Universals of Human Language

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Introduction

In 2018–19, I was a visiting fellow at Cambridge University, a visiting academic at the University of Cape Town, and a visiting fellow at Macquarie University, Sydney. The subject of my overseas research was universals of human language, comparing the languages of Africa and Aboriginal Australia with English. This is a working paper outlining my preliminary findings. I gave an invited talk at Macquarie University (Howe 2019), and an article on my research appeared in the 2019 Cambridge University *Wolfson Review*.[1]

What are universals and why are we interested in them? Universals are the essential characteristics that all languages share. It is a great puzzle that although we instinctively 'know' what language is, it is surprisingly difficult to nail down incontrovertible universals. Some researchers (e.g. Evans and

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[1] I would like to express my sincere thanks to Fukuoka University, the Faculty of Humanities and the English Department for the opportunity and funding to spend one year overseas on research. I would also like to thank Wolfson College, Cambridge University, the Section for African Languages at the University of Cape Town, especially Dr Mantoa Smouse, and the Department of Linguistics at Macquarie University in Sydney, especially Dr Joe Blythe, for making my stays so pleasant.

Levinson 2009) claim that linguistic diversity is largely unconstrained by strong language universals, and Joseph Greenberg's seminal study from 1966 found few if any absolute grammatical universals. However, if we hear people chatting in an unfamiliar tongue, although we cannot understand what they are saying, we sense they are using a language like ours in a way we do not with the whistles of dolphins, dances of bees or vocalisations of chimpanzees.

It is astonishing that human languages can appear outwardly so different in their sounds/signs, vocabulary and grammar, yet any human child can learn any human language without instruction. Why, then, cannot linguistics identify clear universals when informally we can easily recognise the commonality of language and learning language is child's play? The goal of my overseas research, therefore, was to search for universals that could account for both the universality of human language and its diversity.

A valid theory of language should be based on a wide range of languages, without geographical or cultural bias. African and Australian languages offer important perspectives on human language. Spoken by the oldest modern human population, African languages are of primary significance. Conversely, Australian languages are significant because of the long migration of modern humans from Africa to Australia (e.g. Nielsen et al. 2017). When European scientists first came across the duck-billed platypus in Australia, it confounded their ideas of biology: the animal had fur, a beaver-like tail and suckled its young, but it also had a bird-like bill and laid eggs. Australian Aboriginal languages are to linguistics what the duck-billed platypus is to biology. My colleague at Macquarie University, Dr Joe Blythe, called Australian languages 'the graveyard of universal theories'. Australian

languages are therefore an appropriate and challenging subject for any research on universals.

Approach to universals

What aspects of language do we find common to African and Australian languages? And what aspects are shared with 'Standard Average European' languages like English? I will illustrate with examples from Xhosa, spoken in southern Africa, and Murrinhpatha, spoken in the Northern Territory of Australia. My aim is not to look for what is unique to human language or human beings, but what is common to all human languages. I will take an open and broad approach:

- Non-dogmatic, drawing on the best approaches across the linguistic divide
- Primary, basic universals
- Absolute rather than implicational universals
- Combine language features and general cognitive processes to look for characteristics that are universal in human language
- Include biological and cultural universals

That we find these characteristics in other species or outside language is not an obstacle, rather the key. It means that – like the human mouth – they have been co-opted or evolved for language from pre-existing abilities or structures. As Deacon writes in the title of his book on symbolism: the *co-evolution of language and the brain*. Compare Fauconnier and Turner (2002: 33) who state that 'From the standpoint of cognitive science, the everyday capacities of the well-evolved human mind are the best candidates for

complexity and promise the most interesting universal generalizations'. And Gray (2012) notes that co-opted structure is commonly posited in evolutionary biology.

I will also often state the blindingly obvious. In my defence I quote Charles Hockett, who wrote on his *Design features* (1982: 6):

> At first sight some [Design features] appear so trivial that no one looking just at language would bother to note them. They become worthy of mention only when it is realized that certain animal systems – and certain human systems other than language – lack them.

The first and most obvious universal, then, is that language is universal among modern humans. This statement is certainly not trivial, however, when we note that language is also unique to us. While all species communicate, no other species has language.

Primary and secondary universals

I will put forward a number of primary or basic universals. This is evolutionarily more plausible than specific grammatical categories, constructions or parameters and can also account for the significant diversity of human languages. Here I quote Joseph Greenberg (1966: 75) who states that 'In a certain sense we would prefer to have as few universals as possible ... we would like to be able to deduce them from as small a number of general principles as possible'.

In *Universals of Language Today*, Scalise et al. (2010: xv) write:

> Typological investigations have been largely based on the implicit assumption of a number of universal grammatical categories, relations

> and constructions ... derived from the Latin and English grammatical tradition, notions such as parts of speech, passive, subject, direct object, relative clause, etc.
>
> The ... structural diversity displayed by human languages, however, entails a constant reassessment of existing taxonomies
>
> ... linguistic variability again and again demonstrates that these basic notions are extremely difficult to define in both formal and cross-linguistically valid terms.

Lexically, too, there are no universal words in human languages: without some form of contact and borrowing or co-descent, human languages do not share any vocabulary and are mutually unintelligible.[2] We cannot find universal words for concepts such as *sun*, *moon*, *day*, *night*, *water*, *earth*, *man*, *woman* or *child*; or emotions such as *happy*, *sad*, *angry*, *surprise*, *fear* or *disgust*. Further, the vocabularies of human languages do not neatly translate word for word – Japanese *ao* is not simply English 'blue', English *you* is not simply Japanese 'anata', and *be* is not simply 'iru' (cf. Saussure 1983: 114–115). In phonology, we also find significant variation across the world's languages: from languages with only 11 phonemes to a language with 141 phonemes (Crystal 2010).

I will distinguish between primary and secondary universals. To illustrate the distinction, in five hundred years, we might find that all humans travel in flying automobiles. This might be universal in 2520, but it is not a primary characteristic of human beings. The primary universals would be the human ability to make and use tools and to learn from others. The flying automobile

[2] By co-descent I mean recent relative to the likely age of modern human language and origin in Africa.

would be a fantastic example of the work and intellect of many generations. An African language like Xhosa or an Australian Aboriginal language like Murrinhpatha is the equivalent of a modern airliner; but their bases are the primary universals of human language. Basic or primary universals are the linguistic equivalent of tools made and used by the first modern humans rather than the high technology of today.

Secondary universals, then, are derived features or emergent properties. We should therefore not find them in the earliest child language or the first communications of deaf children not exposed to sign language.

Previous research

Joseph Greenberg

Greenberg's (1966) study of 'universals of grammar with particular reference to the order of meaningful elements' lists few if any absolute universals. This is an astounding finding given the very small sample – 30 from about 7000, or fewer than 0.5% of human languages. Greenberg's negative finding is highly significant.

To demonstrate, Greenberg discusses comparison, for example in English 'X is larger than Y'. Here we have a good illustration of what we frequently come up against when we search for grammatical universals. There are perhaps good grounds for assuming that comparison is a semantic universal in human language(s), and an ancient one – i.e. that all languages have some way of communicating that X (or U) is bigger, smaller, faster, slower, tastier, or more dangerous than Y (or I). But in spite of this, as even English can show, we can find no universal language construction, i.e. no 'grammatical'

universal. Greenberg states that a minority of the world's languages have an inflected form as English（e.g. slow-*er*）; however, more often a separate word modifies the adjective, as also in English（e.g. *more* dangerous）. And although Greenberg does compare three elements across his language sample, namely adjective, marker and standard（*larg*(*er*) *than Y*）, he must exclude some languages as they use a verb（with a general meaning 'to surpass'）, as particularly common in Africa: 'X is large, surpasses Y'. Further, Loritja, an Australian language is his sample, also falls outside this pattern, as it uses a construction 'X is large, Y is small'.

To summarise, while we have a likely semantic universal, we cannot find a universal linguistic construction – even a limited sample of thirty or so languages throws several spanners in the works. And we would hardly be justified in positing a 'deeper' universal *grammatical* construction to account for 'surface' manifestations that vary so greatly. One could make a similar argument for questions – i.e. a way of asking for some information or some thing from another human（which also has an extragrammatical form, an intonation pattern, in very many languages）– or for negation, to name just two. This is a common result of cross-linguistic comparison（cf. Croft 2003: 13–19, Tomasello 2003a: 17–19）, and one must of course ask *why*?

Noam Chomsky

Are universals staring us in the face but we cannot see them for all the languages – or are they 'deeper' and more abstract? After several decades of original research, Noam Chomsky came to the conclusion that language is best explained by Minimalism. He（see e.g. 2006）proposed 'Merge' as universal, 'the simplest possible compositional function'（2007）. And in a

famous co-authored paper, Hauser, Chomsky and Fitch (2002) put forward narrow syntactic recursion as 'the only uniquely human component of the faculty of language'.

Tomasello (2003a: 13–14) sums up the generative and usage-based positions on universal grammar as follows:

> Generative grammarians believe that the human species evolved a genetically based universal grammar common to all peoples and that the variability in modern languages is basically on the surface only. There are a number of accounts from this perspective ... But in all ... the basic idea is the same: that the fundamental grammatical categories and relations underlying all of the world's languages come from a biological adaptation (or set of adaptations) in the form of a universal grammar.
>
> The alternative is the usage-based view, in which there is no need to posit a specific genetic adaptation for grammar because processes of grammaticalization ... can actually create grammatical structures out of concrete utterances ... Thus it is a historical fact that the specific items and constructions of a given language are not invented all at once, but rather they emerge, evolve, and accumulate modifications over historical time ...

Does the usage-based alternative mean, then, that human language has no universal 'grammar' of any kind?

Charles Hockett

In his search for universals, Charles Hockett (1960) looked not cross-linguistically, which is problematic as language is universal among humans, but across species. He proposed a number of 'Design features' of language,

published in his well-known article in *Scientific American*. Many if not all of his design features still stand today and form the basis of this paper.

Main topics discussed in this paper

In this bare-bones paper I will discuss the following universals:

- Communication
- Mind reading
- Category
- Combination to make meaning
- Symbolic reference
- Lexicon
- Pattern
- Language learning by children

Communication

Speech

Speech is a primary universal as the default medium for language. It develops in all children with normal hearing.[3] Before the ability to record and transmit language (writing, audio, video), language was necessarily within earshot and normally face to face. It was therefore always social and in context. In this examination of primary universals, I will take the thousands of years of spoken language as given, and ignore writing and

[3] Although humans can communicate using language in several other ways: gesture (sign language), manually (writing, typing), touch (Braille) and sight (reading, lip-reading). I will touch on nonverbal autism later in the paper.

audio and video recording and transmission.

The most important interface in language is communication. Conversation involves social interaction, cooperation and turn-taking. It also involves repair. Communication is multimodal; in conjunction with language, humans have universally:

- Prosody
- Facial expression
  - Including the ability to 'read minds'
- Gesture
  - Including pointing or identifying the topic
  - Including conventional gestures for affirmation and negation
- Vocalisation
  - Including conventional vocalisations for affirmation and negation and for signalling incomprehension[4]
- Body 'language'

Rapid production and comprehension

Context primes us lexically, enabling us to use probability and prediction to rapidly produce and process language. The speed of language processing – production and comprehension – is astonishing and universal. Everyday conversation is approximately 250–300 syllables per minute and the production of language complex (Crystal 2010: 272):

> When we consider the whole range of factors that affect the timing of speech events (such as breathing rate, the movement and coordination

[4] E.g. *uh huh*, *uh-uh* for affirmation and negation and *huh* etc. to signal incomprehension (on *uh huh*, *uh-uh* see Howe 2018; on *huh* see Dingemanse, Torreira and Enfield 2013).

> of the articulators, the onset of vocal-fold vibration, the location of stress, and the placement and duration of pauses), it is evident that a highly sophisticated control system must be employed.

Pinker and Jackendoff (2009: 130) note on comprehension:

> humans do not just make one-bit discriminations between pairs of phonemes. Rather, they can process a continuous, information-rich stream of speech.
>
> they rapidly distinguish individual words from tens of thousands of distracters despite the absence of acoustic cues for phoneme and word boundaries, while compensating in real time for the distortions introduced by coarticulation and by variations in the age, sex, accent, identity, and emotional state of the speaker.
>
> And all of this is accomplished by children as a product of unsupervised learning.

Consequences of connected speech

The production of rapid, connected speech has a number of significant consequences, including coarticulation, abbreviation[5] and chunking.[6] All reduce compositional transparency. Moreover, this connected, coarticulated, abbreviated and chunked speech is the child's input for the language of the next generation. Speech is universally the medium of transmission and mode of language learnt by children with normal hearing.

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[5] Abbreviation depends on the speaker's and hearer's knowledge and derives from a likely universal of economy, which will be discussed in a later publication.

[6] An important characteristic of how humans encode information, reducing 'a larger amount of information to a smaller amount' (Gross 2010: 258–9, see e.g. Bybee 2010 for its application in language).

Hockett's Design feature *Interchangeability* captures the fact that in human language the speaker is also a listener, and the listener also a speaker. In this way, we have conversation. Hockett believes that Interchangeability 'enables a human to "internalize" the roles of others'. However, the human ability to 'mind read' is possibly primary rather than enabled and will be discussed below.

Mind reading

In the British animated series *Wallace and Gromit*, Wallace uses language, while his anthropomorphic but speechless dog Gromit uses facial expression. We are able, without language, to 'read Gromit's mind' – interpreting his facial expression – the position of his eyes and direction of his gaze, and the shape and position of his brow and ears (he has no mouth) – and his body 'language'. Thus the viewer can understand both characters, by decoding speech sounds, and by reading facial expression and body language – with the help of context.

This ability is not simply visual, however, as we communicate easily with someone we cannot see (or, in modern times, on the telephone). Humans look for relevant meaning in language, too (cf. Howe 2014: 236–37): we strive to make a connection between the sound, the context and meaning. This is the basis of the Gricean conversational maxims.

This ability is essential to language and is posited as primary by Burling (2007). Similarly De Ruiter and Levinson (2008: 518), who state:

> ... linguistic signals are ... ambiguous and underdetermined
>
> There is ... a fundamental mismatch [sic] between coded content and

> communicative import, and the gap is filled by reasoning about likely communicative intentions
>
> it is not language that enables us to communicate; rather, it is our communicative skills that enabled us to use language.

Humans have the ability to 'mind-read' and its subcase, to know what someone else is attending to or shared attention (Hudson 1999, Tomasello 2003a). Tomasello discusses child language development as follows (2003b: 95):

> Six-month-old infants interact dyadically with objects ... and they interact dyadically with other people ... If people are around when they are manipulating objects, the infants mostly ignore the objects ... But at around 9–12 months of age a new set of behaviours begins to emerge that are not dyadic ... but triadic in the sense that they involve infants coordinating their interactions with objects and people, resulting in a referential triangle of child, adults, and the object or event to which they share attention. ... Most prototypically, it is at this age that infants for the first time begin flexibly and reliably to look where adults are looking ..., to engage with them in relatively extended bouts of social interaction mediated by an object ... In short, it is at this age that infants for the first time begin to 'tune in' to the attention and behaviour of adults on outside entities.

Category

Humans have a strong bias to categorise – at our worst, we stereotype, pigeonhole and label. Bybee states (2008: 201): 'Categorization, the most

basic of cognitive processes, establishes the units of language, their meaning and form'. The sound units of language, lexical items and grammar are all categorical. Langacker writes (2008: 93): 'Without categorization, we could not discern patterns or regularities, as these involve the recurrence of configurations judged to be "the same"'. Aitchison (2012: 56–57) gives a nice illustration of what life would be like without category or symbolic meaning. Regarding a cat, people would need 'a whole dossier of photographs' for every cat they had ever seen and in every position. As Aitchison asks: 'how could they possibly label a new cat as *cat* if it wasn't in the dossier?' She concludes: 'Anyone who understands the word *cat* must have performed some type of analysis which has isolated the essential "cattiness" involved in being a cat.'

Noun class 3 (singular)	**Noun class 4 (plural)**	**Meaning**
umsebenzi	imisebenzi	work, job, exercise
umbuzo	imibuzo	question
umlilo	imililo	fire
umoya	imimoya	wind
uMzantsi Afrika		South Africa

Table 1 Category and pattern in Xhosa (examples from Munnik 2006: 21)

Although categorisation is universal in human language, specific categories are not. This is an important reason for variation. In phonology, as already noted, we find languages with only 11 phonemes and another with 141 phonemes. Without sound categories, we would not be able to comprehend the 'variations in the age, sex, accent, identity, and emotional state of the speaker' mentioned by Pinker and Jackendoff. The lexicon also comprises

categories, as illustrated by Aitchison's cat. To give another simple example, the word 'shoe' does not refer to a specific shoe, rather a category of footwear. This category can include, for instance, brogues, high heels, ballet shoes and horseshoes, which in turn are also categorical. And we see grammatical categories in the parts of speech of Latin and English described by Scalise et al. earlier, as well as in the noun classes of African languages like Xhosa, for example.

Combination to make meaning

Combination to make meaning – often separated as combinatoriality and compositionality – will be discussed only briefly here. For a fuller discussion, see Howe (2012). The main points of that article are summarised below. Like our bias to categorise, our bias to combine to make meaning is seen in many aspects of human society, including superstition, good luck charms and bad omens.

Different languages may have different patterns of combination, but *all* have combination to make meaning. This simple but fundamental universal gives both enormous power and precision to human language. It underlies phonology, morphology and syntax. It has been put forward as a universal by Chomsky (see e.g. 2006) as 'Merge', as 'Unification' by Jackendoff (n. d./2011), and is a more elementary and universal mechanism in language than the narrow syntactic recursion proposed as 'the only uniquely human component of the faculty of language' by Hauser, Chomsky and Fitch

(2002).[7, 8] It is the process combining meaningless sound symbols to make meaningful units. It is the cognitive process underlying chunking, analogy (see Fauconnier and Turner 2002: 12) and, significantly, meaning.[9] It is also

[7] A note on terminology: by combination I mean *all types of combination* in language, including hierarchical and long-distance relationships, and not the narrower sense of Greenberg (1966: 93) in universal 29. It includes recursion [[[AB] C] D] and unlimited concatenation [A B C D] (see Jackendoff n.d./2011), if we wish language to have a universal of combination to make meaning that can account for both [BAD, DAB] and [[BAD] LY]] for example.
On other terms, Chomsky's 'Merge' combines two elements and therefore does not capture multiple combination or concatenation of phonemes into morphemes for instance. Further, like Jackendoff's 'Unification' (n.d./2011), it suggests amalgamation more than neutral 'combination' and thus, for language, does not sufficiently capture the reverse process of decomposition in comprehension. In discussions that overlap with those here, though with a somewhat different focus, Boeckx has used the term *Homo combinans* (e.g. 2011, 2012a). Hinzen et al. (2012) cite a standard formulation of 'compositionality' as 'The meaning of a complex expression is a function of the meanings of its constituents and the way they are combined'. On 'recursion' and its 'multiplicity of definitions [which] ... has undermined the broader interpretation of empirical results', see Martins and Fitch (2012). Pinker and Jackendoff (2005: 201) state that the 2002 paper by Hauser, Chomsky and Fitch 'ignores the many aspects of grammar that are not recursive, such as phonology, morphology, case, agreement, and many properties of words'. They add (see p. 227) that pidgins have combination to create new meaning but do not necessarily have recursion.

[8] Pinker and Jackendoff (2005: 222), while strongly criticising Chomsky's Minimalist Program, defend as core assumptions of generative grammar 'that language is a combinatorial, productive, and partly innate mental system'. See also Jackendoff (2002: 107) who takes issue with 'a fundamental assumption embedded deep in the core of generative theory: that the free combinatoriality of language is due to a single source, localized in syntactic structure'. Jackendoff (ibid.) 'develops the alternative assumption that language has multiple parallel sources of combinatoriality, each of which creates its own characteristic type of structure' and states further (2002: 111) that language 'comprises a number of independent combinatorial systems, which are aligned with each other by means of a collection of interface systems'. He concludes (2002: 121) that 'Syntax and phonology are independent combinatorial systems, built from distinct sets of primitive elements combined by distinct sets of formation rules. Neither can be reduced to or derived from the other'. Jackendoff discusses combinatoriality at length in (2002) and (n.d./2011). For discussion of Jackendoff's multiple independent combinatorial systems, and Hockett's duality of patterning, see below and Howe (2012).

[9] Jackendoff (2002: 123–4) states that 'It has become clear from the many approaches to semantics in the literature that semantics is a combinatorial system independent of,

the process underlying metaphor（see e.g. Langacker 2008: 69f.）, which gives human language expressive richness and flexibility. It is the process in discourse, turn-taking and narrative（see Jackendoff n.d./2011 for references）.

Word	**Meaning**	**Gloss**
murrirrbe	bird	'feather-arm'
kangarlmawu	god	'above-dwelling'
mardarlart	to be angry	'belly bite'

Table 2 Combination to make meaning in Murrinhpatha（*examples from Street 2012*）

The fact that combination to make meaning is so taken for granted as to be almost invisible to us is a clue its importance. And indeed, if we look outside humans, we see that this apparently simple ability is far from so: while chimpanzees, gorillas and orang-utans can be taught to recognise and use a number of words or signs, even up to a few hundred, their ability to combine them meaningfully seems limited.[10] As Hauser, Chomsky and Fitch（2002: 1576）write: 'It seems relatively clear, after nearly a century of intensive research on animal communication, that no species other than humans has a comparable capacity to recombine meaningful units into an unlimited variety of larger structures'.[11]

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and far richer than, syntactic structure. Formal semantics ... and Cognitive Grammar ... differ on about every issue but this one: they are both theories of meaning as a rich combinatorial system'. On conceptual blending see Fauconnier and Turner（2002）, and on semantic networks and fields see Aitchison（2012, chapter 9）.

[10] See e.g. Crystal（2010: 422）and Saxton（2010: 38–40）with references.

[11] Hockett（1982: 10）makes the point that even if gibbons or protohominoids added a call or cry to their repertoire, this would not make their system productive, rather merely enlarge it.

By contrast, the ability to combine meaningfully is observed in human children very early on. The pronunciation of even single words (such as *ball*, *juice*, *mummy*, *daddy*, *doggie*, *dirty*) requires combination of phonemes and syllables. And morphosyntactic combination is seen already from around 18 months in the so-called 'two-word stage'.[12] It may emerge even earlier in reduplication, in the *wee-wee*, *bye-bye*, *ma-ma*, *pa-pa* and similar forms in other languages, and possibly in nascent form in babbling starting at around six months, as Darwin suggested.[13]

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[12] On average (and at around the same age children can build a tower of two blocks and walk up steps – Saxton 2010: 17). The following are examples of two-word utterances used by Victoria, aged 1;9, *in one hour* (cited in Crystal 1986: 76–77 with normalised pronunciations):

Ady horsie	hat off	my hat
baby bed	hat on	my teddy
baby cry	her coat	my tractor
baby doll	here is	she cold
baby drink	horsie mummy	she hair
baby hat	in there	shut door
baby here	is here	silly hat
baby lie	it gone	that bath
baby like	it off	that car
baby mummy	kiss doll	that hat
Bluey here-y'are	look elephant	that horsie
Bluey where	milk gone	there Bluey
comb hair	more toy	there teddy
come out	mumma back	toy gone
daddy there	mumma drink	waking up
dolly there	mummy off	want on
drink dolly	mummy there	where Bluey
gone milk	mummy toy	where inside
got it	my apple	where there
hat mummy	my bed	you bed

[13] For an example of cognitive combinatoriality at five months, and further examples at ten and 13.5 months, which Jackendoff believes is 'well prior to the onset of

We also find it in profoundly deaf children who have not been exposed to sign language. Goldin-Meadow writes in her 2005 study:

> We might expect such children to fail to communicate – or to communicate in non-language-like ways.
>
> But ... the deaf children's gestures are structured more like the spoken language they can't hear than like the gestures they can see.
>
> The lack of ... language model does not prevent the human child from communicating with self and other, in the here-and-now and in the non-present, using the segmented and combinatorial representational format that is the hallmark of human language.

Universal grammar and recursion

Combination to make meaning is a basic mechanism of cognition, and one that is central to language. The fact that combinations make meaning units and that these combinations can themselves be combined explains how language, when spoken, is simultaneously sequential and hierarchical:

> [The house [that Jack built]] ...

Given combination of combinations, a separate submechanism of recursion is unnecessary. And we can postulate constituency and hierarchy as secondary universals. As Chomsky points out (2006: 183–4) with 'Merge or some equivalent', 'we instantly have an unbounded system of hierarchically structured expressions'.[14] A consequence of combination to make meaning

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combinatorial language', see (n.d./2011: 24).

[14] Compare Bybee (2010: 34): 'The underlying cognitive basis for morphosyntax and its hierarchical organization is the chunking of sequential experiences that occurs with repetition'. And Newell (1990: 7, quoted in Bybee): 'A chunk is a unit of memory organization, formed by bringing together a set of already formed chunks in memory

are the many levels of structure described by linguists. These levels arise from combination, chunking and entrenchment of simpler component symbols to create more complex ones (cf. Langacker 2008: 171). Langacker states (2008: 207): 'Constituency is observed in symbolic assemblies when a composite structure at one level of organization functions in turn as component structure with respect to a higher level'. As Langacker points out (2008: 15–16), 'A defining property of human language is the formation of complex structures out of simpler ones ... a higher-level symbolic structure is itself capable of entering into a combinatory relationship, producing a more elaborate symbolic assembly ... Through repeated combination, at successively higher levels of organization, assemblies having any degree of symbolic complexity can be formed'.

Hockett is perhaps incorrect in suggesting a duality or *two* systems of patterning, namely of sound and meaning, and others wrong in suggesting a dichotomy of grammar and lexicon. Rather all derive from a single primary universal of combination to make meaning.

Symbolic reference

Combination to make meaning is also the process linking the linguistic and the extralinguistic: most fundamentally in human communication, it is the ability that enables us to link a meaning in our head to something outside ourselves, indexically or symbolically, with our human interlocutor, i.e.

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and welding them together into a larger unit. Chunking implies the ability to build up such structures recursively, thus leading to a hierarchical organization of memory. Chunking appears to be a ubiquitous feature of human memory'.

combination enables reference.[15]

Symbolic reference is a conventional shorthand, as some researchers have suggested, deriving in part from a likely universal of economy. People of the same cultural-linguistic-social group share symbolic meanings. As already noted, much meaning is implied rather than articulated and depends on the human ability to 'mind read' and understand context. A symbol thus abbreviates form and subsumes meaning, allowing us to communicate economically.

The processes of connected speech outlined above – including coarticulation, abbreviation and chunking – reduce compositional transparency. And as Langacker (2008) points out, a composite structure is itself symbolic, and entrenchment diminishes the salience of compositionality (1987).[16] Combinations are not always straightforwardly decomposable. *Cupboard* no longer means

[15] On reference, compare Tomasello (2003a: 8) who writes: 'Other animal species do not communicate with one another using linguistic symbols, most likely because they do not understand that conspecifics have attentional or mental states that they could attempt to direct or share'. It is important to realise that 'this complex set of cognitive and social-cognitive processes' is not simply 'association' (Tomasello 2003a: 84): 'if we look at children's earliest comprehension and production of real-live linguistic utterances, we see that there is something very special going on. The child encounters an adult making funny noises at her. To make sense of this odd behavior she must attempt to determine the purpose for which that person is making these funny noises. Once she determines that the adult is making these funny noises in an attempt to communicate with her, she still must determine precisely what the adult is attempting to communicate with some particular word. That is to say, the child must determine, first, the adult's overall communicative intention and, then, the particular way or ways that the new word is contributing to that communicative intention'.

[16] Cited in Evans and Green (2006: 756). Langacker (2008: 164) believes that while component structures 'motivate the composite structure to varying degrees, and may supply most of its content, they should not be thought of as building blocks that need only be stacked together to form the composite whole'. He adds (2008: 166): 'While component structures serve to evoke a composite structure, and provide a way of apprehending it, the latter should not be thought of – in any strict or literal sense – as being constructed out of them. Stepping-stones are not the same as building blocks'.

and is no longer pronounced *cup board*, *gonna* is not simply segmentable, and words borrowed from other languages, like *supercilious* or *origami*, are often not decomposable by speakers.

Symbolism is a fundamental universal of human language (cf. Saussure 1972/1983, Deacon 1997). All languages have conventional combinations and patterns of combination, the cross-linguistic similarities of which were captured by Greenberg's implicational grammatical universals. And significantly, symbols are ubiquitous in human culture but absent from other species.

Why do we have rituals, flags, wedding rings, Easter eggs, the cross, swastika, mathematics and money? And what would possess humans to decorate their possessions, bodies or clothes with symbols? For a summary of research on when symbolism emerged, see d'Errico and Henshilwood (2011: 50–58) who conclude (p. 58):

> Our succinct review of the evidence for symbolic material culture (1) contradicts the idea that the production of symbolic material culture is the result of a sudden change in human cognition occurring in Europe or in Africa after 50–40 ka; (2) suggests the presence of symbolic material culture in Africa by at least 150 ka, in the Near East after 100 ka and probably by at least 60–50 ka in Europe ...

Matsuzawa (2012) notes: 'The association of the symbol and the corresponding things is everywhere in human language but very difficult for chimpanzees'. Lieberman (2006: 65) writes that

> Studies of chimpanzees now suggest that their vocal signals convey complex referential information ... This is not surprising because monkey species also transmit referential information by means of vocal

> signals. These field observations, however, suggest that their repertoire is limited; chimpanzees even have great difficulty suppressing their calls in situations in which that would appear to be warranted.

And Tomasello states (2003a: 199) that chimpanzees do not use gestures referentially:

> This is clear because (1) they almost invariably use them in dyadic contexts – either to attract the attention of others to the self or to request some behaviour of another toward the self ... not triadically, to attract the attention of others to some outside entity; and (2) they use them exclusively for imperative purposes to request actions from others, not for declarative purposes to direct the attention of others to something simply for the sake of sharing interest in it or commenting on it. Thus, perhaps surprisingly, chimpanzees do not point to outside objects or events for others, they do not hold up objects to show them to others, and they do not even hold out objects to offer them to others.

Symbols as indices with mind-reading

Hudson (1999) offers an alternative to Deacon (1997), deriving symbols from indices with mind-reading. Hudson gives the simple example of a child learning the word *cat* and its meaning, summarised very briefly below:

1. As an index for a co-present cat
    a. The child regularly hears *cat* in the presence of a cat and learns an indexical link between the two
2. As an index for a cat which is not present but which the speaker is paying attention to

Hudson adds 'This is fully social because the child is paying attention to the

other person's inferred state of mind'. He states:

> This stage also allows another important characteristic of symbols – 'displacement', whereby a symbol may refer to an object or event which is not co-present.
>
> The child has now acquired the symbol *cat*, because the link between the word *cat* and the actual cat is no longer purely indexical
>
> there is an indexical relationship, but it is now between the observable word and the unobservable ... mental stage of 'attending to a cat'.
>
> it ... achieve[s] Deacon's goal of explaining why humans find symbols so much easier to learn than other animals do; but ... the main weight is borne by the human ability to read other people's minds.

Hudson's explanation can easily account for *cat* or *dog*. But can it account for *god*? His account would mean that symbolism and displacement – the former one of Saussure's central themes, and the latter one of Hockett's main design features – are secondary universals or emergent features of human language.[17] It would also mean that abstract grammar could not be primary or innate as it requires symbols.[18] Nevertheless, as Hockett notes (1982: 11–12), there is no doubt that reference and displacement confer a very significant survival advantage in that we can inform or warn others about

[17] This would also account for the common onomatopoeia or iconic reference in child language (and adult language mirroring child language).

[18] Compare Pinker (2009: 51): 'The problem with almost every nonsemantic property that I have heard proposed as inductive bases is that the property is itself defined over configurations of abstract symbols that are not part of the child's input, that themselves have to be learned. For example, some informal proposals I have heard start from the assumption that the child knows the geometry of the phrase structure tree of a sentence, or the fact that two words in the sentence belong to the same category, or, even worse, the syntactic categories and grammatical relations of phrases'.

food, water and danger and extend the power of teaching and learning beyond the here and now.

Lexicon

The arbitrariness of symbolic reference – multiplied by the number of items in the lexicon – requires an extraordinary ability to learn language by children, and this requires a very strong motivation to communicate, a universal shared by all human beings.[19] This ability is not simply numerical, however: children have an imitative specialisation for speech（Pinker and Jackendoff 2009: 133）, learning the lexicon of a language 'requires a prodigious ability to construct the proper meaning on the basis of linguistic and non-linguistic contexts'（Pinker and Jackendoff 2009: 136）, and learning a language requires much more than 'simply' learning words.

Books on language frequently underestimate the size of the lexicon. Crystal（2019: 133）discusses this issue and suggests figures of between 31,000 and 77,000, taking account of active and passive vocabulary. Conventional dictionaries, too, underrepresent the size of the lexicon as many compounds and multi-word expressions are not listed as separate entries. The research by my emeritus colleague at Fukuoka University, Professor Kosho Shudo, reveals the huge number of multi-word expressions humans store. Shudo estimates a Japanese speaker's lexicon to comprise about 130,000 words and multi-word expressions, depending on how they are counted（personal communication, 26 Sept 2013; see also Toshifumi, Takahashi and Shudo 2014

[19] Some children with autism may have language delay or do not develop speech.

for full references).[20] Diller (1978, quoted in Hurford 2012: 261) tested high school teenagers on a sample of words from *Websters Dictionary* and estimated they knew on average 216,000 words. If this figure excludes compounds and multi-word expressions, the total will be significantly higher.

Vast range and subtlety of meaning

To illustrate the range and subtlety of meaning of the human lexicon, I will quote a few words from Murrinhpatha relating to *were* 'dog':

Word	Meaning
bek	'howl'
ngarl	'bark'
guthkuth	'scratch with paw'
lele	'bite'
ngerengere	'pant'
ngirrk	'growl'
ngkabubuy	'to tame'
yeyel	'urinate'

Table 3 Words relating to 'dog' in Murrinhpatha (examples from Street 2012)

In English, we have the multi-word expressions *dog's dinner*, *dog house*, *dog-eared*, *dog and bone*, *hair of the dog*, *dog's life*, *dog eat dog*, *go to the dogs*, *sick*

[20] 'Gross (1986) analyzed French compound adverbs and compound verbs. According to his estimate, the lexical stock of such words in French would be respectively 3.3 and 1.7 times greater than that of single-word adverbs and single-word verbs. Jackendoff (1997) notes that an English speaker's lexicon would contain as many MWEs as single-words. Sag et al. (2002) pointed out that 41% of the entries of WordNet 1.7 (Fellbaum 1999) are multiword. Uchiyama and Ishizaki (2003) reported that 44% of Japanese verbs are VV-type compounds. These and other similar observations underscore the great need for a well-designed, extensive MWE lexicon for practical natural language processing.'

as a dog, let sleeping dogs lie, you can't teach an old dog new tricks, the tail wagging the dog and so on.

Our language memory is astonishing, even compared to face recognition. Humans know about 5000 faces (Jenkins, Dowsett and Burton 2018). Language memory might therefore be around fifty times more powerful than face recognition. Put differently, we can perhaps remember 200,000 more words, compounds and multi-word expressions than faces. This includes phonological information, grammatical information and of course semantic information. And multilingualism is common, for example in Africa and Aboriginal Australia. Add to this the rapid recall for production and comprehension in conversation discussed at the beginning of this paper and the human language ability seems truly extraordinary.

The 132 or so ASL signs of Washoe the chimpanzee demonstrates a vast difference between humans and our closest relatives.

A powerful clue

The hugely powerful human memory for language is an important clue to how language works. Compared to the vast lexicon, a grammar of say roughly a thousand rules (constructions or patterns) (Crystal 1986: 9) – and these 'free' as abstracted patterns of language use – would be comparatively minor in terms of what a child must learn. It would mean that for a long time linguistics had focused on the trees rather than the wood. Compare Hurford (2012: 268) who writes:

> Several recent syntactic theories converge significantly ... reducing the combinatorial rules to just one or two, and locating everything else that must be learnt about the syntax of a language in the lexicon.

> In all these approaches, a very small number of combinatorial rules or operations are common to all languages, and so are plausibly innate in the human language capacity. Innate, too, is a capacity for storage of an enormous number of structures.

One way of reducing the memory burden is regularity or by using *pattern*. This will be discussed next.

Pattern

The archaeological find in South Africa in 2011 of a cross-hatched pattern drawn with an ochre crayon on a silcrete flake (Henshilwood et al. 2018) from approximately 73,000 years ago was a clear sign of human culture. But why? As with symbols, why do we decorate our possessions, bodies or clothes with patterns? And what would possess humans to tap their feet to music, or move their bodies to a rhythm? If we were to watch people dancing without the music, their behaviour would appear bizarre, as if

nga	nhi	ma	widhung	nu		ngani
I	you	hand	kiss	will		I do habitually
I will keep on kissing your hand						
nga	nanku	ma	widhung	nu		ngani
I	you two siblings	hand	kiss	will		I do habitually
I will keep on kissing the hands of you two siblings						
nga	nanku	ma	widhung	nu	ngintha	ngani
I	you two	hand	kiss	will	two siblings, at least one female	I do habitually

I will keep on kissing the hands of you two who are not siblings and at least one is female

Table 4 Pattern in Murrinhpatha (*examples from Street 2012*)

possessed by some strange compulsion. Why do chimpanzees or bonobos not behave in a similar way?

Instinct for pattern

To comprehend, learn and produce language, humans must have a very strong instinct for pattern, not least audible patterns. We know that pattern-finding is an important feature of cognition, not only in humans (e.g. Tomasello 2003a, Saffran, Gross 2010). But we find patterns everywhere in human language and culture, including sound, lexical and grammatical patterns, music, song, poetry, alliteration, rhyme, chants, earworms, jingles, riffs, marching and dance.

Patterning means that a significant part of language is non-arbitrary. Below I quote various research on pattern in language. First, Langacker (2008: 24):

> A speaker's knowledge of grammatical patterns resides in a vast inventory of symbolic assemblies ranging widely along the parameters of schematicity and symbolic complexity
>
> These schemas are abstracted from occurring expressions, and once established as units they can serve as templates guiding the formation of new expressions on the same pattern.

Hunston and Francis in their study *Pattern Grammar* (2000: 13–14) discuss analysis of language using corpora:

> corpora allow ... us to identify with some certainty the frequently-occurring sequences of items ... The work of Sinclair and other corpus linguists suggests that all language is patterned, that there is no such thing as a free phrase.
>
> Grammar patterns ... constitute an attempt to describe the whole of the

> language ... in a principled way

Hunston and Francis (2000: 17) cite Sinclair (1991: 100): 'evidence suggests that grammatical generalizations do not rest on a rigid foundation, but are the accumulation of the patterns of hundreds of individual words and phrases'. They continue (2000: 17):

> Sinclair's choice of the word 'generalizations' is significant here, in that it contrasts with those approaches to grammar that expound an abstract 'langue' or system that in some way underlies actual instances of language use. For Sinclair, it appears, there is no system setting the parameters of what may be said or written, only a set of generalisations capturing the essence of what has been said or written.

This last sentence captures Hockett's *Traditional transmission*, namely that children learn second-hand language to produce novel utterances. However, patterning in language is instinctual and universal rather than merely handed down. Goldin-Meadow (2005) writes on deaf children who were not exposed to language:

> The deaf children we have observed are not exposed to a language that has had its word order patterns passed down from generation to generation.
>
> Nonetheless, they invent gesture systems with consistent ordering patterns.

Hunston and Francis (2000: 255–56) argue that pattern and meaning are associated: 'Firstly, when a word has more than one meaning, the meanings tend to be distinguished by having different patterns ... The second piece of evidence for the association of pattern and meaning is that words with the same pattern share aspects of meaning'. They argue (2000: 250) that 'lexis

and grammar are not distinguishable ... the observations of pattern and phraseology made using a large corpus blur the traditional distinction between lexis and grammar. Put simply, a description of a word and its patterns cannot be classified under the heading either of "lexis" or of "grammar"'.

Langacker concludes（2008: 170）that 'composition and compositional patterns have to be a central focus of linguistic investigation'. Hunston and Francis（2000: 177）conclude as follows:

> The logical outcome ... is to replace a structural analysis with a pattern analysis, that is, to allow the pattern analysis to stand by itself, without attempting to relate the elements of the pattern to other, more abstract, categories. In those cases where the abstract categories reflect a useful distinction ... a description of meaning groups would have to carry this distinction. The result, of course, would be a description ... that was less abstract, more lexical and "surface" in orientation.

Secondary universal: Grammar

This means that what we term grammar, i.e. the complex patterns and exceptions of individual languages, is an emergent feature. A diachronic and synchronic product. The universal 'grammar' of human language are the primary universals of category, combination to make meaning, pattern and others outlined here.

Language learning by children

Humans share language but human languages are not mutually intelligible.

Why is this so? Sampson (2005: 131), following Pinker (2003), points to the 'advantages in the flexibility of learning over the rigidity of innate knowledge'. No other primates have been shown to learn their vocalisations (although they can make meaningful use of them, by learning associations, Zeigler and Marler 2008). Human children, in contrast, learn the ready-made combinations – symbolic assemblies – of previous generations, combining them to create new meaningful utterances.

We also know that repetition – practice – is crucial to expertise, whether it be language, manual dexterity, walking, playing a musical instrument or sport (see e.g. Ericsson et al. 2018). Hauser, Chomsky and Fitch (2002: 1577) state correctly that 'A child is exposed to only a small proportion of the possible sentences in its language'. However, it is the number of times the child hears the combinatorial patterns of her language that is significant. The 'poverty of stimulus' argument ignores the fact that the child hears the patterns of his language again and again, even more so for the most frequent patterns in the language – and these are precisely the ones she will need to produce most.[21]

Rather than postulating constraints, i.e. what is not allowed, ungrammatical or irregular, we can postulate usage patterns, schemas or templates, learned on the basis of input (cf. Tomasello 2003a, Langacker 2008).[22] These patterns

[21] On the 'poverty of stimulus', Boeckx for example states relatively recently (2011: 44), without reference to data: 'The acquisition of language is all the more remarkable when we take into account the enormous gap between what human adults (tacitly) know about their language and the evidence that is available to them during the acquisition process. It should be obvious to anyone that the linguistic input a child receives is radically impoverished and extremely fragmentary'. For a discussion of examples cited by Chomsky and others as evidence for a poverty of stimulus, see Sampson (2005: 43–49) with references.

[22] Cf. Evans and Green (2006: 754): 'In the cognitive model, the schema does not give

are abstracted from use to produce schemas or templates for production. Christiansen and Chater (2008: 502) write:

> Language processing involves extracting regularities from highly complex sequential input, pointing to a connection between general sequential learning (e.g., planning, motor control, etc.) and language

In *A New View of Language Acquisition*, Kuhl writes (2000: 11852):

> Infants detect patterns in language input
>
> Infants exploit the statistical properties of the input, enabling them to detect and use distributional and probabilistic information ... to identify higher order units.

If combination to make meaning is an innate universal, it means that every human has combinatorial competence both as a producer and comprehender of language. We thus use this universal 'grammar' not only to produce language but also to decompose it. This universal would mean that children have an inherited ability and 'knowledge' of the structure of human

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rise to the instance but follows from it: the schema represents a pattern that emerges from entrenched units as a consequence of usage'. And Langacker (2008: 221): 'Since schemas are the reinforced commonalities of occurring expressions, they amount to positive characterizations of what actually occurs in language use ... the positive characterization of conventional patterns can indicate implicitly (and quite effectively) that options outside their range are nonconventional and will be judged ill-formed'. Compare Crystal (1986: 76–77) on the examples of two-word utterances used by Victoria, cited in the footnote earlier: '... several interesting features of this "two-word" style stand out. For instance, various sets of sentences "go together", because they all begin with the same word – *baby* and *mummy*, especially. Several other sentences all end with *there* ... It's almost as if the child picks up a certain pattern and "rings the changes" on it. You can sometimes hear children of this age going through a litany of sentences all beginning or ending with the same word, almost as if they were drilling themselves ... Another point to note is that the order of the words usually corresponds to what you'd expect in an adult sentence: the child says *my bed* and *got it*, and not *bed my* and *it got*. Sometimes you get both orders ... But on the whole, Victoria seems to have learned a lot about the main patterns of English word order – and she's only 1;9'.

language(s); it would therefore be a key to learning and part of the explanation for how they can acquire any language so precociously.[23] The fact that any human child can learn any human language is strong evidence for a common origin of human language.

The language we learn as children is not an ideal system of 'perfect design' but a historical miscellany of vocabulary native and borrowed, compounds, multi-word expressions, grammaticalised constructions, productive patterns, formerly productive patterns, and cultural meanings. This is Hockett's Traditional or Cultural transmission. A child has parents, siblings, grandparents, aunts, uncles, cousins, friends and neighbours, all with heterogenous language. From this input, with her powerful pattern-finding ability, a child abstracts templates or schemas that enable him or her to produce language and communicate fluently with the people around her.

Secondary universal: Variation

Traditional transmission is the primary universal resulting in language variation. To draw a very simple contrast: a rooster's crow is innate; he does

[23] On recent research comparing two approaches to the evolution of compositionality, one appealing to biological evolution, the other focusing on cultural evolution, see Smith and Kirby in Werning et al. (2012). Smith and Kirby hypothesise that compositionality is socially learned.
There is evidence that children can segment words from fluent speech already at seven months (Jusczyk and Aslin, 1995, cited in Saxton 2010: 119). And children overgeneralise this 'knowledge' of the structure of human language(s), as illustrated below (examples from Crystal 1986: 108-109):

> Mother: You run on ahead, and I'll catch up with you.
> Jane (2 ; 6): Whose head, mummy?
>
> Mother: Don't argue!
> Hugh (3 ; 0): I don't argme.

not learn his crow and it never changes. His offspring crow in exactly the same way. A songbird, by contrast, learns its song. It has innateness plus learning and the song varies. Children, too, have innateness and learning. Each child constructs his language himself, from the speech she hears around her. So no two children's language input can be identical.[24] Therefore there is no single language, rather thousands of languages, hundreds of thousands of dialects and millions of idiolects.

Conclusions

Greenberg was unable to show absolute grammatical universals in his seminal study because he was looking at the result of thousands of years of the workings of universals（cognitive and linguistic）rather than the universals themselves. However, if we look at deaf children who were not exposed to language – an indisputable poverty of stimulus – we can see the universals more immediately. Goldin-Meadow writes in *The Resilience of Language*（2005: 227–28）:

> The list of properties that the deaf children develop is particularly impressive when compared to the linguistic accomplishments of chimpanzees who have been exposed to models of human language
>
> Whatever gains chimps make in learning language, they appear to do so at great cost ... In contrast, language comes naturally to human children – even when they lack an adequate model for language

[24] Even siblings will have different inputs, as they are born at different times, as they may or may not have one or more siblings when acquiring language, as parenting styles may differ with each successive child. Even biologically identical twins will not have identical linguistic inputs.

resilient properties of language are not maintained as universal aspects of language solely by historical tradition. These properties are sufficiently fundamental to human communication that, in a supportive social environment, children can invent them de novo.

Universality and diversity: A unified explanation

The universals are deliberately stated in this paper in as elementary or 'minimal' way possible. They must be sufficiently generic to account for the fact that – as Greenberg's study and subsequent work on universals found – human languages vary significantly. Overspecific principles would mean we should expect less variation in human language. Basic, primary universals, on the other hand, can explain both the universality of human language and its diversity.

In 'The Myth of Language Universals', Evans and Levinson (2009: 429) state 'just how few and unprofound the universal characteristics of language are'. I would argue on the contrary that there are in fact numerous universals of human language, a small number of which I have outlined here.

References

Aitchison, Jean (2012) *Words in the Mind*, 4th ed., Malden, MA/Oxford: Wiley-Blackwell.

Boeckx, Cedric (2011) Some reflections on Darwin's problem in the context of Cartesian biolinguistics, in Di Sciullo, Anna Maria and Boeckx, Cedric (eds) (2011) *The Biolinguistic Enterprise: New Perspectives on the Evolution and Nature of the Human Language Faculty*, Oxford/New York: Oxford University Press (= Oxford Studies in Biolinguistics).

Boeckx, Cedric（2012a）Homo combinans, Paper presented at *Evolang 9*, Kyoto, 13–16 March 2012.

Bybee, Joan（2008）Formal universals as emergent phenomena: The origins of structure preservation, in Good, Jeff（ed.）*Linguistic Universals and Language Change*. Oxford: Oxford University Press.

Bybee, Joan（2010）*Language, Usage and Cognition*. Cambridge: Cambridge University Press.

Burling, Robbins（2007）*The Talking Ape: How Language Evolved*. Oxford: Oxford University Press.

Chandler, Daniel（2003）*Semiotics: The Basics*. Routledge.

Chomsky, Noam（2006）Biolinguistics and the human capacity, in Chomsky, Noam, *Language and Mind*, 3rd ed., Cambridge: Cambridge University Press, pp. 173–185.

Chomsky, Noam（2007）*The Biology of the Language Faculty: Its Perfection, Past and Future*. Online lecture, 19 October 2007, MIT World. http://mitworld.mit.edu/video/517（accessed 14 March 2012）.

Christiansen, Morten H. and Chater, Nick（2008）Language as shaped by the brain. *Behavioral and Brain Sciences* 31, pp. 489–558. doi:10.1017/S0140525X08004998

Christiansen Morten H., Collins, Christopher, Edelman, Shimon（eds）（2009）*Language Universals*, Oxford University Press.

Croft, William（2003）*Typology and Universals*, 2nd ed., Cambridge: Cambridge University Press.

Crystal, David（1986）*Listen to Your Child: A Parent's Guide to Children's Language*, London: Penguin.

Crystal, David（2010）*The Cambridge Encyclopedia of Language*, 3rd ed., Cambridge: Cambridge University Press.

Crystal David（2019）*The Cambridge Encyclopedia of the English Language*, 3rd ed., Cambridge: Cambridge University Press.

Deacon, Terrence W.（1997）*The Symbolic Species: The Co-evolution of Language and the Brain*, New York and London: W. W. Norton.

De Ruiter, J. and Levinson, S.（2008）A biological infrastructure for communication

underlies the cultural evolution of languages, *Behavioral and Brain Sciences* 31 (5), p. 518. doi:10.1017/S0140525X08005086

Dillier, Karl Conrad (1978) *The Language Teaching Controversy*, 2nd ed., Newbury House Publishers.

Dingemanse M., Torreira F., Enfield N. J. (2013) Is 'huh?' a universal word? Conversational infrastructure and the convergent evolution of linguistic items. *PLoS ONE* 8 (11), e78273. doi:10.1371/journal.pone.0078273

d'Errico, Francesco and Henshilwood, Christopher S. (2011) The origin of symbolically mediated behaviour: From antagonistic scenarios to a unified research strategy, in Henshilwood, Christopher S. and d'Errico, Francesco (eds) *Homo Symbolicus: The Dawn of Language, Imagination and Spirituality*, Benjamins, pp. 49–73.

Ericsson, K. Anders, Robert R. Hoffman, Aaron Kozbelt, A. Mark Williams (eds) (2018) *The Cambridge Handbook of Expertise and Expert Performance*, 2nd ed., Cambridge: Cambridge University Press.

Evans, Vyvyan and Green, Melanie (2006) *Cognitive Linguistics: An Introduction*, Edinburgh: Edinburgh University Press.

Evans, Nicholas and Levinson, Stephen C. (2009) The myth of language universals: Language diversity and its importance for cognitive science, *Behavioral and Brain Sciences* 32, pp. 429–492.

Fauconnier, Gilles and Turner, Mark (2002) *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities*, New York: Basic Books.

Goldin-Meadow, Susan (2005) *The Resilience of Language: What Gesture Creation in Deaf Children Can Tell Us about how All Children Learn Language*, Psychology Press.

Greenberg, Joseph H. (1966) Some universals of grammar with particular reference to the order of meaningful elements, in Greenberg, Joseph H. (ed.) *Universals of Language*, 2nd ed., Cambridge, MA, and London: MIT Press, pp. 73–113.

Gross, Richard (2010) *Psychology: The Science of Mind and Behaviour*, 6th ed., London: Hodder Education.

Hauser, Marc D., Chomsky, Noam and Fitch, W. Tecumseh (2002) The faculty of

language: what is it, who has it, and how did it evolve? *Science* 298, no. 5598, pp. 1569–79.

Henshilwood, Christopher S. and d'Errico, Francesco (eds) (2011) *Homo Symbolicus: The Dawn of Language, Imagination and Spirituality*, Benjamins.

Henshilwood, Christopher S., Francesco d'Errico, Karen L. van Niekerk, Laure Dayet, Alain Queffelec and Luca Pollarolo (2018) An abstract drawing from the 73,000-year-old levels at Blombos Cave, South Africa, *Nature* 562, pp. 115–118. https://doi.org/10.1038/s41586-018-0514-3

Hinzen, Wolfram, Werning, Markus and Machery, Edouard (2012) Introduction, in Werning, Markus, Hinzen, Wolfram and Machery, Edouard (eds) (2012) *The Oxford Handbook of Compositionality*, Oxford: Oxford University Press (= Oxford Handbooks in Linguistics).

Hockett, Charles F. (1960) The origin of speech, *Scientific American* 203, pp. 88–111.

Hockett, Charles F. (1982) The origin of speech, In *Human Communication: Language and Its Psychobiological Bases*, ed. by William S.-Y. Wang, *Scientific American*, pp. 4–12.

Howe, Stephen (2012) A re-examination of Greenberg's universals, *Fukuoka University Review of Literature and Humanities* XLIV (I), pp. 209–253.

Howe, Stephen (2014) The etymologies of Old Frisian *iemma*(*n*) and *himmen*, Paper presented at the *20th Frisian Philologists' Conference*, Leeuwarden, The Netherlands, December 2014.

Howe, Stephen (2018) Emphatic yes and no in Eastern English: *jearse* and *dow*, in *Southern English Varieties: Then and Now*, ed. by Laura Wright, Berlin and Boston: de Gruyter Mouton, pp. 148–187.

Howe, Stephen (2019) Primary universals of human language, Invited talk, Department of Linguistics, Macquarie University, Sydney, Australia, 29 March 2019.

Hudson, Richard (1999) Review of Terrence Deacon 'The Symbolic Species: The Co-evolution of Language and the Human Brain', *Journal of Pragmatics* August, p. 527.

Hunston, Susan and Gill, Francis (2000) *Pattern Grammar: A Corpus-driven Approach to the Lexical Grammar of English*, John Benjamins Publishing.

Hurford, James Raymond (2012) *The Origins of Grammar: Language in the Light of Evolution 2*, Oxford: Oxford University Press.

Jackendoff, Ray (2002) *Foundations of Language: Brain, Meaning, Grammar, Evolution*, Oxford: Oxford University Press.

Jackendoff, Ray (no date/2011) What is the human language faculty? Two views, http://ase.tufts.edu/cogstud/incbios/RayJackendoff/humanlanguage.pdf, to appear in *Language* 87 (3), September 2011, pp. 586–624.

Jenkins, R., Dowsett, A. J. and Burton, A. M. (2018) How many faces do people know? *Proceedings of the Royal Society B* 285 (1888), https://doi.org/10.1098/rspb.2018.1319

Jusczyk, P. W. and Aslin, R. N. (1995) Infants' detection of sound patterns of words in fluent speech, *Cognitive Psychology* 29(1), pp. 1–23.

Kuhl, Patricia K. (2000) A new view of language acquisition. *Proceedings of the National Academy of Sciences*, October 2000, 97 (22), pp. 11850–57. doi: 10.1073/pnas.97.22.11850

Langacker, Ronald W. (2008) *Cognitive Grammar: A Basic Introduction*, Oxford: Oxford University Press.

Lieberman, Philip (2006) *Toward an Evolutionary Biology of Language*, Harvard University Press.

Martins, Mauricio and Fitch, W. Tecumseh (2012) Empirical approaches to recursion, in Scott-Phillips, Thomas C., Tamariz, Mónica, Cartmill, Erica A., Hurford, James R. (eds) (2012) *The Evolution of Language: Proceedings of the 9th International Conference* (*EVOLANG9*), Kyoto, Japan, 13–16 March 2012, New Jersey and London: World Scientific, pp. 219–226.

Matsuzawa, Tetsuro (2012) Outgroup: the study of chimpanzees to know the human mind, in Scott-Phillips, Thomas C., Tamariz, Mónica, Cartmill, Erica A., Hurford, James R. (eds) *The Evolution of Language: Proceedings of the 9th International Conference* (*EVOLANG9*), Kyoto, Japan, 13–16 March 2012, New Jersey and

London: World Scientific, pp. 227–233.

Munnik, Anne （2006） *Learn Xhosa with Anne Munnik*, Pietermaritzburg, Johannesburg and King William's Town: Shuter and Shooter.

Newell, Allen （1990） *Unified Theories of Cognition*, Cambridge, MA: Harvard University Press.

Nielsen, R., Akey, J., Jakobsson, M. et al. （2017） Tracing the peopling of the world through genomics, *Nature* 541, pp. 302–310. https://doi.org/10.1038/nature21347

Pinker, Steven （2003） *The Language Instinct: How the Mind Creates Language*, Penguin.

Pinker, Steven （2009） *Language Learnability and Language Development*, With new commentary by the author, Harvard University Press.

Pinker, Steven and Jackendoff, Ray （2005） The faculty of language: what's special about it?, *Cognition* 95, pp. 201–236.

Pinker, Steven and Jackendoff, Ray （2009） The components of language: What's specific to language, and what's specific to humans, in *Language Universals*, Morten H. Christiansen, Christopher Collins, Shimon Edelman （eds） Oxford: Oxford University Press.

Saffran, J. R., Hauser, M., Seibel, R. L., Kapfhamer, J., Tsao, F. and Cushman, F. （2008） Grammatical pattern learning by infants and cotton-top tamarin monkeys, *Cognition* 107, pp. 479–500.

Saffran, Jenny （2012a） Out of the brains of babes: domain-general learning mechanisms and domain-specific systems, Paper presented at *Evolang 9*, Kyoto, 13–16 March 2012.

Saffran, Jenny （2012b） Out of the brains of babes: domain-general learning mechanisms and domain-specific systems, abstract, in Scott-Phillips, Thomas C., Tamariz, Mónica, Cartmill, Erica A., Hurford, James R. （eds） （2012） *The Evolution of Language: Proceedings of the 9th International Conference （EVOLANG9）*, Kyoto, Japan, 13–16 March 2012, New Jersey and London: World Scientific, pp. 529–532.

Sampson, Geoffrey （2005） *The 'Language Instinct' Debate*, revised edn, London and

New York: Continuum.

Saussure, Ferdinand de (1972/1983) *Course in General Linguistics*, ed. by Charles Bally and Albert Sechehaye with the collaboration of Albert Riedlinger, translated and annotated by Roy Harris, London: Duckworth.

Saxton, Matthew (2010) *Child Language: Acquisition and Development*, London: Sage.

Scalise, Sergio, Magni, Elisabetta and Bisetto, Antonietta (eds) (2010) *Universals of Language Today*, Dordrecht, The Netherlands: Springer.

Sinclair, John (1991) *Corpus, Concordance, Collocation*, 3rd ed., Oxford: Oxford University Press.

Smith, Kenny and Kirby, Simon (2012) Communication and the complexity of semantics, in Werning, Markus, Hinzen, Wolfram and Machery, Edouard (eds) (2012) *The Oxford Handbook of Compositionality*, Oxford: Oxford University Press (= Oxford Handbooks in Linguistics).

Street, Chester S. (2012) *Murrinh-Patha Dictionary*.

Tanabe, Toshifumi, Takahashi, Masahito and Shudo, Kosho (2014) A lexicon of multiword expressions for linguistically precise, wide-coverage natural language processing. *Computer Speech and Language* 28, pp. 1317–1339.

Tomasello, Michael (2003a) C*onstructing a Language: A Usage-Based Theory of Language Acquisition*, Cambridge, MA, and London: Harvard University Press.

Tomasello, Michael (2003b) On the different origins of symbols and grammar, in *Language Evolution*, ed. by Morten H. Christiansen and Simon Kirby, Oxford: Oxford University Press, pp. 94–110.

Wolfson Review 2018, Basic universals of human language, article about my research, Cambridge University, p. 41.

Zeigler, H. Philip and Marler, Peter (eds) (2012) *Neuroscience of Birdsong*. Cambridge: Cambridge University Press.