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Why brains matter: an integrational perspective on *The Symbolic Species*

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Abstract

The paper argues that Deacon's co-evolutionary theory provides a basis for changing how we think about language and brains. Instead of ascribing language to either nature or nurture, it is seen as intrinsic to both: biological principles ensure the brain can only function by attuning to its body's worlds. For humans, this means not only that our brains are biosocial organs permeated by history but also that our infants' bodies tightly constrain the nature of our languages.

While endorsing the thought that language is insinuated into brains, I also identify what I believe is the theory's Achilles heel. Deacon pictures brains as able to process words *qua* symbolic 'tokens'. Unlike morphosyntactic patterns, these belong to a private domain where referential interpretation detaches from experience. Opposing this split between symbolic and nonsymbolic aspects of language, I claim it is both unnecessary, implausible, and damaging to co-evolutionary theory. © 2001 Elsevier Science Ltd. All rights reserved.

1. Language and brain activity

Regardless of whether we are interpreting linguistic signs in the light of experience or articulating experience by means of language-activity, we use our brains. How can the language sciences deal with this truism? Following recent tradition, one option is to adopt the segregational view that studies of language and brain meet only at a postulated functional "level". Alternatively, we can set out to explicate how utterances, texts and brains together contribute to human "contextualizing" (Harris, 1996, 1997). On this integrational view, brain activity is inseparable from

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experience and language. The approach thus aims to clarify how — in evolutionary, developmental and real-time — language becomes insinuated with neural activity. In Harris's (1996) terms, it examines how brains and bodies exert “biomechanical” constraints on language.

For the uncommitted, segregational models have the virtues of generality and simplicity. Indeed, by treating languages as systems “representing” meaning and/or world, such form-based models have been made compatible with a symbolic model of mind. This is achieved by idealizing utterances as configurations of pre-extant forms and thus dissociating language from bodies, brains and — in many cases — social action. Generative models, for example, rely on specifying symbol configurations by calculating the output of possible processing mechanisms. More surprisingly, the brain is also pictured as a symbol processor in socially oriented work such as systemic linguistics. As Halliday (1985) shows, if language as a “social semiotic”, persons are the makers of unconscious “choices” that give rise to “language-use”. Just as in generative grammar, utterances and texts are output from word-based processing that stands beyond individuals and time.

2. The new cognitivism

Through integrational eyes, *The Symbolic Species (TSS)* represents a new way of thinking about how linguistic signs influence the brain (and vice versa). Instead of subtracting language from experience, Deacon accepts we must consider how (and why) individuals feel, think and act in exploiting utterances and texts. Thus, side-stepping problems with segregational views, his work converges with recent challenges to classic computational models of mind.

During these “exciting times” (Dennett, 1997) in the cognitive sciences, support for a symbolic model of cognition has been collapsing. While conservatives argue that the “old questions” can be addressed by non-symbolic techniques (e.g. Hunt, 1999), moderates declare exclusive commitment to symbol manipulation “profoundly impractical” (Clark, 1997, p. 1). Firstly, non-symbolic computation has major implications for behaviour and language (e.g. Elman et al., 1996). Secondly, organic intelligence often exploits body-based properties and requirements that are trivialised in serial, digital modelling (Dreyfus, 1971, 1992; Searle, 1980). Thirdly, since living organisms form populations shaped by natural selection, they can treat the world as “its own best representation” (Brooks, 1991), and exploit models intrinsic to neurophysiological processes of bodily activity (Clark, 1997). Finally, for radicals, such insights show that the second cognitive revolution has already occurred (Harré, 1992). Far from being symbol processors, human brains are delicate instruments individuals attune by enacting socially constructed ways of meaning (Harré, 1999).

Whereas classic models treat mind as a locus of symbol processing, new cognitive perspectives highlight how brains couple body with world to exert flexible control over action (Clark, 1997). On this view, humans achieve their purposes by, among other things, exploiting brains jointly with the physical signals we think of as words. However, if words are *directly* implicated in conversations, segregational linguistic

doctrines must be abandoned. No formal account of language can begin to capture how we exploit brains to use linguistic resources in interacting with the world. Sensing this, rather than advocate any grammatical theory, there is a new tendency to highlight the interplay of cognition and communication (Carruthers and Boucher, 1998), recognise the function of external symbols (Christiansen and Devlin, 1995; Clark, 1998) and, in radical circles, ask how discursive practices exploit neurally embodied, human “cognitive instruments” (Harré, 1999).

From the new cognitive perspective, brains evolved so organisms can “make things happen” (Clark, 1997, p. 21). On this view, language can only have arisen as a supplement to action based, primate cognition. Rather than hypothesise than an internal language-system “evolved”, the puzzle becomes that of clarifying how, in spite of biomechanical constraints, hominids developed the knack of using linguistic and cultural resources. Deacon’s co-evolutionary solution to this question, I believe, is seminal for the language sciences. The achievement of *TSS* is to show *how* adaptive changes in brains can promote the development of (external) languages. Stressing that brains are subject to Darwinian processes, Deacon shows how natural selection could favour the development of communities that unite hominids capable of using “symbols” in manipulating their fellows.

3. An overview

What follows is a critical appraisal of Deacon’s co-evolutionary hypothesis. I focus on *TSS*’s perspective on cognitive neuroscience to spell out how it is possible to avoid opposing nature and nurture. In so doing, I endorse Deacon’s co-evolutionary stance, finding it both plausible and useful for thinking about brains and language. I stress that the theory moves beyond the old cognitivism, above all, by presenting brains as organs whose relative size and patterns of connectivity derive from competitive Darwinian processes (p. 221). It is through the working of these processes that we gain the ability to sculpt our brains and, by so doing, change our nature. In integrational terms, co-evolved brains are instruments shaped by how we contextualize in given circumstances. From this perspective, *TSS* breaks new ground by presenting our brains as deeply permeated by history.

Within a co-evolutionary framework, brains are biosocial organs. Indeed, it is by taking this perspective that Deacon is able to develop a new way of conceptualizing how we exploit language to transform experience (and vice versa). Crucially, in this perspective, it is not enough that human brains — and bodies — be regarded as subject to historical influence. Rather, just as they are sociohistorically unique, they must also be biologically specific. Yet, if Deacon is correct that our brains are predisposed for symbolic reference, their reference-bias distances language from unmediated experience. Since the uniqueness of experience is central to integrational theory, I endorse his co-evolutionary argument but deny we differ from other primates in having a neurally-based predisposition to use symbol-tokens. Rather, with Wittgenstein, Halliday, Hudson, and integrational theorists, I suggest that, like morphosyntax, verbal aspects of language are normatively tied to social practices.

Languages, as standardly described, are fuzzy, external systems whose word-based and dynamic properties ensure they are mastered by humans. Acting jointly with adults, children exploit modified ape-brains to re-invent voluntary ways of using bodies, verbal expressions and artefacts. By this means, they also rediscover constructs as diverse as sounds, spirit-ancestors, lying, and symbolic reference. Neurologically, what matters is — not symbolic reference — but the development of utterance capacity. Challenging this “token realism”, I nonetheless endorse Deacon’s refutation of the widely held view that language evolved ‘inside’ the brain. Indeed, I argue token-realism sits ill with the liberating view that brain change not only enhances language-making but, conversely, that language resources exploit Darwinian processes to reorganize brains. Reworked as a thesis about utterance capacity, this can provide an explanation of how we developed a propensity for exploiting (what we think of as) *external* symbols. Even if human brains do not embody symbol-tokens, brain change has surely made us the “symbolic species”.

4. The co-evolutionary hypothesis

There is abundant evidence that, thanks to natural selection, brains have evolved to serve the needs of a particular body and, by extension, its DNA. Remarkably, however, if brains evolved to “make things happen” (Clark, 1997) this challenges the doctrine that language evolved as a system-in-the-brain (e.g. Bickerton, 1990; Pinker, 1994, 1997). This is because, whatever its representational functions, no-one can deny that language is a flexible means of achieving social ends. Yet, for those taking the classic symbol-processing view, this leads to puzzles. As Deacon emphasises, if languages were adaptations, as with eyes, other animals would surely possess analogous, if simpler, symbol systems (p. 12). Not only do these not exist but, even in principle, the classic view faces another difficulty. How could an *internal* symbol system ever develop the plasticity of language?

Where natural selection uses semantically-based communication, the resulting systems are functionally inflexible (pp. 55 ff). This is illustrated, say, by vervet alarm calls which, allowing observers to identify criteria for “correct” behaviour, leave little room for deviance. When cheating and other idiosyncratic behaviour occurs, it exploits not form-based structure but (what we see as) underlying semantics. Because it is inflexible, the system seems to have reached a communicational dead-end. Lacking reflexivity, its indirectness — its dependence on experience-based knowledge — deprives it of metabehavioural potential. It thus contrasts with communication that relies on “direct” manipulation. For example, Wittgenstein’s (1958) builders influence each other by vocalizations whose potential for flexibility arises from their volitional nature. We can imagine, for example, that a tired builder might respond to *slab* by, say, repeating a similar sound in an audibly “tired” manner. Human listeners have the potential to hear this as (what we call) a refusal. In principle, moreover, given the nature of our brains and worlds, the pattern could give rise to a custom and, over time, social practice. Even without reflection, the move can underpin development of metabehavioural routines. Here there is no parallel

with vervet alarms which, it seems, are too tightly constrained for new “ways of connecting” to emerge.

In evolutionary perspective, the builders’ language is biologically impossible. No such convention-based system, it seems, could emerge from natural selection. Thus, rather than assume that human languages resemble vervet-calling or that they fit the Augustinian picture, Deacon denies “reality” to language-systems. Instead of posing a philosophical challenge to those who attribute brain change to macromutation or the gradual adding on of processing power, neural evidence is used to show these theories address the wrong questions.¹ Denying that brains embody language-systems, he posits human communicative capacities became language as we adapted to fit interactions that couple person with world. Just as social processes transform primate brains, neural changes alter how groups act. Accordingly, we need to understand brain dynamics and, specifically, how neural activity changes in phylogenesis and embryogenesis as well as post-natally.

In individuals, brains develop by exploiting natural selection. In Deacon’s terms, the principle of displacement (pp. 207 ff) governs the neural competition that leads to brain change. Indeed, there is plenty of evidence showing that, as Hebb (1949) predicted, neurons compete with each other to build networks serving an organism’s needs. As this takes place within individuals and populations, it helps explain why, for example, a new species needs no new brain (p. 206). Adaptable brains are selected by interaction between environmental factors, populations and behavioural ecology. For Deacon, the fact that natural selection builds brains justifies scepticism about theories claiming that languages have evolved to fit children. Rather he argues it is more likely that we thrive because we were served by languages embodying the “predispositions of children’s minds” (p. 109).

Brain development is competitive (p. 203). Indeed this is why, as environmental factors affect an organism’s needs, brain changes emerge in genetically-based interactions between bodies, mind and world. In vertebrates, moreover, the interplay is often actively managed by the organism. Ecology permitting, displacement ensures that internal structures are developed by how individuals act. If a strategy correlates with reproductive success, moreover, the resulting structures become more common in the population’s gene pool. Displacement thus facilitates individual brain-change and, without altering the genome, ensures increasing diversification in how brain-organization is distributed across groups and species.

The principle of displacement enhances understanding of how brains connect with language. Design features of the latter derive neither from genes nor society but, rather, from how these impact on the brain growth and decay that organise neural circuitry. Evolution can exploit individuals and populations because reproductive

¹ Deacon denies encephalization explains human intelligence because, far from being a unitary trait, it arises from factors as different as dwarfism, embryonic reduction of body size and prolongation of brain growth (p. 174). Following Darwinian principles each brain-region adapts to the body in which it finds itself. Consequently, “phylogenetic differences in the size and functions of particular cortical or nuclear regions cannot be attributed to the addition of cells to that region or to changes in gene expression in that area” (p. 206). On this view, Broca and Wernicke’s areas are only “complicated clusters of areas each with different component functions” (p. 297).

success favours competitive brain organization. Although affected by “outer” factors, brain evolution differs from sexual selection. While changes in, say, the peacock’s tail are attributable to genetically-based female preferences, brain changes also occur in experiments and social practice. Emerging over evolutionary time, primate brains adjust to practices whose utility ensures that, in turn, these adapt to the brains’ demands.² Not only are “social” aspects of language fuzzy (and languages subject to change) but, to the extent they exist, universal tendencies must derive from learning bias. Drawing on Christiansen’s (Christiansen, in preparation; Christiansen and Devlin, 1995) parallel, Deacon develops the idea that, like viruses, languages fasten onto brain-hosts.

What about human brains ensures that language is insinuated into them? Rather than focus on its grammatical properties, Deacon recognises infants respond to utterances in their iconic, indexical and symbolic fullness. The plausibility of this view arises from its implication that social life is ordered by discoveries of how the world-perceived fits with indexical, iconic and symbolic aspects of utterance-activity. At the same time, however, Deacon believes the symbolic properties of words separate off from experientially-based representations (p. 99). While not appealing to physical symbol systems, he takes language-activity to use “internal” form-based networks that establish symbolic reference by linking tokens of determinate value.³ Drawing on this “token-realism”, he hypothesises an interplay between brain and language pushed our species across a symbolic threshold. The momentous event occurred only once, he thinks, because biological constraints work against the suppression of perception required for symbolic thinking (cf. Glenberg, 1997). The survival price of crossing the threshold prevents other species from entering a symbolic world. Later I argue Deacon’s token-realism weakens his more general thesis. First, however, I show how his view of neural change fits the new cognitivism and renders plausible the argument that ape-brains co-evolved with language as both came to serve human communities.

5. Brains in general

For Deacon, the principle of displacement underpins the developmental dynamics of brain change. Far from relying on functional symbol systems, language exploits brain organization that changes unpredictably both *in utero* and across the lifetime. Rather than being controlled by discrete brain components, behaviour manifests regularities found at species, group and individual levels. In the embryo, say, a brain is predisposed to reproduce organic structures, in part, thanks to the products of homeotic genes. What matters, though, is how their expression is actualized (pp. 174 ff). Since the genes perform the same “functions” in, say, humans and fruit-flies,

² Much the same argument is presented, at a higher level, in Dunbar (1996); grooming and gossip have similar social functions, lead to expansion of brain size, and use neurobiology to make the behaviour pleasurable.

³ Deacon uses “symbol” with systematic ambiguity to refer to external entities and hypothetical internal tokens. Like Peirce, he treats symbols as determinate entities that can lack iconic and/or indexical aspects.

these cannot be reified as blueprints. Thanks to what Elman et al. (1996) call chronotopic and architectural constraints, the same genes can induce different effects. Even in primates, major consequences are due to the rate at which homeotic genes carry out their functions. The slow and prolonged nature of human development (cf. Gould, 1977) allows axons time to grow and, as Deacon stresses, some of our peculiarities may depend on the resulting connectivity.

Evidence that brain structures do not, in any direct way, control cognition is adduced, for example, in studies of how ferret brains compensate for experimentally caused loss of “touch” (pp. 208 ff). When connections between tactile centres and the thalamus are cut, populations of visual neurons are re-routed to a “touch” area. Changes in connectivity thus transmute this to a “visual” region and improve a ferret’s seeing. From a design point of view, the workings of displacement show the brain-region to be “disposed”, not for feeling, but for ecological interactions with a body’s world. While modular, the design reflects — not genetic predisposition- but the brain’s adaptive capacity. To suppose otherwise is to overlook mind-world relations by uncritically adopting the myth of “local determinism” (p. 206). It is to suppress the role of environmental factors by conceptualising brain-function as derived exclusively from the interaction of genotype and physiology.

If local determinism is false, it is senseless to ask *where* human brains represent as varied an capacity as language. There is, quite simply, no reason to assume either that language abilities are localized or that their development is genetically based (pp. 284–285). To reiterate, at both species and individual levels, neural structures emerge through interaction between genetics, the body, and a behavioural ecology. It follows that, in social animals, brain organization may be affected not only by what individuals do but also by how they participate in joint activity. Thanks to displacement, brains change over a lifetime, during history, in postnatal and embryonic development and, of course, through phylogenesis. Instead of reifying language as a system that exploits a cerebral location, Deacon asks how language affects our use of brains (and vice versa).

Recent techniques make possible the study of brain activity as persons carry out particular tasks. In using these methods, individual and population differences come to the fore. Thus, for example, in “mindless” tasks (p. 294), a particular brain region may often be active while, in other tasks with the same words, different areas come into play. Similarly, there is evidence that monolinguals with languages relying heavily on syntactic organization (e.g. English) may exploit different parts of the “language region” from speakers of a morphologically richer language like Italian (p. 306). Further, brains reorganize around what persons *do* with words. Among simultaneous interpreters, for example, a non-dominant hemisphere may become crucial in how *one* language is accessed (p. 315). Just as brains adapt to experimental manipulation, individuals can restructure cognitive abilities. It is, therefore, simplistic to separate language and “language-use” or treat brains as generators, processors or choosers of word-based forms. Such models mask the processes that make species subject to culturally influenced evolution and individuals able to sculpt their brains.

Natural selection functions to ensure brain-sculpting can produce far-reaching consequences. Thus, just as agriculture ensured that some populations tended to

develop lactose tolerance, Baldwinian processes ensure that brains can be modified by social practices (pp. 322 ff). In extending this idea, it is important to avoid Lamarckian errors by stressing that, in natural selection, the individual is the vehicle through which behavioural patterns may influence brain organization (e.g. Dawkins, 1986; Mayr, 1988). Brain circuitry arising in, for example, hammering, throwing, cuckoldry or seduction may favour development of language capacity. Accordingly, Deacon links sociobiological ideas with the insight that particular phenotypes are advantaged when reproductive success enables *some* individuals to pass on genetic material. Thus, even where no genotypic change occurs, related processes can influence phenotypes and, over time, the population's gene pool. The power of such selective mechanisms can be grasped by imagining a community where, through the power of a dictator, only accomplished simultaneous translators were permitted to reproduce. Since the skill can induce non-dominant hemisphere computation, natural selection will favour a quirk of neural connectivity that is a by-product of a social norm. Although brain structure depends on genes — and the proteins they release — a practice that affects reproductive success connects brain-changes with “cultural” factors. External pressures thus engender changes in neural organization: if social practices exploit vocalization, natural selection can favour brain-organization that facilitates symbolic action. Crucially, this argument focuses on practices rather than either “learning”, or, as in Pinker's (1994) work, genes representing traces, cases, X bars, etc. It emphasises natural selection can exploit a coupling of brains with the dynamics of vocal and visible behaviour.

Deacon's idea that brain structures were transformed in the service of making sense of social vocalizations is plausible because both learning biases and experience serve in the ontogenesis of interaction. In integrational terms, we contextualize vocal and visible behaviour long before producing appropriate vocalizations. There is, moreover, plenty of evidence that natural selection favours individuals who develop contextualizing abilities. Not only is this explored empirically in recent work on, say, how cowbirds know what to sing (West and King, 1996) but the idea also supports Owings and Morton's (1998) contention that animal communication emerges as individuals compete to “assess” and “manage” each other's doings. Since this depends on both symbolic and nonverbal aspects of behaviour, it is likely that humans differ from cetaceans and other primates in that one system became superimposed on another (e.g. Krebs and Dawkins, 1984; Locke, 1993). Before returning to the “hybrid” basis of language (pp. 230 ff), however, it is useful to consider what is distinctive about human brains.

6. Oddities of human brains

An extra-terrestrial would not only see human brains as similar to those of other apes but would note that interspecific contrasts had little – not nothing — to do with the so-called “language” region. Firstly, Broca's and Wernicke's areas are present in all primates (p. 287) and, as noted, how “functions” are distributed shifts between people, tasks and languages. Secondly, the areas cannot be localised because, Deacon claims, their demarcation probably has no biological basis (p. 288). Thirdly, linguistic tasks involve simultaneous processing in many brain regions in both hemispheres

(pp. 309 ff.). There is reason to doubt that brains carry out functions corresponding to what computers model as speech “production” and “processing”.

Viewed at greater levels of specificity, our brains differ from those of other primates. Firstly, as noted, human axons grow during the developmental period to produce long-distance links between regions that, in other apes, remain unconnected. Secondly, not only do we have a highly developed prefrontal cortex but where structures develop in unusual ways, this is often linked with this typically human “prefrontalization”. In line with both displacement and Baldwinian evolution, Deacon finds not only that the networks fit species-specific learning biases but are, very largely, individual-specific. As connections are not pre-determined, functional changes can occur independently of either cell addition or the expression of specific genes. Further, observation of verbal tasks brings out the idiosyncratic hybridity of the accompanying brain-activity.

For Deacon it makes no sense to follow Pinker in assuming that, as brains solve grammatical problems, they learn the sentence patterns of an environment. Rather than see brains as symbol processors, he suggests 2 million years of vocal-gestural communication (p. 356) equipped humans with brains that facilitate (what we see as) *external* symbol manipulation. Like Harré, he apparently thinks of brains as cognitive instruments which, among other things, are sculpted by how persons carry out language-mediated tasks. Indeed, strong evidence for Baldwinian processes lies in the human tendency to treat objects, events and utterances as if they were symbolic. While taxing the abilities of other animals (see Savage-Rumbaugh, 1986), humans have a propensity for such interpretation. The capacity to use brain-instruments to accomplish symbol-mediated tasks may, at some time, have correlated with reproductive success. Following Peirce, Deacon concludes we differ from bonobos and parrots because our brains predispose us to match words and neurological tokens that help us achieve our goals.

Rather than ask how abstract grammatical objects can be embodied in neural tissue, Deacon thus explores how symbol-mediated action maps onto brain activity. Finding regions carry out different functions, he uses the diversity of brain activity across tasks and persons to argue against a ‘language’ module. The enlarged prefrontal cortex, in particular, suggests human brains are adapted, not for acquiring form-based systems, but for the planning and social skills correlated with activity in this region (pp. 268 ff). Independently of linguistic theory, this is reason *not* to ascribe morphosyntactic organization to the brain. After all, while norm-based patterns need only be learned, agent-centred activity is needed for intelligent responses to symbol-mediated activity. It may be thus significant that, when talking, we exploit brain regions as unlike as the central grey area — used in all primate communication — and the characteristically human prefrontal cortex.

Far from assuming language is “localised”, Deacon explores how, in some of its diversity, language-activity maps onto the brain. A behavioural ecologist might put it that real-time action is inseparable from evolution, development, context (proximal causation) and an individual’s goals. To map brain activity and language we must, in the first place, understand the connectivity of a hybrid communication system. Like other vertebrates, human talk depends on visceral motor systems based

in the mid-brain and brainstem (pp. 243 ff). Indeed, as in many species, this primitive area underpins a tendency for turn-taking or calling in response to a call (p. 236).⁴ Unlike birds and cetaceans, however, our communication networks fit a primate pattern where the central grey area links vocalization to emotion, gesture and posture (p. 232). Possessing a unified communication system, our modular vocal-gestural system thus operates in ways symptomatic of emotional and arousal states (p. 236). Contrary to what is often claimed, there may well be homologies between human vocalization and that of other primates.⁵ Close attention to brain connectivity also brings out that we differ from other apes in, especially, our dual control over tongue and larynx. Unlike chimpanzees, for example, we “partially decouple” vocalizations from emotional states accompanying limbic arousal (p. 243). Rather than shift control from visceral to voluntary means, long axons provide cortical control over the larynx, jaw and tongue. The *sine qua non* for selecting brains that accompany language may lie in how exercise of voluntary vocal control came to supplement earlier primate communication.

There are good reasons to oppose any claim that the findings derive from theories positing speech is separable from language. Above all, without voluntary control over words, it is doubtful that language could develop.⁶ Secondly, although often treated as distinct, in both ontogeny and everyday life, speech, language and gesture constitute an expressive whole. In spite of structuralist doctrine (Saussure, 1916; Bloomfield, 1933), no behavioural “gap” separates the verbal and non-verbal. Rather, both aspects of utterance activity are part of kinesic expression (e.g. Kendon, 1990; McNeill, 1992; Armstrong et al., 1995; Harris, 1995). Thirdly, even if language were separable from speech, observations about brain-sculpting urge scepticism about the localisation of brain functions. While brains *are* modular,⁷ local and general factors affect how exactly different regions are connected. As Deacon suggests, organic computation may exploit localisation without this determining structure. Not only would this explain evidence from aphasia (pp. 280 ff) but, as noted, it fits with task differences and, perhaps, variation in brain-activity accompanying different languages. Indeed, since the brain is a sculpted organ what belongs to nurture is given by nature. Rather than argue about equipotentiality, vertebrate behaviour can be seen as contextualized interaction. In Hinde’s (1987, 1998) terms, while neurophysiologically constrained, dialectical processes imbue real-time interaction with patterns characteristic of individuals, groups and, especially in primates, types of relationship.

Investigating how language maps onto the prefrontal cortex confirms that this region, which is disproportionately large in humans, is not a language area. Further,

⁴ Elsewhere, I give theoretical and empirical grounds for denying that human uniqueness is demonstrated by “turn-taking”. (Cowley, 1998).

⁵ Elsewhere (Cowley, 1994), I argue that, in all vertebrates, communication is governed by co-ordination. If we are looking for convergent solutions, likely candidates may link human vocalization to duetting in gibbons and/or gelada baboons.

⁶ An obvious flaw of Pinker’s (1994) “language instinct” theory is its assumption that language learning is involuntary and unrewarded.

⁷ Elman et al. (1998) endorse the view that brains (not minds) are modular.

like counting by rote, some language tasks require minimal prefrontal involvement. Just as for other primates, many sensorimotor aspects of behaviour are automatised and, when they exploit rote learning, require no higher-level input. It is also of interest that the prefrontal cortex gives rise to features which segregational linguists often treat as marginal. It is exploited, for example, in aspects of language-activity that involve the socially mediated invention of new words (pp. 259 ff). Indeed, its role in creating symbols (p. 264) leads to a claim that, without development of this area, humans could not have crossed the symbolic threshold. For Deacon, the ‘front-heavy’ nature of human brains helps us learn the skill of suppressing contextual information to interpret symbols (p. 277). Evidence from children suffering from autism and Williams syndrome (pp. 273–275) suggests that the prefrontal cortex links with other areas of the brain to ensure social biases influence word-based understanding.

Front-heavy ways of contextualizing are typically human. In the first place, if language routines draw on older areas of cognition, novel aspects of language must exploit connections that lead to new sense-making. Not only does this differ from a product emphasis in earlier views, but it fits with what emerges in animal training programmes. If difficulties in vocal control are overcome, several species learn to understand talk and, in some settings, produce appropriate action. While the parrot, Alex, can vocalize conceptual knowledge of shapes (e.g. Pepperberg, 1986), Savage Rumbaugh’s work with the bonobo Kanzi has been so successful that they have had anxious exchange about a man on a roof where, she had told him, a monster lives (Savage-Rumbaugh et al., 1997). Despite these abilities, however, bonobos and parrots use symbols to contextualize experience intrinsic to routines. They do not, it seems, engage in symbol-making, use monologue, ask questions, or exploit symbols for modelling the world. This too suggests that language adapts to brains rather than that human brains embody language “organs”.

What are we to make of the developmental evidence? While less clear-cut than that about the pre-frontal cortex, it also fits the idea that brains and language co-evolved. To bring this out, it is useful to consider Deacon’s views on the importance of chronotopic constraints in language learning. Rejecting the view that development is completed when a system reaches a “final state”, he emphasises that connectivity arises in accordance with species-specific patterns. In learning to see, for example, it is well established that the networks enabling a cat to carry out the necessary activity are in place well before birth. Thus, when its environment is experimentally manipulated, competitive processes disrupt brain-activity and permanently damage sight. Were language development similar, this would fit recent work exploring capacities for phonetic discrimination (e.g. Jacuszk, 1997) and support a common-sense reading of the critical period hypothesis (see Sampson, 1997). Rather than model language development in terms of states, we can say that as brains grow and are sculpted, persons learn to take part in social practices.⁸

⁸ Not only do we learn grammar but we develop a network of indexical and iconic representations. Significantly, for Pinker (1994), these are *not* language: rather, their equivalents are present in mentales (for succinct critique, see Sampson, 1997).

Whereas Pinker thinks of language growth as an internal, causal process, Deacon emphasises neurons deal with what is, for persons, “more than” structural information. In carrying out linguistic tasks, brain-activity also exploits what Peirce (1955) describes by appeal to indexical, iconic and symbolic representation. Rather than something that is processed, information heard during talk excites sensations that evoke sensorimotor action and, therefore, how brain regions connect. Experience thus influences function by exploiting the range of different cell types found in brains. A cognitive roboticist would stress that this is pertinent to the distinction between (Shannon) “information” and “information-for-an-agent”. Unlike abstract probability reduction, information-for-an-agent “affords” action potential. While anything but unconstrained, learning will exploit neural activity that draws on relevant biases that have arisen in evolutionary history (p. 205). This is why a new species has connections appropriate to its niche (p. 302) and an embryo’s axons form patterns suited to a species-specific way of living. Far from exploiting deductive logic, from the perspective of natural selection, neural growth and sculpting are adapted to cope with chance. They use “outside” influences which, over time, ensure some neural connections are culled and others reinforced. If, as in humans, homeotic genes ensure slow growth this process can augment the contribution of brain-change to learning. And, as models have shown, related principles affect “learning” simulated in artificial connectionist systems (Elman et al., 1996). What distinguishes Deacon’s view of how neural connections develop from their engineered counterparts, however, is that the nature of the process changes over time. Early growth-supported learning gives way to changes relying on what is reinforced, and brain-sculpting that exploits cell-death and the atrophy of connections (pp. 195 ff). It is as if, once basic patterns are in place, axons die off to help brains adapt to bodies whose adjustments meet the requirements of “outside” social worlds. Brains help organisms get used to things by favouring nonlinear patterns of development that, in Vygotsky’s (1978) sense, lead to “internalisation” of social practices and learning that proceeds with qualitative jumps. Strikingly, advances in understanding early phonetic learning support this view in that, at a few days or weeks, infants hear phonetic distinctions that, a year later go un-noticed (e.g. Jaszuk, 1997). Neural abilities shape development so that infants become able to identify predictable (phonological) “patterns”. Far from applying only to “higher” cognitive skills, this skewed development explains qualitative shifts typical of much learning. Not only does it corroborate Deacon’s model, but interplay between growth and sculpting may clarify developmental findings in fields as diverse as those concerning abilities to imitate (cf. Melzoff and Gopnik, 1996) how memory is applied (Nelson, 1996), and the shaping of emotional expression (Stearns, 1994).

7. Human brains and token realism

Deacon views the brain as an instrument that develops thanks to the principle of displacement, Baldwinian evolution and the vicissitudes of an individual’s experience (both in utero and post-natally). The brain is thus inseparable from its genotype, its

body, and the world in which it is alive. Against this dynamic setting, language becomes insinuated into developing neural organization as an individual exploits symbol-mediated activity to develop social skills and capacities. Crucially, these draw on not only intraspecific (“higher”) cognitive functions but also those of older brain regions. We are predisposed to master both (what we think of as) form-based patterning and activities that exploit what a person *interprets* as information.

In Deacon’s work, this new cognitivist vision of the brain is juxtaposed with a theory deriving from Peirce’s semiotics. Specifically, he takes the view that minds interpret symbols thanks to a discrete “referential relationship”. Mature adults, Deacon thinks, are fully equipped for symbolic reference thanks to the development of species-specific neural organization. Implicitly, to exploit this uniquely human resource, words are conjured up, firstly, as internal tokens and, later, as elements that contribute to externally conditioned utterance acts. In short, Deacon combines an external model of grammar with an internal model of symbolic reference. Below, I argue this split analysis of language engenders theoretical difficulties and contradictory observations about evolutionary, developmental and real-time brain events.

Deacon’s split vision of language invites critique from far beyond integrational perspectives. Thus in his review of Deacon’s “outstanding synthesis”, Hudson (in press) suggests that positing an inbuilt capacity for symbolic reference is “circular” and derives from a (mistaken) assumption that lexical and syntactic organization are fundamentally different. This, together with the lack of space given to syntax, enables those treating languages as constrained by form-based combinations to argue Deacon lacks understanding of the “real object” of linguistics (howsoever conceived). For those who treat languages as social constructs, his token-realism will seem to prop up the (allegedly) erroneous view that brain-events influence linguistic choices. For those theorising languages as biological systems, by contrast, it may seem bloody-minded to argue that, on the one hand, we exploit internal symbol-tokens and, on the other, that we have no need for internal grammars. Contra Deacon, if co-evolution gave brains a propensity to acquire symbol tokens, this is reason to follow generative tradition by hypothesising parallels between artificial symbolic computation and the workings of (putative) internal grammars.

Seeing no need to argue for a split conception of language, Deacon asserts the relevant abilities are guaranteed by a “referential relation”. To his mind, “one of Peirce’s most fundamental and original insights” (p. 73) was to recognise that interpretation exploits a hierarchy of natural kinds of symbol (or “sign”). As these can be iconic, indexical and/or symbolic, interpreting an utterance is pictured as a causal process that must depend on the (complex) sense a sign evokes. It is aligned, not with action, but a kind of perception closely akin to “information processing”. Overlooking ecological counter-arguments (e.g. Gibson, 1979; Grene, 1990; Harré, 1990), Deacon takes interpretation to be a process whereby utterances are automatically mapped onto neurological tokens that call up a partial sample of a “virtual set of associations” (p. 266). Rather than treat this as a picture, Deacon thinks the brain actually maps utterances onto an (inner) system with a “definite and distinctive typology” (p. 99). In short, he sees neither that the model derives from post-Bloomfieldian linguistics (see Matthews, 1993), nor that it emerged from an interest

in “value-free” propositions. For Deacon, utterances are determinate symbol-configurations: when interpreting we “reconstitute” (p. 266) symbolic reference on the basis — not of what a person hears — but thanks to neural tokens that allegedly make this possible.

From an integrational point of view, the problems with this theory are familiar from a general criticism of segregational thinking (e.g. Harris, 1981, 1996; Davis and Taylor, 1990; Toolan, 1996; Harris and Wolf, 1998). His “split” vision shares with its “autonomous” rivals the assumption that there is such a thing as context-free language (viz. “pure” acts of symbolic reference). In the first place, this is because, temporarily forgetting talk is iconic and indexical, Deacon treats language as mapping onto neurological tokens. Secondly, he uses a surrogational model of communication (see Harris, 1998) in assuming that, to the extent utterances are symbolic, they must derive from (at least) a two-stage process whereby internally generated tokens *later* slot into externally sanctioned frameworks. Thirdly, a mechanical view of interpretation treats “literal meaning” (for criticism, see Toolan, 1996) as an entity akin to the positivist’s verifiable proposition. In spite of insights about how the brain depends on mind-world interaction, token-realism harks back to ideas developed by Wundt (1911–1192, originally published 1900), Russell (1940), the younger Bloomfield (1914) and Saussure (1916). Deacon’s compromise between internal and external views of language is unlikely to win many theorists to a co-evolutionary position.

The split vision of language also sits ill with Calvin’s (1997) neurophysiological criticisms of co-evolutionary theory and, in particular, with his claim that it makes the “usual mistake” of confusing natural selection favouring language with selection “for” language. In the terms of this paper, his token-realism jars with not only the principle of displacement but also observations about brain-sculpting. Indeed, as Deacon himself emphasises, natural selection brings about — not the development of simple systems — but, rather, increasing diversification and distribution (p. 29). It is improbable therefore that, brain-internally, the referential comes to disengage from sensorimotor-based experience. Rather, any such separation of the referential from the indexical and/or iconic would seem to have the hallmarks of metalinguistic practices such as the making of lists consisting in written sequences of marks. Secondly, it is difficult to believe that a brain whose knowledge-bearing properties are complex, distributed, and reliant on inter-regional connections needs pure mappings between neurological tokens. Thirdly, the doctrine contradicts observations about the brain’s plasticity. Since rote counting and sorting shapes do *not* rely on the same representation of, say, “square”, there is no reason to think that — brain internally — “square” is a symbol at all. Indeed, findings about the prefrontal cortex suggest there is *no* need for internal type-token relations. If the region creates expressions, the brain needs — not storage-capacity — but means for linking words with experience-based patterns. Finally, inner-tokens are incompatible with flexible mind-world interaction and practices that are profoundly biosocial. If brains are hybrid, they depend on principles unlike those of artificial computing. As enquiry into dynamical systems shows (e.g. Thelen and Smith, 1994; Clark, 1997), internal token systems are not *necessary* for cognition.

Token-realism also runs into practical, logical and philosophical difficulties. Firstly, to posit we know “pure” symbols merely pushes debate between empiricists and nativists to a lower level. This is because, if using word-based forms exploits arrays of word-types, the “types” must pre-exist learning and also use a mechanism for connecting to and/or disconnecting from nonsymbolic representations. By evoking “pure” representational knowledge, token-realism revives philosophical problems pitting body against mind, nature against nurture. Secondly, from a logical point of view, if a brain can embody the “same” token on two occasions, determinate neural connections are necessarily replicated at different times. However, if we lack a language module, the distributed nature of connections linking the symbolic and the non-symbolic makes this replication both statistically unlikely and devoid of functional value. Indeed, if grammar is external, symbols need connect neither with novel nor socially-conditioned patterns because symbol replication is unnecessary. Thirdly, what applies to one brain applies to others. Even if brains do acquire fixed and determinate sets of token mappings, there is no reason for these to correspond to (external) words or determinate representations in other brains. Intuitively, as implied by the builder’s tired speaking of *slab* (see above) a species whose behaviour binds the symbolic and the non-symbolic has potential for communicative flexibility. Finally, even if such a distinction were neurally embodied, we cannot identify utterances that exploit referentially pure internal tokens. Conscious use of language, like its more “automatic” counterpart, is typically iconic, indexical and symbolic. Symbolic action, it seems, is functionally at one with its non-symbolic counterpart. Peirce’s semiotic typology would seem to be — not a basis for positing neural reality — but rather a useful heuristic. Below, I argue co-evolutionary theory gains power if it abandons token-realism.

8. Human brain dynamics in integrational perspective

Once token-realism is overthrown, we can take the view that co-evolution primed us for use of external symbols or, in lay terms, words. With Harré and Stearns (1997), we can posit that humans exploit neurally-based predispositions for what they call “symbolic manipulation”. Since language connects brain with behaviour, brains are integral to social practice. Accordingly, before revisiting the co-evolutionary thesis, I consider consequences of abandoning neural tokens by sketching an integrational view of how brains are insinuated by language.

Instead of treating tokens as internal entities, we can regard language as symbolic only in appearance. In other words, especially in literate societies, humans rely on shared illusions derived from versions of the “language myth” (see, Harris, 1981). Language is regarded as symbolic not because talkers “really” use neurological language-tokens but because we are heirs to metalinguistic models that describe language-behaviour this way. For the integrationalist, this insight is the basis for refounding linguistics. Instead of seeing languages as inherently systematic, interest shifts to capacities for treating whatever-there-is as more coherent than the evidence merits. In this perspective, Deacon’s token-realism is explicable by his lacking a

concept of contextualization and failure to see that it may be metaphorical to say tokens are “produced” and “processed” brain-internally. In short, the co-evolutionary basis of talk may lie, not in symbolic reference, but in our predispositions to exploit the iconic/indexical/symbolic fullness of experience. Social realities may well be constituted as brains make things happen in ways that the persons concerned regard as “rational”.

Utterance-activity is not “purely” symbolic. Provided it is viewed from close up, even cursory examination shows it to be irreducible to the linear configurations of morphemes venerated by tradition. Physical properties of talk (and silence) lasting fractions of a second show vocalizations to be events whose interpretation is inseparable from jointly constructed bodily activity (e.g. Couper-Kuhlen, 1996; Cowley, 1997a,b, 1998). While I have explicated the point with reference to dialogical functions of prosody, the same principle almost certainly operates in the domains of gesture, posture and facial expression (e.g. Condon, 1976; Kendon, 1990). Only believers in the language myth see utterance activity as other than tightly co-ordinated events organized in episodes whose outcomes can be unexpected. For the same reason, what “counts” as utterance-activity depends on the circumstances and brains from which it springs. For the utterance maker, formal and physical characteristics of vocalizations often matter less than how, in real-time, persons respond. Queer as it sounds, contextualizing activity itself imbues the sense of an utterance with human responsiveness (see, Shotter, 1994) characterised by Wittgenstein (1958) as *how a person goes on*.

While contextualizing dominates dialogue, related “interactive” processes fuel the creation and interpretation of both its monological counterparts and many “non-linguistic” acts. Thus, a visual artist or hunter-tracker also engages in historically specific contextualizing activity. What, though, does this imply for the brain? Firstly, it fits the new cognitivist view that the organ functions by exploiting signs as a basis for body–world interaction. Far from being a black box that interprets “input” in relation to goals, its contextualizing powers help us do what, within a set of cultural circumstances, “feels right”. While neural activity may be the processing of (Shannon) information, brain functions mediate action relying on “information-for-an-agent”. Human brains enable us to adjust behaviour by attuning to (social) environments. Extending the idea to Deacon’s work, we can say that persons exploit brain dynamics to embody contextualizing activity. In looking at, say, a PET scan we see, not an analogue to “language processing”, but images of a contextualizing brain. Stripped of token-realism, Deacon’s work is read as showing that, in language, persons act *as if* to command events. In Clark’s phrase, brain instruments “make things happen”.

Exploiting language depends on activity quite unlike that modelled in closed systems of rules and symbols. Disembodied machines undertake nothing even remotely like talking because of the draconian constraints that limit their computing powers. Symbol manipulating machines, unlike language-trained individuals (even Alex, the parrot), cannot develop world-relevant flexibility precisely because their symbols are radically disembodied. Indeed, this is why habits, skills, strategies, sensations, etc., are caricatured by translation into symbolic form. Unlike computers, language-trained individuals *take part in* (what we think of as) symbolic manipulation. Although not

a matter of principle, it is anything but trivial to assert that while machines compute, living beings contextualize. While constraining action, brains shape sense-making in ways that remain opaque to acting persons. From the perspective of socialised, biological individuals, however, brains matter because of what world-based sculpting empowers persons to do.

Far from being symbol processing mechanisms, brains are biological links between persons, bodies and societies constituted in and by history. Individuals with uniquely sculpted brains emerge from interplay between phenotype, genotype and collectively constituted social worlds. We are biosocial persons whose brains fulfil goals characterised, roughly, in saying we act “with intention”: tasks we carry out must be recognised as separate from the neural instruments used to accomplish our goals (cf. Harré, 1999). Even in doing something as “simple” as, say, counting items in a warehouse (see Scribner, 1997) persons use brains and bodies differently. Further, since brain activity affects what occurs *between* us, its consequences are usually unpredictable. One person’s acting can, quite unexpectedly, open up new ways of contextualizing the world-perceived.

Unlike problem-solving mechanisms, brains perform organic computation that may exploit symbolic activity in solving problems. This is the importance of, say, the finding that a simultaneous translator can, on one occasion, listen to German with right hemisphere bias and, on another, revert to using a dominant left hemisphere. Indeed, the principle of displacement provides support for the contested integrational claim that the “same” word-based forms are not the “same” either in different brains or the same brain at different times (Harris, 1981, p. 155; Pateman, 1987, p. 2). Further, because we solve problems differently, our brains are sculpted differently. And, social circumstances permitting, Baldwinian processes exploit reproductive success to induce changes in the occurrence of neural sculpting. It is no trivial fact that, as Putnam showed (1990, originally published 1967), being in pain can correspond with many configurations of brain-activity. Rather, investigating brain differences points towards new ways of explicating how we shuttle between what Levinas (1993) calls the “saying and the said”. Whereas the said incorporates metalinguistically mediated practice, the saying may draw heavily on a person’s cognitive biases (see Sacks, 1986; Levinson, 1995). Our bodily instruments may ensure that what is actually heard is infused with activity driven by another person’s brain and body. In short, the semantic basis of talk may lie — not only in known forms/functions — but in activity as biosocial as tennis. Although linguistic tasks vary in use of brain-hybridity, they are always embodied and dependent on sculpted neural organization. As in using our muscles, contextualizing as we do today affects what we achieve tomorrow. Integrational theory can seek to explicate — not only metalinguistic practice — but also the biosocial basis of human life.

9. Co-evolution revisited

Deacon’s co-evolutionary thesis is riven by tension between two guiding thoughts. While insight that people live in a symbiotic relationship with language promises

escape from the nature-nurture debate, his token-realism threatens to pull co-evolutionary theory back into the philosophical mire. From an integrational perspective, the theory needs to be freed of the assumption that words correspond to neural tokens. Instead of appealing to symbolic reference, what is needed is recognition that no utterance can be context-free and that every contextualization is necessarily unique (Harris, 1998). When co-evolution of language and brain is seen to have brought about *this* outcome, it gives rise to a powerful heuristic for understanding mind-world interactions.

In any ordinary sense, an individual crosses a symbolic threshold every time he, she, or it learns to participate in talk. Laboratory experiments aside, humans alone make use of abilities to co-ordinate utterance acts finely by giving rise to phonetic patterns that permit form-based analysis. And, as Deacon demonstrates, the principle of displacement goes a long way towards explaining the emergence of this remarkable capacity. In broad terms, as I have stressed, the co-evolutionary model provides a new way of thinking about the biosocial primate brain. Thanks to the principles of brain change adduced in *TSS*, we contemplate the thought that “design” features of language derive not from neural “structure” but from how brain dynamics are exploited in meeting an agent’s socially constrained needs. Although brains empower us by constraining how we act, they are subject to processes which ensure, first, that language catches hold and, later, that it grows in complexity as an emergent person gains familiarity with sociohistorically specific practices.

To integrational thinking, this broad vision is undermined by Deacon’s use of Peirce in theorising the symbolic threshold as a neural reality. The problem is that, *contra* Kant, interpretation is taken to depend on a perceptual process distinct from cognition.⁹ This leads to the thought that, for an external sign to be interpreted as a unit whose value derives from a symbolic system, interpretation must be a neural activity. At times Deacon falls into the trap of implying that, brains — not conscious human bodies — are masters of symbolic reference. Indeed, this careless move prevents him from seeing that token-realism fits ill with his own co-evolutionary vision. Accordingly, I have argued it can be replaced by recognition that persons use neurally grounded capacities to contextualize experience by responding to events in ways that may influence future action.

Without a concept of contextualization, Deacon’s co-evolutionary theory remains open to several objections. For example, in spite of how the brain is presented, his thought echoes an old cognitivist emphasis on interspecific brain-differences. For all its radical implications, Deacon tends to play down the idea that brain-sculpting occurs in a social reality. Inevitably, then, difficulties arise with observations about the so-called symbolic threshold. Why, it can be asked, do trained bonobos and parrots not make dramatic linguistic progress once they have been helped across? And, once children cross the threshold, why do they not move rapidly to abstract ways of contextualizing? Another difficulty raised by token-realism is that, if language is

⁹ The philosophical point is argued by McDowell (1994); similar ideas appear in Harré (1999).

based on an inner capacity for symbolic-reference, it should have much in common with the simple “codes” of vervets and Wittgenstein’s builders. In fact, of course, far from being form-based, it is inseparable from, among other things, the environment, social and relationship norms, memory quirks, and everything contributing to prosodic, gestural, and verbal behaviour. In modern humans, there has been no withering away of the links between language and the central grey area (e.g. Weisenkrantz, 1987). Indeed, not only is human intelligence profoundly skewed by social bias, but “purer” forms of symbolic manipulation are difficult even for educated adults (see Kahneman et al., 1982).

These problems vanish if the outcome of co-evolution becomes — not a substratum of neurological tokens — but an enhanced capacity for symbolically-mediated contextualizing. Logically, the above objections have no impact on an integrational version of the co-evolutionary thesis. Symbolic manipulation, on this view, depends on fuzzy social systems whose development changed brains just as the dynamics of social practices were constrained by brain change. Or, simply, while brains constrain language, linguistic practices constrain “brain-use”. Challenging the internal notion of symbolic reference ensures that, in its place, importance is given to practices that drive changes in contextualizing and, by so doing, give rise to myths, legends, history and science.

10. Why brains matter

The Symbolic Species shows brains matter to language precisely because they exploit Darwinian competitive processes whose powers, while subject to species-specific constraints, encourage the diversification and distribution of cultural resources. Unless there is an undetected flaw in the argument, it necessarily follows that brain development is inseparable from the experience of a particular body that has developed in sociohistorically unique world. Crucially, this implies that debating the development of language around a dichotomy of learning and/or genetic determinism is grossly oversimplified. The triumph of *TSS* is therefore to have shown how — in principle — competitive neural processes allow primate brains to become biosocial organs. In spite of its simplicity and generality, the segregational assumption that brains are “natural” thus provides an inadequate basis for describing (let alone explaining!) language. It ensures that the models have nothing to say about how language is insinuated into brain activity not only in evolutionary, but also in developmental, historical, experiential and real-time.

Reading *TSS* from an integrational point of view simplifies the hypothesis that brains and languages emerged symbiotically. To posit that natural selection favours changes in the brain ensures a traditional fixation with word-based forms gives way to a new cognitive concern for mind-world interactions. Further, by focusing on contextualizing, greater weight can be given to differences in how mind is manifest across persons and social circumstances. Rather than invoke a bogus opposition of nature and nurture, we ask how different kinds of activity influence brain-sculpting and, of course, how brain change affects our capacities to take part in social practices.

Finally, while giving us new ways of looking at differences between social groups, this reading of *TSS* brings us closer to other primates. Although we alone develop complex symbol-mediated ways of experiencing a socially constructed world, as for all primates, these arise from brain-mediated social bias (cf. Byrne and Whiten, 1988; Goody, 1995; Whiten and Byrne, 1997). Social activity reflects both opportunities persons afford and our intentions. In coming to use brains to contextualize experience, individuals exploit abstract goals (e.g. discovery of truth), enjoy the natural opiates our brains produce (see Dunbar, 1996), and fulfil their ambitions (e.g. climb a hierarchy, obtain a healthy mate). Like grooming, as Dunbar (1996) argues, language is joint action that fulfils social purposes by allowing individuals to exploit our neighbours' bodies and brains. Unlike its evolutionary predecessors, though, language also contributes to technological fantasies and, of course, houses of cards.

Recognition that brain-dynamics are crucial to what we do also shows brains matter in a less obvious sense. Applied to real-world issues, if language abilities underpin control of external symbolic manipulation, community practices shape not only what we think but, more significantly, *how our brains function*. Not only does this counter facile social determinism but suggests capacities for brain-use may derive less from design than chronotopically influenced events and practices. If this is so, what social groups value itself influences how brains are shaped by the persons who constitute the group. A co-evolutionary view of contextualization, therefore, raises social questions that imply, among other things, that the politics of brain-use may be a battleground of the future.

Finally, this reading of the co-evolutionary thesis stresses that, while used to contextualize the world-perceived, brain design acts so that, for bodies, things happen. They are most unlikely to rely on executive control-systems or a core of cognitive processes separable from action and perception. Human brains may be predisposed for interpersonal relations in ways which, given our fascination with what others afford, is crucial in formation of self. What is striking about reading *TSS* in this light is that, breaking from form-based theory, it opens new questions about the emergence of languages, persons and other dynamic *social* systems. If ways of contextualizing emerge in tandem with a hybrid brain, the *TSS* brings out why the reflexivity of language is crucial to human cognition and communication. While genetically designed to perceive the world symbolically, we may do so without neurologically encoded symbol-tokens. Rather, the trick may lie in a propensity for belief. Instead of relying on symbol tokens, language learning may depend on a predisposition to accept mythical constructs. Socialization may be fostered by — not special brain-properties — but a tendency to ascribe “reality” to, for example, sounds, spirit-ancestors, lies and, in scientific communities, symbolic reference.

References

- Armstrong, D.F., Stokoe, W., Wilcox, S.E., 1995. *Gesture and the Nature of Language*. Cambridge University Press, Cambridge.

- Bickerton, D., 1990. *Language and Species*. Chicago University Press, Chicago.
- Bloomfield, L., 1914. *An Introduction to the Study of Language*. Bell, London.
- Bloomfield, L., 1933. *Language*. University of Chicago Press, London.
- Brooks, R.A., 1991. Intelligence without representation. *Artificial Intelligence Journal* 47, 139–159.
- Byrne, R., Whiten, R.W., 1988. *Machiavellian Intelligence*. Oxford University Press, Oxford.
- Calvin, W.H., 1997. Talking heads. *New York Times Book Review*, 10 August.
- Carruthers, P., Boucher, J., 1990. *Language and Thought: Interdisciplinary Themes*. Cambridge University Press, Cambridge.
- Christiansen, M., in preparation. *Language as an Organism — Implications for the Evolution and Acquisition of Language*. (Web version available at <http://www.siu.edu/~mortenc/csl>).
- Christiansen, M., Devlin, J., 1995. Recursive inconsistencies are hard to learn: a connectionist perspective on universal word order correlations. In: *Proceedings of the 19th Annual Cognitive Science Society Conference*. Lawrence Erlbaum Associates, Mahwah, NJ, pp. 113–118.
- Clark, A., 1997. *Being There: Putting Brain, Body and World Together Again*. MIT Press, Cambridge, MA.
- Clark, A., 1998. Magic words: how language augments human computation. In: Carruthers, P., Boucher, J. (Eds.), *Language and Thought: Interdisciplinary Themes*. Cambridge University Press, Cambridge, pp. 162–183.
- Condon, W.S., 1976. An analysis of behavioral organization. *Sign Language Studies* 13, 285–316. Weitz, S. (Ed.), 1979. *Nonverbal Communication: Readings with Commentary*. Oxford University Press, New York, pp. 149–167 (reprint).
- Couper-Kuhlen, E., 1996. The prosody of repetition. In: Couper-Kuhlen, E., Selting, M. (Eds.), *Prosody in Conversation*. Cambridge University Press, Cambridge, pp. 366–405.
- Cowley, S.J., 1994. Conversational functions of rhythmical patterning: a behavioural perspective. *Language and Communication* 14, 353–376.
- Cowley, S.J., 1997a. Conversation, co-operation and vertebrate communication. *Semiotica* 115 (1/2), 27–52.
- Cowley, S.J., 1997b. Of representations and language. *Language and Communication* 17 (4), 279–300.
- Cowley, S.J., 1998. Of timing, turn-taking and conversations. *Journal of Psycholinguistic Research* 27/5, 541–571.
- Davis, H., Taylor, T.J. (Eds.), 1990. *Redefining Linguistics*. Routledge, London.
- Dawkins, R., 1986. *The Blind Watchmaker*. Penguin, London.
- Dennett, D., 1997. Our mind's chief asset. *Times Literary Supplement*, 16 May, p. 5.
- Dreyfus, H.L., 1971. *What Computers Can't Do*. Harper and Row, New York.
- Dreyfus, H.L., 1992. *What Computers Still Can't Do*. MIT Press, Cambridge, MA.
- Dunbar, R.I.M., 1996. *Grooming, Gossip and the Evolution of Language*. Faber and Faber, London.
- Elman, J.L., Bates, E., Johnson, M.H., Karmiloff-Smith, A., Parisi, D., Plunkett, K., 1996. *Rethinking Innateness*. MIT Press, Cambridge, MA.
- Gibson, J.J., 1979. *The Ecological Approach to Visual Perception*. Houghton Mifflin, New York.
- Glenberg, A.M., 1997. What memory is for. *Behavioral and Brain Sciences* 20 (1), 1–55.
- Grene, M., 1990. Perception and human reality. In: Bhaskar, R. (Ed.), *Harré and his Critics*. Blackwell, Oxford, pp. 17–22.
- Goody, E., 1995. *Social Intelligence and Interaction*. Cambridge University Press, Cambridge.
- Gould, S.J., 1977. *Ever since Darwin: Reflections in Natural History*. WW Norton, New York.
- Halliday, M., 1985. *An Introduction to Functional Grammar*. Edward Arnold, London.
- Harré, R., 1990. Exploring the human *umwelt*. In: Bhaskar, R. (Ed.), *Harré and his Critics*. Blackwell, Oxford, pp. 297–364.
- Harré, R., 1992. Introduction: the second cognitive revolution. *American Behavioral Scientist* 36, 5–7.
- Harré, R., 1999. Nagel's challenge and the mind body problem. *Philosophy* 74, 247–270.
- Harré, R., Stearns, P., 1997. *Discursive Psychology in Practice*. Sage, London.
- Harris, R., 1981. *The Language Myth*. Duckworth, London.
- Harris, R., 1995. *Language, Signs and Communication*. Routledge, London.
- Harris, R., 1997. *The Language Connection*. Thoemess, Bristol.

- Harris, R., 1997. From an integrational point of view. In: Wolf, G., Love, N. (Eds.), *Linguistics Inside Out*. Benjamins, Amsterdam, pp. 229–310.
- Harris, R., 1998. Three models of signification. In: Harris, R., Wolf, G. (Eds.), *Integrational Linguistics: A First Reader*, pp. 113–125. Pergamon, Oxford, Originally in Gill, S.H. (Ed.), 1993. *Structures of Signification*, Vol. 3, New Delhi, Wiley, pp. 667–677 (reprint).
- Harris, R., Wolf, G. (Eds.), 1998. *Integrational Linguistics: A First Reader*. Pergamon, Oxford.
- Hebb, D.O., 1949. *The Organization of Behaviour: A Neuropsychological Theory*. Wiley, New York.
- Hinde, R.A., 1987. *Individuals, Relationships, and Culture*. Cambridge University Press, Cambridge.
- Hinde, R.A., 1998. *Relationships: A Dialectical Perspective*. Psychology Press, Hove.
- Hudson, R., in press. Review of Terrence Deacon, *the Symbolic Species: the co-evolution of language and the human brain*. *Journal of Pragmatics*.
- Hunt, E. 1999. What is a theory of thought? In: Sternberg, R.J. (Ed.), *The Nature of Cognition*. MIT Press, Cambridge, MA, pp. 3–50
- Jacuzk, P., 1997. *The Discovery of Spoken Language*. Cambridge University Press, Cambridge.
- Kahneman, D., Slovic, P., Tversky, A., 1982. *Judgement under Uncertainty: Heuristics and Biases*. Cambridge University Press, Cambridge.
- Kendon, A., 1990. *Conducting Interaction*. Cambridge University Press, Cambridge.
- Krebs, J.R., Dawkins, R., 1984. Animal signals: mind-reading and manipulation. In: Krebs, J.R., Davies, N.B. (Eds.), *Behavioural Ecology: An Evolutionary Approach*. Blackwell Scientific, Oxford, pp. 380–402.
- Levinas, E., 1993. *Collected Philosophical Papers*. Kluwer Academic, Dordrecht.
- Levinson, S.C., 1995. Interactional biases in human thinking. In: Goody, E. (Eds.), *Social Intelligence and Interaction*. Cambridge University Press, Cambridge, pp. 206–220.
- Locke, J.L., 1993. *The Child's Path to Spoken Language*. Harvard University Press, London.
- Matthews, P.H., 1993. *Grammatical Theory in the United States from Bloomfield to Chomsky*. Cambridge University Press, Cambridge.
- Mayr, E. 1988. Is biology an autonomous science? In: *Toward a New Philosophy of Biology*, pp. 8–23. Harvard University Press, Cambridge MA
- Melzoff, A.N., Gopnik, A., 1997. *Words, Thoughts and Theories*. MIT Press, Cambridge, MA.
- McDowell, J., 1994. *Mind and World*. Harvard University Press, Cambridge MA.
- McNeill, D., 1992. *Hand and Mind*. University of Chicago Press, Chicago.
- Nelson, K., 1996. *Language in Cognitive Development*. Cambridge University Press, Cambridge.
- Owings, D.H., Morton, E.S., 1998. *Animal Vocal Communication*. Cambridge University Press, Cambridge.
- Pateman, T., 1987. *Language in Mind and Language in Society*. Clarendon Press, Oxford.
- Peirce, C.S., 1955. *Logic as Semiotic: The Theory of Signs*. In: Buchler, J. (Ed.) *The Philosophical Writing of Peirce (1955)*. Dover Books, New York (originally published 1887/1903).
- Pepperberg, I.M., 1986. Object permanence in the African Grey parrot (*Psittacus erithacus*). *Animal Learning and Behaviour* 14, 322–330.
- Pinker, S., 1994. *The Language Instinct: The New Science of Language and Mind*. Penguin, London.
- Pinker, S., 1997. *How the Mind Works*. W.W. Norton, London.
- Putnam, H., 1990. The nature of mental states. In: Lycan, W.G. (Ed.), *Mind and Cognition*, Blackwell, Oxford, Originally *Psychological predicates*. In: Capitan, W.H. and Merrill, D.D. (Eds.) *Art, Mind and Religion (1967)*. University of Pittsburgh Press, Pittsburgh.
- Putnam, H., 1991. *Representation and Reality*. MIT Press, Cambridge MA.
- Sacks, O., 1986. The president's speech. In: Sacks, O. (Ed.) *The Man Who Mistook His Wife for a Hat*. London, Pan Books, pp. 76–80.
- Sampson, G., 1997. *Educating Eve*. Cassell, London.
- Saussure, F. de, 1916. *Cours de Linguistique Générale*. Payot, Paris (Trans., 1959. *Course in General Linguistics*. Peter Owen, London).
- Savage-Rumbaugh, E.S., 1986. *Ape Language*. Columbia University Press, New York.
- Savage Rumbaugh, E.S., Shanker, S., Taylor, T.J., 1997. *Apes, Language and the Human Mind*. Cambridge University Press, Cambridge.

- Scribner, S., 1997. *Mind in Action: A Functional Approach to Thinking*. In: Cole, M., Engstrom, Y., Vasquez, O. (Eds.), *Mind, Culture and Activity*. Cambridge University Press, Cambridge, pp. 353–368.
- Searle, J., 1980. Minds, brains and programs. *Behavioral and Brain Sciences* 3, 417–457.
- Shotter, J., 1994. ‘Now I can go on’: Wittgenstein and Communication. Paper given at the University of Calgary, 30 September. (Web version available at <http://www.massey.ac.nz/~ALock/virtual/wittgoon.htm>).
- Stearns, P., 1994. *American Cool: Developing a 20th Century Emotional Style*. New York University Press, New York.
- Thelen, E., Smith, L., 1994. *A Dynamic Systems Approach to the Development of Cognition and Action*. MIT Press, Cambridge, MA.
- Toolan, M., 1996. *Total Speech: an Integrational Linguistic Approach to Language*. Duke University Press, Durham.
- Vygotsky, L., 1978. In: Cole, M., John-Steiner, V., Scribner, S. and Souberman, E. (Eds.), *Mind in Society: The Development of the Higher Psychological Processes*. Harvard University Press, Cambridge, MA.
- Weisenkrantz, L., 1987. Brain function and awareness. In: Gregory, R.L. (Ed.), *Oxford Companion to the Mind*. Oxford University Press, Oxford, pp. 110–113.
- West, M.J., King, A.P., 1996. Social learning: synergy and songbirds. In: Heyes, C.M., Galef, B.G. (Eds.), *Social Learning in Animals: The Roots of Culture*. Academic Press, London, pp. 155–178.
- Whiten, R.W., Byrne, R., 1997. *Machiavellian Intelligence II: Extensions and Evaluations*. Cambridge University Press, Cambridge.
- Wittgenstein, L., 1958. *Philosophical Investigations*, 2nd. Edition. Blackwell, Oxford.
- Wundt, W., 1911–1912. *Volkerpsychologie: Eine Untersuchung der Entwicklungs-gesetze von Sprache, Mythus und Sitte*, Vol. 1: *Die Sprache*, 3rd Edition. Engelman, Leipzig (originally published 1900).