does* realise that he presenting us with a possible model of what the logic of such a semantic network might look like (cf. Deacon, 1997, p. 100) and that we are ''far from a satisfactory account'' of the underlying topological principles of semantic organisation. The important aspect of his argument is the contention that symbolic reference is inherently systemic and cannot take place without knowledge on the part of the user of such symbols of the systematic relationships (p. 100). Hence, one cannot think symbolically without language. Both language and brains have evolved to accommodate one another and the argument is that some of the brain's information processing capacities have been influenced by the effect that language has had on its structure (pp. 256–278; 322–375). This has resulted in a unique human ''cognitive style'', namely symbolic thinking.

As far as the possibility of neural tokens goes, Deacon (p. 266) has the following to say:

> It would be misleading . . . to suggest that [mental images] are all there is to symbols, any more than the words on these page suffice in themselves to convey their meanings. They are merely neurological tokens. Like buoys indicating an otherwise invisible best course, they mark a specific associative path, by following which we reconstruct the implicit symbolic reference. The symbolic reference emerges from a pattern of virtual links between such tokens, which constitute a sort of parallel realm of associations to those that link tokens to real sensorimotor experiences and possibilities. Thus, it does not make sense to think of the symbols as located anywhere within the brain, because they are relationships between tokens, not the tokens themselves; and even though specific neural connections may underlie these relationships, the symbolic function is not even constituted by a specific association but by the virtual set of associations that are partially sampled in any one instance. Widely distributed neural systems but contribute in a co-ordinated fashion to create and interpret symbolic relationships (p. 266).

Once we abandon the reification of language areas as modular language algorithm computers plugged into an otherwise nonlinguistic brain, it becomes evident that language functions may be widely distributed and processed simultaneously at many places at once. They may also be distributed according to a computational logic that is not necessarily obvious from the apparent external speech signal (p. 293).[23]

7. Conclusion

The above argument shows that viewing Deacon's thesis as holding that the brain can process words as tokens is an unjustified oversimplification of his argument. Taken in its entirety, his argument can be said to be ''token-realist'' only in the very superficial sense of saying that information gained both internally and externally to the body is somehow encoded in the brain at a neurological level. One would be hard-pressed to deny such a contention. ''Tokens'' in Deacon's sense do not belong to a ''private domain'', but are obtained through various learning mechanisms and employed symbolically through learning how to structure them in terms of the structure provided by language. As such, referential interpretation relies necessarily on experience. Furthermore, the argument is not made that the brain embodies ''symbol-tokens'' but that the symbolic referential relationship emerges from the relationship between iconic and indexical information encoded in the brain. The ''form-based networks'' are not internal to the brain but are learned when language is learned. Language is learned in the context of a particular language community and is as such a fundamentally ''biosocial'' process, while symbolic reference is necessarily contextual.

Finally, we have seen that Deacon does not view the brain as a symbol processor in the tradition of most computational theories of mind. Interpretation is not where ''utterances are neurologically mapped onto internal tokens'', but is a complex process where information from the world (including utterances) can be construed as iconic, indexical, or symbolic (not necessarily limited to one of these categories) in terms of past experience in a process that is widely distributed across the brain and which includes iconic and/or indexical ''tokens'' (interpretants) and possible ways in which they can be combined to form symbolic reference. Deacon does not purport to know exactly how this process takes place, which remains a theoretical quagmire in terms of current neurological knowledge.

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[23] Also see Deacon, 1997, pp. 300–309.

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