



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)



Language Sciences xxx (2007) xxx–xxx

**Language  
Sciences**

[www.elsevier.com/locate/langsci](http://www.elsevier.com/locate/langsci)

## *H. sapiens* as ecologically special: What does language contribute?

Don Ross \*

*Department of Philosophy and Department of Finance, Economics and Quantitative Methods,  
University of Alabama at Birmingham, United States  
School of Economics, University of Cape Town, South Africa*

---

### Abstract

This paper inquires into the extent to which humans are specially constituted relative to other animals by their language. First a principled concept of evolutionary specialness is operationalized. Then it is agreed that humans satisfy the criteria for this sort of specialness in consequence of the kind of cultural evolution in which they have participated. However, it is argued that although certain representational capacities limited to highly social and intelligent animals are necessary for such cultural evolution, the representational capacities in themselves are not special. Instead, the special property of humans that leads them to explosive niche-construction is the propensity to stabilize coordination through socially controlled self-narration. This propensity indeed depends on special aspects of human language, though syntactical structure is not necessarily among them.

© 2007 Published by Elsevier Ltd.

*Keywords:* Human distinctiveness; Human language; Cultural evolution; Strategic signaling

---

### 1. Introduction

It has lately become unfashionable in some parts of the behavioral sciences to focus on respects in which humans, and especially human language, are unique phenomena. This

---

\* Tel.: +1 91 205 3969071; fax: +1 91 205 9756610.  
E-mail address: [dross@commerce.uct.ac.za](mailto:dross@commerce.uct.ac.za)

26 has understandable origins. The histories of anthropology, ethology and linguistics are  
27 indeed littered with misleading ideas about the specialness of the one species to which  
28 all anthropologists, ethologists and linguists have belonged. One way of criticizing the  
29 thrust of all these older ideas involves denial that *H. sapiens* is in fact special. However,  
30 this requires refusal to acknowledge some obvious facts. Another way of criticizing most  
31 historical doctrines of human specialness all at once is to argue that they tried to find the  
32 causal and explanatory basis of specialness in the wrong *kind* of place (as opposed to just a  
33 variety of specifically wrong places). This is a form of criticism with which, in what fol-  
34 lows, I will sympathize. In particular, I will maintain that we do not find the basis of  
35 human oddness by looking *inside* the human phenome or genome. Rather, human special-  
36 ness is ecological. By this I would not just mean that humans exert special ecological effects  
37 – this is the obvious sense, to which I alluded above, in which people are special. Instead, I  
38 will describe ways in which the human species is unusually ecologically *constituted*. I'll  
39 then narrow attention to one dimension of this unusual constitution, namely, the strange  
40 human signaling behavior we call 'language'. The domain of linguistics, I will suggest, is  
41 both the most transparent site of traditional errors about human peculiarity, and – for  
42 much the same reason – provides an ideal perspective from which to diagnose and correct  
43 those errors. Put in terms critically discussed by other authors in this volume, the way in  
44 which linguists have misguidedly looked inside people for the mark of specialness, instead  
45 of attending to ecological properties, is by searching for the basis of language use in inter-  
46 nal 'decoding'.

47 Different possible conceptions of specialness need to be distinguished, so that we can  
48 focus clearly on just one of them. First, by 'specialness' of some type X in general we  
49 should not (if we want to say interesting things about X's specialness) mean merely that  
50 we can distinguish X's from conceptually nearby non-X's and keep these distinctions in  
51 view over time. These are necessary conditions for theorizing about X's in the first place,  
52 and if we then say that everything about which we can theorize is special, this statement  
53 adds nothing to our theoretical knowledge; we might as well do without the concept of  
54 specialness. Thus if someone wants to say '*H. sapiens* is special' they had better intend  
55 something more substantial and precise. Rather than try to cook up a general philosoph-  
56 ical theory of specialness – the difficulty and prolixity of which would be great and the sci-  
57 entific utility of which would be negligible – I will instead propose an operationalization of  
58 specialness tailored to the sciences of evolved systems.

59 First, assume that we have an evolutionary process modeled in the replicator dynamics  
60 (a standard parameterization of evolutionary game theory; see Weibull, 1995). Let us say  
61 that an evolved type of system *T*, or a type of aspect *T* of an evolved type of system, is  
62 'special' just in case the model requires a *phase shift* in the dynamics governing *T*'s devel-  
63 opment relative to the dynamics that model the evolution of *T*'s nearest evolutionary rela-  
64 tive *T*\*. 'Nearest relative' here needs to be given a more general interpretation than  
65 'nearest phylogenetic relative' if the concept of specialness is to be applied to types other  
66 than groups of organisms (for example, to products of cultural evolution or market selec-  
67 tion). Let us say very roughly that a type's nearest relative is determined by reference to  
68 the nearest occupied point in the *n*-dimensional feature space used to model the type's evo-  
69 lution, where *n* is the smallest number needed to predict the evolution of all features and  
70 dispositions of the type we have reason to regard as adaptive. (This reflects application of  
71 a parsimony condition to considerations that explain selection and stabilization of the  
72 type's adaptive features and dispositions. It is a specifically selectionist conception of relat-

73 edness and is not intended to contest the usefulness for other purposes of alternative  
74 conceptions; I am operationalizing here, not philosophizing.)<sup>1</sup> Then, by a ‘phase shift’ I  
75 mean that to explain the evolutionary trajectory of  $T$  relative to that of  $T^*$ , a new strategy  
76 parameter (as opposed to just a new value of a parameter) applicable to  $T$  but not, in the  
77 short run, to  $T^*$  must be introduced into the modeling dynamics. ‘Short run’ will here refer  
78 to the part of the dynamics during which  $T^*$  remains  $T$ ’s nearest relative. Put very gener-  
79 ally: a phase shift is a dimension increase in the adaptive complexity of selection dynamics.

80 Note that on this operationalization, specialness is relative to the grain of analysis at  
81 which types are sorted. If we are modeling the evolution of biological kingdoms in the rep-  
82 licator dynamics, then the coming of organisms that carry out photosynthesis represents a  
83 phase shift by the above criterion and the green plants are special. Likewise, among ani-  
84 mals the vertebrates are special; among vertebrates those with central nervous systems are  
85 special; and so on. By contrast, most species, at the grain of analysis where evolutionary  
86 paths to speciation are modeled, are not special. Exceptions to this last generalization are  
87 mainly found at the very early stages of the evolution of life – but I will be arguing that *H.*  
88 *sapiens* might be an exception, or, if it is not, then the number of related species with which  
89 *H. sapiens* shares its special status (a few other extinct forms of hominid) is unusually  
90 small.

91 Due to limitations of evidence that would decisively rule in favor of particular game-  
92 theoretic models of evolutionary processes, we often will not be able to determine with  
93 much or any confidence whether a given type is special, or exactly where the boundaries  
94 around a type thought to be special occur. But this does not undermine the operational-  
95 ization if it is sometimes useful.

96 Note one last aspect of the operationalization. A group of organisms might act on the  
97 environment in such a way as to generate a short-term phase shift in the modeling of all  
98 evolutionary processes in that environment. Since this will be relevant to the modeling of  
99 all trajectories in the evolutionary process, it will not pick out the responsible – let us call  
100 them ‘high-impact’ – organisms as constituting a special type. This highlights the point  
101 that the notion of ‘specialness’ here is technical. As I said at the outset, anyone must  
102 regard *H. sapiens* as special in the everyday sense of ‘special’ because of the way in which  
103 its pace of increase and quantity of niche construction have transformed the environment  
104 for all species. It is because this sort of human specialness is patent that I want to define it  
105 out of consideration. The inquiry here is into the question of whether *H. sapiens* and some  
106 of its specific aspects are specially *constituted* so far as evolutionary modeling is concerned;  
107 I am not wondering whether *H. sapiens* is unusually *important*.

108 In the literature on human evolution, the issues of specialness (in the sense just isolated)  
109 and importance (as high-impact status) have often been poorly separated. Since the focus  
110 in this paper will be on language, let us go straight to that as the example. There has been a  
111 great deal of energy (and heat) devoted to the question of whether non-human animals  
112 engage in ‘anything like’ human linguistic communication and/or linguistic representation.  
113 Among those who argue that the answer is ‘no’, the basis of the answer is often spelled out  
114 in terms of putatively unique human constitutional features – dedicated modules for

<sup>1</sup> Note that my formulation does not try to rule out extreme cases of convergence in which types that are maximally similar to one another are not linked by close phylogenetic relationships. This will be unusual or non-existent in biological evolution, but may be more common in cultural and some instances of virtual evolution. For my purposes here it would not matter.

115 universal grammar (Chomsky), or capacity to simulate serial computation (for example,  
116 Dennett, 1991b).<sup>2</sup> But now if one asks further questions about why these putative differ-  
117 ences are relevant to the original question, the answer to *that* frequently adverts implicitly  
118 to importance. No one has ever doubted that human brains are differently connected, in  
119 some ways, from brains of members of other species, and that these differences are relevant  
120 to behavioral differences, including differences in communication and representational  
121 behavior. Why are these differences supposed to imply a qualitative chasm between the  
122 *kinds* of communication and representation available to humans and those available to  
123 non-humans? What is said at this point is usually more intuitive than exact. We are inter-  
124 ested in our sort of communication and representation because they seem important to us.  
125 Inevitably, though, as we focus on distinctions closer to those we keep track of for the sake  
126 of our own everyday projects, taking our peculiarities as already salient, we will find spe-  
127 cialness if that is our criterion. (Consider: “Only humans can think about sets!” That is  
128 probably true. But unless one happens to be the sort of being who is already accustomed  
129 to the significance of sets, why is this fact of *evolutionary* importance?) Seeing the looming  
130 trivialization of the issue, discussions at this point can fall back on something more objec-  
131 tive, namely, the disproportionate impact of human capacities on the world. (“Because of  
132 our ability to think about sets, we could build steam engines and airplanes and ...”) To  
133 deny that this *is* an objective difference is just to play word-games over ‘objective’. How-  
134 ever, the move to it changes the original question from at least one way in which it might  
135 have been intended. It fails to address the issue of whether human language is special in the  
136 alternative objective sense I defined – which is much closer to the sense intended by  
137 Chomsky and his followers than any interpretation that focuses on distinctive human  
138 impacts.

## 139 2. Representational capacities and the basis of cultural evolution

140 This problem does not beset all discussions of the issue. I can best frame my discussion  
141 here by embedding it in the context of another that avoids the problem. Sterelny (2003)  
142 has defended the specialness of human language in the sense of my operationalization.  
143 That is, he argues that aspects of human language make possible certain properties of rep-  
144 resentations that in turn (as I would put it) give rise to phase shifts in evolutionary dynam-  
145 ics (of humans). For reasons I will discuss, I do not think that Sterelny’s account addresses  
146 the issues that *linguists* have mainly had in mind when they have wondered about the spe-  
147 cialness of language, and those are the issues I want to take up. But I will build on the  
148 platform Sterelny provides.

149 He distinguishes *social* dynamics, which arise whenever biological individuals play  
150 games that are not just draws from rounds of games played among recurring types in their  
151 lineages, from *cultural* dynamics. The former occur wherever agents have capacities for  
152 differential levels of cooperation sensitive to variable individual learning histories, and  
153 for coordination when their games confront them with multiple equilibria. The latter arise

<sup>2</sup> Some philosophers think that the unique constitutional feature in question is that we and we alone have a ‘language of thought’ in which sentences have meanings independently of public behavior, and which serves as a necessary basis for public language having semantic content (Fodor, 1975). I do not think this thesis has sufficiently non-tendentious empirical evidence in its favour to merit being taken seriously by scientists, so will ignore it here.

154 when accumulation of niche-construction activity across generations changes the fitness  
155 landscapes in which games are played. The main goal of Sterelny's evolutionary anthro-  
156 pology is to explain how cultural dynamics can arise out of social dynamics through  
157 endogenously driven<sup>3</sup> transformation of the cognitive and representational resources of  
158 social organisms.

159 He begins this explanation by arguing that non-parametric selection factors make envi-  
160 ronments 'translucent' to organisms, by which he means that many variables that organ-  
161 isms come under pressure to track fail to be reliably correlated with features that can be  
162 directly transduced by sense organs. This establishes selection pressure for (some) repre-  
163 sentations that are both *robust* and (relatively) *decoupled*. An organism deploys robust  
164 tracking of a feature when its cognitive architecture allows it to represent the feature inde-  
165 pendently of a specific perceptual stimulus or cue. The architectural conditions for robust  
166 tracking have been discussed in the literature for some years. Basically, robust tracking  
167 requires patterns of neural activation arranged in such a way that some neurons are sen-  
168 sitive only to other neurons, rather than to features of the environment directly, and some  
169 systems of neurons including these 'hidden' neurons implement nestable sets of and-gates  
170 and or-gates.<sup>4</sup> Gould and Gould (1988) offered behavioral evidence of robust tracking in  
171 bees. Lloyd (1989) sketched the generic model of a control system he argued to be the min-  
172 imal requirement for a 'simple mind' because it allows for at least a minimal degree of  
173 robust tracking, and there has been empirical discovery of such architectures in cock-  
174 roaches (Ritzman, 1984), toads (Ewert, 1987) and other animals.

175 Robust tracking is required for the implementation of complex strategies, and so is,  
176 unsurprisingly, ubiquitous in cognitively social animals.<sup>5</sup> (With respect to language-related  
177 phenomena, Cheney and Seyfarth (2005) describe robust representation of the meanings of  
178 conspecific acoustic signals in non-human primates.) However, Sterelny argues that  
179 humans exhibit to a uniquely high degree the use of a representational genus that goes  
180 a level beyond robustness in achievement of abstraction. Many representations in humans  
181 are not merely robust but also *decoupled* from specific action responses. By this he means  
182 that they are not tied to specific, stereotyped classes of behavioral responses (as, for con-  
183 trasting example, are Lloyd's simple minds that merely robustly represent).<sup>6</sup> Decoupling

<sup>3</sup> That is, driven by the dynamics of the social games themselves, rather than by exogenous environmental causes or chance mutations. This reflects no assumption to the effect that these or other kinds of exogenous developments might not have been important in the actual evolution of people; Sterelny indeed thinks, like almost everyone, that such developments were crucial. In particular, they are crucial for explaining why humans, but not most other social animals, evolved cultural dynamics. But this is a different question than the question: given the right selection conditions, how do cultural dynamics, in general, evolve out of social ones?

<sup>4</sup> And-gates are implemented in brains 'for free,' so to speak. That is, their presence follows from the way neurons work, as units with activation potentials that respond summatively to inputs. Or-gates are fancier. In the simplest neuronal implementation, they are achieved when an uptake neuron is linked to two input neurons that are linked to each other in a mutually inhibitory way. Lloyd (1989) argues that the output of the hidden neuron in the simple or-gate is the basic kind of 'proto-representation' – the kind of structure on which all representation is built – found in nature.

<sup>5</sup> I use 'cognitively social' in contrast to both 'asocial' and 'eusocial'. This is not to imply that actual eusocial and many asocial animals do not, in fact, make use of robust representations. The point is just that such representations are necessary for cognitive sociality. I do not know whether eusociality could exist without them.

<sup>6</sup> Note that Sterelny does not thereby deny a point emphasized by several authors in this volume, namely, that a great deal of human representation is tightly coupled to the environment, and probably necessarily so; see Rowlands (2003).

184 allows information to be looped back out into the external environment, and can thereby  
185 package information into new salience classes<sup>7</sup> to which even robust representational  
186 capacity is insufficient for sensitivity. (For example, no animal but a person could behav-  
187 iorally respond to any and all Toyotas in Toyota-specific ways.)

188 A disposition to form decoupled representations is the crucial requirement, Sterelny  
189 maintains, for cultural accumulation, which depends on the evolution of cognitive capac-  
190 ities for more than mere imprinting on others as imitation targets, and permits evaluation  
191 of hypothetical goals and techniques based on others' behavioral patterns as models. This  
192 in turn facilitates 'downstream' (that is, downstream from representation) niche construc-  
193 tion in which the niches in question are fabricated by manipulation of social parameters  
194 instead of first-order environmental ones. (People pull off the feat of reliable Toyota-rec-  
195 ognition thanks to an array of information they have built up in institutionalized public  
196 representational structures they know by convention how to use, from catalogues to metal  
197 logos fixed on cars.) When groups of humans competitively and cooperatively construct  
198 networks of such niches over time and space, the result is progressive reconfiguration of  
199 their environment so that (i) there are steadily increasing returns over time to further  
200 investment in decoupled representation and (ii) the environment becomes an increasingly  
201 densely stocked storehouse of accumulated information that itself cues more and addi-  
202 tional decoupled representations.<sup>8</sup> It is this last feature that enables developmental pro-  
203 cesses in children to come to track the eccentric perceptual salencies that decoupling  
204 requires, and that other animals miss.

205 Thus, in summary, a special thing that humans have done according to Sterelny is col-  
206 lectively fill our environment with accumulated cultural artifacts, some physical but many  
207 virtual, that cue our behavioral responses and coordinate them around abstract salience  
208 classes that we alone can track. Sterelny reserves the phrase 'cultural evolution' for this  
209 process, and distinguishes it from social evolution – that is, from the evolution of sociality  
210 itself, which has happened many separate times in natural history. In moving from mod-  
211 eling social evolution to modeling cultural evolution one must represent a phase shift in  
212 the time scales. For example, with respect to the longer-run evolutionary dynamics in  
213 our species, it may be just noise that Europeans domesticated pack animals centuries  
214 before Americans did, and that the former happened to get gunpowder and resistance  
215 to smallpox as well; but this is anything but mere noise when we are trying to explain pat-  
216 terns in cultural evolution. In addition, because decoupling populates fitness landscapes  
217 with virtual objects in addition to pre-established physical ones, it typically also produces  
218 the sorts of dimensional phase shifts in terms of which I have been defining specialness.  
219 (For example: people who found it easy to learn to read enjoyed a sudden fitness advan-  
220 tage after the invention of writing; and this advantage may well have been correlated with  
221 other cognitive dispositions that accelerated the pace of further cultural innovations along  
222 similar lines, such as manipulation of equations. Off course, I do not imagine that the  
223 invention of writing was a phase shift in human *genetic* evolution, which writing is too

<sup>7</sup> See the paper by Menary in this issue, as well as Wheeler (2004).

<sup>8</sup> Again, both Menary (this issue) and Wheeler (2004) describe common instances. The methods for instantiating this kind of loop between behavior and cultural scaffolding in robots are discussed in this issue by Cangelosi.

224 recent to have influenced yet; but it has certainly involved a phase shift in the cultural evo-  
225 lution of those cultures, the great majority, that have experienced it.)

226 This account provides a theoretical basis for regarding humans as special that is not  
227 mixed up with issues surrounding their importance to themselves or with their objective  
228 ecological importance. It stresses the extent to which a new, phase-shifted, evolutionary  
229 dynamics arose in the history of life as a result of the peculiarities of development of  
230 one species. Note that language in *one* sense is front-and-centre in the account. As Menary  
231 describes elsewhere in this issue, it is largely by means of linguistic artifacts (including  
232 repeated uttered phrases of the sort that are easily remembered as units; see Love's paper  
233 in this issue) that humans deposit their collectively accumulated representations into the  
234 environment so as to then cue new decoupled representations in particular individuals  
235 and groups.

236 Why do I qualify this last point by referring to language 'in one sense'? I will explain  
237 this by contrasting the properties of linguistic representations that make them important  
238 to Sterelny's account with the manifest and theoretical properties of language that have  
239 been emphasized by mainstream linguistics since Chomsky. As we will see, these are not  
240 quite the same features. I will then consider the implications of this contrast for answering  
241 the following questions: To what extent does human specialness *derive from* the specialness  
242 of human language? To whatever extent it does, is the relevant sort of specialness the sort  
243 that has mainly interested linguists?

244 There are two basic properties of collective representations required in cultural-  
245 evolutionary processes of the sort described by Sterelny. The first is that the properties  
246 of the representations (both types and tokens), *and* properties in their users, must be so  
247 configured that the representational types admit of multiple access, where individual epi-  
248 sodes of accessing do not typically distort them in ways highly idiosyncratic to individual  
249 accessers.<sup>9</sup> This implies minimal physical stability conditions on representational tokens  
250 and minimal similarity conditions, along dimensions salient to the relevant representers,  
251 within representational types. And representers have to have enough similarity in the  
252 behavioral responses cued in them by similar patterns of some properties of representa-  
253 tional tokens that conventions can evolve about the social uses of representational types.  
254 In the first place, for the cultural evolution of language and language elements it was  
255 relevant that humans have similarly structured vocal tracts, hearing equipment, and audi-  
256 tory processing dispositions in their brains, and can speak above whispers. It is important  
257 that, as the feats of oral story-transmission in many cultures attest, humans are highly con-  
258 ditioned to remember phrases, especially when they are set to music or rhythmically  
259 rapped. As noted above, the development of writing brought about a phase shift in the  
260 evolution of most human cultures, since this has allowed many people – eventually mil-  
261 lions, and over spans of centuries – to access representations that are exact copies of  
262 one another.

263 Of course, some degree of variance in human responses to representations is also essen-  
264 tial for cultural evolution (since any evolutionary process necessarily requires variance).

---

<sup>9</sup> Love, in this issue, seems on one possible reading of him to deny that there can be any systematic metric against which to understand 'distortions' of messages, let alone compare their extents. I am referring here to physical distortions of signals, however, not to differences between intentions of signalers and interpretations of receivers.

265 The required stability is stability only up to some threshold. Exactly where the threshold in  
266 question lies will vary with high sensitivity to other parameters in any particular replicator  
267 dynamics (though its second-order quantitative estimation by sensitivity analysis across  
268 ranges of models ought to be possible); the important point is just that a threshold must  
269 always exist if communication is to support cultural development. One of the key func-  
270 tions served by collective cues in replicator-dynamic models of cultural evolution is that  
271 of facilitating coordination in games with multiple equilibria. This offers one potential  
272 way of making the idea of the threshold more precise: there must be just enough stability  
273 in both signals and responses to them as to generate vectors of behavioral choices that  
274 individuals can recognize, consciously or otherwise, as equilibria. This is the core insight  
275 in the otherwise misleading metaphor of language as ‘encoding’<sup>10</sup> meaning: similar public  
276 linguistic representations cue similar behavioral responses in individuals with similar  
277 learning histories, as a result of conventional associations established by those similar  
278 histories.

279 Note that this crucial property of linguistic representation need not have anything  
280 directly to do with syntax or phrase structure, the properties of language that have been  
281 emphasized by linguists who advocate the thesis that human specialness partly rests on  
282 special human language. In principle, pictures could perform the function of cultural-evo-  
283 lutionary cueing if sufficiently stable conventions for behaving in response to stylized clas-  
284 ses of them evolved (biologically or socially or both). Indeed, to some extent pictures  
285 drawn on cave walls perhaps did perform the function, and our philosophical tradition  
286 has probably caused us to underestimate the importance of pictorial cueing of cultural  
287 accumulation in more recent times. Of course, it would be foolish to therefore deny the  
288 centrality of linguistic representations in the actual history of most cultures. Defenders  
289 of the view that syntax and phrase structure make people constitutively special might  
290 argue that pictures could not have carried the main load precisely because they lack the  
291 digital structural properties conferred on linguistic representations by syntax, and it is  
292 these properties that ground the conventional stability required for human cultural accu-  
293 mulation.<sup>11</sup> (The point here is that stabilization of conventions require that there be lim-  
294 ited options for conventions to choose amongst.) What is at stake at the moment,  
295 however, is not whether people could have accumulated the particular culture they actu-  
296 ally have done without syntactically structured linguistic representations. Our question is  
297 whether these sorts of representations are necessary for the phase shift involved in the  
298 transition from social to cultural evolution. We have reviewed the properties required  
299 for this shift in the bearers of collective cueing, and not found syntactic structure to be  
300 among them. Someone who thinks that the list of necessary properties should be strength-

---

<sup>10</sup> I agree with the point expressed by several authors in this issue that a language is not a code in the sense that became popular under the influence of early artificial intelligence. That is, it is not a set of structures from which one can recover, by de-coding, ‘ultimate’ information grounded in some more fundamental format. As usual, this negative insight can be stretched to the point of absurdity. Harris (2002) seems to go as far as denying (or wanting us to at least wonder if he is going as far as denying) that we can ever explain stabilities in communication by reference to objectively measured similarities. That is surely false, even if there is no one dimension of similarity that is always privileged, or even if the set of stabilizing dimensions varies from case to case.

<sup>11</sup> Fodor (2000) argues in something like this way. However, his critical target is a different thesis from the one I am defending here.

301 ened by the addition of syntax or phrase structure owes us a new argument. (See Toma-  
302 sello, 2005 for a specific rebuttal of old ones.)

303 This point does not deny that human language is unique among animal communication  
304 and representational devices in being (lexically) syntactically structured.<sup>12</sup> What has been  
305 questioned is merely the claim that this uniqueness is part of the basis for the constitutive  
306 evolutionary specialness of *H. sapiens*. It almost certainly *is* part of the basis for humans'  
307 special ecological impact; but a similar point can be made about almost any unique adap-  
308 tation, such as elephants' trunks or vipers' infrared detectors. The specialness thesis in lin-  
309 guistics has been intended to have more general modal force than that; it has been  
310 intended as the counterfactual-supporting generalization that *if* something like special  
311 human cognitive capacity evolves (anywhere, any time) it will have part of its necessary  
312 basis in the evolution of (lexically) syntactically structured (often read, for this very rea-  
313 son, as implying the modifier 'real') language.

### 314 3. Individualistic views of specialness

315 I now aim to provide a new argument for a thesis linking constitutive human evolution-  
316 ary specialness to specialness of human language. This argument will not quite license the  
317 specialness thesis of mainstream linguistics, because it will not (at least as far as I can see)  
318 warrant the implication that phrase structure is a necessary aspect of special language.  
319 Furthermore, the sense of 'syntax' as a necessary part of special language that my argu-  
320 ment will imply is not what many linguists will agree to call syntax as it has been under-  
321 stood since Chomsky. On the other hand, it might well be that no system for  
322 communication and representation that has the features I will argue to be necessary for  
323 human specialness could evolve without syntax in the Chomskyan sense. This is a question  
324 I will leave open.

325 It will help to clarify the thesis I will defend if I introduce it by way of contrast with a  
326 related and more familiar one. To linguists the two theses are apt to look like mere vari-  
327 ants of the same idea. From the perspective of evolutionary game theory, however, the the-  
328 ses suggest quite different models.

329 The view defended by a mainstream linguist, Bickerton (1990) will be my foil. He argues  
330 that although the selection pressures that drove the evolution of syntactically structured  
331 language were all related to the benefits it conferred in terms of more efficient communi-  
332 cation, what is special about this kind of language from an evolutionary point of view are  
333 the new representational capacities to which it gave rise. These are distinguished in classi-  
334 cally cognitivist terms: minds endowed with the capacity to form syntactically structured  
335 representations, according to Bickerton, can entertain counterfactual propositions. This in  
336 turn equips them to manipulate virtual as well as physical objects, events and processes.  
337 Organisms that can do this can thereby construct niches unavailable to organisms that  
338 can not. Thus we get – translating Bickerton's thesis into the conceptual terminology I  
339 used here – a phase shift in evolutionary dynamics as fitness landscapes take on extra

<sup>12</sup> Cheney and Seyfarth (2005) follow Marler (1977) in distinguishing between phonological and lexical syntax. They then suggest that non-human primates may have the former but not the latter. Phonological syntax is in place where "call combinations carry a meaning that is more than just the sum of their parts" while in lexical syntax "the component parts also play functional roles as subjects, verbs, modifiers, and so on" (Cheney and Seyfarth, 2005, p. 144).

340 dimensions of complexity. Thus, with humans, we get a new kind of evolutionary process,  
341 all owed to special properties of language.

342 This thesis finds a supporting and almost exactly complementary one in [Dennett \(1996\)](#).  
343 Whereas [Bickerton's](#) version emphasizes in detail the relationship between syntactically  
344 structured representations and statements of counterfactual-supporting generalizations  
345 ([Bickerton, 1990](#) 162), [Dennett](#) instead stresses the way in which systems that can build  
346 virtual models of reality can (uniquely) build rich intentional models of themselves –  
347 can, in his terms, take the intentional stance towards themselves – and thus bring new (vir-  
348 tual) 'real patterns' ([Dennett, 1991a](#)) into being. This, in my terms, confers specialness by  
349 virtue of the fact that an adequate model of the resulting dynamics will necessarily be more  
350 complex than the dynamics that accounts for the evolution of the non-intentional-stance-  
351 taking ancestors.

352 I will offer no quarrel with [Bickerton](#) or [Dennett](#) to this point in the story (or with [Den-](#)  
353 [nett](#) at any point in that part of the story that is just his). As [Tomasello et al. \(2005\)](#) and  
354 [Cheney and Seyfarth \(2005\)](#) agree, humans are indeed special in being able to take the  
355 intentional stance towards themselves and others. This depends on their being able to con-  
356 struct virtual domains in which informational dependencies that are otherwise inaccessible  
357 can be isolated and manipulated. New evolutionary dynamics, with new equilibria in  
358 higher-dimensional fitness landscapes, thus arise.

359 Where I will suggest an emphasis different in kind from [Bickerton's](#) is over the basis on  
360 which representation of counterfactuals is associated with specialness. [Bickerton](#) suggests  
361 that the basis for human syntax is found directly in the functional structure of the verte-  
362 brate (or perhaps just the mammal, or just the primate) brain. According to him, this  
363 structure partitions the world, at the most elementary level, into objects and processes.  
364 We see evidence of this, he maintains, when we study the speech of very young children,  
365 or of damaged, diseased or drugged adult humans falling back on primitive resources  
366 when communicating, or of apes who have learned sign language. They employ a pre-  
367 human 'protolanguage,' which expresses representations that mainly consist in predicating  
368 actions of subjects (but without any phrase structure or principles of government and  
369 binding). Protolanguage takes a world that is all processes and abstracts from it a repre-  
370 sented world built out of objects of nouns and objects of verbs. This, [Bickerton](#) argues,  
371 was the evolutionary platform on which a genetic modification occurred in *H. sapiens*.  
372 The modification in question produced a governing mechanism, an inhibitor, which  
373 restricts all phrase composition so as to follow the template of a noun phrase. This  
374 amounts, in effect, to the evolutionary invention of phraseology *period*, since [Bickerton's](#)  
375 suggestion is not that noun phrases already existed before the modification; his thesis is  
376 that nouns evolved into noun phrases and the part of the brain that now constructs noun  
377 phrases is, so to speak, 'in charge' of protolinguistic, and now (in non-infant humans) lin-  
378 guistic, representation. The core of the argument is stated thus:

379  
380 What noun phrases do as wholes is describe individuated entities: *a large book with a*  
381 *dark red cover, this friend of Mary's, three things that you told me about*. But at the  
382 heart (or head!) of each phrase is an abstract category: *book, friend, things*. Thus, the  
383 three layers of X-bar structure represent, respectively, (a) a generic class; (b) the  
384 properties peculiar to particular members of that class (*large, with a dark red cover,*  
385 *of Mary's*); and (c) the specification of the complete individual in terms of abstract

386 relations such as quantity, proximity, familiarity and so on (*a, this, three*) . . . Phrases,  
387 then, are simply machines for going from class to individual . . . on a purely formal  
388 level their three-layered structure constitutes a template that provides uniform struc-  
389 ture for all linguistic material. (Bickerton, 1990, p. 195)

391 Evolution of a similar mechanism for constraining representation of events is also hypoth-  
392 esized.<sup>13</sup> The post-modified human brain imposes a partitioning of the ontology of events  
393 by representing complex events (and, trivially, simple ones too) as, in the case of each one,  
394 a cluster consisting of a single verb and its arguments. Then

395  
396 Given the overall recursive nature of the phrase, these clusters could now be instan-  
397 tiated simply by inserting a verb and its arguments into an automatically generated  
398 phrase matrix. Thus a verb and its arguments, instead of being merely strung  
399 together as in protolanguage, now formed parts of a single cohesive unit. These  
400 units, roughly equivalent to clauses, would then impose a series of boundaries on  
401 the stream of speech, thereby enabling the hearer to know where one unit of utter-  
402 ance ended and another began – a result that could never have been achieved in the  
403 undisciplined protolanguage. Within each unit, arguments and verbs would be  
404 assembled according to something like the following algorithm: build the internal  
405 arguments of a verb (that is, the non-subject arguments) into phrases; join them into  
406 a phrase with the verb as its head; build an external argument (the clause subject)  
407 along the same lines; and then insert the external argument and the verb phrase  
408 under the non-head nodes in a superphrase. (Bickerton, 1990, pp. 195–196).

410 It should be emphasized that on this hypothesis language is not something over and above  
411 general neural organization. The idea is that the mammal (or perhaps just primate) brain  
412 organizes the world into an implicit ‘metaphysics’ of objects and events. The protolan-  
413 guage is simply the evidence of this in communication. Language then results from further  
414 brain organization, as a result of which the metaphysics are constrained yet further: now  
415 there is a particular, hierarchically arranged, set of types of objects and events that may  
416 stand only in certain sorts of logical relationships to one another. These new restrictions  
417 on which possible metaphysics can be represented and communicated are the cost paid for  
418 a new capacity: they allow the representation of worlds that are possible with respect to  
419 the constraints, but non-actual. Thus was born, in Sterelny’s terms, cultural accumulation.

420 It should now be clear why I said that, for Bickerton, although language evolved under  
421 selection pressures favoring richer communicative capacities, its representational aspect is  
422 analytically primary: the structure of language is a direct expression of the representa-  
423 tional structure of the brain. Thus, on his thesis, what makes humans special are their spe-  
424 cially wired brains. It was once this wiring arose that the phase shift in evolution  
425 associated with *H. sapiens* took place.

426 I will offer no comment, by way either of endorsement or criticism, of the speculative  
427 evolutionary morphology here. Baynes and Gazzaniga (2005) provide neuroscientific evi-

<sup>13</sup> Bickerton is unclear as to whether this part of his story is supposed to be interpreted as postulation of (i) two evolutionary modifications with a common genetic or selectionist cause, (ii) two modifications in which one served as a constraint on immediate subsequent development that thereby caused the other, or (iii) a high-level, abstract discrimination of two aspects of one modification.

dence in favor of the suggestion that the right hemisphere in left-handed people implements Bickerton's protolanguage, and manifests this in behavior when it is isolated from the left hemisphere. The concerns I will raise here are not with Bickerton's model of the way in which the brain might implement the capacity for syntax, or with the implications of this that he suggests for the ontogeny of thought and speech. What I instead want to do is draw attention to the way in which his hypothesis makes the specialness of the *species* a function of the innate specialness of *individuals*. In this respect, the hypothesis reflects the individualist cognitivism that dominated the late 1980s and early 1990s. If there is any doubt about this, consider the following remark: "What gave our own species its ascendancy was not so much the power to communicate as the power to think, to imagine, and to plan, using our language-constructed model of reality as an arena in which to rehearse possible future actions. This power could have flourished in the absence of any adequate means of expression" (Bickerton, 1990, p. 162).

How are we to understand the force of this last 'could have'? No doubt it is *logically* possible that a creature could represent the world to itself in the way a normally socialized human does without being able to talk about it to others. But mere logical possibility is of no scientific interest. There is no other obvious sense of possibility we have empirical grounds for endorsing here. It is mysterious as to how evolution might build a group of creatures each of which represented a flexible range of counterfactual spaces to itself, but none of which could stabilize referential fixed points in these spaces by means of shared conventions that are stored in the cultural environment. The problem is that nothing else, external to the creature's control, seems to be available to stand in to stabilize the counterfactual reference relationships instead. An organism might be able to represent a narrow, fixed, and stereotyped set of counterfactual relationships privately, but that sort of restricted capacity is not what Bickerton is talking about – or needs to posit to predict specialness. The relatively unrestricted representational power he *is* talking about may be necessarily social. Indeed, as I will argue, it seems to merit being called 'hyper-social'.

Let me be explicit about the problem I believe confronts Bickerton's suggested basis for specialness. Novel brain wiring, which humans self-evidently have to some extent, does not in itself predict, or therefore explain, a phase shift in evolutionary dynamics. Fancier representational capacities have no doubt often conferred fitness advantages on their bearers throughout evolutionary history. Both Bickerton and Dennett (1996) have much of interest to say about how the capacity to model counterfactuals plausibly enhanced the fitness of the first of our ancestors who had it in some degree. But why should this predict a phase shift? Suppose, on the one hand, that an organism *innately* models certain counterfactuals. This is just a common or garden adaptation, a tropism built into neocortex that might, for all the logical difference this makes, have been built into the nerve net.<sup>14</sup> Suppose alternatively, therefore, that the counterfactual regularities in question are learned. In that case, they must be learned by observation of *non-counterfactuals* (since counterfactuals them-

<sup>14</sup> Consider a brittle star that visually tracks its prey, despite not having a brain, by means of photosensitive cells whose outputs directly drive the motions of its arms. Does it represent the counterfactual 'If the occluded light shifted 5 degrees to the right, I would keep tracking the prey by halting my front right arm and keeping my front-left one going'? It does not represent this 'in so many words', of course, but then brains by themselves do not represent anything 'in so many words' either. We should simply say that the brittle star *procedurally* represents the counterfactual, in the sense that the information its behavior expresses could be extracted by study of the functional architecture of its nerve net.

467 selves, by definition, cannot be observed). As Dennett (1996) emphasizes, a creature might  
468 very efficiently learn by monitoring and then modeling the consequences of others' mis-  
469 takes. But this is only a strategy that can go on yielding increasing returns to the extent  
470 that the others closely resemble the observer (since otherwise their powers and constraints  
471 do not accurately model the observer's powers and constraints) and their situations resem-  
472 ble the observer's situation. This implies a natural dampening function on any tendency of  
473 mere capacity for counterfactual modeling to produce runaway selection relative to the  
474 parameterization of an initial fitness landscape – that is, to produce dynamical phase  
475 shifts. Representation of counterfactuals is not based on magical intuition; and given that  
476 it is not, it is not evident why it necessarily transforms evolutionary possibilities. Note that  
477 Dennett does not imply that the phase shift relevant to human specialness occurs with ste-  
478 reotyped counterfactual representation, the trick that arises with the development of what  
479 he calls 'Popperian creatures'. On Dennett's account, what is distinctive about people is  
480 their status as 'Gregorian creatures', that is, their ability to take the intentional stance  
481 toward others and to themselves. This is why, despite the extent to which Bickerton's  
482 and Dennett's accounts of the basis for sophisticated cognition are complementary, my  
483 worry about Bickerton's hypothesis does not apply to Dennett's.

484 This problem, I suggest, generalizes to any strategy that aims to predict new *dynamical*  
485 properties out of *localized* structural differences. If this is so, then here is how *not* to try to  
486 construct an account of human specialness: first, account for special sorts of individuals by  
487 reference to new internal properties they have; then aggregate these individuals into a spe-  
488 cial sort of species. As the (relatively) new discipline of cognitive ethology/ecology (Dukas,  
489 1998; de Waal and Tyack, 2003) has recognized, the early modern (Lockean) metaphysics  
490 of the relationship between individuality and social structure got the conceptual relation-  
491 ship more or less backwards. It is not false to say, as a theorist of Lockean inclinations  
492 might, that evolution eventually builds organisms sufficiently representationally sophisti-  
493 cated that they can express subtle individual differences in their dispositions and thereby  
494 make these a basis for intraspecific competition with one another. Individuality *does* rest  
495 crucially on individual representational capacities; insects probably do not have distinct  
496 personalities because they lack adequate scope for differentiation in cognitively mediated  
497 behavioral dispositions.<sup>15</sup> The problem with this description is that it leads us away from,  
498 rather than closer to, the dynamical explanation of the evolution of increasing behavioral  
499 variation within species. This emerges most clearly in its failure to predict a salient fact  
500 about the distribution of such variation in nature, namely, that it occurs to a far greater  
501 extent in intensely social species than in non-social ones. That enhanced representational  
502 capacity and intraspecific behavioral variability are correlated is a tautology, since we infer  
503 representational *capacities*, as opposed to actual representations that would explain an  
504 individual's own manifest behavior, from behavioral variability across the individual's  
505 type in the first place. By contrast, it is not a tautology but a deep empirical regularity that  
506 these also correlate very closely with social complexity. Increased representational capac-  
507 ity does not explain enhanced individuality because these are the same fact under different  
508 descriptions; whereas increased social complexity is a key part of the explanans of both.

<sup>15</sup> On the other hand, it takes surprisingly little variation for personality differences to be manifest; see Gosling and Vazire (2002). I will return to this below.

#### 509 4. Narrative selfhood as the special human property

510 The so-called ‘Machiavellian intelligence’ hypothesis (Byrne and Whiten, 1988; Whiten  
511 and Byrne, 1997; Dunbar, 1998) has become familiar across the evolutionary sciences, and  
512 is integrated to some degree into most specific theories now entertained about the genesis  
513 of cognitive sociality. According to this hypothesis, the main selection pressure that gave  
514 rise to enhanced representational capacity was the need for organisms in social groups to  
515 remember different conspecifics and their variable track records with respect to reciprocity  
516 and tendencies towards sociopathy and violence. Notice that this account necessarily  
517 treats social structure and individual variation as coevolutionary. Thus it does not explain  
518 a special social origin of a special *kind* of individuality; it in effect treats sociality as ampli-  
519 fying the basic biological distinction between individuals that arose with the formation of  
520 multicellular coalitions. In light of my focus in this paper on humans and their language,  
521 I will here work around this issue by invoking a distinction between two different concepts  
522 related to advanced dimensions of individuality: the distinction between *personality* and  
523 *selfhood*. The former refers to the sort of individual variation we find emerging with  
524 strongly enhanced emphasis in all the social birds and mammals; evolution of the latter  
525 is (or so I will argue) distinctive of human specialness, and rests on special properties of  
526 human language.<sup>16</sup> I will thus pass over the interesting and complicated question of  
527 whether the evolution of personality represented an evolutionary phase shift, and concen-  
528 trate on why and how the evolution of selves did so. This enterprise is more or less equiv-  
529 alent to explaining, in terms of evolutionary dynamics, the distinction between  
530 personalities and selves in the first place.

531 In ethology, *personality* refers to a particular animal’s matrix of response dispositions  
532 with respect to the social emotions (e.g., rage, fear, lust, care, panic, play).<sup>17,18</sup> That is,  
533 it maps expected ranges of intensities-of-response across a set of social emotion types to  
534 social situations (which are not, so far in the animal personality research, typed according  
535 to any standard model). On the basis of these judgments, animal personalities are assigned  
536 as scalars on some or all independent dimensions of a five-factor model derived from  
537 human psychology: these dimensions are neuroticism vs. emotional stability, agreeableness  
538 vs. antagonism, extraversion vs. introversion, openness vs. closedness (to new experiences)  
539 and conscientiousness vs. impulsiveness (Gosling and John, 1999).<sup>19</sup> While these con-  
540 structs fare reasonably well in tests for agreement in application among independent

<sup>16</sup> The terminology inherited from the meeting of different disciplinary literatures here is about as non-transparent as can be, and so will ultimately need some reform efforts from would-be unifiers. I will not attempt this now, however, so the reader is asked to just abide the following potential confusion. I take *personto* denote a moral idea: persons are entities that respond to threats and enhancements to their integrity of their *selves*. Thus only humans (but not all humans) are persons (though we typically socialize dogs in such a way that they simulate persons up to low levels of approximation). In general, non-human animals are not persons. These terminological conventions derive from philosophy and (to a lesser extent) political theory. But then from recent ethology comes the convention that *personality* is found across the social animals, so even rats and mice have personalities – despite not being persons.

<sup>17</sup> This list is taken from Panksepp, 2001. There is not yet complete consensus among behavioral scientists as to how the social emotions should be categorized. My use of Panksepp’s list should be taken as merely exemplary.

<sup>18</sup> Ross and Dumouchel (2004) give reasons for doubting that the idea of a ‘non-social emotion’ makes conceptual sense.

<sup>19</sup> The overwhelming majority of animals do not admit of measurable variation on the last dimension.

541 observers and scorers (Gosling and Vazire, 2002), they obviously represent compressions  
542 of more fine-grained underlying differences across ranges of behavioral dispositions. For  
543 this reason, most researchers have been reluctant to regard them as individually adaptive.  
544 (It is, however, not uncommon for personalities to be treated as non-adaptive variations  
545 within adaptive ranges of population-average behavior.)

546 Against this tendency, Dall et al. (2004) argue that personalities may represent fre-  
547 quency-dependent equilibrium strategies in within-species evolutionary games that have  
548 polymorphic equilibria. It is too soon to evaluate this suggestion, since the only way to  
549 do so is to design many game-theoretic models of intra-specific dynamics, predict person-  
550 ality distributions within populations on the basis of them, and then test the predictions.  
551 Dall et al. describe no such tests as having yet been performed, though Dall (2004) inter-  
552 prets a field study by Dingemanse et al. (2004) of differential survival among great tit per-  
553 sonality types under different levels of seasonal severity as evidence of matching of  
554 personality distributions to shifts in selection pressures. Note that as long as we are dealing  
555 with animals that have significant learning capacity – which is often, but not always, the  
556 case in this literature<sup>20</sup> – then unless personality is used to denote a fixed trait in the organ-  
557 ism (one that possibly summarizes a probability distribution over dispositions to adopt  
558 variable specific behaviors on different occasions), the hypothesis of Dall *et al* becomes  
559 trivial (because ‘personality’ ceases to be a construct with any validity independent of  
560 behavioral dispositions). Thus we have good reason (that is, our desire for a construct  
561 we can use to make contingent predictions) to regard personalities as either (i) stochastic  
562 products of development of underlying dispositions that stabilize at some point in an  
563 organism’s maturation, or (ii) strategies in intraspecific evolutionary games among  
564 lineages.

565 Whichever of these turns out to be the most perspicacious way of conceptualizing per-  
566 sonality – it may emerge that each concept applies in some species but not others, or to  
567 some dimensions of personality but not others in a given species – it is possible that per-  
568 sonality and intelligence are the only psychological axes along which members of non-  
569 human species vary as specific individuals (rather than as males or females, adults or juve-  
570 niles, members of seal-eating pods or fish-eating pods, etc.). At least, they are the only such  
571 axes suggested in literature to date.

572 However, this is surely not true of humans, who in addition vary with respect to kinds  
573 of preferences, styles of self-description, and sensitivity to different bases for forming  
574 beliefs. These are the basic dimensions of human *selfhood*. That they are behaviorally  
575 important is undeniable. People tend to bond closely with particular others, for example,  
576 not just as representatives of personality types (or as instances of genetic relatives), but as  
577 distinctive selves. (Thus, for example, a person whose mate has lost their self to trauma or  
578 disease will not be consoled if the mate’s personality type has remained constant.) Further-  
579 more, people generally regard the integrity of their selves as tremendously important; most  
580 will risk, and many will even willingly embrace, death in defense of this integrity. This does  
581 not apply, or at least apply nearly so widely, to personality.

<sup>20</sup> Among learning animals, Gosling and Vazire (2002) report that personality variation has been studied in humans, chimpanzees, rhesus monkeys, ferrets, hyenas, rats, sheep, rhinoceros, hedgehogs, zebra finches and octopuses. However, they also report studies in garter snakes and guppies, both of which learn only over crudely partitioned spaces.

582 Why should selves evolve over and above personalities? Ross (2004, 2005) answers this  
583 question as follows. The range of types of games that humans can play is, just by virtue of  
584 the complexity of human institutions, greater by orders of magnitude than what other ani-  
585 mals encounter. Furthermore, humans, but not other animals, can construct and circulate  
586 detailed records of their own games and the games of others throughout their societies,  
587 with limits set only by conspecifics' levels of interest. As a result, the lives of humans  
588 are dominated by repeated rather than one-shot games – so much so that a range of evi-  
589 dence indicates that when experimental human subjects are set into one-shot games they  
590 initially mistake them for repeated games and play accordingly for some time until learn-  
591 ing corrects the error (Ledyard, 1995; Sally, 1995; Binmore et al., 1995). Humans therefore  
592 face not only a bewildering variety of game forms, but mainly play games in which the so-  
593 called 'folk theorem' applies; that is, in which there are multiple equilibria. In such circum-  
594 stances, knowledge of ranges of distribution of personality types, or even knowledge map-  
595 ping personality types onto specific individuals, will generally offer insufficient guidance  
596 for finding equilibrium strategies. A social species whose members cannot find equilibrium  
597 strategies in games with one another must either evolve away from sociality or face extinc-  
598 tion. Although natural selection cannot look ahead and see that a new device is needed to  
599 maintain human sociality, the path to genetic extinction or extinction of behavioral pat-  
600 terns leads through individual failures to maximize. Thus individuals are incentivized to  
601 help each other find equilibria (though they will often disagree over which equilibria it  
602 would be best to find).

603 These parameters around human games are expressed in the following behavioral gen-  
604 eralization about people: they will tend to avoid playing games with individuals whose  
605 selves they cannot model. A person with whom others will not play games is a person  
606 in a desperate predicament. (She is also a biological entity with a low fitness coefficient,  
607 though this in itself might not matter to her as a person.) This explains the overwhelming  
608 importance people attach to their selves. Selves are necessary devices for playing successful  
609 coordination games among people, and coordination games are the basic ecological tasks  
610 facing people.

611 What is a self, then, that it can perform this function? Following Dennett (1991b), Bru-  
612 ner (1992, 2002) and Ross (2005), a self is a narrative construct similar to a character in a  
613 novel.<sup>21</sup> It is a virtual object 'spun' in public discourse and closely monitored and tended  
614 by the organism that hosts and takes the lead in constructing it. Humans begin to tell (very  
615 simple) stories with themselves as objects when they are children, picking up on cues sug-  
616 gested by parents and other caregivers. The child's contributions to these stories are  
617 (unless the child is neglected) enthusiastically reinforced when the contributions are narra-  
618 tively consistent with what has already been developed. Early in the narration, many pos-  
619 sibilities remain open; but as people get older the possibility space becomes narrower. This  
620 reduced space *is* the self; the reduction is what enables others, along with the subject her-  
621 self, to predict what the person will do across a range of situations. Thus people – defined  
622 now as biological individuals of the type *H. sapiens* equipped with selves – can successfully  
623 find coordination equilibria across ranges of games with others. We may not fully appre-

<sup>21</sup> Though Dennett (1991b) appeals to this analogy because he assumes his readers will have thought about where characters in novels come from more than they will have thought about where selves come from, in one sense it reverses figure and ground. People are able to understand the idea of a character in a novel because they already understand the idea of the self, even if they have never thought explicitly or theoretically about it.

624 ciate the power and importance of the self as a kind of virtual object if we do not take the  
625 game-theoretic perspective here fully seriously. Because people play most of their games  
626 under observation from third to  $n$ th interested parties, who thereby receive strategic infor-  
627 mation, and because people know that this is their situation, a human social life – which is  
628 to say, the main part of a human life – is a non-parametric general equilibrium problem.  
629 For a population of interacting agents of non-trivial size, that is about as hard as a prac-  
630 tical computational problem can get without being mathematically intractable.<sup>22</sup> It is thus  
631 rational for adult humans to defend the integrity of their selves with their lives, as they  
632 tend to do, because a human with a dysfunctional self is in a situation comparable to that  
633 of a songbird with a broken wing.

634 Theorists from a range of disciplines have wrestled with the difficult concept of narra-  
635 tive consistency in efforts to make it more precise. It has been a focus of much interest in  
636 historiography, for obvious reasons. In this literature one finds enough good examples to  
637 justify confidence in human reliability as narrative-consistency detectors; but the theoret-  
638 ical generalizations tend to be trite.<sup>23</sup> Far less subtle as considerations of cases but better  
639 as explicit theorizing are efforts from AI researchers who have recognized that no com-  
640 puter would pass a true Turing test if it could not both respect narrative consistency in  
641 its discursive behavior and detect violations of narrative consistency in people. The  
642 attempt to build these capacities into AI programs goes under the label of ‘schema theory’  
643 (Schank and Abelson, 1977; Mandler, 1984). Unfortunately, far from building procedural  
644 theories of narrative consistency that can handle general equilibrium problems, schema  
645 theorists have gotten no further than methods that work in tiny toy worlds and crash into  
646 the so-called ‘frame problem’ (Pylyshyn, 1987) when one tries to scale them up.

647 Most cognitive scientists think that people avoid being crippled by frame problems  
648 thanks to massively parallel processing neural hardware that automatically equilibrates  
649 among ranges of so-called ‘soft constraints’, as opposed to sequentially working through  
650 hierarchies of hard constraints (Clark, 1989). This nicely explains how people (and other  
651 animals with brains) can execute real-time solutions to practical action problems without  
652 seizing up while searching arrays of irrelevant ideas in order to mark off their irrelevance.  
653 However, one of the things that massively distributed processors tolerate to a much  
654 greater extent than people is precisely narrative inconsistency. If one part of a brain is exe-  
655 cuting a plan for domain D1 based on conclusion P, another part can be cheerfully imple-  
656 menting its plan for domain D2 based on not-P. The functional efficacy of the brain, the  
657 fact that its functional partitioning is well adapted to typical human environments (includ-  
658 ing, though cultural learning, to culturally evolved environments), ensures that, usually,  
659 no grief will result from this sort of situation because D1 and D2 are not directly related  
660 to one another. But this circumstance precisely does *not* describe a general equilibrium  
661 problem of the kind that calls forth selves. It is important to the viability of the parallel

<sup>22</sup> The ‘problem of life’ is analytically intractable. People generally handle it, between occasional bouts of self-analysis that may or may not be very helpful, by simulating the external market of pressures and influences in the 13-trillion-synapse parallel processors between their ears. A massively distributed system built to equilibrate over an enormous range of input is just the tool for a general equilibrium problem, if, as in the biological case, one’s hardware is too slow, given the input load, for implementation of linear programming.

<sup>23</sup> Roberts (1996) is an exemplary instance. The explicit theory at the conclusion of the book, following wise reflections on interesting examples, is its only disappointing aspect. No one familiar with this literature should be surprised by this.

distributed processing approach to problem solving that P and not-P in the example be *sub-personally* represented data structures; if both are simultaneously incorporated into the self's narrative, the person actually *will* tend to halt in confusion until the dissonance is sorted out.

There is, to my knowledge, only one theoretical approach in the cognitive science literature that makes at least conceptual headway against this difficulty. This approach is [Dennett \(1991b\)](#), and it makes essential appeal to distinctively human language. The property of language to which Dennett's account appeals is not that it has syntax or phrase structure but that it is *digital*.

Dennett's basic account is as follows. People, as described above, are socially required to narrate selves. Selves are required to be broadly consistent in their normative judgments, and a person's behavior is required to be broadly consistent with those. Thus people must monitor their own behavioral patterns, including the behavior of their brains insofar as they have access to it. Describing their behavior in the terms made available by a natural language that has evolved mainly under normative pressure forces people to sort the data into categorical spaces of lower dimensionality than would be used by a neuroscientist or behavioral scientist who was trying to be objective. Thus I might feel myself under pressure to report that I approve, disapprove or do not care about so-and-so's recent behavior, even if the facts about my own behavior and monitored emotional signals support only a much more nuanced and equivocal verdict. Similarly, objects with which people interact must be placed into distinctive categories and decisions made about their boundary conditions, even if, at the sub-personal level of neural representation, these boundaries are fuzzy dynamic equilibrations across multi-dimensional feature spaces. This kind of dimensional compression through translation into a digital representational format is, at any rate, how we should charitably understand Dennett when he suggests that the connectionist brain (in humans) simulates a serial processing von Neumann machine.<sup>24</sup> Some critics of this proposal (e.g., [Churchland, 2002](#)) have read it as the implausible suggestion that the brain, using its own representational resources, performs this simulation *directly*.<sup>25</sup> However, if this were Dennett's thesis then he would be failing to make full use of his own narrative theory of the self. Selves are compromises between two sets of constraints. On the one hand, they must make sense of the behavioral data. On the other hand, they must interpret that data so that it comes out as consistent with previously told stories and – the crucial point here – must do so in the terms made available by the culturally determined 'report form' they find in the environment: the local language.

So far, it might seem that this account is subject to the objection I raised against Bickerton's hypothesis as an explanation of specialness. Because it has all been put in terms of individual cognitive processing, one can ask why and how it predicts any phase shift in evolutionary dynamics. The answer lies in attention to the feedback relations that govern every part of the process. Brains are goal-driven systems ([Granit, 1977](#)). Therefore, if a standing goal at the whole-system level is that output should conform as closely as possible

<sup>24</sup> In earlier work, Dennett distinguished sub-personal level 'beliefs' from their linguistically inflected, and therefore more precise, expression as 'opinions'.

<sup>25</sup> In fact, when not engaged in criticism of Dennett, Churchland suggests the same thesis himself. Thus he says at one point that a declarative utterance is a "one-dimensional *projection*– through the compound lens of Wernicke's and Broca's areas onto the idiosyncratic surface of a speaker's language – of a four- or five-dimensional 'solid' that is an element in his true kinematic state" ([Churchland, 1981](#), p. 85).

702 to expectations coded into the descriptive and normative terms of the linguistic reporting  
703 medium, this will influence dynamics at the sub-personal level. Sub-personal judgments  
704 that both P and not-P will become less likely, even though this implies some sacrifice of  
705 perceptual objectivity. (In effect, the central nervous system will be partly captured by a  
706 prevailing ideology built into the local language.) Here lies the key trick by which the  
707 non-parametric general equilibrium problem that is a person's social life is (approx-  
708 imately) solved. She, herself, *does not* really solve it; it comes partly solved for her in cul-  
709 turally evolved limits on which sorts of combinations of behavior may be reported. The  
710 biological individual learns about these limits, and defines the further restrictions on her  
711 own freedom of movement within them, when she narrates herself into being in childhood  
712 and adolescence.

713 It would be a considerable exaggeration to claim that linguistic structures do *all* of this  
714 constraining work on selves. (Such exaggeration is what is wrong with the Sapir–Whorf  
715 thesis in anthropology.) Children master their local languages before they are four years  
716 old, yet in modern economies we let them go on making fairly fundamental revisions to  
717 their selves into early adulthood, and many cultures allow even adults to make substantial  
718 changes as long as they do so according to some meta-narrative others understand (e.g.  
719 'being born again', or 'going to alcoholics anonymous' or 'having their consciousness  
720 raised'<sup>26</sup>). But it is the demand imposed on individual brains to make their outputs lingu-  
721 stically describable that is the necessary dynamical wedge for the whole process.<sup>27</sup> If people  
722 were not required to report their own behavior within the terms of an evolved natural lan-  
723 guage, they would grow up to be something like – incompetent – chimpanzees, and com-  
724 plex coordination games would be beyond them (as they in fact *are* beyond actual,  
725 otherwise competent, chimpanzees, as discussed in Tomasello et al., 2005).

726 This account immediately predicts an evolutionary phase shift. For people, and no  
727 other animals, the most important part of the evolutionary environment is a set of virtual  
728 artifacts. These are themselves evolved and evolving structures. Thus modeling human  
729 evolution, by contrast with modeling the evolution of humans' nearest non-human rela-  
730 tives, involves a *massive* phase shift. The complication goes beyond our merely having  
731 to increase complexity by adding parameters. Instead, we take on an entire further evolu-  
732 tionary level – the level of cultural evolution – and then must model both this novel level  
733 and the standard genetic level as an interlocked coevolutionary process. The methodolog-  
734 ical implications of this for evolutionary game theorists who study human interactions –  
735 the vast majority of game theorists, then – are profound, and presently the subject of  
736 heated debate as to technical means (Ross, 2006). The disputed issues in question do  
737 not arise for the game theoretic modeling of non-human lineages.

## 738 5. Human specialness and language

739 We may now finally describe, in intuitive terms, the respect in which humans are spe-  
740 cial, and the significance of language to this specialness. Humans are not just another,

<sup>26</sup> The normative acceptability of these meta-narratives is often disputed among sub-cultures. Atheists tend to be uncomfortable with the first meta-narrative while conservatives (both American-style and others) disapprove of the third. But everyone *understands* them all, which is the relevant point here.

<sup>27</sup> Locke and Bogin (2006) review a large body of evidence for the thesis that competition to verbally articulate striking but plausible commentaries and narratives is a core aspect of typical adolescent development.

741 unusually adaptive, species of social mammal. They have evolved a degree of sociality  
742 that approaches that of the eusocial animals (hymenoptera, termites, naked mole rats)  
743 without this adaptation being based on modification of fundamental reproductive  
744 dynamics. They may be unique in nature in this respect, though we do not yet know  
745 enough about the toothed whales and elephants to pronounce emphatically on this  
746 point. However, humans are strongly distinguished from their nearest living relatives  
747 in this respect. Almost all human behavior is mediated by attention to ongoing coordi-  
748 nation games played with dozens of other specific individuals and, in the case of humans  
749 integrated into national and international economies, millions of anonymous individuals.  
750 By contrast, as Tomasello et al. (2005) document in a survey of evidence, chimpanzees  
751 fail at even simple 2-animal coordination projects if these are not modeled closely on  
752 familiar activities. Even important coordination problems that recurrently confront wild  
753 chimpanzees require very long learning times, by human standards, for achievement of  
754 mastery. Boesch (2003) reports that male chimpanzees in the Tãï forest of Cote D'Ivoire,  
755 who rely on monkey meat as their principal source of protein and hunt cooperatively on  
756 most days, require about 20 years to learn to ambush prey that has been flushed by oth-  
757 ers. Whether relative chimpanzee incompetence at coordination results from lack of ded-  
758 icated cognitive apparatus that humans possess, or is instead related to absence of  
759 motivation is not known. In either case, however, it is now no surprise that they cannot  
760 learn human languages, which require fine coordination in negotiation of meaning  
761 (Tomasello et al., 2005).

762 It is not clear to what extent humans rely on special cognitive apparatus to achieve their  
763 prodigious coordination feats. Many commentators, distracted by individualist metaphys-  
764 ical assumptions, have inferred special cognitive mechanisms directly from social behavior.  
765 This pays insufficient heed to the informational 'scaffolds' (Clark, 1998) that coevolve with  
766 people. These artifacts, which humans invest considerable energy in maintaining, cue cog-  
767 nitive routines in such a way as to strongly bias behavior in the direction of equilibrium  
768 play in coordination games. (Binmore, 2005 argues that most human social breakdown  
769 and institutional failures occur as consequences of lags, when games change as a result  
770 of exogenous developments but people persist in using familiar equilibrium strategies from  
771 previous games.)

772 As Clark (1998) and others have argued, the foremost piece of informational scaffolding  
773 in every human environment is language. It serves as far more than a device for exchang-  
774 ing information (which evidence suggests to be the overwhelming or sole function of other  
775 animal signaling systems). In particular, humans force their thoughts to conform to  
776 evolved digital categorization spaces by continuously narrating accounts of their behavior  
777 and interpreted mental processes, both ongoing and in retrospect. It is this behavior,  
778 enforced and policed by systems of social sanction and reward, that more than any other  
779 causes each individual human to be in large part a variation on a group theme, an instan-  
780 tiation of prevailing cultural patterns in his or her community. To the question "How do  
781 humans achieve coordination approximating that of eusocial animals despite their stan-  
782 dard mammalian population genetics," a best quick answer, if one were required, would  
783 be to say that immersion of behavior in language performs the job that hapladiplod genet-  
784 ics does in bees. Thus humans are constitutively special partly because they have language  
785 of a kind unknown in the rest of nature. This is so independently of facts about possible  
786 special neural adaptations for language use, about possible innateness of universal gram-  
787 mar, and about whether other animals have or can learn syntax.

788 **6. Uncited references**

789 Diamond (1997), Rowlands (1999).

790 **Acknowledgements**791 I would like to thank Stephen Cowley and Karl MacDorman for helpful comments on  
792 an earlier draft of this paper.793 **References**

- 794 Baynes, K., Gazzaniga, M., 2005. Lateralization of language: toward a biologically based model of language. The  
795 Linguistic Review 22, 303–326.
- 796 Bickerton, D., 1990. Language and Species. University of Chicago Press, Chicago.
- 797 Binmore, K., 2005. Natural Justice. Oxford University Press, Oxford.
- 798 Binmore, K., Gale, J., Samuelson, L., 1995. Learning to be perfect: the ultimatum game. Games and Economic  
799 Behavior 8, 56–90.
- 800 Boesch, C., 2003. Complex cooperation among Tai chimpanzees. In: de Waal, F., Tyack, P. (Eds.), Animal Social  
801 Complexity. Harvard University Press, Cambridge, MA, pp. 93–110.
- 802 Bruner, J., 1992. Acts of Meaning. Harvard University Press, Cambridge, MA.
- 803 Bruner, J., 2002. Making Stories: Law Literature Life. Farrar, Strauss and Giroux, New York.
- 804 Byrne, R., Whiten, A. (Eds.), 1988. Machiavellian Intelligence: Social Expertise and the Evolution of Intellect in  
805 Monkeys, Apes and Humans. Oxford University Press, Oxford.
- 806 Cheney, D., Seyfarth, R., 2005. Constraints and preadaptations in the earliest stages of language evolution. The  
807 Linguistic Review 22, 135–159.
- 808 Churchland, P., 1981. Eliminative materialism and the propositional attitudes. Journal of Philosophy 78, 67–90.
- 809 Churchland, P., 2002. Catching consciousness in a recurrent net. In: Brook, A., Ross, D. (Eds.), Daniel Dennett.  
810 Cambridge University Press, New York, pp. 64–80.
- 811 Clark, A., 1989. Microcognition. MIT Press, Cambridge, MA.
- 812 Clark, A., 1998. Being There. MIT Press, Cambridge, MA.
- 813 Dall, S., 2004. Behavioral biology: fortune favours bold and shy personalities. Current Biology 14, R470–R472.
- 814 Dall, S., Houston, A., McNamara, J., 2004. The behavioural ecology of personality: consistent individual  
815 differences from an adaptive perspective. Ecology Letters 8, 734 ff.
- 816 Dennett, D., 1991a. Real patterns. Journal of Philosophy 88, 27–51.
- 817 Dennett, D., 1991b. Consciousness Explained. Little Brown, Boston.
- 818 Dennett, D., 1996. Kinds of Minds. Basic Books, New York.
- 819 de Waal, F., Tyack, P. (Eds.), 2003. Animal Social Complexity. Harvard University Press, Cambridge, MA.
- 820 Diamond, J., 1997. Guns, Germs and Steel. Jonathan Cape, London.
- 821 Dingemans, N., Both, C., Drent, P., Tinbergen, J., 2004. Fitness consequences of avian personalities in a  
822 fluctuating environment. Proceedings of the Royal Society of London B: Biological Sciences 271, 847–852.
- 823 Dukas, R. (Ed.), 1998. Cognitive Ecology. University of Chicago Press, Chicago MI.
- 824 Dunbar, R., 1998. Grooming, Gossip and the Evolution of Language. Harvard University Press, Cambridge,  
825 MA.
- 826 Ewert, J.-P., 1987. Neuroethology of releasing mechanisms: prey-catching behavior in toads. Behavioral and  
827 Brain Sciences 10, 337–368.
- 828 Fodor, J., 1975. The Language of Thought. Harvard University Press, Cambridge, MA.
- 829 Fodor, J., 2000. The Mind Doesn't Work That Way. MIT Press, Cambridge, MA.
- 830 Gosling, S., John, O., 1999. Personality dimensions in nonhuman animals: a cross-species review. Current  
831 Directions in Psychological Science 8, 69–75.
- 832 Gosling, S., Vazire, S., 2002. Are we barking up the right tree? Evaluating a comparative approach to personality.  
833 Journal of Research in Personality 36, 607–614.
- 834 Gould, J., Gould, C., 1988. The Honey Bee. Freeman, San Francisco, CA.
- 835 Granit, R., 1977. The Purposeful Brain. MIT Press, Cambridge, MA.
- 836 Harris, R., 2002. The Language Myth in Western Culture. Routledge, London.

- 837 Ledyard, J., 1995. Public goods: a survey of experimental research. In: Kagel, J., Roth, A. (Eds.), *The Handbook*  
838 *of Experimental Economics*. Princeton University Press, Princeton, pp. 11–194.
- 839 Lloyd, D., 1989. *Simple Minds*. MIT Press, Cambridge, MA.
- 840 Locke, J., Bogin, B., 2006. Language and life history: a new perspective on the development and evolution of  
841 human language. *Behavioral and Brain Sciences* 29, 259–280.
- 842 Mandler, J., 1984. *Stories Scripts and Scenes: Aspects of Schema Theory*. Lawrence Erlbaum, Hillsdale, NJ.
- 843 Marler, P., 1977. The structure of animal communication sounds. In: Bullock, T. (Ed.), *Recognition of Complex*  
844 *Acoustic Signals*. Dahlem Konferenzen, Berlin, pp. 17–35.
- 845 Panksepp, J., 2001. The neuro-evolutionary cusp between emotions and cognitions. *Evolution and Cognition* 7,  
846 141–161.
- 847 Pylyshyn, Z. (Ed.), 1987. *The Robot's Dilemma*. Ablex, Norwood, NJ.
- 848 Ritzman, R., 1984. The cockroach escape response. In: Eaton, R. (Ed.), *Neural Mechanisms of Startle Behavior*.  
849 Plenum Press, New York, pp. 93–131.
- 850 Roberts, C., 1996. *The Logic of Historical Explanation*. Pennsylvania State University Press. Springer, PA.
- 851 Ross, D., 2004. Meta-linguistic signaling for coordination amongst social agents. *Language Sciences* 26, 621–642.
- 852 Ross, D., 2005. *Economic Theory and Cognitive Science: Microexplanation*. MIT Press, Cambridge, MA.
- 853 Ross, D., 2006. Evolutionary game theory and the normative theory of institutional design: Binmore and  
854 behavioral economics. *Politics, Philosophy and Economics* 5, 51–79.
- 855 Ross, D., Dumouchel, P., 2004. Emotions as strategic signals. *Rationality and Society* 16, 251–286.
- 856 Rowlands, M., 1999. *The Body in Mind*. Cambridge University Press, Cambridge.
- 857 Sally, D., 1995. Conversation and cooperation in social dilemmas: a meta-analysis of experiments from 1958 to  
858 1992. *Rationality and Society* 7, 58–92.
- 859 Schank, R., Abelson, R., 1977. *Scripts Plans Goals and Understanding*. Lawrence Erlbaum, Hillsdale, NJ.
- 860 Sterelny, K., 2003. *Thought in a Hostile World*. Blackwell, Oxford.
- 861 Tomasello, M., 2005. Beyond formalities: the case of language acquisition. *The Linguistic Review* 22, 183–197.
- 862 Tomasello, M., Carpenter, M., Call, J., Behne, T., Moll, H., 2005. Understanding and sharing intentions: the  
863 origins of cultural cognition. *Behavioral and Brain Sciences* 28, 675–691.
- 864 Weibull, J., 1995. *Evolutionary Game Theory*. MIT Press, Cambridge, MA.
- 865 Wheeler, M., 2004. Is language the ultimate artifact? *Language Sciences* 26, 693–715.
- 866 Whiten, A., Byrne, R., 1997. *Machiavellian Intelligence II*. Cambridge University Press, Cambridge.
- 867