Biology, culture and the emergence and elaboration of symbolization

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Introduction

The human language capacity presents biological and cognitive sciences with a striking paradox, since this capacity is unique, even though its biological, cultural and communicative foundations are in large measure shared with non-human species. It is widely known that humans share around 99% of their genetic material with their closest primate relatives, chimpanzees. We also know, since the publication of the initial results of the human genome project, that the linguistic gulf separating the human species from other closely related species is not correlated with a difference of any substantial order of magnitude in the available quantity of genetic material for directly coding the language capacity. This does not falsify claims for such a direct coding, but should at least give pause for thought.

Language, it is plausibly maintained by anthropologists and other human scientists, is the basis of human cultural transmission and of the construction of human societies as symbolic and symbolically mediated orders. However, it has also been shown that culture is not a specifically human achievement. Culture can minimally be defined as the existence of intra-species group differences in behavioural patterns and repertoires, which are not directly determined by ecological circumstances (such as the availability of particular resources employed in the differing behavioural repertoires), and which are learned and transmitted across generations. On such a definition, there is ample evidence of culture and cultural differences in foraging strategies, tool use and social behaviours in chimpanzees (Whiten et al. 1999). Such a definition will also qualify, for example, epigenetically learned intra-species dialect differences between songbird communities as cultural and culturally transmitted behaviour.

Human natural languages are communicative systems, and the primary use of language is to communicate. The extent and nature of the relationship between the communicative functions, and the systemic properties, of natural languages may be disputed, but what cannot
be disputed is that language is a vehicle for human communication. Studies of non-human
communication systems have revealed not only the ubiquity of communication in the animal
world, but also unsuspected complexity in some naturally-occurring systems of non-human
communication. A now-classic example is the communication system of the vervet monkeys
studied by Cheney and Seyfarth (1981). These monkeys employ a system of warning calls in
which each of three call-types codes for the presence of a particular predator (snake, eagle,
leopard). Animals hearing a call respond with behaviour that is appropriate to the danger
posed by the predator: hearing an eagle call, they descend from a tree, hearing a snake call
they ascend a tree.

The capacity to use elements of, or corresponding to, the lexicons of human natural
languages communicatively is certainly not unique to humans. People have communicated
with domestic animals for countless generations. However, non-human animals can do more
with human natural languages than respond to simple instructions. When raised in an
environment broadly resembling the cultural and communicative settings in which human
infants acquire language, bonobos (Pan paniscus) can apparently acquire extensive receptive
and productive lexicons, use them combinatorially in ways which involve quite complex
event characterization, and apparently spontaneously teach such uses to their offspring
(Savage-Rumbaugh and Fields, 2000). African grey parrots, when participating in structured
communication settings, can also learn extensive vocabularies and employ them for cross-
classification of objects according to different object attributes (Pepperberg, 1999).

Given these findings, would it be correct to conclude, as some have, that the human
language capacity is, after all, not species unique? Such an argument would hold that the
evident continuity we can observe between humans and non-humans in genetic makeup,
capacity for culture, and capacity to use language-like signs communicatively, justifies the
“gradualist” conclusion that the difference in complexity between human natural languages,
and the communication systems and abilities of non-human animals, is non-qualitative. I will
present some arguments why this is not the case. My argument will not focus solely or
primarily upon the unique grammatical properties of human natural languages, although it is
clear that these exist. My argument is rather that, in contrast to non-human signal systems of
communication, human natural languages are symbol systems. The evolutionary transition
from signal to symbol usage, and the exo-somatic, culturally-driven elaboration of symbol
usage into language, accounts for the unique complexity of human language (including
grammar). This emergent complexity, I suggest, has, in the course of evolution co-opted or
captured a suite of cognitive capacities that are uniquely developed (but not unique) in humans. There is no contradiction, I am claiming, between recognizing both the qualitative uniqueness of human language, and the essential continuity between human and non-human neurobiology. After fleshing out my account of the emergence and elaboration of symbolization, I discuss the wider implications of this evolutionary and developmental approach for our understanding of the mind-brain relation in the human species.

The account I offer of the human language capacity is neither nativist nor empiricist, but one based upon the epigenetic emergence and elaboration of symbolization. Each of the terms in this delineation of my approach is technical, and all of them are disputed. Hence, I conclude this Introduction by providing definitions of how I shall use the terms epigenesis (and epigenetic), emergence, elaboration and symbolization.

**Epigenesis**

Contemporary theories of epigenesis in biological and psychological development build upon the pioneering accounts of Waddington (1975) and Piaget (1979). Epigenetic naturalism (Sinha, 1988) proposes a constructivist account of the interaction between genotype and somatic and extra-somatic environment in organismic development. The claim that such an interaction exists is, as such, trivial and undisputed, since everyone agrees that phenotype is co-determined by genes and environment. There are two particularly important characteristics of epigenesis that I wish to highlight here.

The first is that the role of the environmental factors is constructive rather than, or in addition to, being selective. Nativist approaches to the developmental interaction between genotype and environment stress the role of specific input either in permitting a developmental process to unfold, or in parametrically selecting a particular variant of development. An example of the former would be phenomena such as “imprinting”, where an innate and fully endogenous process of development is “triggered” by an environmental event during a critical developmental window. An example of the latter would be the role hypothesized by generative linguists to be played by typological characteristics of target languages in setting parameters and thereby permitting the child non-inductively to acquire the grammar of the target language (Chomsky, 2000). In neither of these cases does the environmental information add any higher level of organization to the genetically coded information. That is to say, the pathway along which the behaviour develops, and its terminal structural complexity, are assumed already to be directly encoded in genes.
By contrast, in epigenesis the developmental pathway and final structure of the behaviour that develops are a consequence as much of the environmental information as of the genetically encoded information. For example, the development of birdsong seems to involve reproduction by imitative epigenetic learning, rather than selection from amongst pre-established alternatives (Marler and Peters, 1982). Fledglings not exposed to a model do develop birdsong, but it is impoverished or unelaborated relative to that of those individuals developing in a normal environment in which models are available.

The second key characteristic of epigenesis is, accordingly, that a genetically specified developmental envelope or window specifies an initial behavioural (or perceptual) repertoire that is subsequently elaborated through experience of a relevant environment. This process of elaboration is directional (see below), and once it has taken place the initial plasticity of the embryonic, or unelaborated, repertoire is lost. A typical example is the development in human infancy of speech sound perception (Bohn, this volume), in which the “universal” initial processor is transformed into a “language-specific” processor in a process that is probably analogous with that of the development of birdsong. We can note here that an epigenetic account of this process differs from a nativist, parameter-setting process inasmuch as no assumption is made that the infant brain is innately equipped with an inventory of all possible natural language phonemes (Characteristic 1, above). Equally, however, it differs from a classical learning account, inasmuch as epigenesis depends upon the elaboration of an initial repertoire which itself is not learned, in a process which cannot be re-run—the initial, unelaborated capacity cannot be re-accessed after the epigenetic developmental process has taken place, as all second language learners come rapidly to realise. In other words, the process of developmental elaboration implies in epigenetic development a transition from relative plasticity and informational openness to relative rigidity and informational closure.

There are two other characteristics of epigenesis that are particularly relevant to human development. One is its neurobiological basis in “Neural Darwinism”, the selective stabilization of synaptic connections during ontogenesis (Changeux, 1985). The other is the role of ontogenesis itself in canalizing phylogenesis, through Baldwin effects and genetic assimilation.

Emergence

The “emergentist” hypothesis has received considerable attention recently as an alternative (closely allied with epigenetic theories) to nativism (MacWhinney, 1999). I will use emergence to mean, quite widely, the development of new properties and/or levels of
organization of behavioural and cognitive systems as a consequence of the operation or cooperation of simpler processes. Epigenesis is thus a special case of emergence. In this paper, I focus on symbolization as a phylogenetically emergent property of communication, as well as upon its epigenetic development in infancy.

Elaboration

By elaboration I mean the process whereby development gives rise to increased complexity of organism, behaviour and cognition. Increase in complexity usually involves both form and function. A crucial distinction between Darwinian natural selection and epigenetic development is that the latter, but not the former, implies elaboration. In ontogenesis, some instances of elaboration are under more or less direct genetic control, others may be epigenetically driven, and still others may be emergent consequences of the elaboration of subsystems. I will not make a strong distinction between emergence (new properties) and elaboration (greater complexity), which I see as two aspects of the underlying directionality of developmental change. Although it is appropriate to reject teleological explanations for Darwinian evolution, and teleology is not inherent in emergence, teleology is inherent in elaboration as a directional process whose “aim” is the increase in the spatio-temporal extent of the lived and cognized environment.

Symbolization

This is the central topic of this chapter, and I shall restrict myself here to some brief remarks which I shall elaborate below. The epigenetic development of symbolization involves the emergence of symbol usage from communicative signal usage. Whereas a communicative signal can be viewed as an instruction (perhaps coded) to behave, the use of symbols involves two emergent properties, reference and construal. Reference and construal are the basic functional components of the representational function of language, and the development of symbolization is essentially the process of the elaboration of the representational function.

2. Signals and Symbols

Signals and signal sensitivity

Sensitivity to signals is as basic a property of life as the ability to reproduce. All organisms are able to detect signals indicating (indexing) the presence of conditions hospitable to survival (including metabolisation) and reproduction. The more complex the organism, the greater the range of signals to which it is sensitive, and the more complex its behaviours both
in response to, and in the active search for, life-relevant signals. So basic is sensitivity to signals to our understanding of life, that we are hesitant to attribute life to self-reproducing biological systems that display this capacity in only a very limited degree, such as prions. In the most general terms life might be defined as the possession by self-organizing systems of the dynamic and mutually influencing emergent properties of reproduction and signal sensitivity, which together provide the basic conditions for the organismic “value system”.

The functional characterization of simple, non-communicative signals is essentially identical to that of the S-R link of classical learning theory, although the responsivity of the organism may be either innately determined or learned. It is diagrammed in Fig. 1.

![Diagram of non-communicative signal](image)

**Figure 1.** A non-communicative signal.

Signals, in social animals, may also be used to communicate (Fig. 2). Social, communicative signals may be *systematic* and *coded*, that is, the same communicative modality may support a variety of coded instructions (as, we may hypothesize, in the vervet monkey alarm calls studied by Cheney and Sefarth), and it is even possible for them to support a simple “code-syntax”. This does not, however, provide any criterion of symbolicty. In the familiar Peircian semiotic categorization, communicative signals, like all signals, are strictly *indexical*, even if they possess internal structure.
In the case of communicative signals, the only necessary attentional relationships are between the sender and the stimulus (signal$_1$), and the receiver and the behaviour (signal$_2$) of the sender. The social exchange of communicative signals does not require intentionality. The sender does not have to emit the communicative signal purposively, since the signal may simply be an innate or learned response to a stimulus. The receiver does not have to direct its attention either to the sender, or to the original stimulus (signal$_1$) that causes the sender to emit the communicative signal, but only to the communicative signal emitted by the sender. The sender is not signifying or representing a “referent” for the receiver, and no mutual awareness of the cognitive viewpoint of sender and receiver is implied in the exchange.

The social exchange of signals, therefore, does not involve intersubjectivity, since there is no shared world of joint attention and reference. Communicative signals are therefore not conventional. They do not depend upon a socially shared world of joint reference, and it cannot be said that there is a shared convention of a sign “standing for” a referent or class of referents, since the receiver does not refer the communicative signal to the stimulus causing the sender to emit it. The mechanism underpinning the social exchange of signals is neither intersubjectivity nor social convention, but simple co-ordination of individual organismic
behaviour (which may, indeed, be complex, arising like many complex behaviours from natural selection).

Symbols and symbolization.
Symbols, on the other hand, are truly conventional, resting upon shared understanding that the symbol is a token representing some referential class, and that the particular token represents a particular (aspect of) a shared universe of reference and, ultimately, discourse.

Conventional symbol systems are grounded in an intersubjective meaning-field in which speakers represent, through symbolic action, some segment or aspect of reality for hearers. This representational function is unique to symbolization, and is precisely what distinguishes a symbol from a signal. A signal can be regarded as a (possibly coded) instruction to behave in a certain way. A symbol, on the other hand directs and guides, not the behaviour of the organism(s) receiving the signal, but their understanding (construal) or (minimally) their attention, with respect to a shared referential situation.

In this way, we can unpack and understand the concept of intentionality, widely understood to be intrinsic to symbol usage, but used in several different ways. For current purposes we can distinguish three meanings (or related aspects) of intentionality:

**Intentionality**\(_1\). Purposiveness or goal-directedness.

**Intentionality**\(_2\). Orientation to others as “minded” beings.

**Intentionality**\(_3\). Directedness to the world, or reference.

I suggest that these different aspects of intentionality are inter-related in symbol usage, which involves the purposive use by a speaker of a symbolic sign to manipulate or direct the mental orientation (construal, or, minimally, attention) of a hearer with respect to an intersubjectively shared aspect of reality (joint reference). N.B.—“speaker” and “hearer” should be understood as producer and interpreter of a symbolic sign in any modality, “reality” should be understood as any aspect of the shared universe of discourse.

It is important to emphasize here that symbolicity is here defined in terms of the semiotic and pragmatic logic of communicative representation, not on the specific typology, in the Peircian sense, of the relationship between sign and object (Sinha, 1988). Even an indexical sign, such as simple pointing, provided it is intentionally produced in an intersubjective field of joint reference, can be regarded as a kind of “proto-symbolic” communication, and the
intentional and conventional production and comprehension of iconic representations such as maps clearly fall under this pragma-semiotic definition of symbolization.

My claim here is that the first criterion for symbolization, or the existence of a symbolic capacity in any organism or simulated organism, is *reference*. It is, however, important to specify that reference, in this definition, is not a property of signs or symbols “in themselves”: symbols refer only by “inheriting” the referential function intended by their users—senders or receivers. The criteriality of reference to true symbolization has been pointed out by several authors, including by John Searle in his famous “Chinese room” thought experiment (Searle, 1980). However, Searle does not locate his argument in an analysis of the logic of communicative representation as grounded in an intersubjective field of *joint reference*, and his account can be criticized for locating referentiality (mysteriously) in the “mind/brain” of the individual speaker/hearer. The account I offer here and elsewhere (Sinha, 1999) is based instead upon a cognitive-functional or *usage-based* analysis of reference as communicative action.

Reference, however, is only the first of two criteria for fully developed, or “true”, symbolization. I will claim that joint reference is the criterial basis for the *emergence* of symbolization, while the second criterion, which I shall call following (Langacker, 1987) construal, constitutes the set of cognitive operations which underpin the *elaboration* of protosymbolic joint reference into true symbolization.

Simple, unadorned joint reference, such as implied by the production and comprehension of an indexical pointing gesture, serves to orient the attention of the receiver, but does not (in the general case) direct the receiver to any particular *understanding* or *conceptualization* of what is being referred to. The use of a truly symbolic sign, such as a word, however, at the very least implies a categorization of the referent, and may involve complex manipulations of perspective and Figure-Ground relations. This cognitive-functional analysis of symbol usage is essentially the same as that advanced by Karl Bühler (Bühler, 1990 [1934]) in his “Organon theory” of language (Fig. 3).
3. The emergence of symbolization.

It is possible to envisage an evolutionary scenario for the phylogenetic emergence of symbolic communication from signal communication. We may hypothesize the following steps:

1. The receiver comes to pay attention to the sender as the source of communicative signals.

2. The sender comes to pay attention to the receiver as a recipient of communicative signals.

3. The receiver comes to pay attention to the evidential reliability of the sender’s communicative signals as a source of information, by checking what the sender is paying attention to, or doing.

4. The sender comes to pay attention to the receiver’s readiness to reliably act upon the information communicated, by paying attention to what the receiver is paying attention to, or doing.

The first two steps of this sequence do not involve intersubjective “sharing” by the communicating organisms of a referential world, but they do require orientation towards, or
social referencing, of a communication partner either as a source of information or as an actor whose behaviour can be influenced. This level of communicative competence is probably widespread amongst mammals, underpinning complex signal-mediated social behaviours. Not only communication between conspecifics, but also communication between humans and domesticated or working animals such as dogs, horses and elephants often seems to involve an understanding on the part of the domesticated animal that the human can both send and receive signals. My young border collie, for example, brings a ball and nuzzles me with it, while looking at me, when she wants to play (an instance of Step 2 above). This can be considered an elementary instance of Communicative Intentionality, in the sense that the dog is able to treat communication as a means to indirectly achieve goal directed action (Intentionality).

A communicative signal indexing a non-communicative intention (such as a wish to engage in play, grooming, or any other social behaviour) often has its origins in an initiatory segment of the behaviour, which may be abbreviated or stylized in shifting its status from “just behaviour” to signal. It is the understanding by each of the communication partners that the other can both send and receive such signals that constitutes the mastery of Steps 1 and 2 above. Communication, with the achievement of Steps 1 and 2, remains strictly signal-based, but it implies the establishment of a first or primary level of intersubjectivity, consisting of a recognition by each communication partner of the other as a communication partner, and the recognition by each partner of the other as an agent capable of acting as initiator or mediator of goal directed action.

In phylogenesis, then, the basis of intersubjectivity is (I hypothesize) constructed through the mediation of goal directed social behaviours by signals, and the understanding of the communicative partner as a potential agent. The ontogenesis of intersubjectivity in humans follows a different route: primary intersubjectivity appears to be innate (Fig. 4).

Caretakers (usually mothers) and infants engage from a very early age in episodes of “communication” in which the bodily movements, facial expressions and vocalizations of the two participants provide the signals necessary for the maintenance of the communicative channel or intersubjective “we” formed by the dyad. The real time temporal meshing by the mother of her actions with those of the baby is of fundamental importance to the maintenance of intersubjectivity (Trevarthen and Hubley, 1978), indicating the emergence of a psychologically real “ontology of the social”.

In taking Steps 3 and 4, the sender and/or receiver develop the capacity to understand that a signal indexes an intention, rather than the action intended. With this, the possibility is opened for deception and suspicion regarding intentions. The most basic level of understanding of the communicative partner not just as a potential agent, but as an experiential subject within the intersubjective field, is the ability to follow gaze, as evidenced by human infants form about 6 mo. of age (Butterworth and Jarrett, 1991) and by a number of other species (Fig. 5). Gaze following allows the receiver to monitor the activity and attention of the communicative partner, but not to manipulate as sender the attention of the receiver to a specific object or referent. The existence of spontaneous productive pointing even in our closest primate relatives is disputed, and probably occurs in the wild only intermittently, unsystematically and unreliably.
The ontogenetic development of this capacity has been well researched in the past couple of decades. From around nine or ten months of age human infants “begin to engage with adults in relatively extended bouts of joint attention to objects ... In these triadic interactions infants actively co-ordinate their visual attention to person and object, for example by looking to an adult periodically as the two of them play together with a toy, or by following the adults gaze. Infants also become capable at this age of intentionally communicating to adults their desire to obtain an object or to share attention to an object, usually through non-linguistic gestures such as pointing or showing, often accompanied by gaze alternation between object and person.” (Tomasello, 1996: 310). The achievement of joint reference in human infancy establishes the “referential triangle” (Fig. 6), also referred to as “secondary intersubjectivity” (Trevarthen and Hubley, 1978).

The emergence of the “referential triangle” marks the emergence of the first criterion for symbol usage, namely reference in intersubjective field. From this point until about 14 mo.,
age, infants increasingly mediate the manipulation of the field of joint attention by manipulating objects in give-and-take routines, and early in the second year of life they begin to demonstrate active mastery of the conventional or canonical usage of objects in play situations, their usage of such objects being dominated by the cultural specification of conventional function until well into the third year of life (Sinha, 1988; Sinha and Jensen de López, 2000). It seems to be a well-founded conclusion that by early in the second year of life, the basic foundations of symbolization in intersubjectivity, and in an understanding of conventionality, have been laid.

Figure 6. The referential triangle. Joint reference at 9-10 mo. in human infancy, chimps (?), bonobos.

4. The elaboration of symbolic representation.

The classical definition of the sign—*aliquid stat pro aliquo*—specifies very clearly that fully developed symbol usage depends upon the mastery of symbolic material, and in the case of natural languages, a symbolic system. Formalist theories in cognitive science, influenced by generative linguistics, identify the criterion of fully-developed symbolization with the
productive and combinatorial properties of language-like symbol systems, and it is often claimed that the structural and systemic properties of such conventional systems are arbitrary with respect to their functional and cognitive properties.

Such approaches overlook the fundamental motivation of the elaboration of conventionalized symbol usage by cognitive and functional factors, and the basis of this motivation in the communicative requirement for flexible construal of referential situations.

The notion of construal (Langacker, 1987) can be simply illustrated by example. Any referential situation which requires characterization in terms of the relationships obtaining between more than one entity may so be characterized in more than one way. I can say, for example, that the cup is on the saucer, or that the saucer is under the cup. In the first case, the cup is the Figure (or Trajector), and the saucer the Ground (or Landmark) in relation to which the location of the cup is specified. In the second case, these cognitive roles are reversed. Similarly, the lexicalization “father of” represents the same relationship as the lexicalization “child of”, but the two lexicalizations are perspectivized or profiled from different points of view.

Without going into details, we can say that the elaboration of symbolization into grammar involves the mastery of natural language subsystems that functionally permit flexible construal, and that this is the essential cognitive-functional motivation underlying the evolution and acquisition of language by humans.

Linguistic complexity is, on this view, the structural consequence of the operation of cognitive-functional principles for motivating construction that have been extensively studied in recent years by cognitive and functional linguists.

The main principles of motivation are:

- Iconicity and Analogy (including specific motivations by: embodiment, image schematization, force dynamics, cultural schematization).
- Figure-Ground articulation.
- Topic-Comment articulation.
- Perspective and Profiling.

Fig. 7 diagrams the semiotic structure resulting from the elaboration of joint reference into linguistic (symbolic) conceptualization via the mastery of symbolic vehicles enabling flexible construal. Fig. 7 is also to be understood as an elaboration, based upon cognitive-functional linguistic principles, of the Organon-model diagrammed in Fig. 3. In Fig. 7, the broken lines no longer represent merely joint attention, but the mutual construal of a referential situation by speaker and hearer within an intersubjectively shared universe of discourse.
5. Infancy, evolution and culture.

There is a common epigenetic logic to the phylogenetic and ontogenetic development of symbolization. The logic is one of process, from signals to the emergence and elaboration of symbols. This logic involves the following sub-processes, which significantly temporally overlap but which emerge in the order of mention below:

- Intentionality and intersubjectivity.
- Conventionalization based in intersubjectivity.
- Structural elaboration yielding flexible construal.

It should be emphasized that there is no claim here that ontogenesis necessarily involves, within any one of these processes, the recapitulation in ontogenesis of stages passed through in phylogenesis. Although we can observe analogous phenomena in (for example) the communication strategies of human children and non-human primates, there are also many differences. We have seen, for example, that primary intersubjectivity appears to be innate in humans, while it is hypothesized to be emergent in phylogenesis from the mediation by
communicative signals of non-communicative social behaviours. Similarly, although it is plausible to draw very general analogies in terms of principles of motivation between grammaticalization processes in historical language change, and the acquisition by the child of the constructional resources of grammar, the stages and strategies characterizing each of these processes are very different (Slobin, 1997).

Commonalities in developmental logic do not, therefore, imply that ontogenesis recapitulates phylogenesis. Instead, I would like to suggest that ontogenesis—and in particular the ecological niche of infancy—played a crucial role in the evolutionary development of the human symbolic capacity. Human infants, as has often been pointed out, are extraordinarily well adapted to the demands of enculturation and the acquisition of symbolic communication (Tomasello, 1999). I would suggest that this is because, once established, the emergent social ontology of intersubjectivity and conventionalization sets up new parameters for the selection of context-sensitive and socially situated learning processes, rather than “content-dedicated” cognitive mechanisms. In such an evolutionary process, a major role might have been played by “Baldwin effects” (genetic assimilation) that lend a teleological directionality to natural selection through the developmental mimesis of the inherent teleology of the elaboration of symbolic communication (see Section 1).

Such an account is quite different from not only modularity theories of language, but the entire logic of currently popular “evolutionary psychology” narratives of origin. The traditional and still-dominant view of evolution and development is one in which the development of “higher” levels of organization is dependent upon prior developments in “lower” levels of organization. In particular, the priority of individual organismic properties is assumed to carry over from the level at which natural selection occurs to the level of psychological processes. Even if the existence of emergent, higher level (socio-cultural) properties is conceded, the autonomy of these levels is continually undermined by theories that reduce them to the causal properties of supposedly “more basic” levels.

An alternative view, consistent with recent findings in cultural primatology, stresses the emergence of the first foundation of symbolization and language not in individual organismic modules, but in the quintessentially social realm of intersubjectivity and normativity (including conventionalization).

According to such an alternative account, the emergence of what we can designate, in general terms, an emergent socio-cultural level of organization, set the stage for subsequent genetic selection (and epigenetic development)—rather than the other way round. The difference between the traditional and the alternative views is diagrammed in Fig. 8.
Figure 8. Two views of evolution and development.

Fig. 8 is not intended to model actual evolutionary and developmental processes, but to illustrate different ways of conceptualizing directions of causality and dependency between “levels of analysis”. In the traditional view, the “biological” causes (or is identical with) the “psychological”, these two levels together being referred to as the “Mind/Brain.” The (uniquely?) human Mind/Brain, the “organ of cognition”, in turn causes the emergence of the “social” level. Because each higher level is dependent upon the lower ones, the traditional view lends itself readily to epiphenomenal and reductionist interpretations of the higher levels.

In the alternative view, the socio-cultural level is emergent from the biological one, relatively autonomously from (but acting back upon by “capturing”) the “psychological” level (which is non-autonomously emergent from the biological level). In this view, there is no “Mind/Brain”, since “mind” is co-constituted by the biological and social. Although the illustration is deliberately simplistic (to avoid the confusing device of bidirectional “interaction arrows”), it is drawn so as to emphasize the resistance of the alternative view to the kind of reductionist interpretations which are the inevitable accompaniment of the traditional view.

The “Mind/Brain” is the modern, neuro-computational avatar of the Cartesian “I.” It inherits the latter’s universal, rationalist and individualist character, but suggests (by dint of typographic convention) that the dualism of its original has been overcome: the mind *is* the brain. In quite which way the mind “is” the brain is disputed by eliminativists, functionalists, and other philosophers of mind, but the identity-mapping signalled by the typography is agreed on by an otherwise diverse group of thinkers. A “clear and distinct idea” the “Mind/Brain” seems not to be, but such is the power of the Cartesian paradigm that this hybrid creature seems almost impossible to evade, and an alternative difficult to formulate. I conclude this chapter by unpacking as simply as possible the contradiction inherent in the notion of the “Mind/Brain.”

The brain is an organ of an individual organism. Your brain and my brain are different and non-interchangeable parts of each of our separate bodies: we cannot share our brains. It is seductively easy to assume that the mind is just the cognitive reflex or counterpart of this individual organ. After all, it is the very fact that my thoughts present themselves to me as *mine*, and mine alone (you cannot “read my mind” any more than you can share my brain), that provided Descartes with the foundation of his method of doubt.

Thoughts, however, unlike brains, *can* (if the thinker so chooses) be shared (most obviously, through the medium of language). Much of our ordinary discourse about communication employs a “conduit metaphor” (Reddy, 1978) in which utterances are conduits or containers by means of which thoughts are transferred from one individual mind to another. Given this picture of linguistic communication—which can be traced back at least to Aristotle—it is easy to envisage brains as somehow “containing” minds, in the same way that linguistic expressions “contain” thoughts. The “Mind/Brain” tends then to be seen as the “mental/physical” organ of thought, just as in traditional linguistics the linguistic sign unites the concept (content) with its physical-acoustic expression.

What is wrong with this picture of the “mind/brain” is that it assumes a pre-existing individual mind which only secondarily, *via* a kind of *ur*-Social Contract, reaches out to make contact with “Other Minds” – an assumption which carries in its train a host of well-rehearsed philosophical snares and diversions which eventuate, against everyone’s better intentions and intuitions, in a despairing (or, even worse, triumphantly proclaimed) neural solipsism (Sinha, 1999).
There is an alternative. The alternative is to view the human mind as grounded in an intersubjectively shared, ecologically real world: a world populated and animated by artefacts, symbols, conventions, and intersubjectively shared meanings. This alternative view is wholeheartedly materialist, and is fully committed to understanding the biological foundations of human cognition. It differs from the neo-Cartesian narrative of the “mind/brain” in that it embraces the materiality of the products of human cognition, and their formative role in the constitution of the developing human organism, as well as the materiality of the developmental, organismic processes which support the enculturation and self-enculturation of human beings.

As yet, we know too little to accept or reject hypotheses regarding the innateness of a specifically syntactic component of the human language faculty. I certainly would not wish to reject the possibility that the epigenetic processes selected for in human evolution include a predisposition for learning language, although this does not necessarily imply that any such predisposition is or was “dedicated” from the start exclusively to language. I would, however, venture to predict that, in the not too distant future, currently fashionable versions of evolutionary psychology, predicated upon a once-and-for-all fixing of the human mind in adaptations to hypothesized proto-hominid environmental conditions, will seem as quaint and outdated as behaviourist reductions of human cognition to stimulus (signal) – response contingencies.

The human brain is not infinitely plastic, but nor is it a mere Swiss-Army-Knife assemblage of primordial content-dedicated modules. Plasticity is real and, though cumulatively constrained by epigenetic development and experience, it is manifest throughout the human lifespan. Environments do not hold a magic key to the “engineering of the human soul”, but this does not have to lead to the conclusion that human agency is reducible to, and negated by, a “pre-programmed” biology. What we make, and have made, has made and does make us human. To reduce the totality of human cognition, feeling, and behaviour to an invariant set of once-adaptive but outlived mechanisms violates our ethical and political sense of our own freedom, responsibility, and accountability. We need to cultivate such a sensibility. A science of mind that harmonizes with this ethical need is plausible, possible and necessary.
References


