

EVOLUTIONARY PSYCHOLOGY AND THE ORIGINS OF LANGUAGE

(Editorial for the special issue of *Journal of Evolutionary
Psychology* on the evolution of language)

THOMAS C. SCOTT-PHILLIPS*

School of Philosophy, Psychology and Language Sciences
University of Edinburgh

Abstract. A naïve observer would be forgiven for assuming that the field of language evolution would, in terms of its scope and methodologies, look much like the field of evolutionary psychology, but with a particular emphasis on language. However, this is not the case. This editorial outlines some reasons why such a research agenda has not so far been pursued in any large-scale or systematic way, and briefly discusses one foundational aspect of that agenda, the question of evolutionary function. This background provides context for an introduction of the articles that appear in this special issue on the evolution of language.

Keywords: evolution, language, Tinbergen, linguistics, function

1. INTRODUCTION

Discussion as to the origins and evolution of language predates Darwin (STAM 1976), but so unscientific did the 19th-century establishment find these speculations that further enquiry was banned. The *Société de Linguistique de Paris*' 1866 edict was unfortunately timed, coming as it did just seven years after Darwin's *Origin of Species* and five years before *Descent of Man*. As a result, language evolution was something of an intellectual orphan through the 20th century. Furthermore, although the ape language experiments of the 1960s and 1970s (e.g. GARDNER and GARDNER 1969; PREMACK 1971; TERRACE et al. 1979) were in significant part motivated by a

* Address for correspondence: THOMAS C. SCOTT-PHILLIPS, School of Philosophy, Psychology and Language Sciences, University of Edinburgh, 3 Charles Street, Edinburgh, EH8 9AD, UK; E-mail: thom@ling.ed.ac.uk

concern with the origin of language, the mainstream view in linguistics was that evolution had little to say about matters of linguistic concern: “Evolutionary theory is informative about many things, but it has little to say, as of now, of questions of this nature [the evolution of language]... in the case of such systems as language or wings it is not easy even to imagine a course of selection that might have given rise to them” (CHOMSKY 1988: 167). It was in response to this and similar views (e.g. MEHLER 1985; PIATELLI-PALMARINI 1989) that Pinker and Bloom wrote what was to become an influential paper, “Natural language and natural selection” (1990), in which they laid out the argument that the human capacity for language is an adaptation that has been shaped by natural selection for the purposes of communication. The paper’s publication is often said to herald the beginning of the present interest in language evolution. Certainly, research interest in the area has grown year-on-year since then. In recognition of that development, this special issue of the *Journal of Evolutionary Psychology* on the evolution of language marks the 20th anniversary of the publication of Pinker and Bloom’s piece.

In one of the responses to the article, Tooby and Cosmides outlined a research agenda that they called an “adaptationist psycholinguistics” (TOOBY and COSMIDES 1990: 760). Their basic argument was that linguistics and psycholinguistics should recognise that the cognitive mechanisms that underpin language and language use will have been moulded by natural selection to solve recurrent problems faced by language users, since doing so would produce a suite of insights and empirical hypotheses that could better shape our understanding of language. In short, they argued for an extension of the standard practices of behavioural ecology into the domain of language. Yet despite the growing interest in language origins and evolution, this has arguably not occurred in any widespread way. (There are, of course, exceptions, as I shall discuss.) The question thus arises: if language evolution research has not sought to apply the tools of behavioural ecology to its topic of enquiry, as evolutionary psychology has done, then what questions does it ask, and why? *Table 1* summarises four attempts to categorise the questions that evolutionary linguists ask. It is apparent that there is no widespread agreement on what the central questions are. Certainly, it is not the case that Tinbergen’s four whys (1963; see *Table 2*), which provide the theoretical foundation for behavioural ecology and evolutionary psychology, provide an accepted framework in which to position research in the evolution of language. Of the four categorisations surveyed, one explicitly avoids comparison (“It is tempting to compare these questions with TINBERGEN’s (1963) four famous evolutionary ‘why’ questions. However, in contrast, I mean these to reflect the kinds of questions that get posed in the literature on language evolution, some of these being clearly specific to language” (KIRBY 2007: 671–672); one (BOECKX and GROHMANN 2007) claims that their questions are “conceptually unpacked” variants of Tinbergen’s questions; while the other two (BICKERTON 2007; DI SCIULLO et al. 2010) do not mention the four whys at all. The consequence is that language evolution is a somewhat disparate field, with, as *Table 1* makes clear, little agreement on what the central questions are, or should be – let

Table 1. Different categorisations of the questions asked by evolutionary linguists

| Source | Questions |
|--------------------------|--|
| KIRBY 2007 | <ol style="list-style-type: none"> 1. <i>Structure</i>: Why is language structured the way it is and not some other way? How can an evolutionary approach explain the particular language universals we observe? Mechanism 2. <i>Uniqueness</i>: Why are we unique in possessing language? What is so special about humans? Phylogeny 3. <i>Function</i>: How could language evolve? What were the selective pressures involved? Function 4. <i>History</i>: What is the evolutionary story for language? When did it evolve? Were there intermediate stages? Phylogeny |
| BICKERTON 2007 | <p><i>Major issues</i></p> <ol style="list-style-type: none"> 1. How did symbolic units (words or manual signs) evolve? Phylogeny 2. How did syntax evolve? Phylogeny <p><i>Significant issues</i></p> <ol style="list-style-type: none"> 3. What was the initial selective pressure for the first steps towards language? Function/Phylogeny 4. Was the subsequent development of language gradual or abrupt? Phylogeny 5. How did the development of phonology relate to (1) and (2)? Phylogeny <p><i>Minor issues</i></p> <ol style="list-style-type: none"> 6. Did language begin with speech or with signs? Phylogeny |
| BOECKX and GROHMANN 2007 | <ol style="list-style-type: none"> 1. What is knowledge of language? Mechanism 2. How is that knowledge acquired? Ontogeny 3. How is that knowledge put to use? Mechanism 4. How is that knowledge implemented in the brain? Mechanism 5. How did that knowledge emerge in the species? Phylogeny |
| DI SCIULLO et al. 2010 | <ol style="list-style-type: none"> 1. What are the properties of the language phenotype? Mechanism 2. How does language ability grow and mature in individuals? Ontogeny 3. How is language put to use? Mechanism 4. How is language implemented in the brain? Mechanism 5. What evolutionary processes led to the emergence of language? Phylogeny |

Notes: In all cases the wording and presentations of these questions is taken directly from the original source, but after each question I have added, in bold, how the question would be classified in Tinbergen's framework (see Table 2). As can be seen, questions of phylogeny (and, to a lesser degree, mechanism) dominate: even if we ignore one or other of (BOECKX and GROHMANN 2007) and (DI SCIULLO et al. 2010), which share a common author, there are nine questions about phylogeny, four questions about mechanism, two questions about function and one question about ontogeny. The focus on mechanism over function is perhaps unsurprising, given that many researchers consider the question of function either obvious or theoretically uninteresting (see main text for discussion). Similarly, while a proper understanding of ontogeny is a necessary component for a complete understanding of any biological trait, it is not obviously an evolutionary question, so its lack of attention from evolutionary linguists is unsurprising. However the emphasis on phylogeny (not only is it the most common type of question here, it is also the only one that appears in all the categorisations) is worthy of mention, and is discussed at some length in the main text (especially §4).

alone upon the answers. Certainly, it does not consist of a straightforward extension of the standard practices of behavioural ecology into the domain of language.

Table 2. Tinbergen's four whys

| | different types of explanation | | |
|--------------------------------|---|---|--|
| | single form (explains the makeup of one par- ticular form) | development /history (explains the histori- cal process behind the form) | |
| different types of question | ultimate (explains why organisms are the way they are by de- scribing how natural selec- tion shaped their current form) | function – what, if anything, is it adapted for? | phylogeny – what is its evolu- tionary history? |
| | proximate (explains how organisms work by describing struc- tures, process of develop- ment, etc.) | mechanism – how does it work? | ontogeny – how does it de- velop? |

Notes: Tinbergen's four questions (function, mechanism, phylogeny and ontogeny) can be grouped into a two-by-two grid. One axis defines the type of explanation – either a single form or the historical/developmental process behind it. The other axis defines the level of explanation – either ultimate (why it exists) or proximate (how it works). Thus in the top-right corner we have phylogeny, which refers to the evolutionary development of the trait in question, and in the bottom-right we have ontogeny, the development of the trait within the organism. Function, in the top-left, refers to the ultimate, evolutionary level purpose of the trait – what, if anything, it was selected for – and in the bottom-left is mechanism, which addresses precisely how the functional logic is implemented. Examples can be found in any introductory textbook to behavioural ecology (e.g. ALCOCK 2009; KREBS and DAVIES 1993), or to evolutionary approaches to psychology (e.g. NETTLE 2009).

It is thus worthwhile to take the opportunity presented by this editorial to revisit Pinker and Bloom's argument, and to ask why a behavioural ecology of language has not been pursued in any large-scale or systematic way. §2-4 attempt to do this. §2 returns to Pinker and Bloom's main concern: the somewhat vexed question of the evolutionary function of language. I will first discuss how Pinker and Bloom's claim relates to hypotheses about the relative importance of other selection pressures (e.g. gossip, sexual courtship). I will then argue that Pinker and Bloom's conclusion is correct, but that they look to the wrong sources of evidence to support their claim. In §3 I discuss the hostility that some branches of linguistics have expressed towards evolutionary explanation, and in §4 I survey the sorts of questions that do in fact get asked in language evolution research. This background then pro-

vides the context for §5, in which I introduce and briefly discuss the papers that appear in this special issue.

2. COMMUNICATION AND EVOLUTIONARY FUNCTIONALITY

2.1 Derived and direct functions

What might a behavioural ecology of language look like? A first step might be to establish the evolutionary function of language. This was, after all, the goal of PINKER and BLOOM's (1990) article, and they concluded that the answer to this question is communication. Others have expressed skepticism about what can be usefully said here: "communication' is far too vague to constitute such a hypothesis, and none of the other candidates on offer seem much better... seeking a single adaptive function for 'language' ... is more likely to produce confusion and misunderstanding than insight" (FITCH, CHOMSKY and HAUSER 2005: 189). On the one hand, I have some sympathy with the view that Pinker and Bloom's conclusion is not particularly insightful – but then so do Pinker and Bloom themselves; "In one sense our goal is incredibly boring" (p. 708). Many others consider it "obvious" (BLACKMORE 1999: 99; CLARK 2000: 405; DUNBAR 1993: 727; HURFORD 2008: 253; NOWAK and KOMAROVA 2001: 288; PINKER 1994: 367). On the other hand, banality is not a reason to reject the question entirely. Function is an important part of any evolutionary analysis, even if the matter appears trivial.

Having said that, the matter is not as trivial as it might seem. As indicated above, there are other selective pressures that have been argued to be of functional significance for the evolution of language, for example gossip (DUNBAR 1993, 1997) and sexual courtship (BURLING 1986, 2005; MILLER 2000). How should these claims be interpreted? Do they challenge the claim that the function of language is communication?

To answer these questions we should distinguish between *direct* and *derived* functionality (see MILLIKAN 1984). Direct functions are those functions that are historically responsible for the reproduction of the item in question. So, for example, hearts make noise, contribute to body weight, and pump blood, amongst other things. Yet it is only the last of these that is its direct function, since it is their capacity to pump blood, and the contribution this makes to survival, that explains why hearts are reproduced from one generation to the next. Derived functions, in contrast, are those functions that particular instances of an item perform, in order to satisfy that item's direct function. So the direct function of, say, a chameleon's ability to change the pigmentation of its skin is to allow it to disguise itself in a variety of different environments; but the derived function of *this* chameleon changing its skin to a greeny-brown colour is to fit in with *this* particular environment of leaves and shrubs. As should be clear, an item can have one direct function but many derived functions.

This distinction allows us to make sense of the various claims mentioned above (see also ORIGGI and SPERBER 2000): communication is the direct function of language, while acts such as gossip, courtship, hunting and so on are various derived functions of language. Put another way, the ability of language to influence the behaviour of others explains its reproduction from one generation to the next, and it achieves this through the production of linguistic behaviours that we variously call gossip, chat-up lines, and so on (see also §3). “Hands may be very good for throwing rocks, shooting arrows, and pressing triggers, but we do not infer that manipulability therefore arose as an adaptation for success in aggression” (GOULD 1991: 53). Instead we simply conclude that such manipulability is an adaptive end in its own right; a versatile tool with a wide range of applications. Much the same is true here. Language’s great expressivity reflects its diverse selection pressures.

If this analysis is correct, then the successful practices of behavioural ecology (see e.g. ALCOCK 2009; KREBS and DAVIES 1993) should provide a suite of predictions about how the various derived functions of language are used (TOOBY and COSMIDES 1990). These predictions have been little explored thus far. The main exception to this is the role of pitch in sexual attraction and intrasexual competition, which has received a significant amount of research attention (e.g. FEINBURG 2008; PUTS, GAULIN and VERDOLINI 2006). There is also some research on the use of gossip to achieve socially desirable outcomes (BUSS and DEDDEN 1990; GREENGROSS and MILLER 2008; MCANDREW, BELL and MARIA GARCIA 2007; MCANDREW and MILENKOVIC 2002), and on how semantic creativity (FRANKS and RIGBY 2005; GRISKEVICIUS, CIALDINI and KENRICK 2006) and vocabulary size (ROSENBERG and TUNNEY 2008) vary according to the sexual context (males use language in more creative ways, and with a wider vocabulary, when faced with attractive, similar-aged females than with other audiences). Otherwise there are, to my knowledge, very few papers that test predictions about language use that are borne of behavioural ecological theory. This seems a fruitful area for future research, especially if it can be extended into other areas of language, for example syntax. More generally, the relative importance of each of the various derived functions of language is not well understood. Initial ethological observations report that social matters are common topics for conversation, while other supposedly evolutionarily important topics, such as the solicitation of advice and the policing of free-riders, take up relatively little time (DUNBAR, DUNCAN and MARRIOTT 1997; see also LOCKE 2001). More in depth research of this nature would be welcome.

2.2 Models of language

Which data justify the claim that communication is the function of language? Pinker and Bloom’s argument was based on two simple premises: natural selection is the only source of design in nature, and language exhibits evidence of design for

the purposes of information transfer. From these they conclude that language evolved for that reason. To make the case for the second premise, they appeal to linguistic universals that aid information transfer (for example, verb affixes). My goal in the next two subsections is to show that this is not the right sort of evidence for the argument they wish to make. Pinker and Bloom's appeal to linguistic universals is a consequence of their commitment to a particular way of thinking about communication, but linguistic communication is better conceived of in another way, and consequently other sources of evidence should be appealed to in order to make the argument from design that Pinker and Bloom seek to do.

Speaking broadly, two possible approaches to linguistic communication can be identified. One is termed the *code model*, in which communication is conceived of as a process whereby two information-processing devices (in this case, human brains) directly map internal meanings onto external signals in both production and reception. In this picture to encode or to decode an utterance is to perform an act of machine translation, in which a lexicon (a individual's collection of linguistic units, e.g. words) is searched for the meaning of each of the utterance's constituents, and these meanings are then combined to form the meaning of the utterance. A similar process, in reverse, accounts for production. The defining formulation of this model is Shannon and Weaver's *Mathematical Theory of Communication* (1949), which sowed the seeds of information theory and is still the dominant paradigm of communication in artificial intelligence and associated disciplines. The code model also has a natural fit with Chomskyan generative grammar, which conceives of language as a formal, computational system of symbol manipulation. Correspondingly, there is a wide if implicit assumption amongst many linguists that this is a reasonable way in which to conceptualise communication.

There is, however, an alternative, which has been developed and refined over the past 40 years or so within pragmatics – the branch of linguistics that deals with meaning in context (AUSTIN 1955; GRICE 1971, 1975; LEVINSON 1983; SPERBER and WILSON 1995). The *ostensive-inferential* model of communication posits that communication is achieved through the production and interpretation of evidence for the meaning that is to be communicated. The act of production is called ostension and the act of comprehension inference. The evidence is provided through the physical alteration of the shared environment (i.e. by speech, gestures, or whatever other medium is used), an act that triggers the inference of the intended meaning. For example, if I offer my girlfriend a cup of tea in the morning, she may respond "I've already cleaned my teeth". In doing so she provides evidence that she wishes to decline my offer, yet she does not say as much explicitly. Neither must the evidence necessarily be verbal, or even linguistic: I can gesture towards a friend's newly arrived plate of chips, and in doing so provide evidence of my desire to have one of the chips myself. Different pragmatic theories (see HUANG 2007; LEVINSON 1983 for surveys) disagree about precisely how this communication is achieved, but all agree that production is ostensive and that its goal is to induce a particular

change in the listener's mind; and that comprehension is inferential and its goal is to discover the speaker's intended meaning.

2.3 Pragmatics and the evolutionary function of language

That linguistic communication is ostensive-inferential is uncontroversial. Nevertheless, it is common in many branches of linguistics (and indeed in artificial intelligence and other related disciplines) to assume a code model, if only as a methodologically justified simplification. This has, however, meant that pragmatic reality has often been ignored or downplayed in evolutionary approaches to language, not to mention in linguistics in general. In particular, the central protagonists involved in the debate over the evolutionary function of language subscribe to this perspective. PINKER and BLOOM's text (1990), for example, is littered with the terminology of codes and algorithms. The following passage is representative: "the vocal-auditory channel has some desirable features as a medium of communication: it has a *high bandwidth*... however it is essentially a *serial interface*... the basic tools of a *coding scheme* employing it are an inventory of *distinguishable symbols* and their *concatenation*" (p. 713, italics added). It is because of this commitment to a code model of communication that Pinker and Bloom look, for the most part, to linguistic universals (and particularly grammatical universals) for evidence of design in language.

This argument is open to the criticism that linguistic structure is in fact not as well designed for communication as it might otherwise be. It is not difficult to postulate other ways in which language would be well designed for information transfer. For example (PIATELLI-PALMARINI 1989), multiple centre-embedded clauses (e.g. *The man the boy the woman saw heard left*, which would more conventionally be expressed as, say, *The woman saw the boy that heard the man that left*) would be a simple and elegant way to express propositions with multiple dependencies (indeed, it is typically how computer languages perform the same task) – and, more to the point, it is the most efficient way to do so from an information theoretic perspective. Humans are, however, poor processors of such structures. The argument, then, is that if natural selection tends towards optimal design, why is language not optimally designed for the function (i.e. information transfer) that Pinker and Bloom assign to it?

One response (advocated by a number of linguists and cognitive scientists, and discussed further in §3, below) is that it is because natural selection cannot be used to explain language. Another might be to argue that there are always constraints on the optimality that natural selection can achieve, and that we should expect design to be good enough rather than perfect. This is the view Pinker and Bloom take. The pragmatic considerations discussed above suggest a third response: that information transfer is not the right criterion by which to assess good design in communication. Rather, our pragmatic competence, of which information transfer is simply one component, is where we should look for evidence of design. If this is right, then the

correct questions to ask with regard to evidence of design is not ‘Is language well designed for information transfer?’ but rather “Is language well designed to provide the evidence necessary to convey the intended speaker meaning?; and “Is language well designed to take that evidence and infer the intended speaker meaning?”. (Incidentally, this view meshes very well with how evolutionary biology defines communication (SCOTT-PHILLIPS 2010a).) Structure in languages is useful only insofar as it enables speakers and listeners to achieve these goals – and it may well be the case that the degree of regularity that already exists in languages is sufficient for this.

In short, Pinker and Bloom’s argument can be criticised not because of their commitment to Darwinism, but because of their commitment to a code model of communication (SPERBER 1990). The appropriate sources of evidence to which one should appeal in order to make the argument from design are not linguistic universals that aid information transfer (which are, for the most part, the sources of evidence that Pinker and Bloom appeal to), but rather the psychological and cognitive tools that allow speakers and listeners to engage in ostensive-inferential (rather than coded) communication. Correspondingly, this analysis suggests that one key challenge for future research is to describe the mechanisms that allow humans to engage in ostensive-inferential communication, and hence how these abilities relate to phenomena of more traditional linguistic interest (e.g. syntactic universals).

3. LINGUISTIC HOSTILITY TOWARDS NATURAL SELECTION

As already mentioned, Pinker and Bloom considered their conclusion “incredibly boring” (1990: 708). The motivation for their paper was rather to provide a response and counter argument to a hostility, within linguistics, and indeed in cognitive science more generally, towards evolutionary approaches to human behaviour. In particular, Chomsky, the most influential linguist of the 20th century, has been a repeated and vehement critic. Consider the following:

“The processes by which the human mind achieved its present stage of complexity and its particular form of innate organization are a total mystery... it is perfectly safe to attribute this development to ‘natural selection’, so long as we realize that there is no substance to this assertion, that it amounts to nothing more than a belief that there is some naturalistic explanation for these phenomena.” (CHOMSKY 1972: 97)

“What kind of biological evolution [is language the result of]? Well, here you have to look at the little bit we know. We can make up lots of stories. It is quite easy: for example, take language as it is, break it up into fifty different things (syllable, word, putting things together, phrases and so on) and say: ‘OK, I have the story: there was a mutation that gave syllables, there was an-

other mutation that gave words, another one that gave phrases... another that (miraculously) yields the recursive property (actually, all the mutations are left as miracles).'. OK, maybe, or maybe something totally different; stories are free and, interestingly, they are for the most part independent of what language is... the story you choose is independent of the facts, pretty much." (CHOMSKY 2002: 146)

These are not isolated examples; many more statements in a similar vein can be found (see e.g. KINSELLA 2009; PINKER and BLOOM 1990). On the surface, this rejection of evolutionary explanation in general and natural selection in particular is curious, since it would seem that Chomskyan Universal Grammar has a lot to gain from an evolutionary perspective (DENNETT 1996; PINKER and BLOOM 1990). How, then, should it be interpreted?

Chomsky's defining contribution to linguistics was to insist that language, and specifically syntax, is most profitably studied as a formal, computational system of symbol manipulation, whereby phonological input is translated into propositional form. In this respect, the linguistic system is considered to operate independently of exogenous factors. Humans do not learn language merely by virtue of exposure to the linguistic environment; rather, they are endowed with some innate capacity for language – a Universal Grammar. This means that the proper Chomskyan is committed to the view that external phenomena, for instance the communicative context and other pragmatic aspects of meaning cannot, by definition, form any part of a formal grammar (LAKOFF 1991).

The opposite thesis, that the system and the environment cannot be coherently decoupled, can be termed 'Spencerian' (GODFREY-SMITH 1993) (after Herbert Spencer, who developed a selectionist view of human psychology and who can be seen as the original proponent of the idea that behaviour and environment must be studied in the round (see LESLIE 2006)). Because it emphasises the role of the environment in the determination of organismic form, evolutionary biology's modern synthesis is firmly Spencerian (DENNETT 1995). So too is behaviourism – which Chomsky famously mauled (1959) in his review of Skinner's *Verbal Behaviour* (1957). Chomsky makes his anti-Spencerianism plain in a preface to a reprint of that review: "I do not see how his [Skinner's] proposals can be improved upon... I do not, in other words, see any way in which his proposals can be substantially improved within the general framework of behaviourist or neobehaviourist, or, more generally, empiricist ideas that has dominated much of modern linguistics, psychology and philosophy" (CHOMSKY 1967: 142).

It seems natural to conclude, then, that Chomsky's antipathy to an adaptationist account of language is a manifestation of a larger antipathy to Spencerian explanations in general (DENNETT 1995). (Interestingly, a visceral reaction to the idea that outside influences might shape individual behaviour can also be observed in Chomsky's anarchist political views (KNIGHT 2004).) The conviction that exogenous factors cannot be used to explain behaviour is entirely in keeping with Chom-

sky's work in linguistics: "hostility to evolution as an explanation of the origin of language in the species goes hand in hand with hostility to experience as an explanation of the origin of linguistic form in the individual" (HYMES 1991: 49). Chomsky is not alone here. There is a sizable body of thought within cognitive science and the philosophy of mind that denies that the orthodox theory of natural selection has any explanatory value at all (see FODOR and PIATELLI-PALMARINI 2010 for a book length treatment). For example: "Darwin's account of evolution by natural selection cannot be sustained... selectionist explanations, insofar as they are convincing, are best construed as post hoc historical narratives: natural history rather than biology" (FODOR 2008: 1).

Supplementary to the claim that evolution by natural selection is explanatorily vacuous is the supposed observation that there is an ongoing "revolution" (CHOMSKY 2007: 18; FODOR and PIATELLI-PALMARINI 2010: 22, 27, 30) in evolutionary biology. This revolution, it is argued, includes developments in evo-devo, epigenetics, self-organisation, and other endogenous constraints on organismic form. As more and more of these constraints are uncovered, so, it is claimed, the exogenous explanations offered by natural selection are less and less tenable (FODOR 2008; FODOR and PIATELLI-PALMARINI 2010). Evolutionary biology is "completely reshaped" (PIATELLI-PALMARINI 2008: 237) as a result. A major goal of the research program initiated by Chomsky is, in effect, to uncover the precise nature of these constraints in the case of language (BOECKX and GROHMANN 2007). Indeed, Chomsky's prediction that "the biology of a 100 years from now is going to deal with the evolution of organisms the way it now deals with the evolution of amino acids, assuming that there is just a fairly small space of physically possible systems that can realize complicated structures" (1982: 23) resonates closely with the supposed alternatives to natural selection proffered by this school of thought (e.g. "naturally occurring optimizations, quite likely originating in the laws of physics and chemistry" (FODOR and PIATELLI-PALMARINI 2010: xix).

These views have been instrumental in shaping the attitudes of many linguists to matters of the evolution of language, and the role of natural selection in particular. It is not my objective here to critique this position; arguments against this interpretation of Darwinism can be found elsewhere (see e.g. DENNETT 2008; GODFREY-SMITH 2008; SOBER 2008, all of which are responses to FODOR 2008; see also BLOCK and KITCHER 2010, which is a response to FODOR and PIATELLI-PALMARINI 2010; also PINKER and BLOOM 1990 discuss this point in a specifically linguistic context). Rather, I wish to make the point that anti-Spencerianism is not unusual within linguistics. On the contrary, it has been rather influential, at least within some theoretical approaches. So much so, in fact, that it is the implicit editorial agenda of *Biolinguistics*, the only journal dedicated to language evolution research: "[The term *biolinguistics*]... refers to 'business as usual' for linguists, so to speak, to the extent they are... in effect carrying out the research program Chomsky initiated [i.e. as outlined above – TSP]" (BOECKX and GROHMANN 2007: 2). This influence is perhaps one of the major reasons why evolutionary linguistics does not

have the adaptationist flavour of evolutionary psychology – or indeed, of evolutionary biology.

4. THE CONCERNS OF LANGUAGE EVOLUTION RESEARCH

Hostility towards natural selection as a source of explanation is not the only reason why a behavioural ecology of language is not well developed (for one thing, the perspectives that demonstrate hostility are far from the only theoretical approaches to language). A second reason, with which I have more sympathy, is that evolutionary function and related issues (e.g. evolutionary stability) are simply not the central concerns of evolutionary linguists. As *Table 1* makes clear, other questions take centre stage.

Speaking very generally, language evolution research is less concerned with the use of neo-Darwinism as a theoretical framework in which to investigate language itself, as it is with a description of how humans came to possess language in the first place. This includes descriptions of how the various biological and cognitive prerequisites for language evolved, and also the ways in which languages themselves emerge from the interactions of such ‘language-ready’ individuals (SCOTT-PHILLIPS and KIRBY 2010). There are, of course, exceptions; not all language evolution research is concerned with these historical questions. We can, for example, use evolutionary thinking to constrain our theories of language (see e.g. KINSELLA 2009 for syntax; and SCOTT-PHILLIPS 2010b for pragmatics). However, the focus on historical questions is perhaps unsurprising: language is arguably our species’ defining characteristic, so it seems quite natural to ask how it came to be this way. If that is why phylogenetic questions dominate, then it is also another reason why language evolution does not look like the sort of discipline that a naïve observer might expect it to. In both behavioural ecology and evolutionary psychology, neo-Darwinism is used as a theoretical framework with which to generate hypotheses, whereas in evolutionary linguistics the dominant questions are how and why we evolved language at all (see *Table 1*). As a result, questions that depend upon functional analyses receive surprisingly little attention. One clear example is the matter of evolutionary stability, which is a functional question that is central to the study of animal communication (MAYNARD SMITH and HARPER 2003; SEARCY and NOWICKI 2007), but which is not a central focus of evolutionary linguistics (exceptions include DESSALLES 1998; LACHMANN, SZÁMADÓ and BERGSTROM 2001; SCOTT-PHILLIPS 2008).

Speaking very broadly, there are two ways in which this concern with phylogeny manifests itself. One is the focus on the possible intermediate forms that language might have taken. The term *protolanguage* (coined in BICKERTON 1990) is very much part of the vocabulary of the discipline. A large part of what it is to do linguistics is to describe and catalogue languages, both old and new. A natural question to ask, then, is what form the earliest languages might have taken. Did they ap-

pear in some sense ‘fully formed’ with all the richness and idiosyncrasies of the languages in use today, or were there intermediate stages? If so, what did those stages look like? To answer these questions, researchers use a variety of techniques, including computational simulation, artificial language experiments, and the study of pidgins, creoles, and other instances of natural language emergence. Arguably, we can say that evolutionary linguistics ends and historical linguistics begins once protolanguage takes a form that we would today recognise as a fully developed language (SCOTT-PHILLIPS and KIRBY 2010).

The second way in which the focus on phylogenetic questions manifests itself is in the emphasis on the comparative method (see e.g. HAUSER and FITCH 2003), in which the existence or otherwise of various biological traits thought to be of importance for language are compared across species. The idea is that this will allow us to uncover exactly what aspects of language are and are not shared with other species (and if they are shared, if they are analogues or homologues), and in doing so make clear what developments in the human lineage led to the emergence of language. Perhaps the best illustration of how this has been used in language is work on the evolution of speech (which is partially built on in one of the papers in this special issue; see §5 below). Other work has focused on syntactic capacities (e.g. ARNOLD and ZUBERBÜHLER 2006; FITCH and HAUSER 2004) and on pragmatic competence and the social cognition necessary for language use (e.g. TOMASELLO 2008).

In summary, while the reasons why Tooby and Cosmides suggested research agenda of a behavioural ecology of (psycho)linguistics has not materialised will inevitably be various and multifaceted, and while many of those reasons will be specific to individual researchers, we can identify at least two broad trends. One is hostility in some quarters to natural selection as a source of explanation, and to adaptationism in particular. Another is simply that language evolution researchers have, for understandable reasons, chosen to focus on a different class of questions. It is fair to say that questions about evolutionary trajectories are far more common in evolutionary approaches to linguistics than in evolutionary approaches to psychology – and we can discern the outlines of some general reasons for this trend.

5. INTRODUCING THE SPECIAL ISSUE

This focus on the historical question of how language emerged is reflected in the various articles that appear in this special issue. For example, all three original articles, and two of the three book reviews, appeal to the comparative method to some degree. This is, I submit, not the case for a typical issue of this journal, or of other journals with similar remits. The first article, by Lameira et al., investigates the degree of diversity in the acoustic signals of terrestrial mammals. In order to enable proper comparison between the various species they consider, and also with human language, Lameira et al. adopt definitions from linguistics, and hence show that

while accents (defined as “geographic variation in the acoustic characteristics of a shared signal between groups or populations of the same species”) can be observed in many species, dialects (defined as “geographic variation in the presence/absence of a particular acoustic signal and/or in the sequence/composition of calls within a song/coda/composed call between groups or populations of the same species”) are far rarer. This places the huge and extensive variation in human languages in comparative perspective. Lameira et al. then show that within the primates dialects are only seen in species that also demonstrate the clearest evidence of culture in the wild: orangutans and chimpanzees. This leads them to make the intriguing suggestion that human dialects (and hence, presumably, different languages) emerged as a consequence of the evolution of capacities for social learning and culture.

The second paper in this special issue also conducts a large-scale survey of previous results, alongside some new data. Lyn is concerned with the status of the ability to comprehend declarative pointing as a pre-adaptation for language. As Lyn points out, there is some disagreement in the literature with respect to whether or not our closest relatives, bonobos and chimpanzees, can or cannot comprehend declarative pointing. In order to address this, she conducts both a meta-analysis of previous studies, and also presents novel data that looks at the effect of early rearing on performance on declarative pointing tasks. The results of both approaches (experiment and meta-analysis) suggest that great apes can pass declarative pointing tasks, and that previously reported failures are the result of differences in methodology and, in particular, rearing history: apes raised in complex cultural environments were more likely to succeed at such tasks. This in turn suggests that the ability to comprehend declarative pointing was not a specific pre-adaptation for language, but rather was already present in our pre-linguistic ancestors – though it may, of course, be one of the many aspects of our psychology that linguistic competence depends on.

The third original article is concerned with the evolution of speech. Speech is not language, but the two are quite intimately connected. A common argument, with a long history, is that the human vocal tract is optimally designed with respect to the range of sounds that can be produced, and that this benefit outweighs the clear and obvious disadvantage that the human vocal tract has in comparison to the vocal tract of other primates, namely the increased possibility of choking on food. One particularly salient feature of the human vocal tract that contributes to its unique form is that it is descended in comparison with other primates. Comparative work suggests that this is an adaptation to size exaggeration (FITCH 2000). At the same time, a number of models of the human vocal tract have been developed, with the goal of establishing what range of speech sounds can be produced with different anatomies. De Boer’s paper adds to that literature. His model suggests that the human female vocal tract is optimally designed with respect to the range of sounds that can be produced, but that the male larynx is lower than this. He thus argues that the human vocal tract did evolve its present form to enable a wider range of speech, but that the male tract evolved further in response to pressures of size exaggeration.

The special issue also contains three book reviews. Truswell, a linguist, reviews a recent edited collection entitled *The Evolution of Human Language: Bilingual Perspectives* (LARSON, DÉPREZ and YAMAKIDO 2010). As touched on in §3 above, *biolinguistics* is not a theory neutral term for the study of language origins. Instead, it has been adopted by the school of linguistic thought that subscribes to the Chomskyian view that the study of language origins should be concerned with the search for the internal constraints that shape the structure of language. As Truswell points out, this focus is reflected in the composition of the book, large parts of which are concerned with discussion, expansion and clarification of a 2002 *Science* paper that Chomsky co-authored with Hauser and Fitch (HAUSER, CHOMSKY and FITCH 2002), and which can be read as an attempt to place the Chomskyian research agenda in evolutionary perspective. Truswell dissects some of the claims made in the reviewed collection in some detail, and in doing so highlights areas of agreement, as well as areas of inconsistency and disagreement.

The biolinguistic research agenda is also critiqued in the second book under review, Kinsella's *Language Evolution and Syntactic Theory* (Kinsella 2009). The book is a modified version of Kinsella's PhD thesis, in which she subjected the current version of the Chomskyian research agenda (called Minimalism) to an evolutionary analysis. Kinsella's book is reviewed by Edwardes, who himself wrote his PhD thesis on the evolutionary origins of grammar (which has also been published as a book). His review outlines what Minimalism is, and also how Kinsella's successfully raises difficult questions that challenge the foundations of Minimalism. In sum, these two reviews together make clear that biolinguistics faces profound evolutionary challenges.

The final book review is by Dunbar, who needs little introduction to readers of this journal. He begins his review of Fitch's new book *The Evolution of Language* (FITCH 2010) on the same note that I began this editorial – by pointing out that the question of language origins and evolution had, for many years, not received serious intellectual consideration. Now that that has begun to change, Dunbar suggests that Fitch's book can be read as an attempt at synthesis and summary of our current states of knowledge. Although Dunbar concludes that Fitch is successful in this respect, but he is not uncritical. In particular, he disagrees with one of Fitch's central conjectures: that the origins of language lie in the need for extended coordination for cooperative parenting. This claim does not, argues Dunbar, fit with what is known about human brain evolution. At the same time, Dunbar recognises that such disagreements do not significantly detract from Fitch's impressive and wide-ranging volume. Indeed, some disagreement is almost inevitable in multidisciplinary research enterprises. This fact can sometimes make research in language origins and evolution a frustrating experience – but it also makes it a particularly exciting area to work in. My hope is that the papers contained in this special issue reflect this.

REFERENCES

- ALCOCK, J. (2009): *Animal Behavior*. Sunderland, MA: Sinauer Associates Inc.
- ARNOLD, K. & ZUBERBÜHLER, K. (2006): Language evolution: Semantic combinations in primate calls. *Nature*, 441, 303.
- AUSTIN, J. L. (1955): *How to Do Things with Words*. Oxford: Oxford University Press.
- BICKERTON, D. (1990): *Language and Species*. Chicago: University of Chicago Press.
- BICKERTON, D. (2007): Language evolution: A brief guide for linguists. *Lingua*, 510–526.
- BLACKMORE, S. (1999): *The Meme Machine*. Oxford: Oxford University Press.
- BLOCK, N. & KITCHER, P. (2010): Misunderstanding Darwin. *Boston Review*.
- BOECKX, C. & GROHMANN, K. K. (2007): The biolinguistics manifesto. *Biolinguistics*, 1, 1–8.
- BURLING, R. (1986): The selective advantage of complex language. *Ethology and Sociobiology*, 7, 1–16.
- BURLING, R. (2005): *The Talking Ape: How Language Evolved*. Oxford: Oxford University Press.
- BUSS, D. M. & DEDDEN, L. A. (1990): Derogation of competitors. *Journal of Social and Personal Relationships*, 7, 395–422.
- CHOMSKY, N. (1959): A review of B. F. Skinner's Verbal Behaviour. *Language*, 35(1), 26–58.
- CHOMSKY, N. (1967): Preface to the 1967 reprint of *A Review of B. F. Skinner's Verbal Behavior*. In: L. Jakobovits & M. S. Miron (eds): *Readings in the Psychology of Language*. Englewood Cliffs, NJ: Prentice-Hall.
- CHOMSKY, N. (1972): *Language and Mind*. New York, NY: Harcourt.
- CHOMSKY, N. (1982): *Noam Chomsky and the Generative Enterprise: A Discussion with Riny Junybrechts and Henk van Riemsdijk*. Dordrecht: Foris.
- CHOMSKY, N. (1988): *Language and Problems of Knowledge: The Managua Lectures*. Cambridge, MA: MIT Press.
- CHOMSKY, N. (2002): *On Nature and Language*. Cambridge: Cambridge University Press.
- CHOMSKY, N. (2007): Of minds and language. *Biolinguistics*, 1, 9–27.
- CLARK, S. R. L. (2000): The evolution of language: Truth and lies. *Philosophy*, 75, 401–421.
- DENNETT, D. C. (1995): *Darwin's Dangerous Idea*. London: Penguin.
- DENNETT, D. C. (1996): *Kinds of Minds*. New York, NY: Basic books.
- DENNETT, D. C. (2008): Fun and games in fantasyland. *Mind and Language*, 23(1), 25–31.
- DESSALLES, J.-L. (1998): Altruism, status and the origin of relevance. In: J. R. Hurford, M. Studdert-Kennedy & C. Knight (eds): *Approaches to the Evolution of Language*. Cambridge: Cambridge University Press, pp. 130–147.
- DI SCIULLO, A. M., PIATELLI-PALMARINI, M., WEXLER, K., BERWICK, R. C., BOECKX, C., JENKINS, L. et al. (2010): The biological nature of human language. *Biolinguistics*, 4(1), 4–34.
- DUNBAR, R. I. M. (1993): Co-evolution of neocortex size, group size and language in humans. *Behavioral and Brain sciences*, 16(4), 681–735.
- DUNBAR, R. I. M. (1997): *Grooming, Gossip, and the Evolution of Language*. London: Faber.
- DUNBAR, R. I. M., DUNCAN, N. D. C. & MARRIOTT, A. (1997): Human conversational behaviour. *Human Nature*, 8, 231–246.
- FEINBURG, D. R. (2008): Are human faces and voices ornaments signaling common underlying cues to mate value? *Evolutionary Anthropology*, 17(2), 112–118.
- FITCH, W. T. (2000): The evolution of speech: A comparative review. *Trends in Cognitive Science*, 4(7), 258–267.
- FITCH, W. T. (2010): *The Evolution of Language*. Cambridge: Cambridge University Press.
- FITCH, W. T., CHOMSKY, N. & HAUSER, M. D. (2005): The evolution of the language faculty: Clarification and implications. *Cognition*, 97, 179–210.
- FITCH, W. T. & HAUSER, M. D. (2004): Computational constraints on syntactic processing in a nonhuman primate. *Science*, 303, 377–380.

- FODOR, J. (2008): Against Darwinism. *Mind and Language*, 23(1), 1–24.
- FODOR, J. & PIATELLI-PALMARINI, M. (2010): *What Darwin Got Wrong*. London: Profile Books.
- FRANKS, B. & RIGBY, K. (2005): Deception and mate selection: Some implications for relevance and the evolution of language. In: M. Tallerman (ed.): *Language Origins: Perspectives on Evolution*. Oxford: Oxford University Press, pp. 208–229.
- GARDNER, R. A. & GARDNER, B. T. (1969): Teaching sign language to a chimpanzee. *Science*, 165, 644–672.
- GODFREY-SMITH, P. (1993): *Spencerian Explanation and Constructivism*. Paper presented at the MIT philosophy colloquium.
- GODFREY-SMITH, P. (2008): Explanation in evolutionary biology: Comments on Fodor. *Mind and Language*, 23(1), 32–41.
- GREENGROSS, G. & MILLER, G. F. (2008): Dissing oneself versus dissing rivals: Effects of status, personality, and sex on the short-term and long-term attractiveness of self-deprecating humor. *Evolutionary Psychology*, 6(3), 393–408.
- GRICE, H. P. (1971): Meaning. In: D. Steinburg & L. Jakobovits (eds): *Semantics: An Interdisciplinary Reader*. Cambridge: Cambridge University Press, pp. 53–59.
- GRICE, H. P. (1975): Logic and conversation. In: P. Cole & J. Morgan (eds): *Syntax and Semantics III: Speech Acts*. New York: Academic Press, pp. 41–58.
- GRISKEVICIUS, V., CIALDINI, R. B. & KENRICK, D. T. (2006): Peacocks, Picasso and parental investment: The effects of romantic motives on creativity. *Journal of Personality and Social Psychology*, 91(1), 63–76.
- HAUSER, M. D., CHOMSKY, N. & FITCH, W. T. (2002): The faculty of language: What is it, who has it, and how did it evolve? *Science*, 298, 1569–1579.
- HAUSER, M. D. & FITCH, W. T. (2003): What are the uniquely human components of the language faculty? In: M. H. Christiansen & S. Kirby (eds): *Language Evolution*. Oxford: Oxford University Press, pp. 158–181.
- HUANG, Y. (2007): *Pragmatics*. Oxford: Oxford University Press.
- HURFORD, J. R. (2008): The evolution of human communication and language. In: P. D’Ettorre & D. P. Hughes (eds): *Sociobiology of Communication: An Interdisciplinary Approach*. Oxford: Oxford University Press, pp. 249–264.
- HYMES, D. (1991): Is poetics original and functional? *Language and Communication*, 11(1–2), 49–51.
- KINSELLA, A. R. (2009): *Language Evolution and Syntactic Theory*. Cambridge: Cambridge University Press.
- KIRBY, S. (2007): The evolution of language. In: R. I. M. Dunbar & L. Barrett (eds): *Oxford Handbook of Evolutionary Psychology*. Oxford: Oxford University Press, pp. 669–681.
- KNIGHT, C. (2004): Decoding Chomsky. *European Review*, 12(4), 581–603.
- KREBS, J. R. & DAVIES, N. B. (1993): *An Introduction to Behavioural Ecology*. Oxford: Blackwell.
- LACHMANN, M., SZÁMADÓ, S. & BERGSTROM, C. T. (2001): Cost and conflict in animal signals and human language. *Proceedings of the National Academy of Sciences*, 98(23), 13189–13194.
- LAKOFF, G. (1991): Cognitive versus generative linguistics: How commitments influence results. *Language and Communication*, 11(1–2), 53–62.
- LARSON, R. K., DÉPREZ, V. & YAMAKIDO, H. (2010): *The Evolution of Human Language: Bilingual Perspectives*. Cambridge: Cambridge University Press.
- LESLIE, J. C. (2006): Herbert Spencer’s contributions to behavior analysis: A retrospective review of *Principles of Psychology*. *Journal of the Experimental Analysis of Behavior*, 86(1), 123–129.
- LEVINSON, S. C. (1983): *Pragmatics*. Cambridge: Cambridge University Press.

- LOCKE, J. L. (2001): Rank and relationships in the evolution of spoken language. *Journal of the Royal Anthropological Institute*, 7, 37–50.
- MAYNARD SMITH, J. & HARPER, D. G. C. (2003): *Animal Signals*. Oxford: Oxford University Press.
- MCANDREW, F. T., BELL, E. K. & MARIA GARCIA, C. (2007): Who do we tell and whom do we tell on? Gossip as a strategy for status enhancement. *Journal of Applied Social Psychology*, 37(7), 1562–1577.
- MCANDREW, F. T. & MILENKOVIC, M. A. (2002): Of tabloids and family secrets: The evolutionary psychology of gossip. *Journal of Applied Social Psychology*, 32, 1064–1082.
- MEHLER, J. (1985): Review of P. Lieberman's 'The biology and evolution of language'. *Journal of the Acoustic Society of America*, 80, 1558–1560.
- MILLER, G. F. (2000): *The Mating Mind*. London: BCA.
- MILLIKAN, R. G. (1984): *Language, Thought and Other Biological Categories*. Cambridge, Mass.: MIT Press.
- NETTLE, D. (2009): *Evolution and Genetics for Psychology*. Oxford: Oxford University Press.
- NOWAK, M. A. & KOMAROVA, N. L. (2001): Towards an evolutionary theory of language. *Trends in Cognitive Science*, 5(7), 288–295.
- ORIGGI, G. & SPERBER, D. (2000): Evolution, communication and the proper function of language. In: P. Carruthers & A. Chamberlain (eds): *Evolution and the Human Mind: Language, Modularity and Social Cognition*. Cambridge: Cambridge University Press, pp. 140–169.
- PIATELLI-PALMARINI, M. (2008): Novel tools at the service of old ideas. *Biolinguistics*, 2(2–3), 236–245.
- PIATELLI-PALMARINI, N. (1989): Evolution, selection and cognition: From 'learning' to parameter setting in biology and the study of language. *Cognition*, 31, 1–44.
- PINKER, S. (1994): *The Language Instinct*. London: Penguin.
- PINKER, S. & BLOOM, P. (1990): Natural language and natural selection. *Behavioral and Brain Sciences*, 13(4), 707–727.
- PREMACK, D. (1971): Language in chimpanzees? *Science*, 172, 808–822.
- PREMACK, D. (1985): 'Gavagai!' or the future history of the animal language controversy. *Cognition*, 19, 207–296.
- PUTS, D. A., GAULIN, S. J. C. & VERDOLINI, K. (2006): Dominance and the evolution of sexual dimorphism in human voice pitch. *Evolution and Human Behavior*, 27(4), 283–296.
- ROSENBERG, J. & TUNNEY, R. J. (2008): Human vocabulary use as display. *Evolutionary Psychology*, 6(3), 538–549.
- SCOTT-PHILLIPS, T. C. (2008): On the correct application of animal signalling theory to human communication. In: A. D. M. Smith, K. Smith & R. Ferrer i Cancho (eds): *The Evolution of Language: Proceedings of the 7th International Conference on the Evolution of Language*. Singapore: World Scientific, pp. 275–282.
- SCOTT-PHILLIPS, T. C. (2010a): Animal communication: Insights from linguistic pragmatics. *Animal Behaviour*, 79(1), e1–e4.
- SCOTT-PHILLIPS, T. C. (2010b): The evolution of relevance. *Cognitive Science*, 34, 583–601.
- SCOTT-PHILLIPS, T. C. & KIRBY, S. (2010): Language evolution in the laboratory. *Trends in Cognitive Sciences*, 14(9), 411–417.
- SEARCY, W. A. & NOWICKI, S. (2007): *The Evolution of Animal Communication*. Princeton, NJ: Princeton University Press.
- SHANNON, C. E. & WEAVER, W. (1949): *The Mathematical Theory of Information*. Urbana: University of Illinois Press.
- SKINNER, B. F. (1957): *Verbal Behavior*. New York: NY: Appleton-Century-Crofts.
- SOBER, E. (2008): Fodor's *bubbe meise* against Darwinism. *Mind and Language*, 23(1), 42–49.

- SPERBER, D. (1990): The evolution of the language faculty: A paradox and its solution. *Behavioral and Brain Sciences*, 13(4), 756–758.
- SPERBER, D. & WILSON, D. (1995): *Relevance: Communication and Cognition* (2nd. ed.): Oxford: Blackwell.
- STAM, J. H. (1976): *Inquiries into the Origin of Language: The Fate of a Question*. New York: Harper & Row.
- TERRACE, H. S., PETITTO, L. A., SANDERS, R. J. & BEVER, T. G. (1979): Can an ape create a sentence? *Science*, 206, 891–902.
- TINBERGEN, N. (1963): On the aims and methods of ethology. *Zeitschrift für Tierpsychologie*, 20, 410–433.
- TOMASELLO, M. (2008): *Origins of Human Communication*. Cambridge, MA: MIT Press.
- TOOBY, J. & COSMIDES, L. (1990): Toward an adaptationist psycholinguistics. *Behavioral and Brain Sciences*, 13(4), 760–762.