

Biosemiotics 6

Theresa Schilhab
Frederik Stjernfelt
Terrence Deacon
Editors

The Symbolic Species Evolved



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BIOSEMIOTICS

VOLUME 6

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The Symbolic Species Evolved

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Editor and main contributor to a book on the history of evolutionary thoughts. Bonde, N., Hoffmeyer, J., & Stangerup, H. (eds.) 'Naturens historiefortællere' [Nature's history-tellers], 2 vols (1984, 1986, Gad, Copenhagen – 2nd ed. 1996, 960 pp; in Danish). Bonde, N., et al. (2008) Danekrae – Danmarks bedste fossiler [Denmark's best fossils], 226pp. Gyldendal, Copenhagen (in Danish).

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Chapter 1

Introduction – Searching the Missing Links

Frederik Stjernfelt, Theresa Schilhab, and Terrence W. Deacon

Terrence Deacon’s “The Symbolic Species” came out in 1997 and became an important participant in the renewed focusing upon the issue of the origin of man. The basic Darwinian framework agreed upon by all serious research since early 20C had left the important problem of accounting for the evolution of man’s special intellectual abilities, including human language, as compared to other higher animals in general and man’s primate relatives specifically. The many competing theories of the origins of language along with the lack of empirical evidence to support either of them had, for many years, made speculations upon language origins obsolete – but with the increasing amount of knowledge about man’s genetic evolution, historical linguistics, cognitive science, neuroscience, the archeology of early human migrations etc. created a new platform for taking up this old issue. Deacon’s proposal was fourfold – based upon the combination of an evolutionary, a semiotic, a neurological, and an anthropological hypothesis. The evolutionary hypothesis was based upon so-called “Baldwinian” evolution – after the American psychologist James Mark Baldwin: the idea that in social species with individuals possessing a certain degree of ontogenetic learning abilities, new, acquired capabilities may assume a large degree of selective advantage for those individuals able to learn them. Thus, seemingly Lamarckian effects of inheritance of acquired characters may occur within a completely Darwinian framework: the acquired capabilities are not inherited, but the possession of them in some individuals provide a large selection advantage over those who have less ability to learn them. The example chosen in Deacon was, of course, human language: speakers will be strongly favoured at the expense of non-speakers, and thus the appearance of early, primitive language will speed up the process of evolution, eventually making the evolution of language and the evolution of the human brain two aspects of one basic process with intense feed-back between the two.

Baldwinian evolution was also rediscovered by other thinkers in the same period – such as Steven Pinker – but on top of this, Deacon added a neurological hypothesis based on brain scannings of preserved brains of a variety of species:

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namely that a basic novum in the human brain is its comparatively expanded prefrontal cortex and its connections. This hypothesis, to Deacon, contradicted or at least relativized modularism, pointing to the idea that despite the importance of Wernicke's and Broca's areas for language production and understanding, lexical semantics and enunciation covered much larger amounts of brain capacities – facilitated by the human brain's connectedness. This idea, of course, placed Deacon against strong modularists with the central emphasis of linguistic grammar and its supposed core module – and made him argue that the novelty of human linguistic capabilities must have a broader semiotic character rather than a narrowly conceived grammatical character.

This, in turn, made him appropriate some central aspects of Charles Peirce's semiotics – an early attempt to integrate semiotic and linguistic capabilities with logic and cognitive ones. Thus, Deacon hypothesized that Peirce's distinction between Icons, Indices, and Symbols – signs referring to their object by means of similarity, actual connection, or habit – might be a key to the understanding of the specificity of human language. Making the hypothesis that although forms of iconic and indexical communication were present in many species but only humans built on these to communicate symbolically. Deacon proposed that the ability to produce and process Symbols in this special sense of the word is a key to the general, detached intelligence characteristic of human beings. Some intelligent species, like bonobos and gray parrots, might be able to process Symbols to some degree, but the systematic use of Symbols was taken to be the defining feature of human semiotic intelligence – hence the title of the book, *The Symbolic Species*.

What, then, was the specific selection pressure pushing early man over the threshold to Symbol processing? Here, Deacon – anthropologist by training and career – proposed an anthropological narrative to account for a specific set of selection pressures. The discovery of stone tool technology by an australopithecine ancestor some 2.5 million years ago made it possible to include a larger degree of meat in their diet. But this required male-male cooperation and the risk of predation made it increasingly difficult for women with children to participate in hunting, resulting in the classic Stone Age scenario of gathering women and hunting men. This, in turn, made the connection between the sexes fragile. How could the pregnant mother-to-be know that the father of her child would, in fact, return with parts of a corpse after having been away in many days with his gang of hunters? Conversely, how could the hunting man know that the mother of his child would not be unfaithful to him during his hunting absence, making it uncertain it was in fact his own genetic offspring he was busily catching protein for? Moreover, male cooperation is crucial, given the dangers of meat scavenges, and so sexual competition must be minimized. In short, all players in this anthropological dilemma have an interest in securing the link to one another. So to Deacon, establishing socially-mediated fidelity was what required symbols' capacity to represent possible future relationships and commitments the arch-example of speech acts, and which introduced selection pressure to evolve cognitive functions for aiding the acquisition and use of symbolic reference.

Thus, the overall argument of Deacon's book united evolutionary, neurological, semiotic, and social-anthropological arguments. Many competing accounts for

the same issue, like Bruner-Tomasello's emphasis on joint and shared attention, Turner-Fauconnier's pointing to double scope blending or the Chomskyans' focus on linguistic grammar, would disagree on one or several points in this chain of arguments. Deacon's theory is unique, however, in its integration of these many critical threads of causality and also because of its focus on a semiotic cause. This unprecedented approach is what prompted his two co-editors of this book to organize a couple of conferences addressing the critical discussion of Deacon's chain of arguments. The Symbolic Species Conferences I and II took place in 2006 and 2007 and presented a wide variety of scholars each with a unique view on evolutionary cognition and the questions raised by Terrence Deacon. This book is not simply a conference proceeding; rather it is an attempt at concentrating and focusing the conference discussion around the issues highlighted by Deacon's bundle of arguments. This is why some of the papers thoroughly discuss aspects of Deacon's theories, why others address other, maybe competing approaches to the same issue. In order to focus these different contributions on Deacon's argument, we decided to give the overall structure of the book a Deaconian frame.

1.1 Presentation of the Chapters

The volume is divided into three sections, namely “The biosemiotic connection”: “The prehistoric and comparative connection” and “The cognitive and anthropological connection”.

The main focus of the first section is the biosemiotic view on human cognition with special emphasis on the analysis of the Deaconian perspective. In “The prehistoric and comparative connection”, human descent, learning abilities and species-specific cognition is discussed in an evolutionary as well as comparative perspective. The third section; “The cognitive and anthropological connection”, sheds light on various aspects of symbol use especially as this applies to natural language use such as linguistic immersion and embeddedness on the one hand and, on the other, the associated emergence of semantic freedom. The individual chapters will be introduced in the following.

1.1.1 *The Biosemiotic Connection (Part I)*

The introductory chapter of the book is a newly-written contribution by Deacon addressing the issue of the status of the Symbol – in some sense the central concept of the book tying together its biology, neuroscience, semiotics, and anthropology arguments. In this chapter The Symbolic Species hypothesis is truly revisited in three ways: 1. by more explicitly and precisely defining his conception of symbolic reference and its dependency on iconic and indexical processes, 2. by applying this analysis to a re-thinking of the concept of Universal Grammar as neither nature nor nurture, and 3. by demonstrating a role for relaxed selection in setting the stage

for the synergistic reorganization of brain functions to support the demands of language. In the following chapter, Frederik Stjernfelt critically addresses Deacon's analysis of the symbol concept and its hierarchic dependence on iconic and indexical forms of reference hypothesis that pure Icons appear early in evolution, only later to combine to form Indices and eventually Symbols. Although for Deacon the icon-index-symbol sequence is not historical or evolutionary, it is a reflection of the increasing complexity of the cognitive demands of these modes of referring. Thus according to the Symbolic Species the symbolic threshold is only crossed when sufficient special interpretive capacities are in place that he identifies with his systemic conception of symbolic reference. Stjernfelt criticizes this analysis by challenging both the hierarchic dependency of these sign-forms and their supposed separability. His alternative conception does not view symbols as systemically mediated in the way Deacon describes, but instead locates an analogous semiotic-evolutionary threshold in a special form of mental abstraction. He thus opposes the view that Symbols per se are a key to the general, detached intelligence characteristic of human beings and argues instead that the true demarcation criterion seems to be what he describes (after Peirce) as our extensive ability to hypostasize.

In his chapter: "Peirce and Deacon on Meaning and the Evolution of Language", Ahti-Veikko J. Pietarinen investigates the influence from Peirce on the work of Deacon by focussing on the similarities and dissimilarities between Peirce's and Deacon's positions with particular reference to the notions of meaning and the evolution of language.

The last chapter: "Semiosis beyond Signs. On two or three missing links on the way to human beings" by Göran Sonesson is concerned with two (nearly) missing links in the progression from animal to man, that is the (principle of) relevance and the sign, as well as the act of imitation bridging them. Sonesson aims to distinguish stages in evolution and development, notably the relationship between imitation and sign.

1.1.2 The Prehistoric and Comparative Connection (Part II)

The first chapter of part two, "The natural history of intentionality: A biosemiotic approach-2" by Jesper Hoffmeyer, takes the rich occurrence of natural intentionality as its starting point to demonstrate the wealth of sign action and therefore semiotic realism pervasive to the living world.

The chapter "The evolution of learning to communicate: Avian model for the missing link" by Irene Pepperberg offers a comparative perspective on language that analyses to what extent language might be considered (or reconsidered) to be constructed from purely primate-specific qualities.

Similarly, but now based on studies of organized, purposeful actions in great apes, in the chapter "From parsing actions to understanding intentions" Richard Byrne aims to demystify the putative missing linguistic link between man and non human animals is presented. According to Byrne, behaviour parsing might be a necessary step on the road to seeing the world in an intentional-causal way.

In the following chapter by Niels Bonde, named “Hominid Diversity and ‘Ancestor’ Myths: *Homo*, *H. sapiens*, and Other Taxa from a Phylocladistic Viewpoint”, we criticize up to date front-line consensus on our human descent within contemporary palaeoanthropology and claims of ‘direct fossil ancestors’.

Finally, part two is closed by the chapter “The tripod effect: Co-evolution of cooperation, cognition and communication” by Peter Gärdenfors, Ingar Brinck and Mathias Osvath. The chapter simultaneously addresses hominin cognition, cooperation, and communication to show how these interdependent factors mutually reinforce each other over the course of evolution.

1.1.3 The Cognitive and Anthropological Connection (Part III)

“Language as a repository of tacit knowledge” by Harry Collins highlights the linguistic exclusivity that allows almost unlimited knowledge exchange between competent language users. In this view language is not conceived of as merely a tool put to cognitive use but as a form of life.

Theresa Schilhab focuses on the situatedness of language in the chapter “Levels of immersion and embodiment” to expand on the relation between symbol use as it applies to the linguistic exchange in professional communities and the lack of first hand experiences of the concepts mastered to perfection.

In “Emerging symbols”, Stefan Leijnen explores the difference between indexical and symbolic interpretation on the basis of a neural network simulation of a series of language training experiments with chimpanzees. Leijnen then discusses systemic requirements for crossing the symbolic threshold.

Finally, the closing chapter of the book “Gender in innovative techno fantasies” by Cathrine Hasse explores Deacon’s idea of the evolution of language and the evolution of the human brain as two aspects of one basic process to argue that human agents have developed a particular capacity for creating their habitats according to their fantasies about how they would like to live in the future, especially in the case of technological tools.

Part I
The Biosemiotic Connection

Chapter 2

Beyond the Symbolic Species

Terrence W. Deacon

Abstract Confusions about the nature of symbolic reference are at the core of two major challenges to understanding human language. A failure to take into account the complex iconic and indexical infrastructure of symbolic interpretation processes has blocked progress in the study of language structure, language evolution, neural processing of language, and language acquisition. Simplistic notions of symbolic interpretation are critiqued, the semiotic infrastructure of symbolic interpretive processes is described, and some implication for understanding the universals of grammar and syntax are explored. Finally, the evolutionary problem of language origins is re-examined and an unexpected important role for relaxation of selection is demonstrated.

2.1 The Problem with ‘Symbol’

In the years since the publication of *The Symbolic Species* (Deacon, 1997) one consistent source of confusion has persistently been used as a reason to take a critical view of the symbolic threshold as key to the human difference. This is in one sense merely a terminological problem with interpretations of the term ‘symbol,’ and yet it obscures a critical issue that if not resolved will be a roadblock to both the study of language and the further development of semiotic theory itself. The confusion superficially has to do with the concept of arbitrariness of reference, but more deeply it involves a tension between a structural and dynamic conception of the process of semiosis more generally.

I will first address the terminological dispute, which although a source of confusion in the literature, should be resolvable with a bit of care in defining terms and avoiding the attribution of one definition to uses where it does not apply. The conceptual dispute is much more subtle, and I think critical to sort out. Failure to do so will have two serious consequences. First, it will doom semiotic theories to the status of mere taxonomic exercises where different scholars are free to invent their

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own categorical principles without careful reflection on the underlying generative processes and constraints that determine the semiotic differences they hope to distinguish. This often ends up turning semiotic research into a renaming exercise, where commonly studied phenomena are redescribed in semiotic terms and it often devolves into battles over competing naming paradigms from the past. Second, and more serious, it will cut semiotic research off from the sciences of psychology, neurology, and biology due to a failure to come to grips with the *process* of semiosis; the dynamic of interpretive activity by which semiotic relationships emerge from other semiotic relationships and ultimately derive their grounding on the physical phenomena they thereby bring into consideration. The problem here is the tendency to imagine signs as things, or as synchronic relationships, whereas they are instead intrinsically dynamic phases in a generative process, and ultimately something apart from the artifacts being manipulated in this process.

The term ‘symbol’ has come to be used differently in different traditions, and so first we need to be clear what we are talking about. If all that is meant is a mark that need not share any specific quality with its object of reference, then the term has trivial consequences. This gloss of the concept makes it easy to dismiss its importance for evolution, and indeed this simplification has been the motivation for many language origins researchers to imagine that it is only syntax that demands explanation. This assumption about the concept of symbol is also reflected in many critics’ claims that most species are capable of learning arbitrary associations (e.g. see [Chapter 3](#), this volume) so claiming that the symbolic capacity divides humans from other species must be trivially false.

This focus on arbitrary correlation as the defining attribute of symbolic reference is a serious oversimplification that collapses critical distinctions between sign vehicle and referential properties. The common usage of a ‘code’ analogy in describing language reference also reflects this simplification, and for similar reasons leads to serious theoretical misunderstandings. A code does indeed involve an arbitrary mapping or correspondence relationship, but that is precisely why its reference is opaque and is the basis for encryption. A code is a mapping of a parallel set of sign tokens to a language, and typically a token-to-token mapping. So to describe language or any of its attributes, such as the basis for phonology, syntax, or semantics as a code, merely begs the question: what is the basis for this mapping relationship?

It is often argued, for example, that arbitrariness is a property of many animal calls. Consider the case of predator-specific alarm calls (which have been identified in species as diverse as vervet monkeys and chickens). The assumption that these calls ‘mean’ or ‘name’ a particular predator is as, the linguist Derek Bickerton (2010) has also argued, a ‘back-projection of our own language-saturated view of the world.’ Alarm calls are indexical, even though they don’t sound like the predator they indicate and even though they are emitted to many similar types of predators. Their arbitrariness and generic reference are red herrings in this detective story. Their reference depends on and evolved from repeated correlations between the presence of a predator, the production of a call, and an appropriate escape behavior, and merely distinguished from other experiences, vocalizations, or behaviors.

A symbolic sign relationship is, in contrast to an iconic or indexical sign relationship, a doubly conventional form or reference. It involves a conventional sign type that is additionally conventionally-mediated in the way it represents.

Arbitrariness is a negative way of defining symbols. It basically tells us that neither likeness nor correlation are necessary. But this is inadequate, even though it is a common shorthand way of characterizing symbolic reference. All sign relationships include some degree of arbitrariness, because those attributes that are taken as the ground for the sign-object linkage can be chosen from many dimensions. Thus, anything can be treated as iconic or indexical of almost anything else depending on the interpretive process.

For example, with a bit of imagination a face can be discerned on the full moon, or in a cloud formation, and it might even remind you of someone you know. But iconism can also be highly abstract, as in the complex way that a mathematical equation refers iconically, once you know how to discern its symbol-mediated isometry (e.g. between the structure of the equation and a corresponding geometric or dynamical relationship). An equation can be interpreted to be iconic (e.g. of a parabolic trajectory) only, however, if you know how to discern the way that differences in the values or operations directly correspond to differences in the geometric object of reference. So one first needs to be able to interpret the symbolic components before the diagrammatic iconism of the equation can be appreciated.

Indices refer by contiguity in space, time, or substrate. A simple correlation can therefore be the ground for indexical reference. A lipstick smear on a man's shirt collar can be a troublesome indication to his wife, a urine scent on a branch can be a sexual index to a female lemur, and the mobbing call of a small bird can indicate the present of a raptor. What gets correlated and how (accidental, cultural, evolutionary) can be arbitrary, only the fact of correlation is not. Thus, a rat in a Skinner box pressing a bar in response to a bell in order to get a water reward has learned that the bell is an arbitrary index of the state of the apparatus (an indexical legisign). These states are arbitrarily paired in the experimental design, but that doesn't make the one a symbol of the other.

So symbolic reference is not merely a function of arbitrariness, conventionality, and generality, though these features are properties that symbolic reference makes available. First of all, arbitrariness isn't required. For example, many symbols used to designate religious concepts employ obvious iconism and yet this doesn't undermine their potential to symbolize quite complex esoteric abstractions. This also demonstrates that the sign vehicles used for symbolic reference need not be widely understood as conventional. When first encountering an unfamiliar religious symbol it may only require a brief few comments to understand its symbolic import. And of course icons, such as the eye-spots on male peacock tail feathers or faces 'seen' in the clouds often bring to mind general types of objects, not just specific instances. These attributes are not sufficient determinants of symbolic function, either individually or collectively.

As Charles Peirce (1931) pointed out over a century ago, we must distinguish properties of the sign vehicle (which he terms a representamen), which can include being an arbitrarily defined (i.e. conventional) type of sign vehicle, from properties

taken to link it to its object of reference. Thus although current vernacular has habitually termed alphanumeric characters “symbols” this usage ignores any referential relationship. If not used carefully, in recognition of this shorthand, it can lead to all manner of theoretical confusions.

Thus when your computer begins randomly spewing alphanumeric characters onto your screen they are indices of a malfunction, not symbols of anything. And likewise the typographical character combination ;-) does not refer symbolically, even though it is composed of conventional tokens designed for symbolic purposes. Peirce terms conventional sign vehicle types ‘legisigns,’ and argues that symbols must also employ legisigns. However he notes that legisigns can also serve iconic and indexical roles as well. Consider, for example, the conventionalized stick figure icons on restroom doors, or the use of red for traffic lights and road signs to indicate the requirement to stop (i.e. it indicates a convention—an injunction to act according to a rule—but it does not ‘mean’ “stop” in the way that this word does. Because legisigns are often created (or chosen) with a specific type of referential relationship in mind it is the arbitrary choice of the creator which properties are to be used referentially. This is why legisigns created for typographical use to symbolize the parsing and punctuation of written text can also be recruited for their iconic features (as in the case of the smiley face).

Of course communicative intention is also an interpretation, and this also does not fix the referential function of a sign vehicle. Whether something is interpreted iconically, indexically, or symbolically depends on what’s going on in the mind of the beholder.

Recognizing that the same sign vehicle need not always be interpreted as intended, or as referring always in the same way is the first step toward reframing semiosis in diachronic, not synchronic, terms. A sign vehicle can be interpreted in multiple ways not because it is in some way a combination of sign types, a fractional mixture of iconic, indexical, and symbolic features, but because its semiotic significance is not vested in the sign vehicle at all. Although a given interpretation may depend on some feature intrinsic to that artifact for motivating its semiotic function, no semiotic attributes are invested in the sign vehicle itself. They are properties of it being interpreted (whether in its creation or its consideration). So given that the same sign vehicle can be interpreted differently by different individuals, or at different phases of considering it, worrying about whether *it* is a ‘pure’ sign of a given type or a ‘mixed’ sign commits the fallacy of misplaced concreteness.

As we will discuss below, a given sign relation is created by an interpretive process. It is a phase in this process in which the sign vehicle is incorporated in a particular way, but which may be transitory, leading to a different mode of considering that same sign vehicle. And at any given phase of this interpretive process there is no ‘mixture’ of semiotic characteristics. It is only when we attempt to analytically collapse this process into a single synchronic relation that we run the risk of confusing sign vehicle properties with semiotic properties and think of signs as simultaneously exhibiting iconic, indexical, and symbolic features.

Although it is far beyond the scope of this chapter to attempt a reframing of semiotic theory in process terms, carefully dissecting a few examples of interpretive processes can help to illustrate the difference between this and more synchronic forms of semiotic analysis and clear up confusions created by the ‘compositional’ account of symbolic reference presented in *The Symbolic Species* (Deacon, 1997). More importantly, exemplifying the process of hierarchic differentiation of referential form that constitutes an interpretive process allows us to see how semiotic analysis is directly relevant to understanding cognition, and by implication the evolution of symbolic cognition.

As a starting point for exhibiting the hierarchic dependency of the different modes of referential interpretation consider one of the classic examples of a symbolic form: the impression of a signet ring in wax used to seal a note and verify the sender’s identity. Tracing the minute cognitive steps necessary to interpret this simple sign demonstrates that symbolic function depends on more than a simple arbitrary correspondence. First, the formal similarity between the impression and the ring is primary. This is iconic. But without the physical action of the ring-bearer pressing the ring into hot wax to produce this likeness, it would not indicate that this message, thus sealed, was produced by the bearer of that specific ring. The presumed connection between ring and bearer further indicates that a particular individual actually sealed the note. Finally, possession of such a ring is typically a mark of authority, royalty, etc. This status is a social convention. To interpret the wax impression as a symbol of social position, one must also understand these social conventions, because nothing intrinsic to the form or its physical creation supplies this information. The symbolic reference is dependent on already knowing something beyond any features embodied in this sign vehicle.

This dependency on an external system of relations within which the formal similarities and correlative aspects of the wax impression are embedded is a critical property of its symbolic reference. But without familiarity with this entire system of relationships, these non-symbolic components remain merely icons and indices. Indeed, if any link in this chain of referential inferences is broken, symbolic reference fails. So while the features comprising the sign vehicle are not necessarily similar in form or physically linked to what is symbolized, this superficial independence is supported by a less obvious network of other modes of reference, involving both iconism and indexicality.

Notice that the first step in this interpretive analysis involved recognition of an iconism. Only after this recognition was the implicit indexicality relevant and only after that was the social convention able to play a role in providing symbolic significance to the sign vehicle. This hierarchic dependency of symbols on indices on icons was the core semiotic argument of *The Symbolic Species*. But notice that it is not a simple compositional relationship. Indices are not *made of* icons and symbols are not *made of* indices. These are stages in developing and differentiating ever more complex forms of reference. Throughout the interpretive process described above there was only one sign vehicle: the wax impression. At first it is interpreted iconically, then indexically, and finally symbolically. The constructive nature of this interpretive process was what was critical. These semiotic relationships were not

mixed in some fractional sense, they were distinct dependent phases in the process, and most of the relevant detail was supplied by the interpreting process not the wax impression.

This account leaves out many subphases of the interpretive process, but it captures the crucial architectonic that I believe is critical to understanding why there might be a cognitive threshold separating iconic and indexical forms of communicating, common to most mammals and birds, from symbolic communicating that is distinctive of humans. Interpreting something symbolically is simply more complex, and unlike iconic and indexical interpretation there is nothing inherent in the form or physical relationships of the sign vehicle to provide an interpretive clue. This must be supplied entirely by the interpretive process itself, and it is of the nature of a systemic relationship, not some singular object or event.

Before turning to language, it is worth exploring a few other simpler examples of this interpretive differentiation process in order to appreciate the generality of this hierarchic semiotic dependency.

Let me begin with a trivial index: a wind sock that indicates the strength and direction of the wind. What constitutes the interpretive competence to recognize this indexicality? Imagine that it is being seen for the first time through a window. It is iconic of cloth or clothing, and yet it is clearly not clothing or randomly fluttering cloth. Its distinctive shape and careful design, in contrast, indicate that it is likely designed for a purpose. Another iconic feature is its extended fluttering behavior, again iconic of clothing, but of clothing being blown by the wind fluttering on a clothes line. This iconism now brings to mind something that is not directly provided by the sign vehicle: wind. By virtue of developing these iconic interpretations then this sign vehicle is now embedded in a larger context in which something present points to something that it is not: the wind. And a further juxtaposition of iconisms that have involved other windblown experiences can eventually (quickly) lead to interpreting its behavior as an index of both the direction and intensity of the wind. The indexicality is not 'composed of icons' but rather emerges from the comparisons among iconic interpretations. Failing to recognize these iconisms, e.g. because of never having experienced the effects of wind, would make the indexical interpretation impossible to develop.

Next consider the interpretation of the chevron insignia on a military jacket. Initially, it appears just a colored shape, an iconic sinsign in Peircean terminology (a singular instance of something familiar). As similar shapes are seen on other shoulders, it develops from an iconic sinsign to an iconic legisign (shapes of the same type). As it is understood to distinguish the individual wearing it, it becomes interpreted as an indexical legisign (a type of sign vehicle pointing to something about this person). When its particular configuration is understood to designate that person's military rank it becomes interpreted as a symbolic legisign. The same sign vehicle thus is the locus for a sequence of interpretive phases in which both the relationship of the sign vehicle to other sign vehicles and the relationship of the sign vehicle to its reference are progressively developed.

Some of my favorite examples of this hierarchic interpretive dependence are captured in political cartoons and illustrations that make a general statement about

Fig. 2.1 Cartoon from the cover of *New Yorker* Magazine which exemplifies the progressive differentiation of iconic to indexical to symbolic interpretive phases (see text)



things by virtue of the atypical juxtapositions they employ. Consider the cartoon cover from the *New Yorker* Magazine in Fig. 2.1.

On first glance, as soon as the discordant features of the image are appreciated, one's mind jumps to an interpretation that is beyond anything depicted. It is commenting on a somewhat paradoxical aspect of motherhood. But how does it induce us to make this quite abstract interpretation? Seen in isolation an image of a mother and baby or an image of a child playing with a puppet do not 'say' anything, or even provide new information. But the violation of expectation created by the baby controlling the mother puppet is not merely interpreted iconically. Its inversion of expectation is interpreted indexically, pointing to its opposite: mothers control babies. This, in turn, reciprocally points back to the partial truth of the abstract relationship of baby controlling mother, and thereby to the paradox that both abstract relations are true, though the image is absurd. In this example, relationships between icons, one present another brought to mind by it, initiate an indexical interpretation of this relationship that ultimately leads the viewer to interpret this as being about something much more abstract and general. Although this interpretive process involves iconic, indexical, and possibly symbolic interpretive phases (the latter

to the extent that it comments on the conventional cultural assumptions about motherhood), these are not vested in the sign vehicle and are not mixed or additive. They are distinct phases of interpretation in which the same complex sign vehicle is given progressively more differentiated and context embedded interpretations. Failure to initially interpret the iconisms would make it impossible to interpret any indexicality and failure to interpret the indexical relationships would make it impossible to ever assign any symbolic meanings to the image.

The import of these simple examples is this: to generate an indexical interpretation of any sign vehicle requires interpreting it iconically and interpreting this iconicity with respect to other iconic interpretations, and interpreting it symbolically requires interpreting it indexically and interpreting this indexicality in context with other indexical interpretations. A higher order interpretive process must in this way be supported by a lower order interpretive process, and so on down to the most minimal form. Although this analysis only focuses on this representational triad, it in fact captures an enigmatic aspect of Peirce’s 9-part sign categorization system (shown in Fig. 2.2).

In this taxonomic scheme there are three levels of sign vehicle relationship three levels of sign-object relationship and three levels of relationship between a sign and its immediate interpretive semiotic effect (its *interpretant*). One of the strictures that Peirce imposes on the use of this taxonomic triad of triads is that the level of the sign vehicle must be at least as high as the level of the sign-to-object relationship and this must be at least as high as the relationship of the sign to its interpretant. But recognizing that an interpretant is itself, according to Peirce, another sign generation process (what I have above described as a phase of interpretation) we can now see that indeed a sign of a higher type depends on being interpreted (and thus its referential capacity generated) by the generation of lower order signs.

Language competence rests on a quite elaborate system of iconic and indexical relationships that necessarily come into play in the production and interpretation

| | sign vehicle itself | sign to object | sign to interpretant |
|---|------------------------|-------------------|-------------------------|
| 3 | legisign | symbol | argument |
| 2 | sinsign | index | dicisign |
| 1 | qualisign | icon | rheme |
| | 1 | 2 | 3 |

Fig. 2.2 Peirce’s 9-part sign taxonomy. Each sign type is defined by the combination of one property from each column such that no property from a column to the right is at a higher level than that to its left. Thus there can be a rhematic indexical sinsign or a dicent symbolic legisign but not a rhematic symbolic sinsign or a dicent iconic legisign

of linguistic communication. What is remarkable about the semiotic infrastructure supporting the symbolic capacity of language is its incredible size and complexity. Its indexical character is made evident by the web of pointing relationships exemplified by a thesaurus, with its one-to-many reciprocal mapping relationships, or a dictionary in which each word or morpheme is mapped to a particular combinatorial relationship among other words. Indeed, a dictionary suggests that a language is a bit like an organism in which every molecule is created by combinations of other molecules interacting. It is this dependence on an underlying semiotic system of relationships that makes this threshold hard to cross for other species. But not only does this serve as the foundation for language reference, these underlying semiotic supports and requirements are unmasked, so to speak, when symbolic relationships are juxtaposed to form even higher order iconic, indexical, and symbolic complexes. Thus, like a circuit diagram that can only be seen as iconic of a type of electronic circuit when its component features are given correct symbolic interpretations, a sentence or narrative depends on first interpreting its symbolic components and then interpreting the higher order iconic and indexical relationships that their combinatorial relationships offer. These hierarchically embedded and emergent semiotic constraints turn out to be key to understanding the higher order logic of grammar and syntax.

2.2 The Semiosis of Grammar and Syntax

True symbolic communication and grammar are inextricably intertwined. They are hierarchically dependent. It is fundamentally impossible to have grammar without symbolic reference, though grammatical relationships don't automatically come to the fore with all forms of symbolic interpretation. Grammar and syntax are, however, intrinsic symbolic attributes that emerge into relevance as symbols are brought into various semiotic relationships with one another; e.g. in combinatorial referential processes. Once we overcome the tendency to treat symbolic reference as mere synchronic arbitrary correlation we can begin to discern the many contributions of the iconic and indexical supports of symbolic reference that have become incorporated into the constraints that define the grammar of language.

Because symbolic reference involves a complex higher-order interpretive development in order to emerge from more basic iconic and indexical relationships, there are implicit constraints that these supportive semiotic relationships impose on operations involving symbol combinations, such as phrases, sentences, arguments, and narratives. These constraints emerge from below, so to speak, from the semiotic infrastructure that constitutes symbolic representation rather than needing to be imposed from an extrinsic source of grammatical principles. Although this infrastructure is largely invisible, hidden in the details of an internalized system acquired in early experience, using symbol combinations in communicative contexts unmasks the iconic and indexical constraints that are implicit in this infrastructure. These semiotic constraints have the most ubiquitous effect on the regularization of

language structure, but in addition there are sources of weaker less ubiquitous constraints also contributing to cross-linguistic regularities. These include processing constraints due to neurological limitations, requirements of communication, and cognitive biases specific to our primate/ hominid evolutionary heritage. Although none of these sources of constraint play a direct role in generating specific linguistic structures, their persistent influence over the course of thousands of years of language transmission tends to weed out language forms that are less effective at disambiguating reference, harder to acquire at an early age, demand significant cognitive effort and processing time, and are inconsistent with the distinctive ways that primate brains tend to interpret the world.

The list of sources of constraint on language structure can be broken down into four main categories as listed below. They each contribute a number of quasi-universal traits and highly probable language regularities, many of which are listed for a given category of constraint type. These categories and language consequences are listed below:

A. *Semiotic constraints*

1. Recursive structure (only symbols can provide non-destructive [opaque] recursion across logical types)
2. Predication structure (symbols must be bound to indices in order to refer)
3. Transitivity and embedding constraints (indexicality depends on immediate correlation and contiguity, and is transitive)
4. Quantification (symbolized indices need re-specification).
5. Constraints can be discovered pragmatically and ‘guessed’ prior to language feedback (because of analogies to non-linguistic iconic and indexical experiences).

B. *Processing constraints*

6. Chunking-branching architecture (mnemonic constraint)
7. Algorithmic regularization (procedural automatization)
8. Neural substrates will vary on the basis of processing logic, not linguistic categories

C. *Sensorimotor schemas & phylogenetic bias*

9. Standard schema/frame units (via cognitive borrowing)
10. Vocal takeover (an optimal medium for mimicry)

D. *Communication constraints*

11. Pragmatic constraints (communication roles and discourse functions)
12. Culture-specific expectations/prohibitions (e.g. distinctive conventions of indication, ways of marking discourse perspective, prohibitions against certain kinds of expressions, etc.)

2.2.1 *Semiotic Constraints*

The most important and ubiquitous source of constraints on language organization arise neither from nature nor from nurture. That is, they are not the result of biological evolution producing innate predispositions and they are not derived from the demands of discourse or the accidents of cultural history. Semiotic constraints are those that most directly reflect the grammatical categories, syntactic limitations, and phrasal organization of language. They are in a real sense *a priori* constraints, that precede all others. Consequently they are most often confused with innate influences.

In a recent and now well-known theoretical review of the language origins problem (Hauser, Chomsky, & Fitch, 2002) Noam Chomsky appeared to retreat from a number of earlier claims about the innate ‘faculty’ for language, but he repeated his long-term insistence that what makes the human mind unique is an innate capacity to handle recursive relationships. Like many related claims for an innate grammatical faculty, this one too derives from a reductionistic conception of symbolic reference. If we assume, in contrast, that non-human communication is exclusively mediated by iconic and indexical forms of reference and that only human communication is symbolic it becomes clear why recursively structured communication is only present in humans.

Symbolization enables substitutions that cross-logical-type (e.g. part for whole, member for class, word for phrase) levels in linguistic communications. Neither icons nor indices can refer across logical types because of the involvement of sign vehicle properties (e.g. similarity of form, correlation in space or time) in determining reference. But because of the independence of sign vehicle properties from the objects of reference, symbols can represent other symbolic relationships including even combinations of symbols forming higher logical type units (such as phrases, whole sentences, and even narratives). This is exemplified by pronominal reference and also includes recursively operating on iconic and indexical relationships.

In summary, recursion is not an operation that must be added to human cognition over and above symbolic capabilities, it is a combinatorial possibility that comes for free, so to speak, as soon as symbolic reference is available. But it is not possible when restricted to only iconic and indexical forms. So the absence of recursion in animal communication is no more of a mystery than its presence in human communication. The reason that it is not found in the communication of other species is simply due to their lack of symbolic abilities.

Though recursion is made available with symbolic communication, it need not be taken advantage of, and so its paucity in child language and pidgins and its absence in some languages (e.g. Everett, 2005) is not evidence that it is an unimportant feature of language. But it is an important means for optimizing communication. Recursion provides means for condensing symbol strings. By repeated recursive operations it becomes possible to refer to an extensive corpus of prior discourse. This not only optimizes communicative effort, it also reduces working memory load because a large corpus of material can be subsumed into the reference of single symbolic unit