Language: What it's for and why we have it

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Abstract

In this thesis, I agree with the notion that human natural languages are underpinned by an innate faculty of language which predisposes us to acquire the structural aspects of language. Theories pertaining to its primary function, however, are lacking as they are either out of touch with the bigger picture of human social life (Berwick and Chomsky 2017) or, if they do embrace this, they are met with challenges from evolutionary and communication theory (Pinker and Bloom 1990; Jackendoff 2002).

In order to give a more satisfactory evolutionary account of the faculty of language, I propose that we take inspiration from the alternative view that natural languages are social entities which are wholly learnt and exist to improve human cooperation and social living (Tomasello 2014; Sterelny 2012). An important aspect of this view is seeing that humans have an advanced form of social cognition—that is the ability to understand that other creatures also have minds—which underpins their cooperative and communicative capabilities. I suggest, instead, that we ask what the faculty of language brings to this viewpoint.

My response is that an innate linguistic structure is able to bring to mind new thoughts, ideas, or explanations in human communicative discourse and in situations where it would not be possible with just standalone words or pointing and pantomime. In more technical terms 'the primary function of the faculty of language is to make relevant what is not salient in communicative discourses'. The faculty of language, thus, introduces a new paradigm to human communication and social living.

In conclusion, we will appreciate that an approach which integrates valuable lessons from viewpoints that are usually diametrically opposed provides a picture of language evolution that is more holistic and streamlined. My theory, therefore, appreciates and combines our understanding of linguistic structure, social cognition, human communication, and evolution in a way that is not seen in either of the theories that precede it.

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Acknowledgements

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List of Abbreviations

ESS – Evolutionary Stable Strategy

FL – The Faculty of Language

GB – Government and Binding Theory

LOT – Language of Thought

MP – Minimalist Program

SMT – Strong Minimalist Program

UG – Universal Grammar

Chapter 1 – Language

1.1 Introduction

1.1.1 Language

'Natural language' refers to a unique system that humans use to combine meaningful symbols into more complex phrases and sentences (Fitch, 2010). As it is shared by members of a community it enables us to speak to and communicate with one another about complex ideas and thoughts, and about things we have never encountered before. It appears to have endowed us with powers that far exceed the cognitive and cooperative capabilities of other minded animals found throughout the natural world. Such a system is able to yield an infinite number of distinct sentences and messages and create words and meanings as a society sees fit. It is one of the most fascinating and intensely studied topics in all areas of human interest. Scientists, artists, and theologians have all theorised about its underlying nature and purpose—that is, how and why it got here—and why only humans seem to use it. Still, these questions remain open and a matter of great philosophical interest (Christiansen and Kirby, 2003; Bickerton, 2007).

In this thesis, I will support the claim most prominently made by Chomsky (1982) that language is dependent upon an innate system akin to an organ (so it is similar to our having hearts, as opposed to learning to play the piano) that underpins our ability to acquire and use linguistic structure. Since such an approach to language counts it as part of the natural world, I argue that it is also deserving of a natural story which means postulating an evolutionary process unique to the human condition. In this thesis, I aim to not just explain the underlying nature of language, but also its reason for coming into existence at all. I will argue that this linguistic organ evolved for communicative reasons that helped to support and improve social living. Although this thought is discussed in the literature (Pinker and Bloom, 1990; Jackendoff, 2002) it has hitherto remained controversial for reasons that I shall reassess. The goal of this thesis is to approach the controversies from a new angle and ultimately to overcome them. As a result, my thesis re-introduces communicative function as a serious contender to deliver a cohesive theory of language evolution.

It is worth pointing out that there is very little agreement on what language is. The majority of thinkers interested in the function and nature of natural language agree it is partly dependent on biological factors (that which are genetically passed down through

the process of reproduction), and partly dependent on cultural factors (that which is passed down through the process of teaching and learning). Language must in part be a cultural phenomenon because every culture produces and uses its own brand of it. Nevertheless, language is also a biological phenomenon because it requires a body that can facilitate its acquisition and use—which is also a body that is unique in the animal kingdom as no other body seems capable of acquiring it. Controversies arise, however, where theories disagree on which parts of language are biological and which parts are cultural.

This 'pluralistic' line, however, does mean that most thinkers sign up to a 'multi-component approach' to language, as opposed to treating it as a 'monolithic whole' (Fitch, 2010, p. 17). Though this means that there is a difference of opinion on what language is, there is a general agreement on the way in which language is broken down into parts or sub-fields:

- Phonology – the study of how sounds are organised in language
- Morphology – the study of words, how they are formed, and their relationship to other words
- Syntax – how words are arranged or distributed into phrases and sentences
- Semantics – the meaning of words and sentences
- Pragmatics – how language is used in context

Already, this list demonstrates that language is a complex phenomenon that would be hard for any project to discuss in its entirety; thus, a narrowing in on which aspects of language are more important for the questions at hand will be a helpful starting point.

For me, the aspects of language that are *obviously unique* to humans hint toward this starting point. This is because I am interested in telling the story of a feature that has made humans so unique and different to the rest of the animal kingdom. When asked if these aspects are witnessed elsewhere, only one of them seems to stand out: syntax (Chomsky, 1957; Fitch, 2010). Where other animals have demonstrated even just minor or basic competency for acquiring and using meaningful words, an ability for acquiring and using meaningful phrases or sentences is practically non-existent except in humans. One might argue that syntax is found in other natural systems such as bird- and whale-song, but this syntax remains very different from that of linguistic syntax. Whereas bird- and whale-song are rigid and stimulus-dependent in their use, linguistic syntax is flexible

and autonomous. Furthermore, and as I mentioned in the opening paragraph, language allows humans to utter and understand sentences we have never come across before, and makes infinite use of finite means; it is creative. This fact, in itself, suggests that language must be underpinned by some sort of structure that can combine and recombine the units of language in ways that are meaningful, and does not create meaningless word-salads (I will come back to this discussion in 1.2.1).

The thought is that there is something special about linguistic syntax that, if understood, will help us uncover the nature and functions of language in its entirety. A 'syntactocentric' approach to language is not without its sceptics who argue this is a bad starting point as it risks overlooking other essential aspects (Tomasello, 2008; Everett, 2012). Fortunately, for these sceptics, a focus on syntax is only a starting point or 'spring-board' on which to 'jump into' the exploration of language. Since I am interested in a communicative function I am also interested in language in use, and therefore take the subfield of pragmatics seriously. Word-formation and word-meaning are also important aspects of my overall research question and therefore I also address morphology and semantics, although to a much lesser degree. My thesis, therefore, is about the function and nature of linguistic structure, with a particular focus on understanding how and why words are organised into phrases and sentences; but it is not so syntactocentric that other aspects are overlooked.

As a side note, I should point out that 'grammar' is another important linguistic term that comes up in the literature and will be used throughout the thesis. Chomsky warns us (Chomsky, 1975) that 'grammar' is used to describe both the theory of language and the object of that theory. In this thesis, I will use 'grammar' in the latter sense and refer to the former sense with technical terminology such as 'universal grammar' (see 1.2.1) and 'generative grammar' (see chapter 5). 'Grammar' also bears a close resemblance to the term 'syntax' because they both tend to concern the rules and structures that underpin language:

- Grammar: the whole system and structure of a language or of languages in general, usually taken as consisting of syntax and morphology (including inflections) and sometimes also phonology and semantics ('define grammar' google search 10/02/19)
- Syntax: the arrangement of words and phrases to create well-formed sentences in a language ('define syntax' google search 10/02/19)

As these definitions suggest, 'grammar' tends to be used as a broader term which includes the definition of syntax. In this thesis I will use 'grammar' as a general term to refer to the set of rules a speaker adheres to when using their language, or the set of rules that reflect their knowledge of language (Radford, 2016; Smith and Allott, 2016). This not only includes syntax but also morphology and even the rules behind the semantical elements of language. Syntax, on the other hand, simply refers to the rules that underlie how words are distributed in a sentence. When I use the term 'language' I intend to mean all aspects of language I introduced above, but with a focus on syntax. In other words, language would not be 'language' if there is not a syntax.

1.1.2 Function

The function of language also remains a deeply controversial debate in philosophical circles. Anyone of a Wittgensteinian persuasion will be quick to point out that language has many uses. Humans use it to instruct others, make jokes, ask questions, create law, break law, describe a scene, criticise a scene, and so on and so forth (J. R. Searle, 1969; Wittgenstein, 2010). What I will argue in this thesis, however, is that language has an overarching 'primary function' that explains why it evolved in the first place. The many uses of language either somehow embody the primary function or are 'secondary functions' which depend on the factors that initially gave rise to its primary function (see 2.1 for further discussion on primary and secondary function).

Before going on, I should briefly make clear some terminology I will be using in this thesis. I use 'power' as a vague term to point to something language can *do* without making any direct commitments to if that something is useful, and use 'function' to refer to a power that is useful. What is more controversial for this particular field, however, is an argument for *primary function* that is entrenched in the nature and processes of evolution. Where humans make artefacts like water bottles and laptops that have obvious primary functions, the story is a little harder to tell for natural objects like hearts and language. A water bottle was designed by someone who intended it would work as a container for holding water, but no intentional being designed the heart. Instead, it is said that the heart was unintentionally 'designed' by natural selection.

I will explore this in more detail in chapter 2, but this supports a view that the primary function of natural objects is down to understanding their evolutionary history (Wright,

1973; Millikan, 1989; Neander, 1991; Godfrey-Smith, 2009). That is, explaining how and why random genetic mutations are selected for and passed down the generations to create a certain phenotype. The mutations that are 'selected for', that is the ones that stick around, do so because they have some positive effect on the fitness of the phenotype. A neck, for example, that is longer than the usual length, may have a positive effect because it allows a creature to access more food sources than before. This increased fitness also increases the chances of mating, having children and the chances that those children will reproduce. The longer neck, therefore, exists because it gave access to a better food source, which gave the animal more energy for mating and caring for its offspring.

In this thesis I make the claim that the innate system that underpins language evolves to enhance and improve human communication; and that it does this by allowing humans to refer and talk about things that exist outside of the current context of their communicative act. In more technical terms I argue that 'the primary function of the faculty of language is to make relevant what is not salient'. I will show this by arguing that not only are humans 'linguistic creatures' (see 1.2.1) and 'cultural creatures' (see 1.2.2) but are 'hybrid creatures' (see 1.3). The hybrid creature view appreciates that we have evolved to use language *and* culture, but also that these aspects are ultimately intertwined in their primary function and evolutionary history.

My argument for this lies in that the linguistic creature view is lacking when it comes to an account of language primary function and its evolutionary history (see 2.2 for a detailed review). To resolve this problem, I suggest we take inspiration from the 'cultural creature' approach to language which appreciates a larger and more cohesive picture of what makes humans unique and of their evolutionary history. Ultimately, I propose an integrated view of language where humans have evolved a specific faculty for language-use in order to enhance and improve the human dependency on sociality and culture.

1.1.3 Debate

I stated above that I support the claim that language is an innate system and that its primary function is a communicative one that helps to support social living (this is a consequence of the deeper claim that language helps to 'make relevant what is not salient'). This claim, however, is controversial because it does not sit well with either of the current and competing theories in the field. Where I argue that language, or more

specifically, syntax, is innate and dependent upon our biological makeup, others argue it is learnt and dependent upon our social and cultural makeup (Tomasello, 2003; Kirby, 2011; Everett, 2012). And where I argue that the primary function of language is to improve social living through enhanced communication, others argue its function is to improve individual thinking or cognitive function (Carruthers, 2002; Reboul, 2017). These arguments and claims broadly point to two dominant views in the field which both oppose my proposal; those who argue language is innate (in agreement with me) tend to argue it has a cognitive function (in disagreement with me); and those who argue language is learnt (in disagreement with me), tend to argue it has a communicative function (in agreement with me).

Even in just the four or five years in which this thesis was written several books have been released on this very topic, and all remain in line with the current status and splitting of the field as I have just discussed. In 2014 Scott-Phillips released his book *Speaking our Minds: Why human communication is different, and how language evolved to make it special*. He argues that language is learnt and performs a vitally important function that enhances the pre-existing communicative abilities of humans. In 2017 Reboul released her book *Cognition and Communication in the Evolution of Language*. She argues that language is innate and performs vitally important cognitive functions that help humans to navigate and deal with their environments. Also, in 2017, Chomsky released his latest book, co-authored with Berwick, *Why only Us: language and evolution*. They argue from the minimalist stance (see section 2.2.3) that language is innate, but the product of physical constraints as opposed to natural selection.

Although these books consider the theory that language is innate and performs a communicative primary function, neither of them argue for it. So, at this first glance, the argument that language is innate and selected for communicative reasons has few friends in the field. I will come to argue, however, that this is not true; and that as a 'hybrid' approach which takes inspiration from both views, it has the potential to find many allies. The goal for the rest of this chapter is to explore in more detail the current and dominant theories in the field and to explain how and where my hybrid account sits between them. The rest of the thesis will be dedicated to defending this account.

With all that said, a thesis about the primary function of language is not just about the evolution of language, but the evolution of the human species. In 2015 Chomsky also released another book called *What Kind of Creatures are We?* which exposes that

understanding the what's, why's, and how's of language, will help us understand the what's, whys, and how's of being human. It is with this motivation that I would like to explore the state of the field and my proposed contribution to it in more detail.

1.2 What Kind of Creatures are we?

1.2.1 Linguistic Creatures

A prominent view in linguistics suggests our linguistic abilities are underpinned by some domain-specific and innate system that predisposes us to acquire the structural aspects of language. The research refers to this innate system as the 'faculty of language' (or FL)[1]. What the FL actually consists of remains a matter of debate that I will come to discuss, but most will agree that it is an autonomous system, module, or some component of mind analogous to the parts of the mind-brain that also predispose us to sense the world in certain ways. Our visual system, for example, is set up to perceive a certain spectrum of light and to distinguish foreground objects from background objects. We are, for example, predisposed to recognise facial shapes and the meaning of certain facial expressions (e.g. sad, happy, disgusted etc). These are aspects of our knowledge that are not learnt from our environment because, to some degree, we already and fundamentally *know* them. This suggests that if linguistic structure is not learnt from the environment, it must be acquired from something within the individual, and therefore part of our biological or genetic makeup. Such a view on language suggests that some evolutionary progression *built* us to be 'linguistic' and have this ability as part of our very nature. Thus, I propose that this viewpoint sees humans as 'linguistic creatures'.

I am committed to the view that we are linguistic creatures, and this is largely because I argue we need to postulate something like the FL to explain our linguistic abilities. In this section, I will go into more detail about what the FL is and also explain these arguments. As I mentioned above, however, this understanding of natural languages is lacking when we consider why and how we became 'linguistic creatures' in the first place. Theories that attempt to describe the primary function of the FL are faced with problems from evolutionary theory and are not in-line with the larger picture of human sociality. I will go into these in some detail here but will reserve the larger discussion for chapter 2. It is for

[1] In the literature the faculty of language is also often referred to as the 'language acquisition device' or LAD.

these reasons that I suggest we look for inspiration for an alternate view on language which I will explore in the next section—that is the idea that we are not (only) linguistic creatures, but (also) cultural creatures.

The term 'innate' is often confused and sometimes it is simply used to mean something like 'knowledge[2] we are born with'. The term, however, deserves more explanation than this. Especially, when it comes to something as complex as language. Let me explain: at first glance, it seems obvious that language is something that is learnt from our environment. It is not sufficient for a child to be exposed to a language in order to acquire it[3], but language itself is as diverse as the world's cultures. The number of languages recorded across the globe is around 6-7000 (Anderson, 2010), and in some parts of the world, such as tribal Africa, you only need to travel in a car for a few hours before coming across a tribe that has an entirely different language from the one before[4]. A deeper look at the structures of these languages, however, appears to reveal that there are common grammatical principles between them all:

> . . . in their essential properties and even down to fine detail, languages are cast to the same mould. The Martian scientist might reasonably conclude that there is a single human language, with differences only at the margins (Chomsky, 2000, p. 7).

These principles are known as a 'universal grammar' (or UG) and support the thought that all human languages ultimately work on the same set of principles or constraints, and only diverge from one another in superficial ways. UG suggests that all language use, or at least most, dips into this pool of principles that include mostly structural rules and

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[2] Knowledge or 'to know the rules' here is not meant to mean gaining a belief about some truth, but merely the mental representation of something that can be used through interaction with the world. When a speaker produces or comprehends sentences, they do it based on the representation associated with the language inside their head. The knowledge of each language, thus, can vary from one head to the next, and what determines if they can understand the sentence of others is how similar that knowledge is—not if it adheres to some outside entity (Chomsky, 1965, p. 4; Radford, 2016, p. 3).

[3] Famous cases of 'wild children' demonstrate this in that those that miss a 'window of opportunity' when they are young also miss out on a chance to acquire a full language (Fromkin *et al.*, 1974; Curtiss, 1988).

[4] I know this from my own experience of visiting the tribes in Southern Ethiopia where in one day I visited two tribes whose languages were entirely different.

constraints that concern syntax and grammar. The thought is that a commonality between languages means a commonality between all humans that acquire language—and this is due to the work of FL.

Notice that UG does not describe all aspects of language and leaves much open to the constraints of one's environment rather than their apparent FL. This involves particularly things like vocabulary, word-meaning and perhaps even phonetics[5]. What this shows is that input from a linguistic environment is still an essential part of the process of not just acquiring language, but of what one's linguistic knowledge becomes. As an English speaker, my linguistic knowledge might share structural commonalities with German and Japanese, but my vocabulary and word-meanings (that is the meaning or concept a word is paired with) are shaped by what I learn from English culture. FL, therefore, does not just provide linguistic knowledge; instead a linguistic environment 'triggers' FL into action and the FL *guides* that input in a certain way[6]. FL, thus, gives all humans the same 'initial state' on which they start their journey of language acquisition (Rey, 2014; Cain, 2016; Smith and Allott, 2016).

This guidance, therefore, could have FL understood as an 'innate learning mechanism' because it informs our linguistic knowledge in correspondence with what we learn from our environment. It is a sort of a combination of innate knowledge *and* learnt knowledge. To help bring this idea to light we can compares with a another type of innate learning mechanism found in indigo buntings (Carey, 2000). Indigo buntings are birds who, during migration, navigate via the position of the North Star. In their infancy, however, the birds need to learn which star the North Star is in order to orientate themselves correctly. Thankfully, the reference point for this orientation is also the point at which the sky (from our point of view on earth) rotates on around a central point. Indigo buntings, therefore, have an innate mechanism that guides them to look out for this point of rotation whilst they observe the sky as chicks. Learning where north is, therefore, is dependent on the

[5] Both these points have been disputed as both semantics (Pinker, 1994; Jackendoff, 2002) and phonetics (Borer, 2005) are said to be part of UG. I will, however, have to leave this part of the debate open and remain focused on the questions surrounding syntax.

[6] How this is the case will be explored when I come to look at 'parameter settings' in section 5.2.

innate mechanism (north is equal to the point of rotation in the night sky) and the experiential input (observing the night sky).

Natural languages like English, German and Japanese exist because of this set up in the human mind, which is only an influence on our experience of the external environment rather than a reflection of the external environment in its entirety.

> "[T]he English language" is an idealization over the mental grammars of English speakers…Where is the English language, then? If anywhere, in the heads of its speakers (Jackendoff, 2012, p. 21).

In other words, our minds are not blank slates, but entities predisposed to acquire and learn those things that will be most helpful with us as we interact with our world. The FL, therefore, informs our linguistic knowledge in correspondence with what we learn from our environment. Language is as much a 'window into' (Pinker, 1994) or 'mirror of' (Chomsky, 1975; Smith and Allott, 2016) the human mind, as it is of the social environment humans find themselves in.

The claim that there is a UG, however, is a controversial one and many argue that languages are too diverse to propose that there are commonalities between them (Evans and Levinson, 2009; Dąbrowska, 2015; Wolfe, 2016). Furthermore, if there are commonalities, they may exist for reasons other than an FL. For example, they could be rooted in a single language from our ancestry (Deutscher, 2006); a product of learning constraints (Kirby, Griffiths and Smith, 2014); or it is simply that such structures are a commonplace because they are good at providing a system of communication (Everett, 2012). I will discuss some of these in coming sections, but here I will review some arguments that support the view that natural language syntax is underpinned by an FL.

The first is the lesson from the cognitive revolution of the 1950s that showed us that a plain 'behaviourist' account of language (put forward by Skinner (1957)) was fundamentally flawed. The suggestion was that language was acquired as the consequence of conditioning and positive reinforcement. Whilst a child is growing up, he or she is normally surrounded by the spoken language of his or her culture. The constant association with language—through being spoken to, listening to others speak to each other, and trying to speak themselves—eventually has the child acquire language. This view, however, simply does not account for the structural properties of language, especially when we consider the *creative aspect* (Chomsky, 1965) of language. Language

is a system that is able to combine and *recombine* meaningful units into larger phrases and sentences:

> [t]he combination of unlimited specificity of meaning, combined with a free flexibility to use language in novel way… is the hallmark of language…its defining features are its scope and unbounded flexibility (Fitch, 2010, p. 26).
>
> [Language] takes a finite set of elements and yields a potentially infinite array of discrete expressions (Hauser, Chomsky and Fitch, 2002, p. 1571).

Such unbounded flexibility allows us to even utter phrases and sentences we have never experienced before—th\ise aspect seems impossible to explain on the behaviourist model of language.

This challenge was initially made in Chomsky's review of Skinner (1959) where he argued that language could not be explained through an input (one's experience of language) to output (one's behaviour of language) system. There had to be some intermediate mechanism involved. This mechanism receives information from experience, *does something with it*, and has that influence the output. This is comparable to how a computer processor works. If you input '2', you might get '4' as an output—this is because of an internal mechanism '+2'. Chomsky's point was that one's linguistic behaviour does not simply reflect their experience, and therefore some internal mechanism (the FL) must account for this. Although it is true that empirical theories of language acquisition have moved on and are far more sophisticated than they were before the 1950s[7], it remains a matter of debate if an empirical account can, in fact, account for this creative aspect.

Second is the case for the modularity of the mind[8] (Carruthers, 2006, 2010). 'Module' here refers to that intermediate structure in the mind which operates between input and output. It is usually domain-specific in that it is targeted to work with a particular experiential input (e.g. faces in facial recognition or night skies in the orientation for north); and encapsulated, in that the inner workings of one module are isolated from the workings of another (Fodor, 1983). Although I used the term 'faculty' to describe the

[7] Construction Grammar, for example, models linguistic structure on the idea that sentences are learnt constructions that can be applied creatively by changing units within the constructions (Tomasello, 2003; Goldberg, 2006)

[8] This is also a direct response to the idea that the mind is a 'blank slate', see above.

'module' of language[9], I more or less mean the same thing here. The underpinning innate system that explains our acquisition and use of natural language syntax structure is specific and encapsulated to the domain of language. There is evidence and argument that backs up the existence of modules as a way of providing a solution to an evolutionary problem (Tooby and Cosmides, 1992; Mithen, 1999); as a phenomena found in minds across the animal kingdom (Carey, 2000); and in explaining human cognition (Spelke, 2003; Spelke and Kinzler, 2007). Since language is unique to humans, postulating a specific module (or faculty) fits in with the claims of this research.

Thirdly, and probably most importantly, is the argument from the 'poverty of the stimulus'. This argument exposes a gap between what a child appears to know about the language, against what they actually experience of it. In other words, the generalisations over the linguistic data one would expect are not the generalisations that children make. This suggests that linguistic knowledge comes from them, and not their environment. We should also keep in mind that a child's linguistic data is often 'unclean' in that it is full of confusions and incorrect utterances—despite this, children are still able to pick up their target language free of such errors (Chomsky, 1975; Crain, 1991; Laurence and Margolis, 2001; Lidz and Gagliardi, 2015; Cowie, 2017).

We can also demonstrate this through a direct example when we consider certain sentences in language are syntactically related to one another in important ways (Chomsky, 1965). Sentences that contain a 'Wh-word', for example, are transformations[10] of a more basic sentence: like with 'Ethiopia is in Africa' and 'Where is Ethiopia?'. In English, this transformation is known as 'Wh-Movement' and simply states that the 'Wh-word' at the beginning of the sentences is related to a 'gap' later on in the sentence. In this case, the 'gap' in the second sentence corresponds with the placement of 'Africa' at the end of the first sentence. This exposes an important syntactic relationship, however, it is not obvious how children come to learn this rule from the linguistic data they receive.

This rule seems to work with a sentence like 'What did you claim Jack brought?' where the 'gap' has a relationship with the phrase 'a car' in 'Did you claim Jack brought a car?'.

[9] Why this is will become more clear in chapter 5 where I use 'module' in a slightly different sense.

[10] I explore the notion of transformation and movement in far more detail in chapter 5

It does not work, however, with the sentence 'Did you make the claim Jack brought a car?' as *'What did you make the claim that Jack bought?' is ungrammatical (Rey *et al.*, 2017). The reason for this is related to a syntactical constraint (known as an 'island constraint') which prevents the movement or transformation happening across *clauses* (where 'make the claim Jack brought a car' is a clause, but 'claim Jack brought a car' is not)[11]. We can, perhaps, envision a situation where a child is able to learn the 'wh-movement' rule, but it is not at all clear how they could learn the much subtler rule related to clauses. Despite this, we do not hear them make this grammatical mistake. The linguistic creature view claims this is because something internal to them 'knows' this subtle rule.

Finally, the poverty of stimulus argument also accounts for the idiosyncratic nature of language. When one compares the linguistic knowledge of a child to their linguistic experience one wonders why language is this way and not that way (Rey, 2014; Rey *et al.*, 2017). Why is it grammatical to say, 'What did you claim Jack brought?' but not *'What did you make the claim that Jack bought?', when, on the surface, the meaning conveyed by the sentences could be the same. The thought here is that if language were wholly learnt from a child's linguistic data then it would have a very different structural shape, and be made up of very different syntactical rules. The reason why it does not is because something innate, the FL, is constraining it in a way learning from linguistic data alone will not.

The existence of the FL, however, is not the problem that this thesis sets out to explore. It is the explanation behind how and why it exists in the first place. The trouble with this view is that the FL is established in human biology, and therefore requires a story from evolutionary biology to describe how it came into existence. This means that linguistic structure is not passed down through teaching and learning, but through our genetics and the process of reproduction.

The primary function of language will be linked to how and why change takes place in the genetic variances between one generation and the next. Understanding this requires comprehending the process of natural selection which is one of the main topics of chapter 2. What I will briefly mention here is that the genetic variations that are 'selected

[11] This more technical jargon will be made more clear throughout chapter 5.

for' are the ones that enhance the fitness of the species and therefore more likely to get passed down into future generations. For example, the creature with a longer neck is able to reach leaves high in the trees and therefore has access to a food source that creatures with shorter necks do not. This promotes the survival of long-necked creatures and they are more likely to have children and pass those 'long-neck' genes on into the next generations. The long neck, therefore, can be said to have the primary function of reaching a more abundant source of food *because* that reason explains why the longer neck exists.

Theories on the linguistic creature account of language evolution, however, all offer views on language evolution that are problematic. Again, I will go into far more detail in the next chapter (see 2.2), but here I will briefly mention that there are three overarching views:

1) The FL evolved because it gave humans better cognition
2) The FL evolved because it helped humans to communicate more efficiently
3) The FL is the product of physical constraints and/or other evolutionary processes and did not evolve for a particular function

The main trouble with 1) and 3) is that they do not line up with other factors important to the human creature: that is that humans are social creatures who are highly dependent on group living and cooperation for their survival (see more in 1.2.2). The reason I think this is important to consider in a theory of language evolution is that both natural language and cooperation are very unique aspects to humans and treating them as unconnected consequences undermines a holistic picture which postulates that these aspects are intimately related. If we are going to take this point seriously, then 2) is the obvious option as communication between humans is obviously related to our being social creatures.

Option 2), however, also has a variety of problems that prevent it from giving a satisfactory account of the primary function of FL. Most of these are evolutionary issues and will also be discussed in chapter 2, but one issue I can point out here and that is '*language is neither necessary or sufficient for communication'* (Collins, 2008). This points to the fact that humans are capable of communicating without language. It is possible for humans to use pointing, showing, and pantomime to communicate. In a kitchen, for example, I could show you how to bake a cake without uttering a word. Language,

therefore, is certainly not necessary for communication (I will roughly refer to this kind of communication as 'pointing and panto').

Furthermore, it is also not sufficient for communication. In other words, linguistic utterances, on their own, cannot amount to successful communicative acts. This is demonstrated through the observation that linguistic utterances 'underdetermine' the meaning conveyed by a speaker (Wilson and Sperber, 2004; Scott-Phillips, 2014; Smith and Allott, 2016). If I utter, for example, 'it is raining outside' I could mean anything from 'we should not go for a run' to 'make sure you pick up your wellies'. This will entirely depend upon the context and situation in which the sentence is uttered.

If the linguistic utterances severely underdetermine the overall meaning of a communicative act, it becomes very unclear what language or the FL is doing for communication. 2), then, is as unsatisfactory as 1) and 3). These theories, however, have developed from 'syntactocentric' theories that tend to overly focus on the nature of syntax and not the nature of the humans using the syntax. I, therefore, suggest that we at least look at a different perspective on language evolution and see if they can offer any inspiration on the functionality and powers of language.

1.2.2 Cultural Creatures

This alternative view on the human mind and the evolution of language is what I have termed the 'cultural creature' view. This view has an entirely different approach to explaining the existence of natural languages. Firstly, language is wholly acquired through learning, and not from domain-specific systems. However, despite the differences, I believe there is something to learn from the approach; something that should be applied to our overall understanding of the primary function and evolution of language—something the linguistic creature view is lacking. This lesson, I believe, mainly lies in the fact that not only are humans unique in that they are the only creatures who possess languages, but they are also unique in their dependence on sociality and cooperation (Dunbar, 2014; Tomasello, 2014). This uniqueness becomes especially interesting when we consider that our cousins are social animals that live in groups, but that they do not cooperate or depend upon each other in the way that humans do. Where chimps are said to have Machiavellian intelligence geared toward manipulating others for their own needs, humans are far more likely to help one another, work together on projects, and split the rewards equally (Tomasello *et al.*, 2005; Tomasello, 2008).

Furthermore, no matter which take on language one advocates, acquiring it requires a degree of social dependence in that one needs to understand that other minds want to interact and share something with you if they are ever to grasp or learn word-meaning:

> …it is only if a young child understands other persons as intentional agents that she can acquire and use linguistic symbols – because the learning and use of symbols requires an understanding that the partner can voluntarily direct actions and attention to outside entities. (Tomasello *et al.*, 2005, p. 675).

This way of understanding the human creature has another sort of innate knowledge at its centre. That is what I roughly refer to as 'social cognition' (Lavelle, 2018). This also has an impact on how theorists are coming to understand human communication and the role that language has within it.

What this view recognises is that, like the other primates in our evolutionary family, humans rely on groups and social living for survival. Our cousins; the gorillas and chimps, and our ancestors; homo erectus and homo heidelbergensis, survived and thrived because they evolved to coexist in larger units that provide protection and defence against predators. Not only did bigger group sizes provide safety by preventing predators from attacking, but they also offered an opportunity for group members to look after one another and come to each other's aid when needed (this would have been particularly valuable in care and protection of vulnerable infants) (Dunbar, 2014).

Group living, however, comes with a unique set of challenges that puts its members and the group as a whole at risk. Intergroup competition for food, mates, and space is a great cause of stress and tension that, if not handled in a way that benefits all, could end up in the death of a member or tear a group apart. The success of the primate species, however, suggests that they have found ways of dealing with these problems over the last 6 to 8 million years of evolution (Dunbar, 2014, p. 7). Methods include a group structure that depends on individuals taking dominant or submissive roles, grooming, and other methods that build and secure strong bonds between group members. Humans, however, seem to have taken another step forward by evolving to rely on cooperative behaviour for their survival. These are behaviours where humans have to share their intentions—that is to somehow see and understand each other's mental states or thoughts—in order to achieve some goal or activity by working together achieving it

(Tomasello *et al.*, 2005). Such behaviours were allowed by the evolution of advanced social cognition.

I will go into more detail about the importance of social cognition in chapter 2, but for now, it is worth simply describing it as an ability for, what I like to call, 'mind-guessing'[12]. Put simply, mind-guessing is the ability to apply intentions and beliefs to the minds of others. Such an ability gives us the opportunity to predict the behaviours of other animals not just through their habitual patterns or through mechanistic cause and effect, but on account of them having minds that can think for themselves. For example, a submissive primate may never risk stealing food from a dominant primate because that always ends badly; but if they can 'guess' correctly that the mind of a dominant primate has their attention elsewhere, they may also see it is safe to steal some food. Or else a mother may normally leave her child to play around the personal space of other primates because in the past it has always been safe, but if she can correctly 'guess' that the mind of one primate is particularly irritated she can act to move her child out of a potentially dangerous situation.

Humans appear to have a particularly high level of social cognition and mind-guessing, and this underpins their ability to cooperate and communicate with one another. This is demonstrated in the comic below where Jen has made a shrugging gesture at Mike (this is a part of a longer comic strip that I will discuss in more detail in section 2.3.2). Here, she is expressing her annoyance with the situation they have found themselves in. They are on a train together, and the passenger opposite, who turns out to be a very loud snorer, has fallen asleep.

[12]This is better known as 'mindreading' or 'theory of mind' (Ravenscroft, 2019). I have, however, opted to use the term 'mind-guessing' as a simple nickname for the ability offered by social cognition as it avoids postulating all the complex theory and, also, to not confuse it with actual mindreading. Further, I think 'mind-guess' better describes what we are actually trying to do, we are making an attempt to guess what others are thinking to the best of our knowledge, but have no way of actually knowing.

FIGURE 1: COMIC 5

This success in communicating with a mild shrugging gesture is not down to any direct meaning with that gesture, but to the fact that Jen and Mike have done a good job of 'mind-guessing'. Jen has guessed correctly that Mike is annoyed by the snoring; but also that Mike has correctly guessed that she also has these thoughts; thus this act of communication—which is about recognition of the situation they are in—has been made possible because of social cognition. In other words, animals without high degrees of social cognition would not be able to communicate like this.

What the example reveals is of high importance to human communication: mind-guessing, and not merely 'decoding' an act (the shrug in this case) is absolutely essential to human communication. It seems uncontroversial to claim that communication is simply the 'impart or exchange of information' or a 'means of sending and/or receiving information' (quotes adapted from a google search: define communication). What 'information' it is that is being communicated, however, is a question which concerns a separate field of debate that I will avoid getting into here. I will simply stick to a basic idea that what is communicated is a certain 'state'. This state could broadly be referred to as 'information' to be shared with or passed onto another or, even more vaguely, 'meaning' to be shared with or passed onto another. The proteins of a cell inform the immune system that the cell is in a certain state that the immune system can act upon. The huntsman that is waving manically and pointing towards prey is informing his hunting partner of his state of mind: 'I can see that you can shoot that deer!' – a state on which his partner can act. There are, however, two known models of communication which describe how information is exchanged: code and ostensive-inferential models respectively: (quotes in Wilson and Sperber, 2004, p. 607):

- Code Model: *'According to the code model, a communicator encodes her intended message into a signal, which is decoded by the audience using an identical copy of the code'*

- Ostensive-Inferential Model: '*According to the inferential model, a communicator provides evidence of her intention to convey a certain meaning, which is inferred by the audience on the basis of the evidence provided'*

My example above is an example of the ostensive-inferential model of communication. Jen is using 'ostension' to 'point' or 'direct' Mike's attention in a certain direction, and Mike is 'inferring' Jen's intended meaning from her action to the best of his knowledge. It expresses how humans communicate overall when they look to convey and interpret the intentions of individuals, and not just the meaning behind any encoded message (Grice, 1957; Sperber and Wilson, 1986; Tomasello, 2008). Our communicative actions are all about trying to get a listener or receiver to understand or grasp an intended message, and we do this by utilising the current context and things we already know about the person we are communicating with.

The recognition that ostensive-inferential communication was vital to understanding human and linguistic communication was central to Grice's revolutionary approach to meaning (Grice, 1957). His argument was that our communicative acts, including linguistic utterances, are used to point to a 'communicative intention' or 'speaker meaning' as opposed to their direct or literal meaning ('literal meaning' is the static meaning of a word that a dictionary would clarify). His argument was that the act of uttering 'it is raining outside' did not mean to inform you it is raining outside, but to point to *my intention to inform yo*u of something. That we cannot go on that planned run, or we must put our wellies on.

This approach to communication, however, clashes with our more stereotypical understanding of language as a system of communication based on the code-model. This is not surprising because language seems to 'code' our thoughts into a sentence of a chosen language, which is then 'decoded' by a receiver who also understands that language. This is also a way of thinking about language that has tended to dominate the way communication has been thought about in the linguistic creature view on communication. This is a discussion I will return to when I explore the 'hybrid creature' view below (1.3). First, I want to explain how this 'cultural creature' approach understands the emergence and evolution of language and of linguistic structure, as well as other cultural behaviours (I will come to a definition of culture shortly).

Here, it helps to understand the concept of a 'social convention', which not only explains the emergence and evolution of language but the emergence and evolution of cultural behaviour overall (Lewis, 1969). Here is a simple definition:

> A social convention is a regularity widely observed by some group of agents. But not every regularity is a convention. We all eat, sleep, and breathe, yet these are not conventions. In contrast, the fact that everyone in the United States drives on the right side of the road rather than the left is a convention. We also abide by conventions of etiquette, dress, eating, and so on (Rescorla, 2019).

A social convention often arises to perform some sort of function that is useful for everyone who will abide by it. The agreement that Americans should always drive on the right obviously has a function in that it makes the roads safer. Without this convention, Americans could just decide to drive on the left, right, or straight down the middle and thus make road-use a chaotic mess and the chance of accident much higher. An agreement between all road users to follow such a rule is therefore mutually beneficial. Unlike behaviours that are underpinned by some biological system (e.g. eating, sleeping, and breathing), social conventions are arbitrary, which means it *could* have been different, or that they did not *have to* come about in that way. English road-users follow the same rationality as Americans but have chosen to drive on the left instead. This agreement, however, works to the same effect.

Notice, also, how the ability for mind-guessing is essential for the creation and maintenance of social conventions. Jen and Mike need to be able to 'mind-guess' that they are both aware of and sharing knowledge with regards to the social conventions on the train. Why did Jen only gesture to Mike on the train? Why not wake the man up, and why does Mike simply agree with her? It is because they are both aware of and are following a social convention that it is rude to disturb people on the train. Another way of describing that they both knowingly share and agree to this social convention is to say they own 'mutual-knowledge' with regards to the correct way to behave on a train, and it is because of mutuality over a convention that Mike is able to instantly see that Jen is sharing a recognition of annoyance, and not asking him to wake the guy up.

For the creation of social convention, mind-guessing is also required so that a social group can come to agree that some practice or procedure be established in the first place. This requires mutual-knowledge of what the needs of a group are, and also the possible

solutions for meeting those needs. If, for example, a group are going to establish a convention with regards to berry picking, they need to be aware that some intervention will improve the berry-picking process, or that there is some problem that will not be resolved unless all berry-pickers do the same thing. Furthermore, the effort required to improve the situation through some intervention needs to benefit all involved. It is through these means that berry-pickers can agree to work together by following some agreeable convention. They could, for example, establish a practice whereby if they go out in pairs one can jump and pull down the branches of a berry-tree, whilst the other gather the (previously unreachable) berries. These agreements do not have to be fully conscious in the sense that all berry pickers directly think 'there is a problem we all need to pay attention to and resolve in an agreeable way', but they do need to be safe in the knowledge that the other berry pickers experience the same problems and motivations as they do. Without this mutuality, there is no way they can establish forms of agreement. In other words, no social cognition, no mutual-knowledge, no social convention.

Of course, not all social conventions are obviously useful; nor do they obviously point to an original function that has since dissolved, but the convention has carried on anyway. This requires an appreciation for how complicated social conventions can become. Why, for example, would one follow the social convention to not disturb people on the train, when it would obviously be more beneficial to everyone to wake up a snorer? What is really at play when Jen and Mike share their frustration at their noisy co-passenger comes down to them both observing a huge and interacting web of conventions established by their culture. The reason why they won't wake up the man could be mixed up with conventions to do with minding your own business; embarrassing the sleeper; the idea that it is rude to put your needs over someone else; or that it is expected that a member of staff should wake him up. Furthermore, a subtle change to the context may also affect their action; like if there were far more people on the train they might wake him up due to some convention related to a weigh-up of how many people are suffering. This highlights how far-reaching and complex mutual-knowledge between humans can become. The scope of which I will revisit in upcoming chapters.

It is here that we also start to understand what 'culture' means. It is the collection of ways of behaving and believing—acquired though social norms, conventions, and institutions (Tomasello, 2014). What is essential is the existence of a social and cohesive group that is able to, and is interested in, creating and maintaining these behaviours and beliefs. I will

come to explore this definition of culture, as well as of 'cultural evolution' in more detail in section 2.3.1, but for now, it is enough to contrast it to the behaviours and knowledge that are genetic or biological. The behaviours and knowledge that we acquire through our genetic heritage is universal and inevitable, whereas the behaviours and knowledge we acquire through social cooperation are particular to a group and arbitrary.

Social cognition and social convention mean that humans are not only set up to overcome challenges together but to teach these ways of overcoming challenges to the next generation. The process of cultural transmission, therefore, is another important aspect of culture. The advantage of this is two-fold. First, learning means that each generation need not 'reinvent the wheel' each time they come across a problem—they simply use the solutions they learnt from their parent's generation. Second, those things that are passed down through cultural transmission are not rigid in the same way genetic transmission is. If they need to change within the lifetime of the learner, they can. This also allows for new ideas to build upon and improve upon old ideas, opening humans up to a form of progression which is far more flexible and changeable than that of biological evolution.

A grandfather, for instance, will teach his son to fish, and the son will also pass on this knowledge to his children, but what the grandfather and his grandchildren know about fishing may vary because the intermediate generation adapted the fishing style. The grandfather may have fished in a deep lake without worrying about water flow, but a change in the environment meant his son had to move and fish in a river which meant adapting the fishing technique to deal with flowing water. Thus, a change in fishing style takes place and the grandchildren acquire an evolved version of the knowledge that their grandfather acquired. Cultural practices and behaviours change and move with the environment and needs that human groups find themselves with and so, naturally, culture also varies between groups. Cultural behaviours and practices may be as minor as the differences between you and your neighbours, or as major as the differences between English living and Japanese living. This means those behaviours that are learnt can adapt to a changing environment far quicker than behaviours that are genetic. The relevance of this will become more clear in chapter 4, but it is worth pointing out that this nature of change has allowed humans to move to and master living in many different environments across the globe (Sterelny, 2012; Laland, 2018).

For advocates of the cultural creature view, language is simply a set of social conventions that are mutually beneficial to all who have agreed to adhere to them. Language-users have come to agree upon word-sounds and their meanings, and how they can combine those words to create larger phrases and sentences[13]. In keeping with the argument that humans have evolved to be cultural creatures, it is typically argued that the reasons why these conventions came into existence are to further aid social living. For a group to survive, individuals need to be implemented into group life and working efficiently alongside others; language helps this process by providing a quick, easy, and cheap form of communication (Deutscher, 2006; Everett, 2012), that also allows individuals to share information that is also clearly and precisely expressed (Devitt and Sterelny, 1999; Tomasello, 2003; Scott-Phillips, 2014).

What does this say, then, about the emergence and evolution of linguistic structures—that is of syntax and grammar? First, its existence depends upon a group of minds that are able to interact with one another; both in order to create and use linguistic structure in communication, and to learn it in the first place. On this view, language is dependent on many minds for its existence, and since all minds who use it need to benefit from it, they sure serve a social function. This is very different from the linguistic creature view which takes a much more individualistic approach to language because, in a sense, language is dependent on a single mind. This is because any one mind 'knows' language due to the FL which provides the 'initial state' of all possible linguistic structures (this putting to one side the need for a linguistic input to get it started). Second, the evolution and changes of linguistic structures for the cultural creature are down to the movements of *cultural evolution* and not biological evolution like in the linguistic creature view (see more 2.3.1).

The thought that linguistic structure is the product of an agreement between many minds, and that it evolves and changes through cultural evolution means that language is part of a neat package where it does not need to be distinguished from other behaviours that provide a social function (like law and religion) or of cultural evolution (like cooking techniques and tool-making). On this view, neither of these other unique

[13] The theory from construction grammar best makes sense of this view. Please see footnote 7 for more information (Tomasello, 2003; Goldberg, 2006).

behaviours require a specific and biological faculty, and neither does the rise of linguistic structure.

In section 1.2.1, I explained where I disagreed with this view that linguistic structure is a cultural phenomenon and argue that I am committed to a view in which language is underpinned by some domain specific structure—such as FL. This explains how it is that language is creative, idiosyncratic, and also closes the gap between a child's knowledge and experience of language. In 1.1.1, I also argued that there was something vital to learn from this view that we are cultural creatures—that humans are unique in their dependence on social life. These lessons—the importance of social cognition, ostensive-inferential communication, and cultural evolution—are the ones that I think theories of language evolution should not take for granted if one wishes to establish an integrated and holistic account of language evolution. This has prompted me to revisit the approaches of the linguistic creature as I propose we consider what the FL might bring to human living if we start from these lessons. This has led me to build another view of language evolution, that is the idea that humans are hybrid creatures, combining parts of both preceding views.

1.3 Hybrid Creatures

1.3.1 Primary Function of Language in Hybrid Creatures

In section 1.2.1 I mentioned that previous theories had argued that the FL had evolved to perform a communicative function which, it is assumed, fulfilled the sort of primary function that promotes social living. Although this theory would appear to be in line with the sort of thinking and lessons of the social creature view—and therefore in line with the larger picture of human evolution—this view was problematic. One of the main reasons was because linguistic utterances underdetermine the overall communicative act and are, therefore, neither '*necessary or sufficient for communication*' (Collins, 2008). Other reasons will be explored in more detail in chapter 2.

This problem, however, dissolves when we seriously consider that humans are primarily ostensive-inferential communicators. Here, underdetermination is just a matter of fact about how language operates within the larger picture of human communication. The ostensive-inferential model has it that *all* acts of communication underdetermine the communicative intention itself because it all works within a larger context. Communicative acts are instances of 'pointing towards' a speaker meaning, and not the speaker meaning in and of itself—this includes linguistic utterances (Grice, 1957; Wilson

and Sperber, 2012). This means that a linguistic utterance cannot be correctly interpreted through simply knowing a linguistic 'code'. A hearer also needs to know how and why the linguistic code is being used in that moment of communication and within that particular context. This requires an awareness or understanding about the sort of knowledge that the speaker and hearer share with one another: whether it is about the current state of affairs (e.g. that when it is raining it gets muddy at the park where the dog is walked, so that wellies will be required), or about the speaker (e.g. that the speaker gets cold easily, and so will opt out of running if it is raining).

My thought, therefore, is to consider what the function of language or the FL might be in this act of 'pointing to' speaker intentions. Does it bring anything new to human communication? Does it work to solve any particular problems or open up any particular opportunities? I think it does, and I will lay out the basics of my argument here: the FL has evolved to enhance and complement the social capabilities that I explored in 1.2.2. I, therefore, argue that humans are hybrid creatures that combine elements of the linguistic and cultural creature viewpoints that I introduced above.

This approach makes a suggestion about the order in which things happen: that the social cognitive mechanisms that underpin our ability to 'mind-guess' precede the evolution of FL that underpins linguistic structure. This also means that our ability to communicate on the ostensive-inferential model of communication precedes our ability to use language. In other words, there is a form of communication that pre-exists linguistic communication: what I will term 'pointing and panto'. Pre-linguistic communication involves the ability to use gestures, pointing, pantomime, showing, and even basic symbolic-use to communicate (Tomasello, 2008).

This order of evolutionary events is justified by two things. First, it is not clear if it makes sense to postulate language before social cognition. Is it possible to use language without the ability to mind-guess?[14] The response is 'of course not', as in order to create and use words—in order for sentences to be useful—we need to understand what and why our speakers are doing with them in the first place. This requires the ability to mind-guess and to have mutual-knowledge (Sperber, 2000; Tomasello *et al.*, 2005). Secondly, if one

[14] There are arguments that the FL may pre-exist social cognition if the FL has evolved for non-social reasons, but in this section I focus on the views that argue the FL evolved for social reasons.

did claim that language emerged prior to other forms of human communication, then one also raises questions about the basis on which such a move is made. Not only does it not make sense for language to exist without mind-guessing (remember, language always underdetermines), but it is not clear what the motivation for this evolutionary change is. The words and structures that make up language would somehow have to exist in the mind of all language-users before pointing and panto, but the mutations that change the FL start from an individual, and an individual cannot communicate with themselves. Further, even if a mutation could start in more than one person, what would be the use of it? What is there for humans to communicate prior to mind-guessing? Such an approach would have to commit to the thought that language is fully a form of code communication that behaves more like computer languages or animal alarm calls. I will discuss the evolutionary problems in further detail in section 2.2 but will revisit the nature of language communication as code in 1.3.2. With this in mind, we can ask what does human communication look like before the rise of FL, and then what does it look like after the rise of FL? What are the differences and does the FL bring anything new to human communication? This is central to the discussion in chapter 3, but here I will briefly review my theory and explain why I think the FL evolved in the first place.

This involves asking: what does the FL actually do? I have mentioned several times that it provides the basis on which we build our knowledge of phrases and sentences, but what is this? What is a sentence? Sentences are collections of structured words that express 'complete thoughts', in that there is always a subject and a predicate[15]. The subject indicates what the sentence is about, and the predicate says something about that subject. This simplified formula allows sentences to express a variety of things. In 'declarative sentences'—sentences that make a statement—this can involve describing how some subject is involved in some activity (e.g. Bill hit Bob, or Blackbirds nest next season) or giving some detail about a subject (e.g. Bill is angry, Polly is a bird). In 'interrogative sentences' a speaker can use the same formula, but to ask a question (e.g. who hit Bill? When do Blackbirds nest?). There are also 'imperative sentences' that make

[15] The thought that there are sentences in language is subject to some controversy in the field of linguistics, and whether or not it is part of UG. I will, however, be revisiting these issues in chapter 5.

commands (e.g. help me pick berries) and exclamative sentences that make exclamations (that's great).

As the simplest form, I will focus on the use of declarative sentences throughout this thesis, but it will be important to keep in mind that all sentence types follow this formula even at the simplified level: they all have a subject and related predicate. As a side note, I should mention that this does not mean to say that linguistic utterances have to be sentences. It is entirely possible for us to utter a single phrase that could be the part of a sentence (e.g. 'Can't help', instead of'I can't help'), or separate words that do not appear to be joined by a syntax at all (e.g 'one, two, three'). Sentences, however, are an essential part of understanding the nature of natural language syntax as it is supported by our intuitions following what we intuit as grammatical. This will also be explored in chapter 5.

Sentences, thus, are capable of expressing a variety of things, but they always involve some main topic (the subject), and something about that topic (the predicate). If we take this point into the field of human social life and our renewed understanding of the social creature, we can ask what does language and sentence-use do for us? The usual response to this question is that sentences allow humans to more clearly and precisely express their thoughts about the things they want to share (Pinker, 1994; Jackendoff, 2012; Scott-Phillips, 2014). This is certainly something that sentences give us the power to do. If I want to explain to someone what I want for dinner, I can do that through use of a sentence and clearly express my thought that: 'I want roast vegetables and rice smothered in soy sauce'.

This claim, however, does not necessarily point to a new or improved version of human communication and therefore does not necessarily point to a primary function of language that gives a satisfactory evolutionary story. This is because to express thoughts more 'clearly and precisely' is something that human communication was already capable of doing. I could express this very same thought by pointing to some uncooked vegetables and rice, and then to the oven and the pot. As long as the hearer has some basic cooking knowledge (e.g. that rice must be cooked in a pot, and not in the oven) I can get the same detailed message across through pointing. This is because human communication is all about choosing the sort of action that points the hearer towards the speaker intention, and this does not imply that the use of a precise and clear sentence is equal to sharing a precise and clear thought.

The process of evolution, however, suggests that the emergence of a new trait or behaviour brings with it some new power or function. New traits or behaviours emerge—are prompted into existence—*because* something about the old body or 'phenotype' could not deal with a new problem or improve a situation. Overall, new traits evolve because they are likely to promote the survival of that body or phenotype and, subsequently, the chances of reproduction and the survival and reproduction of their offspring. The ability to more clearly and precisely express a thought does not reflect the primary function of the FL because the body pre-existing it was already capable of doing this. In other words, humans do not *need* sentences to clearly and precisely express their thoughts.

For example, it is possible for me to use a very simple action, like a grin, to convey the same clear and precise dinner message to my hearer. What allows me to do this is the mutual-knowledge I share with the hearer. Perhaps the hearer has cooked me roast vegetables and rice every time I have asked in the past, or it is common knowledge that they cook this dish very well - so it is obvious what I would like. Further, we could be so well acquainted that a certain grin between us is understood as 'take your best guess'. In this context if I grin when asked 'What do you want for dinner?' my hearer receives a precise and clear answer: I want roasted vegetable and rice with soy sauce.

This point can be taken further, as it is possible for individuals who do not even know each other to communicate in a clear and precise way providing they have been brought up in a similar culture. I may be able to quite clearly, through a gesture at the breakfast table, communicate my frustration about the lack of tea and fresh milk at hotels on the European continent, provided I am communicating with someone who was also brought up on the British Isles. The point is that the details exist in the mutual-knowledge between people who know each other, or even in the collective knowledge of a shared culture. All that is required to get the message across is a well-placed act of communication that guides the hearer to the speaker's intention. This does not have to be linguistic.

What, then, is the point of linguistic communication? To answer this, it helps to explore the limitations of pre-linguistic communication and ask what it cannot do. The answer: it cannot bring to mind the sorts of things that do not exist in the current context—where 'current context' refers to all things in the cultural collective, mutual knowledge, and immediate environment. Linguistic utterances, on the other hand, can. If my hearer is not well acquainted with me, and I am not in a kitchen where I can point out my desired meal

then the utterance 'I want roast vegetables and rice' gets my thought across by referring to something that is not in the current context. Linguistic utterances, of course, will always work on the basis of contextual considerations—as one would always need mutual-knowledge on the meaning of words, and of the cultural practices around dinner and cooking—but they are able to get across a message that was impossible for pointing and panto. The main thing to notice is that it is not about the detail, precision, or clarity of a message, but about what is and is not contextual, i.e. what is immediately apparent within the communicative situation.

Since this is what linguistic utterances can do over and above pre-linguistic communication, this is what I argue the FL has evolved for. The subject and predicate formula that makes up sentences, therefore, reflects a structure that helps humans refer to and bring to mind things that are not in context, or, at least, are not obviously in context. This not only represents the power language brings to human communication, but a way of improving the chances of human survival and of reproduction (see 4.3.1 for more details). Therefore, its biological evolution was motivated by this power and evolved for this reason. I call this the primary function of the FL.

In technical terminology, I argue that 'the primary function of FL is to make relevant what is not salient'. Where 'to make relevant' refers to the use of the heuristics of relevance that both hearer and speaker utilise in acts of communication; and 'not salient' refers to subjects, ideas, or matters that will not be obvious to the hearer in the context of the communicative act. This approach will become clearer in chapter 3 when I introduce the relevance theory (see 3.2.1) and explore the powers of communication in more detail.

There is, however, a technical issue I should explore. That is not 'what does language do for human communication?' but 'what model of communication is language acting on?'. I claim that linguistic utterances bring a certain power to communication because of the way they 'point to' speaker intentions. This makes it sound like language works on the ostensive-inferential model of communication, but it also seems necessary to see it as working on the 'code-model'. This is because to understand the meaning behind 'I want roasted vegetable and rice' requires knowing how to decode word-meanings and rules. This also raises important questions about the relationship between language and *meaning* (or the field of 'semantics' I introduced in 1.1). I shall address these in turn.

1.3.2 Meaning of Language in Hybrid Creatures

No question involving language is complete without addressing meaning, and my account of the hybrid creature combines intuitions from theories that are usually diametrically opposed (that is the account of the linguistic creature and the account of the cultural creature). My account of linguistic meaning also has a similar 'hybrid flavour' which, again, conflicts with the traditional approaches to this question. On the one hand, linguistic meaning is direct and rigid, where a word-sound is paired with some direct word-meaning. This follows the code-model of communication where to understand the meaning of a sentence is to understand the linguistic code. On the other hand, linguistic meaning is interpreted freely within the context that it is used in. This follows the ostensive-inferential model of communication where to understand the meaning of a sentence is to understand the context in its entirety.

To highlight my hybrid understanding of linguistic meaning and communication, I will start by briefly explaining these traditional approaches. First, those who take the cultural creature view typically follow a 'language in use' approach to linguistic meaning. Under this theory, it is acts of social communication, cooperation, and interaction that create and maintain the meaning of a word or linguistic utterance. Word-meanings, therefore, can be called upon again and again because of a set of expectations and associations related to how society predictably and consistently moves with and reacts to a linguistic utterance (J. Searle, 1969; Dummett, 1996; Wittgenstein, 2010).

Here is a possible example of this with the word 'hold'. A group of humans who regularly work together to gather roots and berries to feed themselves find a way to collect more berries than they could do alone. If person A jumps up and pulls a branch down, person B can collect all the berries on that branch, which allows them to collect far more berries than they could have collected alone. The community of berry collectors develop the signal 'hold' to associate with this act. A berry picker can use this to signal in a communicative act towards the 'holder' when they are ready to collect the berries. The meaning of 'hold' therefore *is* its use. When 'hold' is used within a communicative act, hearers are not 'looking' to connect it with any sort of direct meaning, but to work out its overall meaning 'off the hoof' which involves a consideration of their previous experiences with the word as well as the context of the experience they are having in that moment.

Second, those who hold language as underpinned by the FL (see 'linguistic creatures' above) will typically follow a 'meaning is representation' approach. This is the thought that word-meanings are connected to representations in the mind of the individual. This suggests that the mind of the individual is full of meaningful representations which they can call upon whenever they are in communication with other individuals (which also have a head full of representations). These representations are also used for thinking and it is argued that they themselves might be entrenched in their own 'language of thought' (or LOT) which is connected but different to public language (Fodor, 1975; Pinker, 2005; Cain, 2016).

On this view, the word 'hold' may be created for the same reasons I described above, but it does not derive meaning from the movements and reactions of the community, it is derived from the head of the individual who has, somehow, set it up in relation to their own representational makeup. The word 'hold' is understood correctly because the same or similar enough representations are activated in the minds of all those involved in the communicative act. 'Hold', therefore, doesn't mean *hold* because of the *way it is used* within a community (as it does with the social view); it means *hold* because of *representations in the mind* of each person. Such an approach also suggests that language works according to a code-model of communication because this is what the interpretation of the word 'hold' requires. The word 'hold' is linked with a unit in LOT, and so 'hold' is coded to a certain representation that is triggered each time the word is heard.

Both the social and representational views on meaning are far more complex than what I have described here, but this explanation should be enough to highlight my dilemma. On the one hand, I am committed to a group-based or social approach to meaning. Human language works on the ostensive-inferential model of communication, which admits that successful communication relies heavily upon things like the immediate environment and mutual-knowledge. Linguistic meaning, therefore, is largely determined by its use—that is how society is expected to react to and move with meaning. On the other hand, I argue that language evolved to facilitate a form of communication that refers to things outside of current context (that is 'to make relevant what is not salient'). Linguistic structure that is underpinned by an FL enhances human communication by combining word-meanings to make phrases and sentences. This surely requires something like representations or mental units to work in and with the combinatory functions of the FL.

These commitments cause friction that winds up the academic intellects committed to either side of the language debate. It is, however, worth reminding my reader that, as far as this thesis is concerned, intuitions from both sides are required for understanding human behaviour and language (see 1.1.1). We cannot deny that humans are largely shaped by their social group and that we are obviously highly skilled mind-guessers, learners, and rememberers. So, arguments that take linguistic meaning to be wholly social and worked 'off the hoof' and within the movements of the group are easily relatable. They do not, however, seem to wholly explain human life and especially linguistic communication which needs to be set and rigid in some sense for linguistic communication to be successful at all. Pinker says:

> Language is a lever with which we can convey surprising facts, weird new ideas, unwelcome news, and other thoughts that a listener may be unprepared for. This leverage requires a rigid stick and a solid fulcrum, and that's what the meaning of a sentence and the words and rules supporting must be. If meanings could be freely reinterpreted in context, language would be a wet noodle and not up to the job of forcing new ideas into the minds of the listener'. (Pinker, 2005, p. 123)

Much of human behaviour is explained by the needs of its social setting, but it is hard to make a case for creativity that comes from social interactions alone. These interactions enforce habit and 'the norm', but not the breaking away from these things that give rise to acts of innovation. Thus, it makes sense to turn inward and argue some internal mechanism supports these sparks of creativity and originality. Therefore, more internal stuff beyond the social cognition, learning mechanisms and memory is surely required. This seems particularly true when it comes to my arguments about language-use. Something that is rigid and inflexible is surely required to help humans communicate successfully outside of context; where context is created and maintained by flexible social whims.

With this in mind I will explore linguistic meaning as a two-sided coin, roughly working where the tension lies, and offer potential solutions to the problem. It will quickly become obvious that this issue cannot be addressed in any satisfactory way in this thesis, but it will at least pave the way toward a coherent view on language meaning. On the first side of the coin: social interaction creates meaning, much in the way I explored above with the word 'hold'. Due to there use, these words are highly useful for society and are therefore created and used on a regular basis to help further the chances of survival for a human

group (see section 3.3.1). On the second side of the coin, 'hold' and other words are 'picked out' and manipulated by an FL which has the power to bring these meanings together and create more complex sentences which can be 'spat' back out into the social domain with the function of 'making relevant what is not salient'. The big question seems to be: how do social meanings become the sort of thing that can become fixed and associated with representations that are 'picked out'?

The claim I need to make seems simple enough. The representations associated with word-meanings are shaped by those social interactions that take place outside the mind but become ingrained 'into' the mind. If we follow the current literature on representation in the mind, this could go one of two ways. Either word-meanings become associated with pre-existing representations that exist in a LOT (Fodor, 1983; Jackendoff, 2002; Pinker, 2005), or they are associated with learnt-patterns in a neural network based upon a connectionist theory of mind (Clarke, 2001). I am not committed to either view, but I will briefly explore the advantages and disadvantages of each approach to highlight the overall nature and challenge of language meaning in this approach.

The advantage of a LOT account is that it automatically makes sense of word-meanings being entities that are 'picked out' by the FL as representations that are fixed and discrete. If representations are already entrenched in a LOT, then they are, also, already discrete and manipulated through the syntax that underlies LOT. Whether word-meanings are associated with representations on a one-to-one basis (Fodor, 1975), or on a one to many basis (Jackendoff, 2002; Pinker, 2005); or whether they are set or change over time; it is argued that there is at least a sensible connection between the two systems. The disadvantage to this approach is that it requires an explanation of the nature and evolution of LOT as well as FL and if it altogether makes sense to postulate more than one syntactical system (Collins, 2004). This throws up a lot of questions that are hard to answer. Did LOT exist before language? Does language change LOT? Does LOT look the same for everyone? I will leave these questions to one side and focus my attention on two others that I think are more relevant to the thesis.

An important question arises when we consider the bigger picture of human communication. Remember, on the ostensive-inferential model of communication, linguistic utterances are used to 'point ' to a larger speaker intention. Communication is not merely a case of coding a thought into a public language and decoding it again at the other end. The process involves 'decoding' the sentence, plus everything else in context

(this includes the immediate environment, mutual-knowledge, and even things like tone of voice). The question, therefore, is what is happening in a LOT when it comes to communicative discourse? The reason why this may be important to bring out is because it queries a general idea in the field that a sentence can equal a thought (as one would expect on a code-model of communication), when what is happening is that the content of a sentence can only ever amount to *part* of a thought that needs to be *fully* understood within the context. The response to this is to simply accept that language, on its own, cannot fully reflect human thought. When interpreting a linguistic utterance, LOT is at work decoding the sentence, but also working out the rest of the content—perhaps functioning on the heuristic of relevance I mentioned above (see chapter 3 for further exploration).

The advantage of a connectionist view is that representations will reflect the meaning *society* attributes to a word, as opposed to the meanings available in a LOT. Unlike LOT, representations are not innate and therefore do not require an explanation as to how or why meanings could exist prior to humans needing or creating words. The neural network will learn and measure out the 'meaning' for itself and based on what is witnessed by the individual. In other words, 'hold' comes to gain its 'representation' as instances of the word are observed for the commonalities and differences between each use. The pattern that 'means' *hold* reflects those commonalities. If we assume that word-meanings somehow become 'set' or 'entrenched' in the neural network (perhaps based upon some consistency or regularity with the use), we can also make sense of how the word can be used outside of the context in which it is learnt. A connectionist account of linguistic meaning also helps to account for the larger picture of human interaction as *all* aspects of communication are learnable by the neural network and therefore initially generated from society as opposed to the individual mind. This includes, for instance, the subtle differences between a tone of voice (e.g. the use of sarcasm) or the difference in the company one is surrounded by (e.g. speaking with siblings versus speaking with grandparents). The disadvantage of this view, however, is that it is not clear how discrete entities become part of the mind, which also poses a challenge for the creative aspect of human behaviour.

I am, however, in a position where I would argue that a plain connectionist account of the human mind is not a satisfactory way to explain human behaviour. The usual approach to connectionism argues that all aspects of the human mind work on these neural networks,

however, it is very hard to accept that the mind is not at least biased so that it interacts or observes the world in certain ways. The visual system, for example, is programmed to pay more attention and track things that are moving quickly over things that stay still or move slowly.

On my account, the FL would be an example of a very strong bias that evolved in the human mind. Although the mind is not set up as an automatically discrete system, those parts that are associated with language are selected to *funnel* or *force* those learnt word-meanings into something that is usable by the FL. When it comes to communication such a connectionist network may underpin to the ostensive-inferential model of communication simply because a hearer would automatically weigh-up the most relevant or obvious outcome based upon the input to the network. Something different happens when it comes to inferring the meaning of a sentence which, because of the FL, operates differently than the rest of the communicative act. Since all humans will be set up with an FL, and all should be learning words with more or less the same meaning, it is likely that the mind has, in part, evolved to operate some of its communication as code.

In conclusion and despite the tensions that surround my thesis when it comes to language meaning, there are ways in which a representation-based model of meaning can explain the hybrid approach to language. Here, social interaction and the external state of affairs remain central to creating linguistic-meaning in the first place. Although I will not commit to either the LOT or connectionist version of meaning I hope to have shown how and why each account does work with this view. Although this lack of a determination means I do not promote an all-encompassing theory of the nature of language, it will greatly help toward understanding the hybrid theory on linguistic structure and how its primary function is ultimately entangled in human communication.

Ultimately, this hybrid creature approach offers a way of thinking about the primary function of language that overcomes what was seen as problematic in the preceding theories introduced above (the linguistic creature and the cultural creature). First, seeing FL as a social tool, which emerged and evolved to enhance and improve human communication (by making relevant what is not salient), is in keeping with the bigger picture of human evolution. This recognises that humans are as unique in their dependence on social and cultural living as they are with their ability for language. This alone makes it worthwhile exploring the idea that language has evolved to perform a social function, but further, it directly supports our being cultural creatures. Overall this

means that FL is more incorporated into the bigger picture of human evolution which includes the survival strategy of flexible living through cultural transmission (Sterelny, 2012; Laland, 2018) and social interaction (Tomasello *et al.*, 2005; Dunbar, 2014). Second, finding a sensible evolutionary story that supports the existence of the FL means avoiding the problems that I am due to sketch out in 2.2.2. Overall the hybrid creature approach to language neatly integrates intuitions from evolutionary theory, linguistic theory (including the thought that humans are linguistic creatures), and the overall understanding that humans are social creatures. The rest of this thesis will be dedicated to further expanding these arguments. First, however, I will go into more details regarding primary function and the processes of both biological and cultural evolution—this is the focus of chapter 2.

Chapter 2 – Function

2.1 Primary Function in the Natural World

2.1.1 Primary and Secondary Functions

In chapter 1 I argue that language is a feature of the natural world and a product of biological and cultural processes that have worked together to provide a communicative function for human social living. This notion of 'function', however, requires more attention and explanation as it is not always clear if it makes sense to apply this term to the natural world (something I only briefly addressed in 1.1.2). A central issue is that talk of function in the natural world often leads us into very murky waters. This chapter, therefore, is dedicated to clearly defining what it is I mean by 'primary function' and how the notion can be applied to products of both biological (2.1) and cultural (2.3) evolution. I will also explore how this notion of function is applied to the faculty of language (or FL) in the current literature (2.2). Finally, I will show how I apply this notion of function to the FL under my view that we are hybrid creatures (2.4).

I will start my explanation of function in the realms of the biological world. People often talk about biological traits having a design; a design that serves some sort of purpose and explains its reason for existing. Wings are designed *for* flying; elephant trunks are designed *for* picking fruit from high trees; or language is designed *for* communication or cognition. Such talk, however, is at great risk of telling 'just-so stories', or applying what sounds like intentional psychology and not a process of natural or causal mechanisms uncovered by scientific investigation of the natural world (Ariew, Cummins and Perlman, 2002; Ruse, 2002). It is important, therefore, to explore and define this concept of 'function' and carefully explain how it can be applied to non-intentional, but natural, phenomenon.

'Function' is a difficult concept to describe. For a start, it is a term that has at least two different but related meanings. In one sense, language has many functions. It can make us laugh, cry, make the law, break the law and so on and so forth. This sense of function points to the many things that we use language to do or *powers* language has. It does not, however, point to the sense of 'function' that I am interested in. I refer to these sorts of powers as the 'secondary functions' of language. The other sense of function points to

the power that explains why language is there in the first place, and why it has continued to exist. The power of language that explains its very existences is what I refer to as the 'primary function' of language. To pick out the primary function of an object is to answer the question: 'why is it the way it is?'; and to pick out a secondary function is to merely answer the question: 'what can it do?'

It is worth pointing out that this way of talking about primary function is disputed, particularly in evolutionary biology (which I discuss in more detail in the next section), as it is argued that to understand the nature of things we should focus on *how* objects do the things they do, and not *why* they do them (Mayr, 1983; Cummins, 2010). If one wants to understand the primary function of the indents of the soles of trainers, for example, then one need to observe and analyse what they do and how they do it. When they provide grip for the wearer in muddy conditions then we should describe the physics behind how the indents interact with the consistency of the mud. I argue, however, that this approach to function does not 'get at' the thing I am interested in. Like secondary functions, focusing on the 'how' fails to tell us why those indents came into being in the first place. The indents could have been the product of design for an off-trail running shoe, but they could have also been the product of a fashionable design[16]. Thus, it is only in the former case that talking about the physics between shoe and mud informs us about the sole's primary function, whereas in the latter we would need to talk about something different to get at the primary function (e.g. the current fashion in the world of trainers). In fact, in the latter scenario, the detail that the indents prevent slippage in mud is a secondary function of the shoes.

We can explore the difference between primary and secondary functions by observing the functions of human artefacts. Hammers are tools we use to strike nails into some material, so it becomes attached to other materials. This allows us to do very useful things like build houses. Alarm clocks make a loud noise at a set time to wake someone up. This allows us to get up at a good time in the morning so that the rest of our day goes smoothly, or it prevents us from napping for too long. These are the primary function of these objects because they *exist* or are *made* for these functions. They are, after all, the reason why their inventor created them in the first place. A way to think about this

[16] Credit for this example goes to my supervisor, Mark Cain.

relationship between the object and its primary function is to say that the form (that is the shape the object takes) follows a function (that is something the object does). The object has the form it has *because* of the function it was designed to do.

Hammers and alarm clocks, however, also provide other functions. A hammer makes a good doorstop, paperweight or weapon. The timed ringing of an alarm clock makes a good reminder alarm, egg timer, or even entertainment for a child. These functions, however, do not explain why these objects have this form, or why they were created in the first place. They are just other useful things these objects can do. Even if a hammer were always used as a doorstop, door-opening remains a secondary function. This is because door-opening does not affect the reason why the hammer has this form. The inventor designed the hammer for striking nails and building houses, and not for stopping doors. A way to think about secondary function, therefore, is to see that the relationship between the object's form and function is the reverse of the primary function: function follows form. The power to hold a door open or entertain a child is a function of these objects that is possible due to a form that *already* exists.

This approach to primary function works well for human artefacts but does not clearly explain the function of objects in the natural world. Their creation or 'design' does not rely upon forward-thinking human insight, but only on the causal processes as dictated by the laws of the natural world. Unless you approach the world in terms of gods and the supernatural, there is no case for an inventor who designed hearts, flowers, or language. There is, however, a way of answering the question: 'why do natural objects exist?' or 'why do natural objects have those forms?' and, therefore, a way of discovering their primary function. What this requires, however, is an understanding of how the natural world 'makes things', which also requires an understanding of biological evolution, and, most importantly, the process of natural selection (Darwin, 1859; Dennett, 1996; Dawkins, 2009).

Where primary function in artefacts is 'foretold' by human intention, many argue that the primary function of biological traits or objects comes about through the mechanical and causal processes of natural selection (Neander, 1991; Dennett, 1996; Godfrey-Smith, 2009). This gives rise to an 'illusion of design' in the natural world, but the thought here is that even though there is no intended designer, natural objects still have primary functions. They still have a reason for existing in the way they do, and there is a resemblance to the 'function follows form' rule. It is just that the method for their

'creation' is very different from that of human artefacts. In the next section, I will show how it is the process of natural selection reflects this.

2.1.2 Natural Selection

The heart is an organ that is the product of biological evolution, but, like the alarm clock, it serves several functions. It pumps blood around the body and its sound is an indicator of our stress levels whic can be drawn on for medical diagnosis. The first of these functions, however, appears to explain the existence of the heart. This is not because a creator intended it to be that way, but because of the evolutionary processes that carved out that form. Cells need oxygen to work, the blood supplies the cells with oxygen, so the blood needs to be replenished with oxygen. If cells get this replenishment from the respiratory system, then something needs to move the blood between the system and the cells—which is precisely why the heart has the form it does and therefore also amounts to its primary function. The fact that a heart communicates stress levels is a case of a function following form, and thus a secondary function. However, how did the heart gain this form for this primary function, and how was this possible without an inventor?

The key to this appearance of design is to understand two things about biological evolution and biological objects (I use 'object' broadly here to refer to a whole species, creature, organ, behaviour, or trait). First, is that all biological objects that are alive and well today are the product of previous biological objects that were able to survive and, most importantly, reproduce. Second, is that the form of biological objects is dependent upon their genetic blueprint, and that each time a biological object reproduces, its offspring or 'copy' is also based on that genetic blueprint. However, it is also in the nature of biology and genetics that there is always the chance of having some variance in this blueprint (also referred to as 'copying errors'). Since this is the process that describes *why* biological objects exist, this is also where to start looking for the primary function of such objects.

How do reproduction and variance give rise to numerous designs or forms across the natural world? The answer is natural selection (Darwin, 1859; Dennett, 1996; Dawkins, 2009). A passage from Pinker's article in 'The Edge' magazine highlights how this process works with a very simple explanation:

> The core of natural selection is that when replicators arise and make copies of themselves, (1) their numbers will tend, under ideal conditions, to increase exponentially;

> (2) they will necessarily compete for finite resources; (3) some will undergo random copying errors ("random" in the sense that they do not anticipate their effects in the current environment); and (4) whichever copying errors happen to increase the rate of replication will accumulate in a lineage and predominate in the population. After many generations of replication, the replicators will show the appearance of design for effective replication, while in reality they have just accumulated the copying errors that had successful replication as their effect (Pinker, 2012).

In other words, the current form of the heart is the result of a process which favoured a particular 'variant' or 'copying error' in our evolutionary history. The successful variant was well adapted to that environment and thus was more likely to thrive, survive, and reproduce than its less adaptive cousins. Therefore, future forms (copies or offspring) of that biological object were more likely to be based on that genetic blueprint than any other.

The key thing to understand here is that the variant was *adaptive*. This means that it was particularly successful in producing offspring that was also able to survive, thrive and reproduce. In this, the variant had an advantage or 'edge' over the other variants living in the same environment, but it was better at coping with the challenges and overcoming any problems it may have been faced with. Particularly in regard to that ability to reproduce well-adapted offspring. An example of such a challenge or problem is in the competition for essential resources (like food and water). The variant that is more successful at securing those resources is more likely to be selected for because it is better adapted to surviving and reproducing in that environment. Here, a variant is selected in a purely natural and unintentional fashion, and eventually predominates the entire population and defines the typical model for the species it is a part of. The process of natural selection, therefore, is the persistent selection for adaptive variants and filtering out of non-adaptive or maladaptive variants throughout the generations.

It is this process that explains how and why biological objects come to have the forms they have. Thus, if we continue with the 'form follows function' rule then following the process of natural selection points toward the primary function of any biological object (Wright, 1973; Millikan, 1989; Neander, 1991; Godfrey-Smith, 2009). It is the power or function that gives a biological object the advantage or 'edge' that causes its selection. This process of selection then guarantees the future existence of that particular form of the biological object. In other words, the reason, power, or function that certain variants

are selected for point toward the primary function of that biological object.

This claim has its sceptics in the field of evolutionary biology (Gould, 2002; Cummins, 2010), and, more specifically, in the field of mind and language (Chomsky, 2005; Fodor and Piattelli-Palmarini, 2010), which I will discuss in in future sections (2.2.3 and 5.1.2) as debates in the evolution of language have a particular case with this debate. In the meantime, I aim to explain this notion of function through natural selection in deeper detail as it supports my overall claim that FL has a social primary function.

This approach to primary function and biological evolution reflects Millikan's theory of 'Proper function', where function is fashioned within the evolutionary history of that biological object. Therefore, if there is no history, there is no primary function:

> A originated as a "reproduction" [...] of some prior item or items that, due in part to possession of the properties reproduced, have actually performed F in the past, and A exists because (causally, historically because) of this or these performances (Millikan, 1989, p. 288).

In other words, primary function will not necessarily be reflected in the functions that a biological object is performing right now, but in the time that it was selected. This means that understanding the history of an object is an extremely important factor in determining its primary function. Evolutionary history, however, is not an easy thing to gain knowledge of and thus such discoveries hard to come by. If the primary function of a biological object is entrenched in history, and it is a history we are not able to witness, how can we ever claim to know the primary functions of such thing? The harsh reality is that we cannot and may never be able to do this and that any theory of biological primary function is doomed to remain a speculative one.

I will argue, however, that there are ways that help to determine the primary function of a biological object even in the absence of our capability to rebuild an accurate evolutionary history. We can make sensible guesses about the environment in which the biological object emerged and evolved, and also consider what powers such an object brings to that environment. It is from this perspective that we gain more information about the challenges imposed upon the continued reproduction of a biological object, and therefore the variants, powers, and functions that were naturally selected for.

A larger set of lungs, for example, may have evolved in an environment where the supply of oxygen is lower than before (at a higher altitude, for instance). If a creature's lineage

is to continue, then it would be good that its body and cells 'found a way' to continue to receive the same level of oxygen as before. This is helped by increased lung capacity. Here, we see the creature's environment corresponds with evolutionary changes and therefore a consideration of the environment helps toward a theory of primary function. This approach, of course, is not entirely accurate as there could have also been other reasons that explain why a larger set of lungs were selected for, but it does highlight that understanding the larger picture of the creature's situation helps to build a more complete picture of natural selection and primary function. I, therefore, dedicate the next section to looking at the general role of selection pressures in biological evolution.

2.1.3 Selective Pressures

Let us start by considering the functions of a larger heart. It can both pump more blood per beat and make a louder sound, but which of these is the function it was selected for? To discern this is to discern the selective pressures that are impinged on the form. Selective pressures are those factors which contribute to the likely selection of certain forms over others. Mammals that live in very cold environmental conditions, for example, are under a stronger selection pressure to maintain their own body heat than mammals that live in warmer environments. Thus, in the cold environment, a variant with thicker fur responds to this pressure because it is a method that helps keep it warm. The thicker fur, therefore, is very likely to go through selection. In a warm environment, such a variant is not responding to a selection pressure and therefore is not likely to be selected. Selection pressures, thus, have a significant effect on the forms that the process of natural selection will bring about.

Discerning the primary function of the larger heart, then, is helped by understanding the selection pressures that exist in the environment at the time it is selected. The heart may have been part of a body which was also growing in size, and therefore there was a pressure to ensure that the size of the heart 'kept up' with the size of the overall body. Here, the heart was selected for its function to pump more blood per beat, and not because it was louder. The larger heart, however, may have been adaptive because of a pressure related to the mother-child relationship. When a mother is holding her child, the child can hear her heartbeat, which has a positive effect in reducing stress levels and ensuring a longer and healthier life. In this case, there is a selection pressure to ensure the child can hear their mother's heartbeat as clearly and as often as possible. Here, the larger heart would be selected for its function of making a louder noise as opposed to

pumping blood[17]. What we can conclude here is that the primary function of biological objects is often related to a response to a selection pressure in the environment. There are, however, some points we should keep in mind when making such a claim.

First, is that selection pressures and the related primary functions can change over time. If a current form also responds to another selection pressure, this does not mean that it gains a different primary function. It is necessary that the form of the object is somehow *changed* by this other selection pressure, otherwise, it is just performing a secondary function. If hammers are always used for door-opening because of a pressure to keep doors from closing, this does not mean that the primary function of hammers also changes. Even if hammers are never used for hammering nails ever again, door-opening remains a secondary function. The primary function of a hammer only changes if its form adapts to or is changed by the door-opening situation. For example, someone could remove the handle because people often trip over it. It is only after a change that the (handle-less-)hammer's form starts following a new function, so it is only then that we could say its primary function has changed.

This is constantly happening in biology (Dawkins, 2009), and a good example is the changing primary function of bird feathers. Feathers have obviously adapted for flying, but probably had a previous primary function related to heat regulation (Prum, 1999). In the first instance, feathers were probably selected for heat regulation but later responded to a different selection pressure related to moving through the air (perhaps we can imagine an intermediate gliding stage before flying)[18]. It is only when a variant of the feather is selected because it helps with gliding, instead of heat regulation, that we can say it has the primary function of gliding.

Secondly, a biological object *does not* have a primary function at the point of its initial emergence. The variation of biological objects is, *'"random" in the sense that they do not anticipate their effects in the current environment*' (Pinker, 2012). Any function that a new variation has is, at this stage, secondary because function simply follows form. If a variance on a heart is slightly larger than the heart of the previous generation, then it also

[17] Credit for example goes to my supervisor, Mark Cain.

[18] In evolutionary biology this may be the same thing as an 'exaptation': where some trait has been co-opted for another function (Gould, 1991; Buss *et al.*, 1998).

has a variance in the things it can do. It can pump more blood per beat around the body, but it can also make a louder noise. However, neither of these functions are primary because a selection process for a larger heart has yet to happen. A variation gains a primary function once it has been through the process of selection. That is the larger heart was selected because it was adaptive, rather than maladaptive, for the subsequent copies of the initial variation.

Third, primary function is not a 'black and white' concept and it should be kept in mind that there are many 'shades of grey'. It is not as simple as saying that a form that was successfully copied to the next generation has now a primary function. This would suggest that neutral objects (objects that are neither adaptive or maladaptive) also have a primary function. Further, it may be wiser to see that primary functions come in 'degrees', as some are more concrete than others. If the larger heart 'sticks around' or is 'continually maintained' from one generation to the next, then it appears as if it has a concrete primary function. On the other hand, if the larger heart only sticks around for a couple of generations or is the sort of form that disappears and reappears several times throughout the generations of a species then it seems it has a primary function that is less concrete. I do not plan to use this terminology throughout this thesis and will treat FL as having a concrete primary function, but it is important to keep this in mind.

My discussion of the primary function of biological objects is almost complete. The final thing I feel is important to explore is how the process of natural selection is able to create such complex objects (like the eye) or systems (like the nervous system). This is important to this thesis as I will be arguing that the FL is, indeed, a complex biological object (see chapter 5).

2.1.4 The Ratchet Effect

The 'designs' found in the natural world are often very complex, and it seems that the process of natural selection and the presence of selective pressures are able to explain why this is. The process of evolution discussed here is accumulative in its nature. New and functional variants constantly *build upon* the previous generation of functional variants. This explains why the process of natural selection is normally seen as a slow and gradual one, but also how it is capable of building such complex and integrated systems (eg, the eye, the wing, the integration of the digestive system with the nervous system, and, of course, the brain). This is important because it also highlights how a change in a

form can also change the selection pressures impinged upon that form. As the feather becomes better adapted for gliding, for example, so is the selection pressure for full flight more likely to impinge upon it. The intermediate stage of gliding, however, was a necessary one for flight. To explain this process, I think it helps to turn to the analogy of the ratchet effect. This analogy will also become helpful later (see 4.3).

The ratchet-effect is used to describe a process where a state of affairs is restrained in a certain way until something happens that releases that restraint and allows the state of affairs to change and improve. This is until it is restrained again. This is analogous to a ratchet releasing and moving up to a new position where it is latched again. This is followed by another release, change and improvement, and then another restraint (probably of a similar nature to the previous one). Although each release is met with a further restraint, it has 'latched' at a higher degree—at an improved state of affairs—on the ratchet. Where there is potential for improvement—an opportunity to move up the ratchet—there first needs to be a release. The advantage of the latching or restraining is that it allows a state of affairs to confidently shift up degrees of the ratchet and prevents any 'slippage' back to a previous latching or degree. The disadvantage is that one has to wait for the latch to release before it can move. This analogy has been used to describe the process of evolution in both biology and culture.

Robert Pirsig's fictional book 'Lila' (2011, pp. 159–160) uses this analogy to explain the process of biological evolution. He expresses this through the relationship between dynamic and static patterns, and the motivation to grow towards better or higher 'quality', but we can perhaps use it as a way of describing the relationship between genetic variations and the selection of those adaptive variations as growing toward a higher chance of reproduction:

> evolution can't be continuous forwards movement. It must be a process of ratchet-like steps in which there is a Dynamic movement forwards up some new incline and then, if the result looks successful, a static latching-on of the gain that has been made; then another Dynamic advance, then another static latch…Sometimes a Dynamic increment goes forwards but can find no latching mechanism and so fails and slips back to a previous latched position.

And Tomasello et al. used it to describe the accumulative nature of culture (1993, p. 495):

> Once a practice is begun by some member or members of a culture others acquire it relatively faithfully, but then modify it as needed to deal with novel exigencies. The modified practice is then acquired by others, including progeny, who may in turn add their own modifications, and so on across generations. This accumulation of modifications over time is often called the "ratchet-effect," because each modification stays firmly in place in the group until further modifications are made. No cultural products exhibiting anything like the ratchet effect have ever been observed in the ontogenetically acquired behaviours or products of nonhuman animals.

I will demonstrate how the ratchet-effect explains this accumulative nature of natural selection by means of a simple example, but this should also expose how this process is also capable of creating far more complex objects.

In the grasslands, the main resource for food is grass, which all species that live in that space depend upon for energy and survival. As competition for this resource increases, however, so does a selection pressure to find another food source. Luck has it that a species of tree in the grassland produces leaves that are also edible and nutritious. Currently, however, none of the creatures in the grasslands have access to these leaves because none of them can reach the branch of the tree. What this environmental set-up allows for, however, is that the one variant of a creature that is born with a neck just long enough to reach the leaves on the lower branches responds to this pressure and secures itself and its children (which also have a long neck) a reliable resource of food whilst the other creatures on the grassland continue to compete for grass.

The longer and more adaptive neck guarantees that this variant will go through selection. The appearance of this variant is analogous to a release of a latch on a ratchet (a ‘dynamic advance’) and escape from a limiting state of affairs (in the competition for grass). This release opened the creature to a more secure and positive state of affairs for itself and its offspring. This success is analogous to a new latching further up the ratchet (a ‘static-latch’). Here, the selection pressure to secure a new source of food does not linger over them as they are able to live comfortable lives and reproduce.

As a side note, if a further variant is born with a *really* long neck, this is also analogous to a release on the ratchet, and an *attempt* at a dynamic advance. This ‘really-long-neck’,

however, struggles to live with a body that is out of balance (perhaps the really long neck makes the creature top heavy). Such a body hinders its chances at surviving and reproducing. In selection terms, the really-long-neck is maladaptive and not selected for. In ratchet terms it is analogous to a failure to latch further up the ratchet, and therefore the lack of selection is akin to 'slippage back' to the previous more secure state where the majority of creatures are born with a neck of a sensible length.

The stable state of affairs at this point, however, only lasts so long. The healthy reproduction of the long-neck creatures will eventually cause competition over the leafy food source. A solution is found again when a variant with an even longer neck (but not a really-long-neck) is born and can reach both the lower branches and the middle branches of these trees. Since they have sole access to the middle branches, then they have secured themselves and their offspring a reliable food source. The birth of this variant is like another release on the ratchet, and the successful selection is like another latch at a higher degree on the ratchet. This story can continue so on and so forth until these long-neck creatures have reached the leaves at the very top of the tree.

This story of the long neck creature demonstrates the forward progression of evolutionary biology, usually as a response to selection pressures, and as a constant shifting between release, progression, and further latching. This also shows that the shape and condition of the evolving form itself has an impact on the environment and presiding evolutionary pressures they will need to respond to if the species is to survive. The long-neck would have never become a long-neck if it weren't for a selection pressure to reach for the leaves in the trees (which was also dependent on the existence of those trees). Further, the long-neck would also never have evolved to have longer necks if it weren't for the selection pressure to reach the higher leaves that was created by the existence of the ancestor long-necks that could reach the lower leaves. This highlights that the process of evolution is far from simple and there are many interacting aspects. A topic I come back to in chapter 4.1.

Understanding the accumulative nature of biological evolution also highlights another important aspect: that the process is often messy and entirely capable of producing seemingly counter-functional traits. Since there is no intentional designer, natural selection just simply does what it can do at each stage there is a selection pressure to respond to. When innovations are building on innovations, natural selection will not necessarily pick out the tidiest or most sensible route. The form of the giraffe's neck (a

case of a real 'long-neck') picks this out very well (see figure 2 as extracted from Dawkins 2009, p.361).

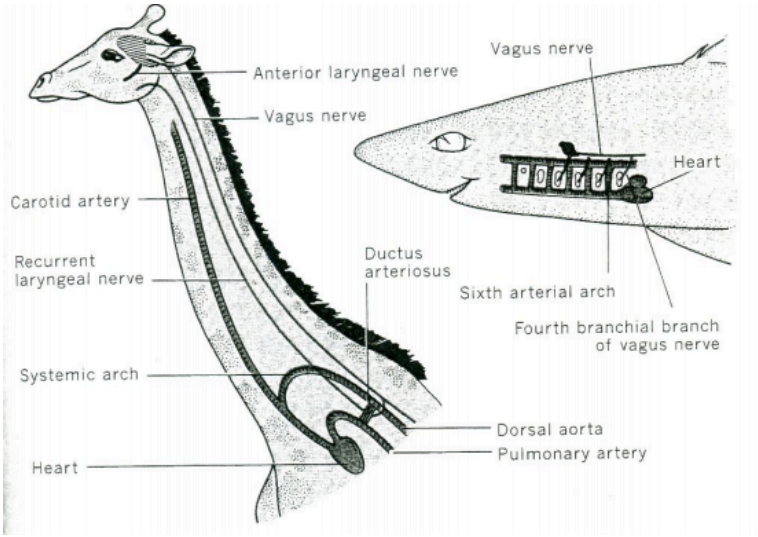

FIGURE 2 - LARYNGEAL NERVE IN GIRAFFE AND SHARK

The figure demonstrates that nerves in the shark are 'well-designed' because they cover a short distance between the two points they need to connect. In a giraffe, however, the laryngeal nerve (which is responsible for control of the voice box) is several feet long and takes a huge detour all the way up the neck and back down again when the two connected points are only a few inches apart (Dawkins, 2009, pp. 260–3). This reflects a poor design, but when we consider the accumulative nature of evolution and the need to just 'cobble things together' as we go, this 'counter functional' or 'messy' design is not surprising and simply reflects the evolutionary history of the neck which was selected for its length – the nerve simply 'grew' with it.

When it comes to discussing a complex organ like the brain, we have a lot more in the way of interactions, complexity, and potential mess to deal with. We should certainly not expect designs that are tidy and elegant. I agree, therefore, that it is best to understand the brain and other complex organs as 'kluges' (Marcus and Hoye, 2008). Solutions to selection pressures are often 'haphazard' or 'workarounds' working without foresight and with what is available at the time of selection.

Overall, the use of the ratchet effect and understanding the connection between natural selection and selection pressures should help us understand what primary function is in the mechanistic and messy world of evolutionary biology. This explains why things look like they have been designed, but most of all, why these things exist in these forms. A central point is that attempting to consider the process of biological evolution from the

wider picture of selection pressures and the state of a creature's environment also helps us deduce the primary function of certain objects. This is a lesson I push for the consideration of the evolution of the FL in chapter 1 when I proposed that we take some inspirations and important lessons from the cultural creature view (see 1.2.2) as it will help build a far more integrated picture of language evolution (see 1.3). I will return to this lesson below when I come to consider the role of cultural evolution in humans (2.3) and how this impacts our understanding of the evolution of FL (2.4). First, however, I would like to return to a discussion I started in 1.2.1 which concerned the current, but problematic, views of the evolution of FL.

2.2 Evolution of the Faculty of Language

2.2.1 Cognitive Function

In chapter 1, I explain that I am committed to the view that we are 'linguistic creatures' and that our knowledge of linguistic structure is underpinned by the FL. This is supported by arguments from the poverty of the stimulus and the idiosyncratic nature of languages. What was problematic with this view, however, was the challenges it faced in describing the evolution of the FL, and, therefore, its primary function. Now that I have introduced evolutionary biology in more detail, and along with this concept of natural selection, it is time to revisit these problems. I will start by reviewing what I think is currently the most popular and supported view: that the FL was selected for cognitive reasons.

'Cognitive reasons' here is used in a very broad manner to refer to those theories that argue FL evolved to support human thinking. This comes in many different varieties which I will come to explain (Carruthers, 2002; Boeckx, 2010), but they all have one thing in common: they are not related to supporting the cooperation or communication with other human beings. They are much more about supporting the survival of the individual as an individual; or, if where they do concern social living, supporting the survival of the individual within the setting of a social group. On this view, linguistic communication is a secondary function of the FL because it is a function that the form of FL turned out to be useful for (function follows form).

How is it that the FL was selected to help human thinking or cognition? The general thought is that the capability to combine and recombine meaningful words or symbols in an infinite number of ways opens up a capacity for cognition or thinking that was not

possible in our pre-linguistic ancestors. I will briefly review two ways in which the FL may do this.

First, is the theory that FL may give rise to our ability to attend to 'multiple projects'; where any meaningful symbol or concept can now be put to use with many other symbols, concepts or 'distinct projects' (Evans, 1982; Camp, 2009). Here, the feat of bringing structure to our thinking means we can do more with it. Where other animals might be quite capable in their capacity to think about the world, humans are just able to do so with far more flexibility. Where a rat may learn to avoid food that made them sick before, they are limited in doing anything else with this knowledge. The underlying structure and flexibility of linguistic syntax, however, may be the thing that gives humans the power to think not just about avoiding the food, but also about warning others of the danger or even using it as a poison to hurt another.

Second, is the thought that FL allows one to combine concepts from different domains or modules of the mind (Mithen, 1999; Spelke, 2003):

> …it is natural language syntax which is crucially necessary for inter-modular integration. The hypothesis is that non-domain-specific thinking operates by accessing and manipulating the representations of the language faculty (Carruthers, 2002, p. 658).

This follows a theory that sees the mind-brain as a collection of functional, but stand-alone modules that describe human behaviour and thinking (see 1.2.1 for a brief introduction to modularity). Advocates of this view suggest we have modules for such domains as folk psychology, folk biology, folk physics, basic mathematics as well as a variety of other things (Tooby and Cosmides, 1992; Carruthers, 2006; Spelke and Kinzler, 2007). The underlying mechanisms of FL may provide a way in which we can bring together and combine representations relating to more than one domain, thus also offering the power of far more flexible thinking.

In both this view and the previous view, the argument is that humans who could think more flexibly were far more likely to deal with the challenges and problems in their environment, and, as a result, were far more likely to be selected and pass this capacity on to the next generation. Although this thesis is concerned with forging a view of language evolution which is more compatible with a social and communicative primary function, it will help if I point out some problems with this more cognitive and individualistic approach. Not only will this demonstrate that the cognitive view is not as

strong as some may think, but it will also throw some light on why a communicative approach might be preferable.

First, is simply the thought that if the FL is so useful in promoting the survival of an individual by helping them think more clearly and flexibly about the world, why do we not see this capacity emerging in other animals? This is surely a selection pressure that looms over all minded creatures who have to interact with and make decisions about a dangerous and complex world in which they live. Why is something so obviously useful to all only present in one species? The obvious response seems to be that something special about the human mind and environment—something that is not present in the mind and environments of other creatures—made it possible for the FL to emerge in the first place. This requires considering what this environment is, but after what we explored in 1.2.2 the answer to this seems associated with human sociality and not individuality.

An advocate of the cognitive view can take this point on board and argue that enhanced thinking and cognition was a response to not the world in general, but to the social world that I have been arguing is also unique to humans. The argument would be that the cognitive load of managing many social relationships was what prompted a selection pressure for such a drastic change to human cognition (Calvin and Bickerton, 2000; Carruthers, 2002; Dunbar, 2014). I would argue, however, that these claims start to run into the unresolved problems about the relationship between human thought and natural language (see 1.3.2 for more). The main question is if there is a difference between the structure or syntax that underpins thought (the 'language of thought' or LOT) and the structures and syntax that underpin language (the FL). This point is not so much an argument against the cognitive view as theorists are certainly working with these problems (Aydede, 2010), but it does show that these are issues that are not present in a more social view on the primary function of FL—this is something I will come back in 2.4.

Second, is to question if the cognitive view can make sense of our ability to externalise language, and especially of the evidence that our speech apparatus allows for precise control over and a large variety of speech sounds (Lieberman, 1984; Pinker, 1994). It is possible to argue that the speech apparatus and FL evolved for entirely separate primary functions which then 'met' when the FL and speech apparatus could share a secondary function of language in communication (Fitch and Reby, 2001; Fitch, 2010), but my

response to this is related to my third problem for this view: that is the lack of integration with the bigger picture.

This comes back to the point I made in 1.2.1 that the sociality of humans is what seems to be so special about our species, and the reason why we were so successful in survival. Although I certainly do not want to deny that our more advanced cognitive capacities contribute to our survival, I argue that these powers are secondary functions, and not the other way around (see more in 2.4). This way of thinking about the FL fits into a more integrated picture of human evolution, which also accepts that language is tied up in our being cultural and cooperative creatures, rather than as an entity that is separate to this larger function as this cognitive approach seems to suggest.

2.2.2 Communicative function

A second, and decisively, less popular view about the primary function of FL, is that it was selected for a communicative function. Such a view does support the social angle I am advocating, but previous formations of this approach come with several problems. In 1.2.1 I explained that this view was problematic not because of evolutionary issues, but because of an under-appreciation of human social living (the role of cooperation and mutual-knowledge), and a fundamental misunderstanding of what human communication is (that it works on the ostensive-inferential model and not the code-model). In this section, however, I will address those evolutionary issues and later (in 2.4) explore how they also dissolve when we take human social living into consideration.

In their 1990 paper 'Natural Language and Natural Selection', Pinker and Bloom argue that the FL has evolved for a communicative function. Reading through their paper, however, demonstrates a commitment to the code-model of communication as they focus on a way to *standardise* the minds of language-users so they are all prepared to use the same code in their acts of communication:

> Any communicative system requires a coding protocol that can be arbitrary as long as it is shared…There is nothing particularly logical about setting your printer's serial interface to the "even," as opposed to the "odd," parity setting. Nor is there any motivation to set your computer to odd as opposed to even parity. But there is every reason to set the computer and printer to the same parity, whatever it is, because if you don't, they cannot communicate. (Pinker and Bloom, 1990, p. 718).

As I mentioned in 1.2.2, such an approach to communication is not surprising because this is precisely what language seems to do. We 'code' our thoughts into a sentence of our chosen language, which is then 'decoded' by a receiver who also understands that language. This theory, however, has at least four issues, most of which clash with intuitions from evolutionary theory.

The first issue is known as the 'continuity problem'. This is the thought that if the FL evolved for communication, then it must be a continuation of a pre-existing system of communication that was entrenched in the biological makeup of our ancestors. In an early paper 'The Origin of Speech' Hockett argues:

> Man is the only animal that can communicate by means of abstract symbols. Yet this ability shares many features of communication in other animals, and has arisen from these more primitive systems (Hockett, 1960, p. 88).

The thought that language has arisen from a more primitive form of communication makes sense when we consider that biological evolution is a constant process of building upon what is already there (see 2.1.4). Further, there might even be some evidence to back up this claim as some of our evolutionary cousins, the vervet monkeys, have a system of communication that contains something that resembles meaningful words (Seyfarth and Cheney, 1985; Price *et al.*, 2015).

Most theorists, however, see this as problematic because despite some similarities language is so unlike other systems of animal communication that it simply cannot be a continuation of them. The main reason for thinking this is the presence of the 'creative' or 'productive' aspect of language (see 1.2.1). This is not a feature found in the systems of communication of our close relatives. In fact, the structural aspects of language cannot even be learnt by our close relatives[19]. Rather there is a *discontinuity* between animal and human communication.

The second issue is known as the 'freeloading problem' and is that language, as a system of communication, does not reflect an 'evolutionarily stable strategy' (ESS) (Dawkins and Krebs, 1978; Fitch, 2010). An ESS refers to an evolutionary strategy that is stable and is

[19] For example, Nim Chimpsky tells the story of a chimp that was raised in a family in the hopes that he would acquire a full syntactical language (Marsh, 2011). The project, like many others, failed (Fitch, 2010).

not easily overcome by another strategy. For example, on flat and spacious grasslands, deer have an ESS to run away when they sense predators because, for the most part, they succeed in getting away and living another day. Conversely, if the deer find themselves in a mountainous environment this strategy is no longer an ESS because the deer is not well 'designed' to traverse this terrain and less likely to escape. This means this evolutionary strategy is open to the dominance of a new and more successful one. The deer, therefore, may evolve and adapt to run over such terrain (perhaps following a body-build similar to that of mountain goats) and produce a new ESS.

Systems of communication and other cooperative behaviours have a particular challenge here.

> a population of sharers can readily be invaded by a population of cheats who take the resource 'donated' by the others, and then fail to reciprocate (Fitch, 2010, p. 415).

Cheating, otherwise known as 'freeloading' are seen as non-starters for an ESS because:

> No instinct has been produced for the exclusive good of other animals, but…each animal takes advantage of the instinct of others.' (Darwin, 1859; found in Fitch, 2010, p. 414).

This is a big debate that I will revisit in 4.2, but here we see why it is particularly problematic for language.

Language not only offers an opportunity to get valuable and detailed information from a speaker for free—so a hearer can easily freeload a speaker—but it is also cheap (Zahavi, 1993; Maynard Smith, 1994). 'Cheap' means that it does not require much in the way of energy or resources to make linguistic-utterances. Compare this to other systems of communication, like the dog's territorial bark or a bird's warning call, that do require a substantial effort from the signaller. A further reason for the selection of these more 'expensive' systems is that they are guaranteed to mean what they mean to the receiver as they are indexical (this means that they are dependent on or refer to something in context). An alarm will always mean there is a reason to be alarmed, and a territorial bark will always mean you are breaching territory; thus the receiver is not cheated. Any of these systems of communication that did attempt to cheat the receiver is not an ESS, as it would eventually stop working once the receiver 'catches on' to the lie and stops paying attention to the signal altogether. It is, however, entirely possible to lie with the use of

linguistic-utterances, which means it is also entirely possible for a speaker to freeload a hearer.

This high potential for freeloading brings into question the FL as an ESS in its communicative use. This simply does not add up as it *'fails to satisfactorily cross the crucial evolutionary bridge from selfish indexical communication to the honest, truthful sharing of propositional information characterising language'* (Fitch, 2010, p. 424). It is for this puzzling aspect alone that many thinkers argue that communication cannot point to a primary function of FL and that it must be something else (such as cognition, see 2.2.1).

The third issue is that if language evolved for communicative reasons, it means the FL needs to exist in the mind of more than one individual to work as a communicative system; at least in the sense Pinker and Bloom have postulated (1990). This brings into question how language could start as a communicative system in the first place and is known as the 'bootstrapping problem' (Origgi and Sperber, 2000; Smith and Allott, 2016). Language can only work if, at least, a speaker *and* hearer are endowed with the FL, otherwise communication between language users is not standardised. This makes it difficult to explain how the FL could arise for communication in the first place, let alone to continually change and evolve to become more complex. This problem supports the suggestion that the primary function of the FL should be a selfish one that could benefit an individual on their own.

The fourth issue is that language, when observed for its structural properties, is badly designed for communication. So, even if language was necessary or sufficient for communication (see 1.2.1), it is not obviously very good at it. This is known as the 'counterfunctional problem' and highlights that linguistic syntax is often redundant in its communicative functionality (Newmeyer, 1998a, p. 307; Hurford, 2014; Smith and Allott, 2016). The syntax of language is redundant in two major ways. First, it is arbitrary, (Newmeyer, 1998b) in the sense that not all linguistic rules are coupled with a function that is useful for communication. There seems to be no communicative reason for why it is right to say '*I held mummy's hand*' but not *'I holded mummy's hand*'; or *'John filled the glass with milk'* and not '*John poured the glass with milk*' (Pinker and Bloom, 1990, pp. 716–7). Second, it is often ambiguous as sentences like 'the man chased the dog with the stick' or 'the girl saw the boy with the telescope' are unclear in stating who has the stick or telescope. Although the meaning of a sentence may be clear in the head of the speaker, it is potentially unclear to the head

of the hearer. Since natural selection tends to design things that are meant to work, and are not counterfunctional, it is not clear that communication reflects the primary function of FL.

These problems show that even though it makes sense to claim that language has evolved for communicative reasons (communication, afterall, is the main thing humans appear to use language for!) it is in fact very hard to implement into evolutionary biology. Theorists, thus, have a preference that language is either not biological (so there is no FL), or communication is only a secondary function of FL. I will come back to these thoughts in section 2.4. In the meantime, I will visit one more view on the evolution of FL, and that is the thought it is *not* the product of natural selective processes, and therefore cannot be said to have a primary function.

2.2.3 Non-Functional

In 2.1.2 I explained how the process of natural selection is related to primary function and creation of biological objects. Natural selection, however, is not the only process that describes the emergence and evolution of biological traits. Other processes can explain how a certain biological object has a certain form without appealing to a power or function that is selected for. Genetic variations that are *not adaptive* can be passed on to future generations without being 'selected for' (these are those 'neutral traits', see 2.1.3), and others may exist due to the physical constraints of the world or even as a by-product of other evolutionary processes.

In the literature, there is a whole account of language evolution which adheres to this sort of thinking. Chomsky and others argue that the underlying nature of linguistic structure is, in fact, extremely simple and not a product of natural selection. This approach argues that the FL is the product of a far simpler evolutionary process that does not involve the gradual and incremental selection of ever-improving syntactic structure (Hauser, Chomsky and Fitch, 2002; Chomsky, 2015; Berwick and Chomsky, 2017). This has introduced a non-functional theory for the FL[20]. Under this view, the cognitive and communicative powers of language are both seen as secondary functions of the FL

[20] This is often referred to as a 'non-selectionist' account in the literature (Pinker and Bloom, 1990; Fitch, 2010)

(function following form), but there is no primary function (no function for a form to follow, it 'just happens').

This approach argues that the FL consists of a single mechanism which is responsible for the hierarchical and recursive structure of language (which we will explore in more detail in 5.1.3). This has highlighted issues over what the term 'faculty of language' should include, this I will briefly address here. A famous paper by Hauser, Chomsky and Fitch (2002) suggested making a distinction between the faculty of language in the broad sense or 'FLB', and the faculty of language in the narrow sense or 'FLN'. Where FLB consisted of all mechanisms relevant to our ability to acquire and use language, and FLN only consisted of the mechanisms that were unique and specific to language. The paper concludes that since no other creature has shown a capability for 'recursion'—that is the ability to create hierarchical or nested structures—then it is this single mechanism that makes up the FLN and is ultimately responsible for our ability to acquire and use language. This approach sparked debates concerning the complexity of the mechanism or mechanisms required to make up the FLN.

The thought is that a single mechanism (known as 'merge' – see more in 5.2.1) is related to what is known as the 'minimalist program' or MP in the field of linguistic syntax. Others argue that FLN is made up of many mechanisms and is far more complex than what MP claims. This particular debate is less about the evolution of FL and more about its form, and, therefore, is something I will return to in chapter 5. What I will point out, however, is that the MP view is often considered as an argument for the FL as having a cognitive primary function:

> …merge emerged as a self-organisation syntactic process for the human conceptual apparatus… (Reboul, 2017).

This is because it makes sense to claim that this 'single operation' was selected for or 'stuck around' due to its positive effect on human thinking. The MP view *could* be told in a way that gives it a functional story. In this thesis, however, I want to separate this thought from the cognitive view because of wider implications MP has for the theories concerning the evolution of language. Some of these I will explain here (others are left for chapter 5).

A driving factor for this approach to language evolution is Chomsky's scepticism about natural selection—and therefore of primary function—playing an important role in the evolution of deeply complex organs such as the spine (Chomsky, 2015) or brain:

> We know very little about what happens when 10^{10} neurons are crammed into something the size of a basketball, with further conditions imposed by the specific manner in which the system developed over time. It would be a serious error to suppose that all properties, or interesting properties of the structures that evolved, can be 'explained' in terms of natural selection (Chomsky, 1975, p. 59).

This way of thinking had Chomsky turn to other evolutionary models that explain the creation of the natural world. He points out that there are three 'design factors' (Chomsky, 2005). The first is due to genetic endowment, the second is due to what is learnt through experience, and the third is due to natural law and mathematical consequences. This final factor, also known as 'third factor', is what Chomsky claims is the cause of the underlying shape of natural language syntax[21]. As a point of comparison, my theory and other natural-selection-based theories place language design with the first factor; and advocates of the cultural creature view place it with the second factor.

This means to suggest that the simplicity of the FL (merge) is able to cause complex and perfect patterns (natural language), and thus reflects the emergence of other complex and perfect patterns in nature that appear to be the product of a simple mechanism (eg. honeycomb, snowflakes, Fibonacci spirals). This supports the MP attitude natural language syntax is the product of 'optimal', not functional, 'design':

> we would have an answer to questions about the apparent optimal design of language: that is what would be expected under the postulated circumstance, with no selectional or other pressures operating, so the emerging system should just follow laws of nature, in this case the principles of Minimal Computation (Chomsky, 2015, p. 25).

[21] This also highlights a deeper debate in evolutionary biology initially sparked by Gould (Gould and Lewontin, 1979; Gould, 1991, 2002) which concerns which traits of the natural world are actually designed by natural selection and which are merely 'spandrels' or 'byproducts'

The consequence of this is that the FL cannot really be said to have a primary function in the sense we have been discussing. There are no selectional pressures or motivating factors that brought about the emergence of the object, it just happened. It is a lucky accident, a quirk in the system that just so happened to be useful for thinking and communicating.

The problems I have with this view are more or less the same as problems I had listed for the cognitive primary function view. Especially the fact that it is not integrated into the larger picture of human evolution. A particular issue I have with this approach, however, is the suggestion that all of what natural language syntax is was caused by a single genetic mutation in the mind of a single human at some point in human evolutionary history. Chomsky has claimed that this fits nicely with the 'great leap forward' that happened about 60,000 years ago (Chomsky, 2015; Berwick and Chomsky, 2017) as it reflects a 'sudden appearance' of more complex human living through the archaeological discoveries of more complex tools and cultural powers. I, however, am not persuaded by this way of thinking about human evolution. For the most part, this goes against the idea that the mechanisms that makeup our mind-brains are messy 'kluges' and certainly not elegant or perfect (see 2.1.4).

With all of this in mind, let us now return to the lesson I urged us to take in chapter 1 – and look into those things that were important to the cultural creature account of language (see 1.2.2). This means exploring cultural evolution as well as the biological mechanisms that underpin the process of cultural evolution taking place at all.

2.3 Cultural Evolution and Social Cognition

2.3.1 Function and Cultural Evolution

Biological evolution is important for this thesis because we want to understand the existence of a biological object. Cultural evolution, however, is just as important. This is for at least two reasons. First, it is central to human life. In 1.2.2 I explain that cultural knowledge and behaviour are survival strategies that have helped ensure that humans thrive, survive, and reproduce. Second, it is involved in the creation of language. Although I argue that the structural aspects of language are underpinned by something biological (the FL – see 1.2.1), word creation and word meaning is a matter of social convention and cultural transmission.

In this thesis, I argue the process of cultural evolution has its part to play in the overall story of language evolution. I will make these arguments in chapter 4, particularly when I come to introduce the concept of 'gene-culture co-evolution' (see 4.1.2 and 4.3). It is, therefore, important that we understand this notion of cultural evolution and how it relates to primary function and biological evolution. What else is important to understand is the *biological mechanisms* that underpin our capacity to rely on *cultural evolution*. This is related to mind-guessing and social cognition, which I initially introduced in 1.2.2.

Primary function in cultural evolution requires a little more exploration than primary function in biological evolution. This is for two reasons. First, the mechanism by which change and evolution takes place is very different from the one in biological evolution. Second, the form of cultural objects is influenced by both human forethought or intention (like the idea to remove the handle of a hammer), and natural selection (like what goes in and out of fashion). Like biological evolution, cultural evolution is essentially down to a process of copying. The next generation is basically a copy of the previous generation, but with some possible changes which may be the cause of a positive or negative experience of the copier. Another word for 'positive change' is 'innovation'. Where biological innovation is random and restricted to the moment of sexual conception, cultural innovation is random or intentional, and open to change at any moment the copier is willing.

Biological objects, therefore, refer to those traits or behaviours we acquire from our genetic make-up. For example, I have red hair because my father's mother had red hair. Cultural objects refer to those traits or behaviours we acquire through copying or learning from the people who are around us. For example, I often wear jeans because I saw everyone else wore jeans whilst I was growing up in the '90s. Biological evolution is the transmission of genetic information from one generation to the next via the mechanisms of reproduction, and where change is down to genetic variance. Cultural evolution is the transmission of knowledge from one generation to the next via the mechanism of learning. Change, however, is down to variations of different sorts. Cultural change happens because of copying errors, unintentional innovation, intentional innovation, or simply because something might be easier to learn.

Since the selection mechanisms between culture and biology are so different, it is worth asking if primary function can be applied in the same way. Does the form follows function rule apply to cultural evolution? To explore this, it is worth looking at an example where

cultural transmission or 'social learning' is simpler than it is in humans. Such an example involves the social learning and feeding habits found in fish (Laland, 2018). It seems to be the case that creatures that depend on group living for their survival have two ways to learn about their environment: either through trial and error (individual learning) or through copying others (social learning). Since social creatures are the sort of creatures that do not survive well on their own, it is often safer for them to copy the behaviour of others when they can rather than risk learning through trial and error. For fish, this means feeding upon whatever the other fish are feeding upon. Their basic fish-reasoning being that if the other fish are not made sick by the food then it is probably safe to eat. Fish who are part of the same group will, therefore, all eat the same thing.

If the food source starts to run low, however, it puts the lives of these fish at risk and some sort of innovation is required to save them. This means turning to individual learning. If a fish risks trying something new and succeeds in discovering a new and safe resource, all other fish are likely to copy that fish. The change from 'feed on x' to 'feed on y' could be seen as an evolution in the behaviour of the fish, but does it have primary function? I want to say 'yes' because this process reflects that of natural selection. 'Feed on y' is 'selected for' and as a response to a selective pressure to find more food. It could just have been that another fish had taken a risk but ate a poisonous food source. This, the other fish would not have copied because even with their limited fish-reason they are not going to eat food that has made another fish ill. The behaviour to 'feed on poison' did not respond to the selection pressure, and therefore, was not copied.

'Feed on y', therefore, has this sense of form following function. This behaviour or form exists due to a function that concerns the survival of those fish[22]. The primary function of 'feed on y', however, is quite dull and is simply something like 'to prevent the fish from

[22] This is not to say that, like biological evolution, cultural evolution always concerns the survival and reproduction of an individual. In fact, when we look at human culture, we see many cultural practices that are counter to this (e.g. drinking and smoking). The forces that motivate cultural evolution will be far more complex than this and a full picture will need to take into account not only the complexity of one's culture (what they learn from their parents vs what they learn from their friendship group), but also biological aspects too (e.g. prone to addiction). There is also the idea of 'meme theory' which suggests cultural evolution is more about the survival of the cultural objects and not the ones using them (Blackmore, 1999). In this thesis, however, I will stick to the idea that cultural objects tend to exist because they help the survival of humans, even of human groups (Traulsen and Nowak, 2006), but this debate, unfortunately, remains outside the scope of this thesis.

dying of starvation'. Although the example demonstrates primary function it fails to represent the innovations found in human culture (like religion and law). Fish culture, therefore, is a very 'thin' conception of culture, and it seems a far 'thicker' conception is needed to give a satisfactory account of human culture that reflects the definition I introduced in 1.2.2[23]. The difference between thick and thin culture, however, requires a discussion of the *biological stuff* that underpins this capacity for *thick cultural stuff.*

The thin conception certainly embraces an important aspect of human culture, in that it is largely a case of social learning punctuated with the occasional innovation of individual learning. This highlights that learning mechanisms play an important role in the lives of social creatures. In human culture, this becomes hugely complex as we are not merely copying what other humans eat, but also how other humans store, prepare, cook, and pray over what they eat. The first big difference between human and fish culture is down to the sophistication of the learning mechanisms. This aspect of culture will not be a focus of discussion in this thesis, but it's important to keep it in mind.[24] The flexibility of learning, after all, allows humans to adapt to their environment far quicker than the slower and more rigid process of biological evolution allows (I will revisit this to a degree in chapter 4). There are, however, two other features that I argue thick culture has that thin culture does not.

Firstly, thick culture is far more demanding of the psychological sophistication of the social creature. It is necessary that the creatures are a part of a socially cohesive group where they actively cooperate and share goals. This requires the ability to mind-guess, share intentions, and have mutual-knowledge. This is made evident by the fact that humans are not just interested in copying and learning from the behaviours of others, but are also in teaching others, especially the offspring of the next generation (Tomasello, 2014). Teaching certainly requires a very sophisticated degree of mind-guessing as an instructor needs to be acutely aware of the mind and knowledge of their student if they

[23] I thank Mark Cain for his helpful suggestion of using 'thick' and 'thin' in this way.

[24] The idea that humans have sophisticated learning mechanisms is also hugely important in the debate of language evolution, as one argument for the 'cultural creature' view is that these learning mechanisms are capable of acquiring the structural aspects of language (Tomasello, 2003; Goldberg, 2006), or even more so, creating the very shape of language in and of itself (Christiansen and Kirby, 2003; Kirby, 2011). Due to interests of time and space, however, I cannot address this in any satisfactory detail and can only turn to the arguments in 1.2.1 with regards to the existence of FL.

are ever to guide them towards learning something new. This aspect of thick culture also greatly enhances culture as a survival strategy. Where, in fish, only a learner is concerned with learning; in humans, both learner and teacher are concerned. In 1.2.2 I explained that these abilities were dependent upon advanced social cognitive mechanisms which I will come to explore in more detail shortly.

Secondly, it appears to be an aspect of thick culture that it is accumulative in that one innovation can build upon another in order to create vastly complex cultural objects. In other words, there is a ratchet-effect at play (see 2.1.4). Fish culture may be capable of this to a degree. If at the same time the fish learn to 'feed on y', they may also learn to 'not feed on z'. Later, their original food source, x, may come back to the environment. The feeding habits of the fish could be seen as innovation building upon innovation as their knowledge goes from 'feed on x'; to 'feed on y'; to 'feed on y, but not z'; to 'feed on x and y, but not z'. This pattern, however, lacks the depth and richness that is represented in human culture.

In human culture, the growth of technology is a good representation of the depth this accumulative effect goes to. We observe this very directly with the way mobile phone technology has changed in just a few short years. My old Nokia 3310 that I owned in 2003, is a completely different machine from my iPhone 5 that was released in 2012, which now also looks and functions very differently to the iPhoneXS which was released in 2018. In-between the releases of each of these phones is a gradual accumulation of new innovations, gadgets and functions (e.g. Cameras, music players, touch screens, and apps), as well as improvements on materials and computational technology (e.g. from the use of plastic to silicon, the downsizing of computer chips, and the advancement in software development). Each innovation is made possible due to the success and widespread use of previous innovations.

Thick culture is dependent upon sophisticated memory and learning mechanisms, but, most importantly, upon mind-guessing or social cognition. Since understanding both cultural evolution and human cooperation is so important to my theory of language evolution, we take some time out to really understand what social cognition is.

2.3.2 Social Cognition and Levels of Intentionality

No matter how you spin your narrative about language its development and use has to involve other human beings. This is particularly true when it comes to acquiring word-meaning in language:

> For example, it is only if a young child understands other persons as intentional agents that she can acquire and use linguistic symbols – because the learning and use of symbols requires an understanding that the partner can voluntarily direct actions and attention to outside entities. (Tomasello *et al.*, 2005, p. 675).
>
> Advanced social cognition is required for children to acquire language: sophisticated "mind-reading" abilities are necessary to deduce word meanings and communicate pragmatically (Fitch, Huber and Bugnyar, 2010, p. 795).

In 1.2.2 I briefly introduced us to 'social cognition' as the capacity that allows us to understand others as intentional and rational beings (Lavelle, 2018; Ravenscroft, 2019). It allows us to think about, consider, and predict the mental states and behaviours of others under an ability I have been referring to as 'mind-guessing'. We do this all day and every day in social human life. It is what is in operation whenever we are interacting with other minds; when we observe and consider the actions of others; when we communicate and cooperate with others; or even when we attempt to fool or manipulate others. When I am walking towards the cafeteria at the university and I see my supervisor run past me, I would wonder why he didn't stop to greet me as he would normally. When I look at the time, I see it is noon, I am able to conclude he is rushing because he wants to beat the cafeteria rush for coffee after the morning lectures—this is an act of mind-guessing.

The cultural creature view recognises that social cognition and mind-guessing is at the centre of human cooperation and communication. It not only explains how and why humans can make use of social conventions and communicate on the ostensive-inferential model but also explains how and why humans are able to make use of 'thick' culture that I discussed in the section above (2.3.1). Social cognition is obviously important to humans, but is not completely unique to humans as the ability to mind-guess has been observed in other social animals to differing degrees (Call and Tomasello, 2008; Fitch, Huber and Bugnyar, 2010). Many argue, however, that humans have a

unique and advanced form of social cognition that helps explain why we are so unique with the way we interact[25]. Let me explain.

Human social cognition does more than just predicting the mind of others. We also have confidence that other minds are also thinking about our mind. If, for example, I approach a roundabout and I see that another driver is approaching the exit to my left at the same time (which means I have right of way), then I will have the confidence to continue driving onto the roundabout. Why do I not worry about the driver pulling out in front of me? It is because I am confident that the driver has a mind that is following the same rules as me, but more than this, I am also confident that the driver is considering my mental state considering their mental state. I believe that they believe that I believe I have right of way in this situation. This is essentially what it means to have mutual knowledge. What this shows is that two drivers approaching the roundabout with the 'give way to the left' rule in mind is one thing, but two drivers approaching the roundabout with the *mutual-knowledge* that we will both follow the rule is quite another. The former is akin to what one might also feel when they are blankly following road-signs (I have right-of-way so I will just go), the latter introduces a level of interaction, a 'working together' (I have right-of-way, but I see that driver also knows this and will expect me to adhere) that affords us quite a different mental experience.

To clearly conceptualise what is going on here many thinkers have turned to the idea that our social cognitive capacity works on what is termed 'orders' or 'levels of intentionality', and the thought that humans have a 'high level of intentionality' (Sperber, 2000; Scott-Phillips, 2014). I should point out that the word 'Intentionality' does not mean to refer to the term intention in the sentence 'I intend to write a PhD thesis', but to the philosophical concept that concerns how mental states are *about* something. Thus all mental states: 'I intend to write a PhD thesis', 'I believe I am writing a PhD thesis', and 'I desire to write a PhD thesis' are intentional states (Jacob, 2019). I will break these orders or levels down by means of an example supported by a comic strip, with the aim to clearly demonstrate what degree of intentionality is required for humans to truly interact with one another[26].

[25] There is a suggestion that it is not so much social cognition that explains this unique capacity of humans, but a tendency towards friendliness and altruistic behaviours (Tomasello *et al.*, 2005; Tomasello, 2014). This discussion I come back to in chapter 4.2.

[26] Credit of example to Mark Cain. Credit of Images to Jen Webster.

In the first comic, we see Jen and Mike are sitting next to each other on the train. Sitting across from them is a man who has fallen asleep, but is snoring loudly to the annoyance of both. Neither of them is paying attention to the mental state of the other.

FIGURE 3 - COMIC 1

Here, Jen and Mike have a similar thought: 'I am annoyed by that guy's snoring', but they only share it in the sense that they happen to have a similar thought. They do not share it mutually. They are not interacting with one another or attending to each other's mental state. They both simply have the same 'first-order belief'.

In the second comic, Jen sees the look on Mike's face and recognises that he is thinking the same thing as her. Mike remains unaware of her thoughts.

FIGURE 4- COMIC 2

Here, Jen is thinking about Mike's thoughts: 'I believe that Mike is annoyed by that guy's snoring' and thus holds a second-order belief because she has a belief about someone else's belief. Mike still has a first-order belief.

In the third comic, Mike comes to recognise that Jen holds a similar belief to him. However, although Jen is aware of his belief about the snoring man, she is not aware of this recent realisation about her beliefs about him.

FIGURE 5 - COMIC 3

Here, Jen and Mike are both annoyed by the guy's snoring *and* both believe that the other holds the same thought. They both hold the second-order belief: I believe they are annoyed by that guy's snoring. However, they still do not have the capability to interact with one another about this thought. Again, they have the same thought, but this is still not mutual. Why this is the case becomes clear in the next comic.

In the fourth comic, Jen becomes aware of the realisation that Mike has in the third comic.

FIGURE 6 - COMIC 4

Jen not only sees that Mike has the same annoyance, but that Mike also understands that they have the same annoyance. Jen, thus, gains the third-order belief: 'I believe that Mike believes that I am annoyed by the guy's snoring'. She is having thoughts about the thoughts that Mike is having about her thoughts! It is only now that Jen has the awareness where she could attempt to interact with Mike. She can see they *could* have mutual knowledge about the snoring guy. However, unless Mike also sees that they could have this mutual-knowledge, she cannot utilise it to interact with him.

In the fifth, Mike becomes aware that Jen is thinking about his thoughts. Upon seeing this Jen gestures towards the hopelessness of their situation. Mike responds in agreement by smiling slightly.

FIGURE 7 - COMIC 5

Here, Jen and Mike both have the third-order belief that: 'I believe that Jen/Mike believes that I am annoyed by the guy's snoring'. Mike 'catches on' to what is going on, and now they have the mutual-knowledge and understanding to interact with one another. Because they both 'see' they are thinking about each other's thoughts they are both 'tuned' into the possibility of interacting with one another with regards to the snoring man and the helpless situation they have found themselves in.

It is only at this level, where both participants share third-order beliefs, that interaction can take place. It is at the level where we can learn about word-meaning and cooperate with others. Here, we see that this is allowed by a certain way of perceiving the world, that is to see it as full of minded beings that own high levels of intentional thinking like our own. Many thinkers agree that this capacity is innate in humans, and not something that needs to be learnt (Baron-Cohen and Leslie, 1985; Baron-Cohen, 2001), thus our ability to mind-guess is dependent upon some biological underpinning. This also means that social cognition is the likely product of natural selective processes and has its own evolutionary history and primary function. Exploring the evolution of social cognition and how it interacts with the evolution of FL will be an important topic of chapter 4, but now I will revisit how these higher levels of mind-guessing impact the powers and primary function of FL.

2.4 FL in the Hybrid Creature

2.4.1 The Communicative Function Revisited

In this thesis, I argue that the FL evolved for a social and communicative primary function. My hypothesis is formed through a commitment to the existence of the FL, but also it is inspired by the view that we are also 'cultural creatures'. In 1.3 I argue that social cognition evolved first, and, thus, set up the environment and selective pressure in which the FL would emerge and evolve. I also argue that the primary function of FL is to provide

a way for humans to refer to things that are not obvious in the current context or 'to make relevant what is not salient'. I did not, however, discuss the evolutionary issues around this view. This is what I plan to do now that we have a deeper understanding of biological and cultural evolution, and what it is to mind-guess.

In 2.2 I explore how current views around the evolution of the FL are problematic. In this section, we saw how the most social version of this view was especially problematic with regards to evolutionary theory (2.2.2). I argue, however, that these are only problems because thinkers of this view have signed up to a code-model of communication that does not take into account our ability to mind-guess and the fact that human communication is based on the ostensive-inferential model of communication. This is how the 'hybrid creature' view aims to understand language, and it is with such an approach that we see a lot of the issues for a communicative function of the FL start to dissolve. Let me explain.

First, the hybrid creature approach understands that the FL emerges from a place where humans are already dependent on social living and cooperation. This has an impact upon the nature of the continuity problem in that we *admit* to a discontinuity between animal and human communication. Therefore, we are expected to explain the rise of a new system of communication. The thought is not that language is new but that the human situation and selective pressures that are present are new. Never before has an animal been in a situation where they can use ostensive-inferential communication, and so never before has an animal had to deal with the limitations and challenges that come with it. On my view, it is this situation that the emergence of FL is responding to, and—if it is meant to be seen as a continuation of anything—it is the continuation of our dependence on social living. The FL simply allows us to continue communicating and coordinating outside of context, and this includes the rise of the mysterious the creativity feature of language that was so problematic in 2.2.2 (I discuss this point in more detail in 5.3.2).

Second, considerations from the cultural creature view also dissolve the freeloading problem. This is because of how ostensive-inferential communication works. As I explained in 1.2.2, one *needs more* than the linguistic code to communicate successfully. Under this approach to communication, however, the underdetermination (see 1.2.1 – this is the problem that linguistic utterances are neither necessary nor sufficient for communication) and freeloading problems counteract one another. It seems freeloading requires one gets something for free, where the underdetermination problem tells us

that it is very hard to get anything for free in human communication! Both speaker and hearer need mutual-knowledge to even have the chance of manipulating a hearer into doing something to the speaker's sole advantage or to comprehend what a speaker is saying to the hearer's sole advantage. Ostensive-inferential communication does not completely eliminate freeloading, but it does make it a lot harder. A freeloader would have to do a fair amount of work in order to cheat or get anything for free. Furthermore, an investment into building the relevant background knowledge is required, and such an investment needs to be worth cheating in the first place.

Additionally, the precursors of ostensive-inferential communication involve the evolution of group and social living which will come back with all sorts of freeloading risks that need to be dealt with. These involve cheating-detection and systems of punishment. Those who come to know and use a language must have also built up the relevant mutual-knowledge for successful communication and are therefore probably members of that social group (or they worked to become part of the group). They will also need to consider the risks of detection and punishment. This means that language is not at immediate peril of domination by a better communicative strategy; and therefore, *is an ESS*. This understanding of language in human communication affects the claim that language is 'cheap'. It may be true that using linguistic utterances does not require much energy or resources, but it does require relevant mutual-knowledge, social commitments, and a group awareness that comes with group membership. I will revisit this in more detail in 4.2.

Third, ostensive-inferential communication also dissolves the bootstrapping problem, as it is not essential for both speaker and hearer to hold the same linguistic code and rules in their head for there to be successful communication:

> Inferential communication is a matter of reconstructing the communicator's informative intention on the basis of the evidence she provides by her utterance. Successful communication does not depend, then, on the communicator and addressee having exactly the same representation of the utterance, but on having the utterance, however represented, seen as evidence for the same intended conclusion (Origgi and Sperber, 2000).

This implies that it is possible for the FL of the speaker to have some differences to the FL of the hearer, and for them to both encode different linguistic structures, but for the

communicative act to be successful. John, for example, may utter a single word, 'drink', after collapsing after a long walk in the desert. Lisa, however, who has a more developed FL has learnt to treat words that indicate an activity (like 'drink' or 'hit') as being syntactically linked to some object (like 'Lisa', 'water', or 'tree'). This means she automatically perceives John's utterance as having an unexpressed word. In other words, she does not hear a stand-alone 'drink' that John expresses, but the more complex and informative 'drink x' (example in Sperber and Origgi, 2012, p. 336). Despite the difference in linguistic code the speaker intention is the same: John needs to drink water. This means it is also possible for gradual changes to the FL to take place without being detrimental to communication.

The fourth problem was the apparent counterfunctionality of language and the thought that the structural properties of language are badly designed for communication. These issues lie with that fact that language is arbitrary and ambiguous. I have two responses to this problem. My first response is to refer back to the fact that evolutionary processes build 'kluges' (see 2.1.4) and to consider that natural selection is a very disordered and messy designer, only working with the materials it has available to it at the time it is 'dealing' with any particular selection pressure (Pinker and Bloom, 1990; Newmeyer, 1998b; Marcus and Hoye, 2008). This explains why language is often arbitrary. It does the job it needs to do, but it by no means does it perfectly.

My second response is that, under this view, we should also expect linguistic utterances to be ambiguous (e.g. the two meanings of the boy saw the girl with the telescope). It is evolving upon a background where a form of communication is already well-established and so the 'goal' is not to build a system of communication where every utterance it completely clear in its meaning, but to enhance a form of communication that is already there (see 1.3). This means that, during the evolution of the FL, linguistic utterances are not only interpreted by virtue of everyone else having an FL, but by virtue of all the stuff that is known in context. Thus, syntactical *and* pragmatic consideration are both constantly involved in the evolution of the FL, thus we should not be surprised at ambiguity. It could simply be that at most times an utterance is ambiguous, the pragmatics is present to resolve the ambiguity (perhaps you can see a boy holding a telescope); and where the context is ambiguous, the use of a linguistic utterance solves the ambiguity (it makes relevant what is not salient!). Since linguistic communication is successful most of the time, I think it is safe to say that the interaction between context

and sentence was one that was designed on the basis of communicative success (Piantadosi, Tily and Gibson, 2012).

Above, I also argue that a communicative and social approach to the evolution of FL resists problems of the other views. That is the cognitive view in 2.2.1, and the non-functional view in 2.2.3. My main argument is that, out of all views, the hybrid creature approach embraces a far more integrated account of language evolution. One that involves consideration of human sociality, the process of natural selection, and the rigid and idiosyncratic nature of linguistic structure. My main point is that the hybrid creature view is preferable to those views that are less integrated (like the cognitive and non-functional views).

A further argument is that advanced human thinking is a secondary function of the FL. Here, I argue that it makes more sense that humans, overall, have evolved toward becoming social creatures that require cognitive mechanisms that support social living, rather than individual thinking. This involves not only social cognition but more sophisticated learning mechanisms and memory. There is even argument that our capacities for reasoning, decision-making, and planning are geared toward sociality rather than rationality as recent research shows how human thinking is often plagued by social biases (Haidt, 2013; Mercier and Sperber, 2017). This undermines the argument that the FL has evolved for individualistic cognitive reasons because it may be that nothing of the human cognitive capacity functions on an individualistic basis. This is supported by the fact that other minded animals have also failed to find such a rich solution to the selective pressure to get smarter or gain more flexible thinking capacities. My point here is that it may well be true that the FL enhances human thinking, but that this enhancement is a secondary function (form follows function) of a biological object that was evolving to further support human sociality.

The hybrid creature view also has an advantage in discussions concerning the nature of human thought. This is related to the discussion I started in 1.3 with regards to the relationship between the syntax of natural language and thought. If one is an advocate of the view that the human mind has a 'language of thought' or LOT and also argues that there is an FL, then one is not stuck for explaining why there are two syntactical systems: one that evolved for thinking (LOT) and one that evolved for communication (FL). This avoids one of the main problems of the view explored in 2.2.1, which could not make sense of two syntactical systems. If one is an advocate of the view that the human mind

is based on a connectionist model, however, then one needs to show that human thought is primarily influenced by the language that one acquires. This latter point remains highly controversial (Camp, 2009; Margolis and Laurence, 2019). These questions, however, remain outside the scope of the thesis but they are worth keeping in mind.

2.4.2 The rest of the thesis

Chapters 1 and 2 are dedicated to building the groundwork for the main argument of my thesis. This is that humans are 'hybrid creatures' and that the FL has a social primary function which aids human communication by 'making relevant what is not salient'. To make my claim clear it has been necessary to introduce and explain several fundamental concepts. This has included describing the nature of language (1.1) and the FL (1.2.1); the nature of human sociality, communication, and culture (1.2.2); and social cognitive mechanisms that underpin it (2.3.2) – not to mention how the hybrid creature approach to the FL (1.3 and 2.4) differs from other views in the field (2.2.2). I have also gone into detail about how processes of biological evolution, cultural evolution, and natural selection are related to the concept of primary function (2.1 and 2.3.1).

The rest of the thesis is geared toward supporting my central claim that the FL was naturally selected to 'make relevant what is not salient', and I will use many of the concepts introduced here to build a richer picture of what the hybrid creature is.

In chapter 3 I will explain in deeper detail how the primary function 'to make relevant what is not salient' responds to a particular selection pressure present in the human environment. This will involve not only exploring the power that syntax brings to human communication (as suggested in 1.3.1), but also the powers of the communicative behaviours that preceded it. The point is not that 'making relevant what is not salient' is a power that syntax has, but a power that syntax was selected to enhance and maintain. The story really starts with the powers of word-use because words are able to bring to mind concepts or meanings of things that do not exist or are not salient in the current environment. I argue that syntax (as underpinned by the FL) was designed to deal with the limitations and risks of miscommunication that word-use brings into human communication. It is in this chapter I also introduce us to the relevance theory of communication—as this gives us a deeper insight into the workings of ostensive-inferential communication—and also deals with the counterarguments that the primary function of syntax is to more clearly and precisely express our thoughts to others.

In chapter 4 I take the claims of chapter 3 into the bigger picture of human evolution, thus endorsing my argument that theories of language evolution should be more integrated into our understanding that we have evolved to become very social and cultural creatures. Here I explore not only the emergence of words and syntax, but also the emergence of group living, social behaviours, and social cognition. I expose more clearly why cultural behaviours are important to human survival and demonstrate how the evolution of the human phenotype is governed by a co-evolutionary process between that which is cultural and learnt, and that which is genetic (this is known as 'gene-culture co-evolution). I show how the evolution of the FL is subject to such a process and conclude that there is a strong case for the view that syntax is not the product of human culture (as the original 'cultural creature view' would argue) but has evolved to fundamentally support it.

In chapter 5 I move from the wide picture of human evolution into a narrower focus of how the FL works in the human mind. My thesis, by this point, will expose that I advocate a certain form or shape of the FL which is complex and made up of several moving parts. This is because I argue that the FL was built through the incremental and gradual process of natural selection, whilst also coordinating a relationship with the cultural movements and needs of the human environment. This intuition, however, clashes with a view in the field of linguistics known as the minimalist program (MP) which advocates a far simpler form or shape of the FL. It is in this chapter I delve into the theories of generative grammar and provide arguments for the 'government and binding' or GB approach which appreciates a far more modular and complex approach to GB. Here, I will also suggest how these modules could be integrated into the gene-culture co-evolution picture I present in chapter 4.

Chapter 3 – Communication

3.1 Powers of Language

The main claim of this thesis is that the FL (that is the 'faculty of language' – see 1.2.1) was naturally selected for a social function. The goal of this chapter is to explore what communicative powers language does have and present a more precise argument regarding its primary function as I have come to understand it. In other words, I aim to do a more thorough job on the arguments I started to express in section 1.3 when I argued that we are neither exclusively linguistic nor cultural creatures, but hybrid creatures. My thought was that the FL had a new power to bring to human communication by allowing us to refer to things outside of context, or more technically speaking: 'to make relevant what is not salient'. In order to give this argument more justification I need to explore the counter-arguments that the primary function of language is to more clearly and precisely express thoughts (see 3.1 and 3.3.5); introduce a deeper understanding of human communication by exploring 'relevance theory' (see 3.2.1); and also account for the intermediate stage of word-use that must have pre-existed full language (see 3.3).

Before going on I should briefly remind my reader of some terminology I will be using in this chapter. I use 'power' as a vague term to point to something language can *do* without making any direct commitments to if that something is useful, and use 'function' to refer to a power that is useful. You will remember that I introduced us to 'primary' and 'secondary functions' in chapter 2. As a reminder, a primary function points to the function that explains why an object was created in the first place, whereas a secondary function points to other functions this object may provide. In this chapter, the overall claim will be that the power 'to make relevant what is not salient' is the primary function of language, whereas 'to make communication more expressive and precise' is a secondary function.

Usually, when we consider the use of language, we think about it in terms of the 'code-model' of communication (see 1.2.2) where we are focused on the role of the linguistic-utterances. A thought is coded into a word or sentence in a certain language, which is decoded by a hearer, who knows the same language, to reveal the same thought. This appears to be the underlying assumption for the theories of language evolution as

advocated by Jackendoff (Jackendoff, 2002) and Pinker (Pinker and Bloom, 1990; Pinker, 1994). When it comes to exploring the primary function of language, they tend to argue that it enhances the expression and precision of a system of communication that works on this literal meaning:

> Given such a capacity [that is to embed phrases into larger phrases], one can now specify reference to an object to an arbitrarily fine level of precision (Pinker and Bloom, 1990, p. 724).

> I will argue that one actually can reconstruct from modern human language a sequence of distinct innovations over primate calls…each of which is an improvement in communicative expressiveness and precision (Jackendoff, 2002, p. 236).

The move that Jackendoff and Pinker allude to is a move from the use of meaningful symbols, words, or word-like objects to a system of communication that is able to combine and recombine these meaningful symbols in ways that can better represent the complex thoughts or ideas we wish to express (I will discuss word-use in more detail in section 3.3). Overall language—or more precisely the syntax of languages—allows us to better express the thoughts with more detail and accuracy than we could have done without language:

> For example, it makes a big difference whether a far-off region is reached by taking the trail that is in front of the large tree or the trail that the large tree is in front of. It makes a difference whether that region has animals that you can eat or animals that can eat you. It makes a difference whether it has fruit that is ripe or fruit that was ripe or fruit that will be ripe. It makes a difference whether you can get there if you walk for three days or whether you can get there and walk (Pinker and Bloom, 1990, p. 724).

This perspective on language, however, often diminishes the importance of a wider spectrum of factors on which humans depend for their communicative acts. This point is made clear by the fact the literal meaning of a linguistic utterance often 'underdetermines' the overall communicative intention of a speaker (Wilson and Sperber, 2004; Scott-Phillips, 2014). As we explored in chapter 1 human communication

is not based on the code model of communication, but on the ostensive-inferential model where linguistic utterances are used to *point towards* a communicative intention of a speaker, and not to the literal meaning of the utterance. It is then the job of a hearer to *infer* from the utterance what the speaker means. In recent years, researchers have argued that the ostensive-inferential analysis of human communication should be taken more seriously in theories concerning language evolution.

The likes of Sperber, Origgi, and Scott-Phillips have argued that language-use helps to convey communicative intentions, rather than literal meanings (Origgi and Sperber, 2000; Sperber and Origgi, 2012; Scott-Phillips, 2014). Linguistic utterances, thus, are a means to an end and not the end in and of themselves. They *point towards* a communicative intention, which also depends on other elements of human communication. For example, mutual-knowledge and the context of the immediate environment will play a role in the correct interpretation of a communicative act.

When it comes to considering the functions and pressures that prompted the emergence of language, however, advocates of the ostensive-inferential approach argue similarly to advocates of the code-model. The primary function of language is to make human communication more 'expressively powerful' (Scott-Phillips, 2014, p. 21).

> The [linguistic] codes provide a way for us to say what we would otherwise have to show, and the consequence is that ostensive-inferential communication can be used far more precisely, and more expressively, than it otherwise would be (Scott-Phillips, 2014, p. 17).
>
> [Linguistic utterances] can be as richly and subtly structured as the communicator wishes...The function of linguistic utterances, then, is - and has always been - to provide this highly precise and informative evidence of the communicator's intention. (Origgi and Sperber, 2000, p. 165)

In chapter 1 I argue that discussions that concern the primary function of language need to work from the ostensive-inferential model of communication, and that language is something that brings more to human communication, rather than acting as a system of communication in and of itself. This move was inspired by the more complete picture of the 'cultural creature' approach to human evolution (see 1.2.2). This, however, prompts a deeper investigation into the powers of human communication and language. Such an

analysis of human communication and language is not something that is often considered in other theories of language evolution, but it will be the main focus of this chapter. This is something I start in 1.3 where I develop an understanding of what human communication is like with and without language.

My thought is this: on the ostensive-inferential model, humans can communicate with a good level of precision and expression even in the absence of language. If we take the angle that language evolves to improve communicative expression and precision, we find that the rise of language does not bring anything *new* or *special* to human communication. It would just be more of the same powers. This goes against the usual consideration of evolutionary processes which tends to select for new strategies when there is a new problem or selection pressure needs them (see 2.1). Let me explain this more clearly by means of an example which exposes the difference between linguistic and non-linguistic communication.

Non-linguistic communication is simply human communication without the use of words or sentences. Humans depend upon many other strategies to communicate which also include actions like showing, pointing, and pantomime. These are also assumed to be forms of 'pre-linguistic communication' and refer to the ways humans may have communicated before the emergence of words and language (Tomasello, 2008). I will, therefore, refer to these forms of communication simply as 'pointing and panto'. This leaves open a large question regarding the emergence of symbol and word use, as well as language, but I will come to tackle these questions as we go through this chapter and the next.

As I argued in 1.3, it is entirely possible for acts of pointing and panto to express information that is both expressive and precise. A brother, whilst looking towards his sister, nods in the direction of a hawk circling an area of ground in the distance. Through doing this he expresses his communicative intention, which is something like 'that hawk has found some food, let us take this opportunity to also hunt in that area. We should fetch our gear and meet near that area to hunt'. His sister understands and leaves to collect her things with the intention of meeting him where he spotted the hawk. This nod *points towards* the brother's communicative intention that contains this expressive and precise information. It is precise in that an exact plan is formulated, and expressive in that he can express his thoughts about how the present moment can bring about a desired

event in the future. This is transmitted through a mere nod because it is well placed and pointed to all the information required to express this thought. This information that readily exists in this context in the form their mutual-knowledge (that is the hunting habits they mutually share and use to survive), and the knowledge they share about hawk behaviour and from what exists in the immediate environment they find themselves in (that there is a hawk, that they are both currently near a hunting ground, and that they are both able-bodied and willing to hunt).

This example shows it is possible to share information as precise as '*a far-off region [that] is reached by taking the trail that is in front of the large tree*' or '*that region has animals that you can eat or animals that can eat you*' (Pinker and Bloom, 1990, p. 724) without use of linguistic utterances as long as the relevant mutual-knowledge is in place and the immediate environment serves to establish this information. Either the speaker can point to things that bring the relevant information to mind, or—if time and space allow it—can even use pantomime to play their thoughts out. Although linguistic utterances may have the power to convey this information more quickly and more immediately than pointing and panto (I will discuss this power in more detail in 3.3), they do not necessarily bring new power to our communicative acts. Furthermore, linguistic utterances are also often bad at conveying clear and precise information! Often, linguistic utterances are very much vague and imprecise.

The sister, for instance, could utter '*remember to be quiet this time*' before she heads off to collect her hunting tools. Since the brother speaks the same language as his sister, he can grasp the literal meaning of the sentence, but it confuses him because he does not recall being loud in the past and is given no indication of how he is meant to be quiet (e.g. it is not clear if he should avoid speaking, being heavy footed, or the clicking of his tools). All he can grasp from his sister's communicative act is to attend to his noisiness whilst they are hunting. This is likely all his sister needed to inform him, but the linguistic-utterance is general and vague particularly when compared to what information was transmitted by the non-linguistic nod.

'Remember to be quiet', however, does something that the nod cannot. The literal meaning behind this linguistic utterance allows the sister to point to and establish information that is inconspicuous, obscured, hidden, or simply not available in the context of the communicative act. The sister remembers that last time the heavy-

footedness of her brother scared off the hawk before they could observe its hunting ground, but she also knows her brother is not aware of the mistake he made. Thus, this information is not part of the mutual-knowledge they share. Furthermore, there is nothing in the immediate environment she can point towards—nothing that could bring loudness or quietness to mind— to help express such a thought. Upon hearing the utterance, the brother is at least made aware of some information that was not available to him through any other means. The function of the utterance, 'remember to be quiet', then, is to hint towards some otherwise unavailable information. In other words, a linguistic utterance could establish something between the speakers that could not be established between them through pointing and panto alone. The utterance makes *salient* something that was otherwise inconspicuous in that context (I will come back to the point of salience in 3.2.1).

One could argue that pantomime also has this power as one can refer to something that doesn't exist in the current context by acting it out. For example, flapping the arms around and squawking may bring a chicken to mind, but I would argue that this still has a certain dependence on context as space and energy are required to perform such an action. Pointing and panto are acts which are iconic and non-arbitrary, which is quite different from the symbolic and arbitrary nature of word-use. The word 'chicken' can bring chickens to mind in a way which, in comparison, is very detached from context. I will come back to the difference between pantomime and word-use in section 3.3.

Which concepts can be 'brought into' the current context that are otherwise missing obviously depends on concepts or meanings that are available in a language itself, but it remains a new paradigm that offers a whole new way for humans to communicate. My main claim, therefore, is that language emerges to provide a means to communicate about things that are not salient in the contexts of communicative discourses. The primary function is to allow humans to push the limits of pointing and pantomime, and ultimately afford a form of communication that allows us to share information that is not supported by our immediate environment or mutual-knowledge. Ultimately, this gives us the power to communicate in situations and contexts that are new or surprising to us rather than just sticking with what we know. I will discuss this latter point in more detail in chapter 4.

This power to establish inconspicuous information through linguistic utterances—through language—is a power that I think we seriously need to consider when discussing its primary function and evolution. Pointing, pantomime, and linguistic utterances all do the same thing in that all 'point towards' a communicative intention. All can refer to things in the current environment or things that lie in mutual-knowledge, however, there will be times when the environment *does not* provide means to point towards the sort of information they desire to share. Only linguistic-utterances have the extra power to 'bring in' concepts or topics to the current context and make salient something that was not at all salient before. It is this power I argue that the FL is responding to, the reason why it emerged in the first place. In section 1.3 I argued that this is what the 'formula' of the sentence was good at doing, but to understand this point more fully I will first have to describe the theory of communication I adhere to in more detail (this is the goal of the next section, 3.2) and then return to the emergence of words and sentences after (see 3.3).

3.2 Human Communication

3.2.1 The Relevance Theory

By now we should see that understanding the communicative powers of language requires us to understand the communicative powers of ostensive-inferential communication. Currently, in the fields of linguistics and the cognitive sciences, relevance theory has provided a successful framework towards explaining human communication (Wilson and Sperber, 2004, 2012). Relevance theory expands on the Gricean insights regarding 'speaker meaning' or 'communicative intention' (Grice, 1957) that I introduced in 1.2.1, but also provides a wider theory of human communication in general. The central claim is this:

> According to the inferential model, a communicator provides evidence of her intention to convey a certain meaning, which is inferred by the audience on the basis of the evidence provided…The central claim of relevance theory is that the expectations of relevance raised by an utterance are precise enough, and predictable enough, to guide the hearer towards the speaker's meaning (Wilson and Sperber, 2004, pp. 607–8).

'*Relevance theory, like other broadly Gricean approaches to pragmatics, takes as its starting point three of Grice's assumptions about verbal communication'* (Wilson, 2016, p. 2). I will clarify these three starting points as they support the underlying argument of this chapter and the overall approach to communication in this thesis. The first—as already discussed—*'is that a sentence meaning is a vehicle for conveying a speaker's meaning, where a speaker's meaning is an overtly expressed intention that is fulfilled by being recognised'* (ibid).The second touches upon a point made in 1.2.1 where I introduce the ideas of social conventions, and *'is that a speaker's meaning cannot be simply perceived or decoded, but has to be inferred from her behaviour, together with contextual information'* (ibid). This second point is important to discuss in some detail because it refers to the sort of thing that makes these communicative acts successful or unsuccessful. It means that all parties involved in a communicative act are aware of the same sort of behavioural and contextual information that count towards the communicative intention of the speaker.

When a patron at a bar gestures towards his empty glass when he has the attention of the bartender, the patron is using both the gesture *and* the context of the bar to get his communicative intention across. He needs and believes that the bartender shares that same sort of knowledge about the context of the bar as he does. In other words, the communicative act depends upon them sharing the same sort of mutual-knowledge that a bar is the sort of establishment where people come to socialise and enjoy a drink (example based on Tomasello, 2008). This mutual-knowledge contains all sorts of interacting beliefs that play a role in the bartender's ability to make sense of the patron's gesture. This includes the rule that if someone wants a drink, they must go to the bar to order and carry the drinks back to their table, but if someone is sitting at the bar, they just need to let the bartender know when they are ready to order again. If these beliefs are assumed and maintained by all that part take in the pub experience, the gesture towards the glass will work.

The point here is that it is not just the gesture that is used in evidence towards the communicative intention, but also the state of the immediate environment and much of the mutual-knowledge held and maintained by the patrons and bar staff. Thus, any change in either gesture, environment, or mutual-knowledge can also change what one might infer from the communicative act. The very same gesture could be made in a

similar environment but towards the patron's sponsor from Alcoholics Anonymous. This will imply an entirely different message because the sort of mutual-knowledge held between the patron and sponsor will be very different from the mutual-knowledge held between the patron and bartender. The patron and sponsor share mutual-knowledge with regards to the patron's journey towards quitting drinking (which is unknown to a bartender), and the communicative intention will more likely highlight that the empty glass contains the only drink they will be having, or even, the last drink they will have ever.

Ostensive-inferential communication, therefore, is an extremely complex process on which a successful inference depends upon on many interacting parts, all of which—if treated individually—will ultimately underdetermine the overall communicative intention. This means that any communicative act (linguistic or not) is highly ambiguous on its own and requires context to determine the communicative intention. Where systems of communication that are based on the code-model depend on all communicators owning a shared-code; systems based on the ostensive-inferential model depend on them owning mutual-knowledge and the ability to treat certain contexts in similar ways.

This also highlights how and where instances of ostensive-inferential communication are unsuccessful—that is when communicators lack mutual-knowledge. This often happens when there is some sort of cross-cultural interaction. An individual who is used to table services in bars, for example, may mistakenly assume that table service is also part of the pub culture. From a table, they may catch the bartender's eye and make the same gesture towards their empty glass. The bartender, being completely unaware that some cultures utilise table service will either be confused or interpret the gesture in a way that makes sense with their pub-culture (perhaps he will think patron wants to point out the glass is chipped and needs disposing of). The cause of miscommunication here is not just that the bar-tender and patron have a 'variation in perspectives' (Sayer, 2013, p. 744) on how service runs in pubs, but that they initially believed that they shared the same perspective. In other words, they assumed that they had mutual-knowledge, when in fact they did not. Thus, whether communicators share mutual-knowledge is a big determining factor in the success of ostensive-inferential communication.

> Since the decisive step in determining the intended meaning of a discourse is inferential, individual differences in executing this step are likely to develop different intended meanings of the same discourse, which increases the likelihood of misunderstanding (Sayer, 2013, p. 745).
>
> They cannot even begin to coordinate on content without assuming a vast amount of shared information or common ground—that is, mutual knowledge, mutual beliefs, and mutual assumptions' (Clark and Brennan, 1991, p. 127).

The risk around unsuccessful or failed communicative acts is something that should be taken into account in our discussion of the evolution of human communication because it is only those methods of communication that are successful which are selected for and are passed down into the next generation. Methods that fail in supporting successful communication are less likely to succeed and will certainly be filtered out as maladaptive traits. When we consider that something as easy as a 'variation in perspectives' or a mismatch in mutual knowledge causes issues for successful communication one will be tempted to ask how it is that humans are able to utilise ostensive-inferential communication effectively at all. My response also highlights the sort of selection pressure impinged on humans—which concerns the communication of things that are not salient—that also prompts the emergence of the FL under my theory.

This brings me to discuss the third starting point of Grice's insight: *'that in inferring a speaker's meaning, the hearer is guided by the expectation that communicative behaviour should meet certain standards: for Grice, a cooperative principle and conversational maxims, and for relevance theorists, a presumption of optimal relevance'* (Wilson, 2016, p. 2). This implies that when faced with communicative acts humans are guided by heuristics or 'principles' of relevance and paths of least effort to make conclusions about what they mean. Relevance Theory applies such principles to both human communication and human cognition.

This implies that when sharing information, a speaker must have an awareness of how their hearer's inference processes will play out when interpreting their communicative act. Further, a hearer must have an awareness that a speaker chooses their communicative act in a way that will guide them towards the correct interpretation. Please note that I use 'speaker' and 'hearer' here to also refer to use of non-linguistic

communication (so a pointer or a pantomime is also a 'speaker' here)[27]. The thought is that both speaker and hearer adhere to an inference process where '*every utterance communicates a presumption of its own optimal relevance*' (Wilson, 2016, p. 7), where an utterance is optimally relevant if and only if:

> a. It is at least relevant enough to be worth the addressee's processing effort
>
> b. It is the most relevant one compatible with the speaker's abilities and preferences
>
> (Wilson, 2016, p. 7)

In other words, upon seeing that someone wants to communicate, a hearer will assume that this act is somehow relevant to them and that it is relevant within the confines of a context which includes both the speaker's and hearer's awareness and relationship with the world. Here is an example.

If a wife points out a flower they like to their husband, the husband will use the principle of optimal relevance to infer what this act means. They will assume that the effort of pointing means that their wife intends to communicate something that is relevant to them in the first place (reflecting a). The husband will also consider that, although they are a botanist who knows a lot about the flower, their wife has no interest in botany. Thus, his botanic knowledge is probably irrelevant in this act (reflecting b). In fact, the optimally relevant interpretation is likely obvious or salient at that moment, and the husband concludes it is to do with the fact that it is their anniversary and their wife would like some flowers to celebrate (also reflecting b).

A challenge for relevance theory is stating what is actually relevant to or for humans within communicative discourses. This, however, can be helped by thinking about the cognitive principle of relevance. This is where 'human cognition tends to be geared to the '*maximisation of relevance*' (Wilson and Sperber, 2004, sec. 2). This means that the human mind attends to those inputs and beliefs that are *relevant* in the contexts of certain decision-making processes. A relevant input is one that '*yields a positive cognitive effect', where 'a positive cognitive effect is a worthwhile difference to the individual's*

[27] The other option is to use the terms 'signaller' and 'receiver' but this tends to prompt one to think of the code model of communication, which we want to avoid here.

representation of the world – a true conclusion, for example' (ibid). [28] This is highly dependent upon context and what is important to the individual, but I think this is the right way to think about human communication. It is an inferential process that is about yielding positive cognitive processes that are relevant within the context communication is taking place.

These principles of relevance can help us make sense of how the process of ostensive-inferential communication is successful most of the time for humans, and so also of an overall strategy that explains how humans are able to successfully cooperate and communicate most of the time. If speakers and hearers are always working towards optimal relevance, then this narrows down the number of possible interpretations a communicative act could mean. This makes it so ostensive-inferential communication functions as a good and useful system of communication. This is the background against which I understand human communication. It is also the ground on which language brings the further powers 'to make relevant what is not salient'. I explain this in more detail in the next section.

3.2.2 From Pointing and Panto to Language

Now that we have a better grasp of human communication, and the problems and selection pressures that may surround it (3.1), I can return to my claim that the primary function of FL is to 'make relevant what is not salient'. To describe and explore the evolution of language, however, requires more than just explaining the emergence of syntax—that is the fundamental structure that underpins sentences—but also the move from non-linguistic communication (pointing and panto), as well as the emergence of word-use that would have pre-existed syntax.

In this section, I will propose a simple and linear story that explores this in three stages. That is that human communication (working on the ostensive-inferential model) starts with an ability for pointing and panto, which gave rise to word-use, which gave rise to language (that is word-use structured by syntax). The simplicity of this story is only meant as a model on which we can theorise and think about the powers and functions that

[28] Continue quote: '*False conclusions are not worth having. They are cognitive effects, but not positive ones'* (Wilson and Sperber, 2004, sec. 2)

explain *why* language emerged, and not meant to actually reflect the process of language evolution. This is something I will expand upon in chapters 4 and 5.

This order of evolutionary stages (pointing and panto, words, then language) is not controversial as thinkers from both the cultural creature (Tomasello, 2003; Kirby, 2011; Everett, 2012) and linguistic creature (Bickerton, 1990; Jackendoff, 1999) views have argued language evolution proceeds in this way. The main topic of interest here, however, is the selective pressure that caused the jump between word-use and language, as it is this gap in which the emergence of language takes place. That is how we got from using the odd words like 'chicken' and 'hold' to using a system with an underlying structure that allow us to use sentences like 'Hold this chicken whilst I check its wings'. However, to make sense of this jump it is also essential that we explore the jump between pointing and panto and word use; and the functions and selection pressures that also surround that.

In this section, I aim to show that word-use has the power to make human communication faster and more efficient than to pointing and panto, but also that words have the capacity to bring a whole new power to human communication. They are able to 'make relevant what is not salient'. This power introduces a whole new paradigm to human communication which also introduces new pressures and problems into the human environment. This is what I argue prompted the rise of syntax, and therefore language as we know it today. I will, therefore, start this section by introducing us to the wonderful world of words.

3.3 Words in Communication

3.3.1 The Wonderful World of Words

What was human communication like before the appearance of words and language? In a time when humans may have only relied on actions like pointing and panto to indicate the sort of content that we would want to share with others? As I demonstrated with the example in 3.1, humans are able to share expressive and precise information with nothing more than a nod or a point. If one is wondering what made that odd sound, another can respond by pointing to the actual bird that made that sound. If someone keeps getting their fishing line tangled and needs help to get it untangled, someone else can show them how to do this, and further, demonstrate a better technique where tangling is less likely

to happen. All of this is the sort of communication that I assume humans are capable of engaging in prior to the emergence of words or language.

Word-use, however, introduces a new set of powers to human communication that enhances or complements the powers of pointing and panto. If anything, it opens a whole new paradigm for sharing information because of an important shift from sharing information through iconic means to sharing it through symbolic means[29]. This is not the main topic of the thesis, as we are more interested in reasons for the emergence of syntax as opposed to words, but I will need to address this point in part. After all, it is the paradigm of word-use that I argue prompts the paradigm of language-use, so, before exploring the power and function of words, I will briefly explain what I understand words to be.

What are words?

In 1.3.2 I addressed this question from the point of view of language meaning. There I explored how and why words are meaningful; but how they hold, maintain or even change their meaning remains part of a huge philosophical debate which concerns the overall nature of the human mind. What I will attempt to do here, however, is give a sensible description of words and word-meaning that resonates with my arguments and can be carried out through the rest of this thesis.

As I explored in 1.3, it is fairly uncontroversial to claim that words are a pairing between a sound and some meaning or 'concept'. The sound 'chicken' denotes, refers, means, or brings out the concept of the domesticated bird that scratches around in the backyard. A central issue, however, regards how that sound became associated with that meaning. Advocates of the cultural creature view argue that words are a case of social expectations, whereas advocates of the linguistic creature view will tend to argue words are linked to concepts in a language of thought (or LOT).

In my hybrid theory of language, I showed that I agreed with the latter approach in which meaning is somehow maintained and represented in the mind of the individual, but I also

[29] Some would argue that it is this shift that is important for explaining the overall uniqueness of the human species, and thus focus on explaining the both the shift to mind-guessing and linguistic use (Deacon, 1998).

argued that meaning was created by social movements and expectations. How the mind was able to maintain the meaning of words was also a question left open for debate, but I showed it could either be the work of an internal LOT which pre-exists language, or of a connectionist theory of mind which is formed and built alongside language—both approaches came with pros and cons with regards to the rest of my theory on language evolution and I will return to this discussion in 3.3.5 below. What is important to expose here, however, is the difference between pointing and panto, and word-use.

As I mentioned above, pointing and panto is iconic and non-arbitrary in its nature. What this means is that the communicative act directly represents or *is* the meaning. The acts of pointing to a bird or flapping around like a chicken are acts that look like or sound like the very thing a speaker hopes to bring to mind. They stimulate the meaning in a very direct manner. Word-use, on the other hand, is symbolic and arbitrary in its nature, which means the word *represents* a meaning but does not in itself have to look like or directly stimulate what this meaning is. 'Chicken' does not look like or sound like a chicken in any way, but the sound has established an 'indirect' link to the bird that scratches around in the back yard.

The essential difference between pointing and panto and word-use, therefore, lies in how the use of any such communicative act is connected with the meaning or concept. Pointing and panto tells a relatively simple and direct story, whereas word-use requires that some arbitrary link is set up between word and concept. This means pointing and panto is limited to communicating about things humans can point to, show, or play out; whereas word-use is limited to the pool of meanings a human group has agreed to connect certain words to.

Powers of Words

Now that we have a slightly better grasp of what words are, I am going to discuss some of the powers they have. This is not an exhaustive list, but it will reveal the sort of things words can do above and beyond the powers of pointing and panto. I will also point out that this list is about the power of words in general, and not of individual words (e.g. the word 'chicken' may have a specific power related to chickens and can be used differently in a variety of contexts—sometimes it may refer to the live animals, and sometimes to the meat).

1. Word-use allows us to share information more quickly and with less energy than we could do with pointing and panto. Word-use means that we do not need to point or show anything, we can just speak it. For example, to convey something like *I need you to hold the chicken, not the duck, whilst I check its wings* is more efficient to say something like 'chicken' and/or 'hold' in the same communicative act rather than finding a chicken to point to, and/or pantomiming the act of holding.
2. Word-use frees up the hands (with the obvious exception of sign language) so that humans can share-information whilst using their hands to perform other tasks. The use of speech also means that a speaker does not need to be visible to the hearer and vice versa which gives further freedom for other tasks during acts of communication.
3. Word-use can quickly ascertain the meaning of communicative acts that turn out to be ambiguous. This is helpful, particularly where pointing and panto may only cause more problems. For example, if one person is trying to show or explain to another to only collect chicken eggs today when they are also surrounded by duck and geese eggs which should remain untouched, the utterance 'chicken' with an affirmative nod could help quickly get the message across without depending upon further pointing or pantomime.
4. Word-use has the power to make relevant what is not salient in a current context (referring to the power of language I have introduced above). Meaning or concepts can be called upon in the absence of the actual meaning. In other words, words allow us to talk about chickens when there are no chickens around.
5. Words allow it that interlocutors can communicate with less cumbersome mutual-knowledge. For example, for those who live in the same household where chickens live in the backyard, a gesture towards the backyard may be enough for them to bring the subject of chickens into a communicative act. Such a gesture, however, would only work with people who have the relevant knowledge. The word 'chicken' however can achieve this in the absence of this mutual-knowledge. This means that for the same sort of communicative act that involves chickens, interlocutors can swap out cumbersome mutual-knowledge about backyards and households for just an agreed word-meaning.
6. Word-use allows humans to continue to communicate in situations where it is not possible for them to use pointing and panto (perhaps due to lack of space or

time), or where pointing and panto are insufficient for a clear communicative act. This power is particularly valuable in situations of surprise or danger where humans do not hold a lot of previous experience or mutual-knowledge because they have never been allowed to build it in the first place. They can, however, use words to bring to mind a concept that may help them point the hearer towards their communicative intention.

What I have come to conclude from this analysis is that the first three powers indicate a primary function of words, whereas the last three indicate a secondary—but wonderfully new—power which will be the basis for the discussion concerning the emergence and primary function of syntax.

The first three powers reflect powers that are also found in pointing and panto but perform those powers in a more efficient way and may well highlight the reasons why word-use emerged. Pointing and panto utilise the immediate environment to bring relevant concepts or meanings to a communicative act and use them in evidence towards a communicative intention. Since the receivers of this act assume the principle of optimal relevance, they will use this evidence to infer the communicative intention of the speaker. The more mutual-knowledge speakers and hearers share, the more expressive and precise this information can be. Word-use allows humans to do this but by merely uttering a word instead. This is potentially more efficient, and less time- and energy-consuming than pointing and panto, it also means communication can take place alongside other activities.

The thought here is that word-use was selected as a method of communication because it was more efficient than pointing and panto, or that it enhanced the powers that pointing and panto we already have. At the very least, the emergence of word-use may simply respond to an overarching selection pressure for methods that are more efficient or save time and energy (Dawkins, 2009; Dunbar, 2014). At the very most, the emergence of words is responding to a selection pressure to bring more richness and potential to human communication. Either way, we can imagine that the primary function of words is either to speed up communication, free up the hands for other activities, or clear up potential confusion caused by other acts of communication.

Word-use is also a case of cultural evolution, and not biological evolution. It's a case of what one learns, rather than what one acquires through genetics[30]. This highlights that word-use is created through the means of social convention or from what one learns from the previous generation. To create or learn words in this way, however, *depends* upon situations where the referent, concept, or 'meaning' exists in the learning environment or at the moment the convention is created. The word 'chicken' could not be established amongst word-users if chickens could not also be pointed to or pantomimed at the moment the word-sound is learnt. If a group of speakers is going to agree to use the word-sound 'chicken' to refer to a chicken, then surely a chicken needs to be around. In the initial creation or learning of individual words, it is important that the given meaning *is* salient.

The last three powers listed (4-6) however, take us beyond this restriction of salience and demonstrate what other things words can do once they are well established in the minds of the word-users. These powers cannot reflect the primary function of words because they are not related to how they were created (remember, form follows function), but they do reflect other powers that words are capable of (where function follows form). These powers, however, are new as they are not so easily reflected in the powers of pointing and panto. In fact, they appear to introduce something entirely new to the realm of human communication.

Depending on which words exist for any given social group, they give their word-users access to a pool of word-meanings that they can call upon to do the job of bringing things to mind. These, like acts of pointing and panto, are used as evidence towards a speaker's communicative intention; but unlike pointing and panto, these things do not need to exist in the immediate context. The pool of meanings is available as long as minds that share those word-meanings (in the link between word-meaning and word-sound) are also available, so it is entirely possible for words to bring to mind anything in this pool in any communicative context.

[30] There is a question here that concerns whether or not there is an underlying system that supports the acquisition of words (and one that may well be part of FL), but what I mean to focus on here is that word-use is flexible in that different groups will choose different words, and in line with their cultural needs. 'Chicken' will be created and used if there are chickens to refer to.

This means that any member of a group that shares the pool of meanings can utilise the connected word-sounds to bring something to mind that does not exist in the immediate environment—the things that cannot be shown, pointed to, or pantomimed. When we consider the relevance theory of communication and the heuristic of optimal relevance this gives word-users the power to make relevant things that are not salient in the context of a communicative discourse. When a word like 'chicken' is uttered, a hearer will pick it up and recognise its meaning. A meaning as created by their social group but held in their mind as some sort of representation (see 1.3 for more). The hearer will then also apply the principle of optimal relevance to work out what the speaker is trying to say with that word used in evidence towards the speaker's intention—this will also involve consideration of the immediate context and the mutual-knowledge they share. What words can be utilised will depend on what is available in the 'pool of meanings'—the meanings that a group has been able to link to certain words, but it also means words can be used as creatively as pointing and panto to get an intention across.

Words, therefore, have a secondary function to make relevant something that is not salient and use it in evidence towards a communicative intention (4^{th} power). It also means that humans can communicate without depending so much on mutual-knowledge or on the immediate environment they find themselves in which tends to be very important for the success of communicating through pointing and pantomime (5^{th} power). Further, a shift from depending on communicating through pointing and panto to some dependence on word-use means that humans can communicate in situations where the immediate environment and mutual knowledge are less likely to support them (6^{th} power). This also means they have more confidence to communicate and collaborate in situations that were risky or dangerous before, and ultimately push beyond the limitations of their previous communicative capacities (a point I will revisit in chapter 4).

It is these secondary functions that I argue expose why words are so wonderful. It opens a whole new paradigm within human communication that brings about many things that simply were not possible with pointing and panto alone. This is the state of communication in the story of language evolution. Further, it is the limitations found in word-use alone that prompt and motivate the emergence and evolution of FL. I will explain this more fully in the next section.

3.3.2 The not so Wonderful World of Words

No matter how useful new powers might be, the natural world will ensure it is met with limitations, not least because new powers often bring new paradigms which affect the environment and then also impact the selection pressures imposed on those creatures (I will go into this in more detail in chapter 4). It is likely, therefore, that further strategies need to be employed to ensure a power like the one word-use introduces continues to provide the function that was useful in the first place. What I mean by this can be demonstrated through an imagined example that considers the function and limitation of the roots of a plant.

Plant roots have the power to search far and deep for life-sustaining water. When it secures a water source it will ensure the plants live longer, endure well, and reproduce. This is the ideal situation where the plant may no longer need to respond to selection pressures for its ongoing survival. This, however, is not often the case as plants, like all species, do not live in an ideal world. The plant roots may find a source deep in the ground but may lack the absorption power to carry water that far back up to the plant; or it may find the source in a fast-flowing river, but may not have the power to cope with the pressure from the flow. Thus, despite discovering a source of water, the plant is limited in its power to use it. In fact, the plant has potentially found itself in a counter-functional situation where to depend on these water sources could also guarantee its demise. Under such a circumstance, the plant roots have the power to find a water source but lack the power to feed and keep the plant alive. What this means, however, is that there is a selection pressure upon the plant to find a new strategy to make use of those water sources. The dilemma of the plant roots represents a case I envision with word-use and the power to 'make relevant what is not salient'.

Word-use has the power to bring to mind those meanings held in the 'pool of meanings' created and shared by society. These words can be used to refer to things outside of the contexts in which they were created or learnt. This gives humans far more capability to share their thoughts than before. This is like the capability of the roots to find a water source. However, it is not possible for humans to communicate about everything they may find useful to communicate about in all possible contexts. This is like the limitation the roots meet when they cannot utilise a particular water source. This suggests, however, that there would be selection pressure on humans to find strategies or ways to further

enhance their system of communication and share information in any possible context. First, however, I should explain why this is not possible with words alone.

Firstly, words are limited to representing those meanings that are realised through the interactions of a social group, and therefore also the sort of things found in their usual environment. It is not possible for someone to share a thought about chickens through word-use if the social group has never come into contact with chickens. Thus, if a group member were to come across a chicken and wants to share this experience with a group member, he will lack the tools to express his experience in any clear way. Secondly, words alone are not very good at representing complex information or different activities. We do not experience a world of static things, but a world of activity, of things doing things to other things. If we want to communicate about this outside of the context in which they exist, then our communication system also needs to reflect this. Word-use alone may be capable of representing an object or thing, and even an action, but it is hard pressed to describe one thing doing some action to another thing.

A potential response to the second problem is the creation of 'holistic words'. This is the thought that any one word can represent a full action or piece of complex information. So, there would perhaps be a word for 'hold the duck', but also another word for 'hold the chicken' and another for 'drop the duck' and so on and so forth (this as opposed to separate words for duck, chicken, drop, and hold). With this, however, come cumbersome problems. Firstly, there would be far more words to create and learn than there would in the more segmented approach. This may become hugely difficult for memory and cognitive load, and becomes increasingly demanding with the introduction of each new word in a way that is not present in a more segmented approach. Secondly, it seems holistic words would be less ambiguous and therefore flexible in their use. It is hard to imagine that the word for 'hold the duck' could be used in as many different contexts as separate words for 'hold' and 'duck'. This sort of approach seems to detract from the advantages that ostensive-inferential communication gives us and therefore is an unlikely solution to the problem of representing activities and complex information.

If holistic word-use is off the table, then embracing a more segmented approach is the next logical step. That is simply to use more than one word to describe an activity or share complex information. This approach, however, is problematic for another reason. Where holistic-word-use prevents ambiguity and flexibility for word-use, multiple-word-use

comes with ambiguity that could make human communication counter-productive. In other words, the potential power to share more complex messages actually results in a power to make the system of communication less likely to be successful. I think Jackendoff explains this well:

> Concatenating more than two symbols multiplies the number of pragmatic possibilities. Much depends on the symbols in question. *'Bread cheese beer'* might well express *'I want bread, cheese, and beer'*; '*Bread cheese Fred'* is less obvious*, 'Bread Fred cheese'* even less so…*'Eat apple Fred'* and *'eat Fred apple*' might be used to convey exactly the same message. In this particular case there would be no problem, because of the pragmatics of the words involved. But in *'hit Fred tree'*, did Fred hit the tree or did the tree hit Fred? Though the larger context might tell us, the pragmatics of the words alone don't tell us (Jackendoff, 1999, p. 275).

The problem here is not the words and their connected meanings but the different communicative intentions a hearer *could* think an utterance points to, just in virtue of more than word being used. If speakers cannot get their hearers to easily come to the correct interpretation of their communicative act, then there is a problem. Humans, therefore, must opt for using multiple words only when they are sure that their hearers will correctly interpret their intentions associated with those words. They must be sure that 'Bill hit Bob' will not accidentally be interpreted as Bill hitting Bob when they are trying to explain that Fred hit Bill.

I should note that this is not an obvious issue when something in the immediate environment is there to help disambiguate the utterance, or, in Jackendoff's words, to reduce the number of 'pragmatic possibilities'. Understanding that the utterance means that Bill hit Bob can be helped by context. For example, in the presence of Bill hitting Bob, or in talking with those who have the mutual-knowledge about Bill's anger and tendency to hit things. In these scenarios, multiple-words continue to sustain the powers of word-use. It does not, however, help in situations where humans want to share such information but the immediate environment or mutual-knowledge does nothing for reducing the pragmatic possibilities.

It is here that multiple word-use meets a limitation. If 'Bill hit Bob' is uttered in a context without Bill, Bob, or mutual-knowledge about Bill's anger, then the utterance will either be misunderstood or ambiguous to the hearer. It is in these scenarios that multiple word-use is an unreliable form of communication that humans are more likely to opt out of using despite the power that words have to refer to things out of context. This reflects the trouble the plant roots have with being unable to obtain water, despite a power to find and access the water source.

The interpretation of multiple-words, therefore, remains heavily dependent on current context (in the form of the immediate environment and mutual knowledge). As with the plant roots, it would be extremely beneficial if word-use could get around this limitation and find a way to make further use of this power 'to make relevant what is not salient'. It is the very existence of such a power that introduces the selection pressure to make further use of it and do so to the fullest capacity. The process of evolution and natural selection, therefore, will certainly motivate and support the discovery of a new strategy that will fortify such a move. Thus, the rise of wonderful syntax.

3.4 Syntax in Communication

3.4.1 The Wonderful World of Syntax

My main point, so far, has been that word-use introduced the power to make relevant what is not salient in the current context of a communicative act. This brings whole new powers to human communication (see 4-6 in 3.3.1), but it also comes with limitations. Limitations, I argue, that introduce a selection pressure to relieve them. Above I show where word-use is badly equipped for a speaker to explain activity or complex information to a hearer. Unless the context the utterance is spoken in contains the sort of thing that will help fill in the gaps, it risks coming across as ambiguous and confusing to the hearer (for example: did Bill hit Bob, or did Bob hit Bill). Yet, if humans did have the ability to do this—that is the ability to share complex information in situations where such information is not salient—then this would further enhance their communicative capacities.

This reflects the story of the plant roots I introduced above. The equivalent to finding a new strategy for word-use is also the equivalent to the roots findingh a new way to absorb water. In the natural world, this can only be done through the process of natural

selection—that is, the process of variation and selection (see 2.1 for more). The day the plant produces an offspring with a genetic variation that has the power to better handle water absorption is also the day the roots start resolving the limitation that prevented it from securing the abundant water source deep in the ground. Likewise, in the story of word-use, some change or new strategy needs to be introduced that will allow a community of word-users to speak and understand more complex utterances in contexts were relevant information is absent.

The solution, the strategy we are already aware of because it is an essential part of natural language, is to bring some sort of order—a syntax—to multiple word-use. The set of rules that underdetermine the syntax has a role in reducing the ambiguities of multiple word-use and will ultimately provide a better system of communication over the use of structure-less 'word salads' I have been alluding to so far. Where word salads can only depend on the current context to help discern the correct interpretation of a speaker's utterance, a syntax gives word-use a whole other means of discerning the correct interpretation of an utterance. I argue that the primary function of syntax *is* to provide a means of communication that does not depend solely on context and responds to this selection pressure to continue the good work that word-use seems to have started. Ultimately, therefore, the primary function of syntax is to make relevant that which is not salient within a communicative discourse.

If we continue with the example that I introduced in the previous section, the introduction of syntax means that the utterances that involved the words 'Bob', 'Bill', and 'hit' can have different meanings depending on the order in which the words are uttered. A syntax, after all, suggests that words are connected to one another in a larger framework, and do not just operate as stand-alone meanings. 'Bill Bob hit', 'hit Bill Bob', 'Bob hit Bill', and 'Bill Bob hit' could all mean something different just by virtue of where one word turns up in comparison to another word.[31]

As an example, we can return to what we already know about syntax and the structure of sentences that was introduced in 1.3. Here we learnt that all sentences are made up

[31] In chapter 5 I will revisit the thought that syntax is not about word order, but about the distribution of words in a larger hierarchical structure. For now, at this early stage of language evolution I will remain talking about word orders.

of a subject and a predicate and that such a formula has power in helping to express activity or the description of something. If we take this as a rough framework to go by, we could suggest that the emergence of a 'subject first' rule helps to resolve the limitations of multiple-word-use. Under such a rule 'Bill Bob hit' would suggest that it was Bob who hit Bill. Where 'Bob Bill hit' suggests that Bob was the one who hit Bill.

Here, the word 'hit' in these examples is somewhat 'standalone' from the 'subject first rule' because one can imagine situations where it could be uttered anywhere in the 'sentence', but the hearer could still understand the speaker's meaning. This, however, starts to run into problems when a speaker may be trying to describe that both Bill and Bob got hit, or they were both doing the hitting. To clear up these ambiguities a larger system and more rules would be required—one that involves a syntactical difference between 'nouns' and 'verbs' for example. As more rules are introduced, however, more rules will be required, but this is something I will come back to in section 4.3.1.

My argument is that the process of natural selection will continually bring more and more order to word-use, slowly building them into the larger syntactical system we call natural language today. This is all motivated by the need for a speaker to bring to mind certain things for a hearer; or, more precisely, to make relevant, those more complex activities or sorts of information that cannot be brought to mind by any other means. To further show why it is this power that motivates the evolution of language, I want to push how particularly useful this is in situations of surprise or danger. These are the sorts of situations that are incredibly important to human survival. Thus, the human groups that *can* successfully communicate here are more likely to survive, thrive, and reproduce—and therefore have their communicative abilities passed down into future generations.

In human life, there will be a number of situations where ambiguous communication should be avoided. If there is a chance that a hearer would misunderstand a speaker, or simply become confused then this could be detrimental to the whole situation. One such situation is that which involves some sort of coordinated hunt. If hunters are running through a wood in order to hunt a type of monkey for food and one hunter sees that his partner—whose focus is elsewhere—is close to a tree that a monkey has run up, he can shout something to the effect of 'up the large elm tree behind you'. Such an utterance distinguishes one tree from the other nearby trees, and even indicates the monkey is up the tree, and not at the base of it. When this is successfully understood by the hearer

who is able to shoot the prey down it also contributes to a more successful hunt which also promotes the survival of the group.

This success is dependent on syntax, and how the utterance was constructed to make relevant what was not salient to the hearer. This fact could not be pointed out to him by non-linguistic means, because if the speaker did try to just get the hearer's attention and pointed towards the precise tree in this high pace situation (where the speaker may have also been running after another monkey) there is a high chance that this act would be too ambiguous to the hearer (as there are many trees in the direction the speaker was pointing). Further, if the speaker had used just words, they would probably have still failed to get the message across. The standalone words of 'large', 'elm', 'behind' may have been interpreted in a number of different ways: do they mean the large tree behind me or the large tree behind the elm tree; or do they mean the large elm tree behind me, or the tree behind the large elm?

Syntax, therefore, gains the form it has because of this function to make relevant to hearers what is not salient in their immediate environment or their mutual-knowledge. It also reflects what is helpful for humans to share with one another to ensure their survival. The structure is built in a way that can handle bringing to mind the active world humans live in—that can explain how one object interacts with another; and structures that can pick out a thing in a complex world—that can pick out a thing amongst similar other things. If the human environment was different, however, then I would also argue that syntax would take on quite a different design. In an alternative world, humans may have to think about a lot of things for their survival, but only need to communicate about a very narrow aspect of their experience—like how, where from and what predators are likely to show up and attack a group in the middle of the night. In this case, the syntax may only require a couple of rules to make these messages clear. Humans, however, are group-dependent creatures who will benefit from sharing many aspects of their experience, and not just which predators they will be attacked by. Thus, they need a syntax that can manage this.

I argue that the shape of syntax has been carved in such a way that is useful for human communication. It does the job of 'making relevant what is not salient' by taking on a certain shape or formula that is good at helping humans talk about things that it is useful for them to talk about. I have argued that sentence structure is good for representing an

activity or for describing things, especially when those activities and things do not exist in the current context. This means that the shape of syntax is dependent upon and formed by the human environment, and not upon the shape of human thought. This final point, however, brings me back to the discussion I opened this chapter with. Those who argue that syntax does reflect human thought also argue that the primary function of language is to (clearly and precisely!) express human thought (Pinker, 1994; Jackendoff, 2002). I will use the final section of this chapter to explain why this should be seen as a secondary function of syntax.

3.4.2 The Secondary Function of Syntax

The view that the primary function of syntax is to better and more precisely express our thought, as opposed to making relevant what is not salient, deserves special mention and discussion. This view reflects a more traditional approach to human thought, communication, and natural language. The sticky factor between this view and my view appears to be about *what* humans are communicating. *What* is it that they are giving more precision and expression to, or making relevant?

In the more traditional way of thinking about it, syntax gives humans a way to more clearly and precisely express the thoughts they already have. 'Bob hit Bill' and 'Up the elm tree behind you' reflects the precision and shape of the thought that a speaker can have, and what they also want to 'input' to the mind of the hearer. In my view, syntax gives humans a way to communicate about things that are useful to communicate about in their environment. The structures that allow for sentences like 'Bill hit Bob' and 'up the elm tree behind you' reflects a reality often found in the environment and are utilised so a speaker can bring their hearer to certain conclusions when they cannot depend on other forms of communication.

What is problematic for my approach is that it is not clear what might be going on with thought, and furthermore with sentence meaning. 'Sentence' here simply refers to an utterance which is underpinned by a syntax (and thus to any stage in the process of syntax evolution). In 1.3 and 3.3.1 I explained that word-meaning is created by a social group, but entrenched in the human mind as a representation that can be called upon during communicative discourse, but does this mean that a sentence in language is the same as a sentence in thought and vice versa? And how does this work on a picture where

linguistic communication is about 'acting in evidence' towards speaker intention, rather than the thought itself. I will use this section to clear up these confusions.

3.4.2.1 No selection pressure for expressing thoughts

First, I want to be clear why syntax was not designed for the clear expression of thoughts. This is because, as far as I understand the evolutionary process in the larger picture of human communication, there is no selection pressure for this in the first place. As I explained in 3.1 pre-linguistic human communication was already well-equipped for humans to share the thoughts they have. All they needed to do was use some communicative action to make relevant to their hearer what they wanted to share, and their mutual-knowledge would do the rest of the work. In this way, a speaker is able to 'input' even their most complex thoughts into the head of a hearer through something as simple as a nod. Under this understanding there are no further selection pressures for a strategy to clearly and precisely express thoughts—humans were already very good at this.

If a parent wanted to show their child how to fish, there is no better way to 'input' this complex information into their head than taking them out to the water edge with a fishing rod and showing them how to do it. This is better than trying to explain it indirectly by the campfire where the child cannot even observe the techniques the parent is talking about. Such an example exposes there is nothing extra which language brings to human communication in terms of expression and precision. In other words, if humans lived in the sort of environment where they could always use this direct kind of communication to share and express their thoughts, then I would argue that linguistic syntax would not emerge and evolve[32]. This is simply because there is no need and no selection pressure for it.

This, however, is not the environment that humans live in. There will often be situations where humans simply cannot share their thoughts by pointing and panto alone. Those who argue that syntax exists to clearly express thoughts would have to argue that language is doing this in a fashion that pointing and panto cannot. Suggesting such a

[32] I am open to the argument that word-use would emerge in this context, but words would have a different primary function – see 3.3.1.

selection pressure is perhaps not so problematic—it could be that the primary function of syntax is somehow similar to the primary function of words in that it makes human communication more efficient (see 3.3.1), but this would require an exploration of the relationship between language and thought. As I have mentioned before there are two ways to approach this factor about human language, and therefore two responses.

3.4.2.2 Thought and Language

In section 1.3 I explained that I understand that word-meaning is attached to a 'representation' in the human mind, but that this could come in one of two forms. Either as a pattern in a neural network, as proposed by the connectionist theory of mind; or as a concept in a language of thought. I will show where the argument that the primary function of syntax is to clearly and more precisely express thought has problems with both of these views.

First, the connectionist theory. There lies the question about what thoughts one is trying to express in the first place. Here, the forming of patterns in a neural network that is to become the representation for a word-meaning is wholly dependent upon the movements of society—this surely also becomes part of human thought. On this approach syntax (as underpinned by the FL), adapts to this architecture of mind and somehow 'funnels' the patterns that make up word-meanings into structures that form sentences. If this is the case for the human mind it would be extremely hard to argue that syntax evolved to better express human thought, because it is not at all clear here what thought there is to express. If the units of thought are dependent upon the movements of society, then there is a question of how we are able to form full thoughts (or thoughts that are made up of several units) without some deeper sort of structure. In fact, the evolved FL seems to be the thing that brings this structure, and therefore hugely impacts the way humans will also think. The power to clearly and precisely express thought does not make much sense as a primary function here, as there is yet to be much in the way of thought to clearly express. This seems to depend on language existing first. This power, however, could be a secondary function of language because as language builds thought it can subsequently also be used to express it. This power, however, cannot explain why language exists in the first place on this model of mind.

On this view, one would claim that language comes before thought. This is quite a controversial claim to make, especially in the field of cognitive science where this

research on thought and syntax come from (Camp, 2009; Margolis and Laurence, 2019). The view of language evolution I have been establishing, however, may fit quite nicely with this claim. If syntax has evolved to make relevant what is not salient, or to reflect the state of the human environment then it looks like the human mind *is* evolving to becoming the sort of mind that helps ensure the survival of humans as socially designed animals, and not as standalone thinkers. Such a claim, however, needs far more research and unfortunately, goes outside the scope of this thesis. It would be worthwhile pointing out, however, that the idea is not original, and there is now a lot of research that looks into the idea that human thought is a reaction to the needs and selective pressure formed by human sociality (Haidt, 2013; Mercier and Sperber, 2017), I just suggest that natural language syntax might have something to add to this.

This brings me to explore this point from the second way of understanding word-meaning and human thought: that a word-sound is linked to a representation or concept in a pre-existing language of thought. On this view of mind, it makes far more sense to argue that the primary function of syntax is to clearly and precisely express thought because there are sophisticated thoughts to express! Syntax simply evolves to better reflect these thoughts, and with an angle towards communicating them rather than thinking them (Pinker, 1994; Jackendoff, 2002). My first response to this view, however, is to seriously question how and why the LOT came to gain the shape it did before natural language came onto the scene. This is bizarre because LOT must have its own syntax that is separate from that of natural language (Collins, 2004) but evolved for a different reason. This is a question that also takes us beyond the scope of the thesis. Instead, I will continue my criticism assuming a LOT is established before natural language[33].

My second response is to review how the ability to express one's thoughts more clearly would have come about through the process of natural selection and gradual evolution. Unless the syntax of LOT and the syntax of natural language are simply the same thing, then evolutionary time is required to create the syntax—the FL—that dictates the structures of natural language. Apart from the creation of words, what is the first move? Surely, it is for a linguistic utterance to better reflect the thoughts of the speaker. It could

[33] The 'language of thought' I have in mind here is the 'semantic composition' sort (Jackendoff, 2002; Pinker, 2005), and not the 'mad dog nativism' sort of Jerry Fodor (Fodor, 1975) .

be that the 'subject first' rule does this well in this early stage, and thus is selected *because* it helps the speaker to express what he is thinking to the hearer. Subsequently, the subject first rule can also be used 'to make relevant what is not salient', but this will be a secondary function (it is a case of function following form and does not explain the selection of the subject first rule).

The question that comes to my mind here, however, is: what if the subject-first rule ends up being the sort of rule that causes issues in communication? It may be that it comes across as ambiguous in some contexts, or often leads a hearer to an incorrect conclusion. My worry is that a rule naturally selected for the expression of thought in communication could also be detrimental for communication overall, but it could still be 'functional' because it clearly expresses a speaker's thoughts in a communicative act. This seems wrong because it is more important for syntactical rules to be geared towards successful communication in the first place than towards the expression of thought.

If we relate this argument back to my view (where syntax is selected on the basis of 'making relevant what is not salient') and suggest that subject first rule is at risk of causing an issue in communication, then it is simply the case that the rule will not be selected. This is because it will fail in the job to make relevant what is not salient. My argument is not that syntax does or does not reflect or express human thought, but merely that there is a matter of priority when it comes to human communication and language. It is more important for human survival that we are able to communicate and cooperate at all, rather than worry over the content of what they are communicating about. It is, therefore, more important that language reflects and deals with the challenges of communicating in the external environment of human social life, rather than the challenges of expressing the internal environment of the human mind. 'To make relevant what is not salient' deals with communication in this manner because it interacts directly with human acts of communication overall, and not just with what is in the head.

A counter to this argument is to point out, that no matter how you spin it, linguistic syntax is a source of ambiguity. Sentences, when inferred alone or out of context, often have multiple meanings and sometimes they are not much better within context. 'The dog chased the cat with the fish', for example, can either mean the dog was chasing a cat that had a fish, or that the dog was using a fish to chase the cat. This highlights that no matter one's arguments with regards to the function of syntax, there is a need to explain the

existence of ambiguity in language. If it is a problem for the approach that language is about expressing thoughts, then it is also a problem for the approach that language is about making relevant what is not salient. My response to this, however, is to again realise that language evolves in interaction with a form of communication which is primarily contextual in nature, therefore, even though the syntax may evolve to help humans communicate in new contexts (by giving them the power to make relevant what is not salient), context and other pragmatic factors remain hugely important factors in understanding the meaning behind a linguistic utterance—so much so that they will disambiguate ambiguities caused by syntax. Therefore, syntax is built with this power to disambiguate pragmatically as part of the package. Unfortunately, I do not have the experimental means to go and test this in the real world, but if I could we could test this by picking out sentences that are ambiguous when they stand alone seeing how often they are ambiguous when actually used in context. I suspect we would find that language-use is rarely ambiguous when in use (Piantadosi, Tily and Gibson, 2012). I also make a similar point to this in response to the 'counterfunctionality problem' in section 2.4.

That being said, it is not to say that what is in the head or in LOT does not influence the design of natural language syntax. It is just that natural syntax is not doing the job of communication alone, there are many other factors at play (see 3.2.1, 'The Relevance Theory'). This brings me to my third response, and that is to remind my reader about the bigger picture of human communication. If it is right to say that when communicating, an individual is attempting to 'input' their thought into the head of another, then this is not achieved by language alone, but by the ostensive-inferential nature of human communication overall. Language merely helps point towards the sort of thought the speaker wishes to 'input' in the hearer. On the understanding of language I have been trying to put forward this means that a sentence in natural language *cannot* directly represent a thought in LOT. Contextual aspects will always be required to fill in the gaps or make the thought complete. This is a direct challenge to the view that natural language syntax is selected to clearly and precise express thought, because, as it turns out, language cannot do this alone. Instead, I argue, natural language syntax only works to express thoughts in situations where forms of pre-linguistic communication (pointing and panto, and standalone words) fail to do so, which is subsequently the function of 'making relevant what is not salient'. In this LOT-based approach to mind, I would argue natural language syntax is designed with the expression of LOT as part of the package (because

this will have something to do with what humans want to communicate), but it is certainly not the exclusive goal of it.

Following these three responses I, therefore, argue that expressing our thoughts precisely and clearly is a secondary function of syntax. It does not explain why syntax has the form it does (for this also includes factoring the overall nature of human communication and the environment it is taking place in), but it is certainly something we can use it for. It is even possible for me to say things like 'I think that...', 'I feel that....' and 'I believe that...' and explain things in depths that may never be possible through other forms of communication. This power, however, is one that follows a pre-established form and is, therefore, only possible because of the form, and not responsible for it. It is the power 'to make relevant what is not salient', however, that is responsible for the form of syntax, and therefore reflects the primary function of language.

To conclude this chapter, I remind my reader that the main argument of this thesis is to show how linguistic syntax improves or enhances human communication This, however, required that I take a deeper look at human communication and the powers that language brings to it. I have argued that the power to 'make relevant what is not salient' is the primary function of language. Where word-use initiates a new paradigm for human communication, language enhances it by dealing with the limitations and risks. Here, I have given an argument as to *why* syntax emerges in the system of human communication. In the next chapter I intend to explore *how* syntax emerges. If we take seriously the insight that I have carved out here I can show how this primary function is implicated in the larger picture of human evolution.

Chapter 4 – Evolution

4.1 Human Evolution

4.1.1 The Stages of Language Evolution

In chapter 3 I explored the primary function of language—that is *why* it emerged—and claimed that it was to 'make relevant what is not salient' in communicative discourse. In this chapter, I aim to explore *how,* following this claim, the emergence and evolution of language took place. As a point of terminology, the use of 'language' in this chapter will often refer to it as supported by the faculty of language or 'FL' as I describe it in chapters 1 and 2. As I hope to have made clear in the previous chapter, language has evolved for communicative reasons, but this requires understanding both the nature of linguistic communication and the nature of human communication in general. This is because I argue that the emergence of language is motivated by a form of communication that pre-exists language (that is human communication that works on an ostensive-inferential model – see 2.2.2). This story of language, then, is ultimately tied up in all the things that also made this more general form of communication possible. This is implicated in not just communicating thoughts and information, but also in human interaction and social life, which is also ultimately tied up in human culture.

In chapter 1 I explained that humans are unique creatures not just because they use language, but also because they are 'cultural creatures' that rely heavily on cultural strategies for their survival. Cultural strategies that are devised and passed on through an ability to interact and understand one another due to an capability to see each other as intentional beings or to 'mind-guess' (see 2.3.2)—an ability that also underpins the basis of human communication. On this picture, the evolution of language is implicated in the evolution of human communication and interaction. The story of language evolution, therefore, is also the story of the 'cultural creature', and a story of human evolution in general.

This chapter has the task of attempting to break down the events and processes that turned us from the non-cultural to the cultural; from the non-linguistic to the linguistic; the non-human to the human; and, ultimately, to the 'hybrid creatures' I argue we are in 1.3. To explain how I envision this process I have provided a table which lists the important stages that took us through this evolutionary journey (see table 1). It highlights

the order in which these stages came and the selection pressures and processes I theorise that brought them about. I will go through the stages of the table in more detail throughout the course of this chapter.

TABLE 1 - HUMAN EVOLUTION

Stage	Thing emerged	Underlying Mechanism	Selective Pressure
1	Group living	E.g. Tolerance of others	E.g. Safety in numbers
2	Mind-guessing	Social cognitive mechanisms for group maintenance	Social living and cheating detection
3	Social Conventions and Culture	Social cognition for cooperation	Social Interaction
4	Word-use (preceded by pointing and panto)	Social interaction/social cognition	Sharing information that is salient
5	Language	Faculty of Language	Sharing information that is not salient

A big message to take away from the stages presented in the table is that although I argue language is underpinned by the FL the process of humans becoming linguistic creatures ultimately depends upon them becoming cultural creatures first and that becoming linguistic creatures is part and parcel of becoming better cultural creatures.

To give the full picture on language evolution I will tell the story of evolution in the fullest way possible. I will start by explaining how biological and cultural evolution are ultimately intertwined in a process known as 'gene-cultural evolution'. This will involve revisiting natural selection and selection pressures in order to explain the more complex 'co-evolutionary' processes found throughout the natural world, and especially in human evolution. I will then explore the evolution of group living and the challenges that accompany it. I will then explain how this made space for the evolution of communication and culture which ultimately paved the way for the evolution of language.

4.1.2 Co-Evolution and Selection Pressures

In chapter 2 I explained how it is that biological evolution, through a process of genetic variation and selection, produces all living things in the natural world. Biological traits

come about due to selection pressures that 'select' the phenotypes that are more prone to survive, thrive, and, most importantly, reproduce in whatever environment they happen to be born into. Certain forms are selected because they contribute toward these goals. Here, the function or power that is selected for is also the primary function of that form and a secondary function is any other functions that a form can carry out.

What I did not discuss in much detail, however, was *what* can influence the processes of natural selection. That is, what elements in the environment can have an active role in the selection of the genetic variations of a phenotype. As it turns out, this can be an extremely complicated story as it is entirely possible for cultural elements to influence the selection of genetic variations, and for biological elements to influence the process of the selection of cultural variations. Before I discuss this 'gene-culture co-evolution', however, it is worth briefly exploring co-evolution in general. 'Co-evolution' takes place when the evolutionary processes of one thing impacts or changes the environment of another thing. This impact affects the selection pressures that impact on the second thing and therefore also has an effect on the form that is naturally selected for.

Species Co-Evolution

The most obvious form of co-evolution is co-evolution of species where the form of one species exerts a selection pressure that affects the form of another and vice versa. The relationship between insects and flowering plants is often referenced, as the plant depends upon the insect for pollination and reproduction, and insects depend upon their flowers for food in the form of nectar (Darwin, 1859). Since plants are under a pressure to attract insects and insects are under a pressure to access the nectar made available by the flowers a change in one is sure to effect a change in the other. For example, a flower that is shallow is more likely to be selected because an insect can reach its nectar by just purchasing on it. On the other hand, a deeper flower exerts a selection pressure on the insect to find a way to reach the nectar, which is why we find insects with long tongues or noses (such as butterflies or the hummingbird hawkmoth). Species co-evolution is known for explaining such mutualistic relationships, but it also explains the more aggressive nature of the predator-prey relationship. As prey are naturally selected to escape their predators (as those who avoid escape are the ones that survive), so there is a selection pressure on the predator to up their game, and so on and so forth.

Niche Construction

Where it is possible for a species to effect a pressure upon another species, it is also possible for a species to effect a pressure upon itself. Where the state of a flower can impact the environment and selection pressures of an insect, the state of a creature's own state or behaviour can also have an impact on its own environment and selection pressures. The beaver, or any other creature which creates its own home, provides a good example of this. Beavers build dams of mud and wood to slow down the flow of water and provide a safe nest for their young, but this ability is the product of natural selection and must have only come about due to a selection pressure for dam building. This form of 'co-evolution' is known as 'niche construction' and is where the behaviours and activities of a creature enact changes on the very environment in which natural selection will take place.

It is unrealistic to suggest that the dam building behaviour of the beaver (which I will assume is entirely innate) was the result of a single genetic mutation. It is far more likely it came about through several genetic variances over the course of many generations, as shaped by the process of natural selection (see 2.1.4 for more on gradual change). However, for something like this to happen the selection pressure for dam building had to be in place. In other words, the beaver and its future generations were far more likely to survive, thrive, and reproduce in this environment if they could build dams. This implies, however, that some basis of dam building existed first (perhaps as a disposition for just manipulating mud and wood)[34]. In other words, without an initial disposition for manipulating mud and wood, there would be no selection pressure for dam-building. What this tells us is that it is the beaver's own behaviour and interaction with its environment—which is part of its genetic makeup—that caused the selection pressure for dam building.

The selection pressure determined by the beavers environment is determined by the beaver's behaviour, which is determined by the beaver's genetic makeup. Therefore, the

[34] How dam building came about in the first place – e.g. the first genetic variation for manipulating mud and wood – is not a question I am concerned about here. However, I would remind my reader that the initial emergence of some behaviour or trait is down to a random genetic variation that has yet to go through a selection process, and therefore has yet to gain a primary function (see 2.2). In a sense, it does not need an explanatory story as long as it is possible for our genetic makeup and any variation of that makeup to make it so.

beaver, as a species, has a sort of co-evolutionary relationship with itself—between its interaction with the environment and its own biological evolution. Beavers and other such creatures, in a way, become masters of their own evolutionary destinies as they seem to create their own 'niches' within the larger environments in which they live. What I hope to have shown here is that natural selection is far more complex than the process I introduced in chapter 2, but also that understanding the basics of co-evolution will help us understand the process of human evolution, which (for my theory at least) includes language evolution.

Gene-Culture Co-Evolution

With these evolutionary processes in mind, I can introduce the process of gene-culture co-evolution. I will start by recognising a huge difference between a beaver home and a human home. The beaver's dam only improves at the rate in which the beaver's biology changes, but a human's home can improve at the rate in which culture—that is what is *learnt* from others—can change. Cultural change and accumulation happen at a far quicker rate than biological change. Human behaviour can, therefore, change more rapidly and respond more quickly to problems in the environment than to other animals who only have their genetic inheritance as their means of meeting selection pressures[35]. The theory of gene-culture co-evolution appreciates a unique relationship between these two types of inheritance that humans can depend on: that which we gain from our genetic heritage, *and* that which we gain from our cultural heritage.

Like the beaver's dam, that which is culturally inherited has an impact on the state of the environment in which humans find themselves. This could involve anything from hunting strategies to farming methods. Since this has an impact on the environment, it also has an impact on the selection pressures within that environment; which changes and impacts on the selection pressures imposed on human biology. In other words, human culture has a role in the natural selection of human biology. Evidence shows this evolutionary process has had an impact on the human phenotype as it can explain some of the genetic differences found throughout different cultures, and the rate at which genetic change has taken place through the history of the human phenotype.

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[35] See 2.3.1 for learning abilities in other animals, and the differences between 'thin' and 'thick' culture that explain why only humans are subject to cultural evolution.

The cultural choice of farming method, for example, can influence biological evolution. The human groups that came to depend on dairy farming for food, for example, have adapted for better lactose absorption than those cultures that did not. Human groups that came to depend on farming practices that introduced more still water in their environment, and therefore more mosquitos, have adapted to be more resistant to malaria. These changes happen because those phenotypes that had genetic mutations that dealt better with these farming methods were more likely to resist disease and intolerance problems and therefore more likely to survive, thrive and pass on their genes than those that did not (Durham, 1991; Laland, 2008).

Furthermore, it seems in recent evolutionary history humans have gone through a more rapid biological change than what would normally be expected:

> Homo sapiens have undoubtedly undergone strong recent selection for many different phenotypes…Given that most of these selective events likely occurred in the last 10,000–40,000 years…it is tempting to speculate *that gene–culture interactions directly or indirectly shaped our genomic architecture*' (Wang *et al.*, 2006, p. 140; italics from Laland, 2008, p. 3578).

Our biology is adapting to rapid changes to our environment, which is not the case for other animals who lack culture.

The human phenotype, therefore, is not only the product of both biological and cultural evolution but a product of a co-evolution between both processes. The protein for lactose-tolerance would have not been selected for if it weren't for the innovation of dairy farming in the first place. Furthermore, this allows a sort of gene-culture accumulation that reflects the ratchet effect I explored in chapter 2.1.4. The greater dependence on the use of dairy or of still water in farming would allow further development and exploration of those farming methods, and this would not have been possible if it weren't for the genetic change. It is therefore entirely possible for cultural innovation and genetic change to be deeply intertwined with one another. A change in one affects and inspires a change in another and so on and so forth. This is demonstrated in the diagram below (Laland, 2008, p. 3578):

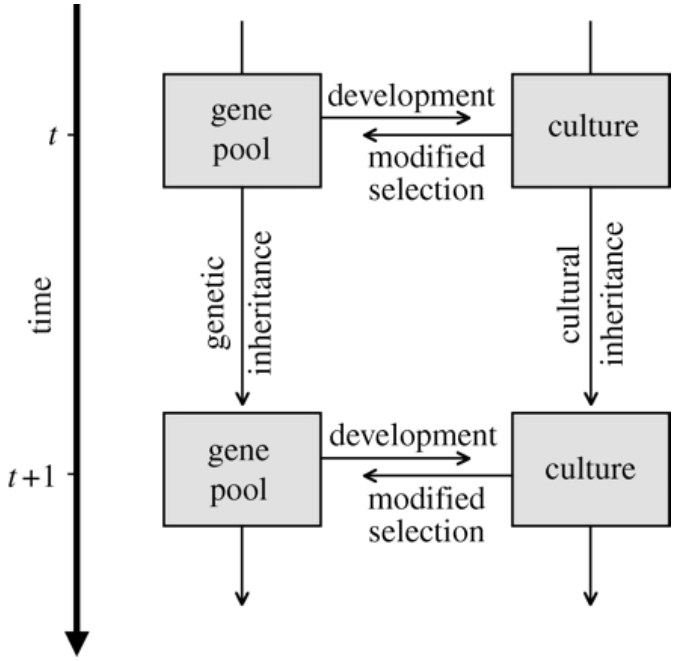

FIGURE 8 - GENE-CULTURE CO-EVOLUTION

This section should expose the potential outcomes of a co-evolutionary relationship between biology and culture that will help inform the upcoming discussions on the emergence of culture and language.

4. 2 The Evolution of the Cultural Creature

4.2.1 The Emergence of Group Living

In 1.2.1 and 2.3 I go into detail about what a cultural creature is, here I intend to explain how humans evolved into one. In 1.2.1 I also briefly introduced the importance of group living. Under this view, understanding the dynamics and challenges that come with group living was key to also understanding the emergence and primary function of language and other cultural phenomena. It was pointed out that group living was a strategy that many of our ancestors and cousins also employed to ensure their survival in the environments they lived in. A popular theory is that coexisting in larger groups provided protection against predators, and better protection for the vulnerable young (Dunbar, 2014).

What is interesting about group living is that it requires some degree of cooperation between group members (Sterelny, 2012). This could be as simple as just tolerating the others being near you; to actively protecting or looking after the young of others (e.g. redwing blackbirds); to sharing workloads in the form of hunting or childcare (e.g. Wolves

and African hunting dogs). The challenge that lies at the centre of every group living situation is the 'freeloading problem' which I have already explored in 2.2.2 as a problem for a communicative account of FL (to which there is a response in 2.4.1).

As a reminder, the freeloading problem is that, unless certain conditions are met, a group of sharers is readily invaded and predominated by cheaters. In other words, if any one member of a group is willing to invade space, not care for the young of others, or not take on any of the workload, then that one individual risks destroying the 'agreements' that maintain group living (Dawkins and Krebs, 1978). Group living, however, is common enough in our world to show that many animals have managed to get around this problem and demonstrates that various forms of cooperation are indeed ESS (an evolutionary stable strategy). For this to be the case there is either a very secure balance within the group living situation; the pay-off for any freeloading is not worth it; or the payoff for freeloading is not costly enough to completely unbalance the status quo put in place by cooperation.

This discussion is particularly important and interesting in exploring group living in humans as, apart from language, human group living may also be another anomaly in the animal kingdom (see 1.21). Our group dependencies and ties far overshadow the ties found in other social creatures that do not even come close to matching this apparently altruistic nature. Humans are willing to trust both kin and non-kin and will also go to great lengths to protect the old and injured. Such group living is unique in humans and so it shares a feature with language. In a paper that compares human cooperation with that of our closest cousins, the chimps, Tomasello aptly points out:

> In general, it is almost unimaginable that two chimpanzees might spontaneously do something as simple as carry something together or help each other make a tool, that is, do something with a commitment to do it together and to help each other with their role if needed (Tomasello *et al.*, 2005, p. 685).

Why humans evolved to become so vastly different to chimpanzees in their approach to group interactions remains a matter of debate that I will not visit in detail, but a general review of the literature shows two possible reasons for this. Human evolution either found itself in a game of 'tit for tat' (Trivers, 1971) or we evolved to become especially friendly (Tomasello *et al.*, 2005; Tomasello, 2014). I will explore both options here but

ultimately adhere to the 'tit for tat' view, that I will use to springboard into the further discussion of the later stages of language evolution.

What seems essential for the development of these cooperative relationships is a 'reciprocal altruism' or 'tit for tat' situation where the act of helping another at the cost of their own resources evolves because it is beneficial to do so (Trivers, 1971). It is, however, in the expectation that the one helped will respond in kind. The creature that tolerates the space of another does so as long as other creatures will tolerate their space also—as a result the risk of sharing space with another is overall beneficial because they are less likely to be attacked by a predator. The expectation is managed by strategical decision-making as modelled by game theory and often demonstrated by the prisoner 'sdilemma (Maynard Smith, 1982). This means that to cheat in this situation will be at a disadvantage to the cheater, as well as the one cheated. If one creature decides that they will invade the space of another, or not protect another's offspring, then they will ultimately lose out on those benefits to others as well. The environment in which these cooperative or co-dependent ties emerge will also be the environment in which going it alone is risky. Therefore, it is not worth breaking these rules.

On the other hand, Tomasello argues that human cooperation is down to a *want or motivation* to help each other that is the important factor in the human ability to interact:

> [A]lthough apes know that others have goals and perceptions, they have little desire to share them. They can interact with other triadically around objects, but they do not engage with others in shared endeavours with shared goals and experiences (Tomasello *et al.*, 2005, p. 685).

In general, almost all thinkers who are interested in human and animal interaction argue that social cognition and mind-guessing is essential for explaining the underlying nature of human cooperation (see 2.3.2). Tomasello's thought, however, is that just understanding that the other has a mind is not enough to fully explain human behaviour. It is not a lack of social cognition that prevents chimps from helping each other[36], but a Machiavellian attitude toward group living. In other words, the reason why humans can

[36] Note that several studies demonstrate the social cognitive abilities of chimps are on par with that of humans (Tomasello *et al.*, 2005).

cooperate at the degree they do and chimps do not, is because human nature is just nicer, friendlier, or more trusting than chimp nature. They have the power to manipulate others toward certain goals, but they are also *willing* to help others achieve their own goals too. From an ESS viewpoint some human behaviours seem problematic because of a willingness to sacrifice their time, energy, and even life for the benefit of another. This flies in the face of the freeloading problem, and so an exceptional evolutionary story about human altruism may be necessary to describe human behaviour (Dunbar, 2014; Tomasello, 2014). Unfortunately, however, I do not have the space or time to explore this potential aspect of human nature with the detail it deserves.

Although the discussion concerning altruism is important for the overall question regarding the evolution of humankind and therefore will intersect with the question of language evolution, we can approach the debate in a way with a basic assumption that allows us to put it to one side. What is important at this point is to simply show that human interaction has a way to manage freeloading and cheating—and therefore maintain an ESS—even when they are sharing cheap and potentially false information with one another through language-use.

For this, we can simply hold that humans are at least 'mutualistic' in their behaviour and interactions towards one another. Mutualism is '*where [cooperative] activity is beneficial to all participants*' (Reboul, 2017, p. 169). Mutualism, after all, is the very definition of 'reciprocal altruism' described where a beneficial and on-going agreement of 'I will scratch your back if you scratch mine' is enough to keep freeloaders at bay. The thought here is that a 'tit for tat' approach to group living, social interaction, and communication is also enough to explain how humans became 'hybrid creatures' that use language in communication without the freeloading problem getting in the way. In other words, language-use in communicative discourse is unlikely to be overrun by another more useful evolutionary strategy, or by a strategy where humans become the kind of creature who always use language to cheat. I also make a similar point in 1.3.1,

and how and why this is the case will become clear as we go through this chapter. What is central to human group living, cooperation, and human communication, however, is the emergence of 'social cognition' (see 2.3.2 for a description of social cognition). Under my view of language evolution, it is the emergence of this internal mechanism that is the

real starting point of the story because it also leads to the emergence of human communication and culture.

4.2.2 The Emergence of Social Cognition

It is evident that social cognition is central to explaining the cooperative and social behaviour of humans, as well as their ability to use language in communication. Up until now, we have explored its role in both these behaviours (see chapter 1.2.1 for social interaction and 3.2.1 for language), but we have yet to consider its primary function (see chapter 2.1 for definition) and initial emergence. Following the discussion of group living, reciprocal altruism, and mutualism it should come as no surprise that this ability to 'read or guess the minds of others' reflects a selection pressure that would exist in an environment that must be shared with peers.

Like everything else in language, communication, and human evolution, the evolution of social cognition is a complex story with its own field of research. What I give here is a simplified story with the goal of providing the essential stepping stones between the emergence of group living and the emergence of language—as represented by 'stage 2' on the table above. Here, I follow the insight from Sperber's paper on 'Metarepresention in an Evolutionary Perspective' (2000)[37].

As a reminder, I introduced social cognition in section 2.3.2 and I explored the 'levels of intentionality' needed for the sort of social interaction that we observed in comic 5 (also copied here as figure 9). Cooperation or communication was only possible when Mike recognised that Jen was aware of his thoughts about her being aware of his thoughts—this is 'third-order intentionality'. In other words, Mike believes that Jen believes that he believed that x. Therefore, another way to think about social cognition is as the ability to represent representations and to represent representations of representations, or more simply to 'metarepresent' (Sperber, 2000). Here, 'representation' refers to something like a mental state like 'I desire food' or 'I know where the best hunting ground is'. To metarepresent is to have a mental state about your own mental states like in 'I believe I

[37] Dan Sperber is also a lead researcher in the development of relevance theory I introduced in chapter 3.2.1.

desire ice-cream', or to have a mental state about another's mental state like in 'I believe that they desire food'.

FIGURE 9 - COMIC 5

Sperber's claim is that metarepresentation evolved as a response to selective pressures caused by group living. The ability to metarepresent would help us better function in a world where our survival and wellbeing is often affected by other minds that have their own desires and intentions. The primary function of social cognition—the ability to metarepresent—is to help us deal with these risks.

> The ability to interpret the behavior of intelligent conspecifics not just as bodily movement but as action guided by beliefs and desires gives one a much-enhanced predictive power. Predicting the behavior of others helps to protect oneself from them, to compete successfully with them, to exploit them, or to co-operate more profitably with them. A metarepresentational ability is a plausible adaptation quite independently of communication. (Sperber, 2000, p. 123).

Social cognition is an adaption that helps the individual predict the behaviour of others because it is a good strategy to protect oneself. If a mother sees that her offspring is near a dominant male who is not behaving as he usually does she can predict that his intention might mean danger for her child—'I believe that he believes something is wrong'—and therefore act to take the child to a safer place. This need to predict the behaviours of others, however, only explains the initial emergence of mind-guessing and gets us to 'second-order' intentionality. To get to the essential 'third-order intentionality' needed for human communication we need further explanation.

The ability to predict the mental statse of others has further power to manipulate others toward actions for one's own benefit. An individual could exploit another by causing him to leave his food by fooling him into thinking they are danger—*I believe that George*

believes that he cannot win a fight for his food—and therefore get a free snack for just putting on a show of intimidation. This, however, is not an ESS that is likely to stick around as to be manipulated in this way is maladaptive for the victim. If it is possible for members of the group to be manipulated and cheated out of food, space, or energy then we have a freeloading problem that needs to be replaced with another, more stable, evolutionary strategy.

What sort of strategy could one use to protect themselves from the dishonest behaviour of another? Well, it would help if they could read the manipulator's attempt at manipulating their mind—*I believe that Fred believes that I believe that I cannot win a fight for my food*—and therefore detect and protect against potential manipulation. When Fred puts on the display of aggression George, who sees Fred is trying to manipulate him (this is third order intentionality because George can have thoughts about Fred's thoughts *about his thoughts*, and not just about Fred's thoughts), can now decide it is worth holding his ground as there might not be a fight. This response means Fred must give up his attempt at manipulation (that is give up his attempt at freeloading), and either spend his energy actually fighting George or find another food source.

What we have here is a sort of co-evolutionary process that reflects a construction niche (see 4.1.2). The state of the human mind has an impact on the environment in the form of manipulating others, which also introduced a selection pressure to avoid manipulation. The response to the selection pressure was to select for phenotypes that could 'up' the mind-reading game to the next level, giving them the ability to detect and therefore avoid manipulation. The thought is that the powers of mindreading crossed with the risk of manipulation triggered a sort of feedback loop or co-evolution between manipulation and detection of manipulation. This brought about the emergence of social cognition that allowed for mindreading or metarepresentation at a third-level of intentionality.

The advantage of third-level intentionality is that everyone can read everyone else's mind trying to read their mind. What is important to recognise is that the process of natural selection will ensure all members of a group are equally good mind-guessers and maintain a status-quo whenever possible so that cheating remains difficult to achieve. If more levels of intentionality did evolve and manipulation was possible again, then natural selection would respond with the suitable manipulation detecting strategy on the next level of intentionality.

This evolution through the levels of intentionality of social cognition puts a group of mind-guessers in an interesting situation. From the third-level of intentionality they will find it hard to manipulate each other for exploitive gain, however, there is a possibility they could manipulate each other for a mutualistic gain. For it is at the stage that that 'connection' for communication or mutual-cooperation is also possible (as represented in figure 9). Sperber puts it this way:

> Moreover, a well-developed metarepresentational ability makes certain forms of communication possible quite independently from any code or language. Organisms with metarepresentational abilities live in a world where there are not only physical facts but also mental facts. An individual may form beliefs or desires by emulating those it attributes to another individual. An individual may want to modify the beliefs and desires of others. It may want others to become aware of its beliefs and desires and to emulate these (Sperber, 2000, p. 123).

In other words, a manipulator could manipulate the mind of another, let's say, by alerting it to a poisonous snake whilst in the forest. This 'manipulation' is advantageous to both minds because the manipulated avoids getting bitten, and the manipulator continues to have the protection of moving through a dangerous place as a pair (at least where travelling solo is more dangerous). If reciprocal altruism is maintained, then so is the possibility of this mutual form of manipulation—this *is* cooperation. Notice also, that we are describing the beginnings of ostensive-inferential communication (see 3.2.1) because the act relies upon the manipulated inferring the intention or meaning of the manipulator and not just the meaning of the act itself. The manipulator points out the snake with the awareness that they share mutual-knowledge about it being poisonous. This brings us onto the next stepping stone and stage 3 in the evolution of language: the emergence of culture.

4.2.3 The Emergence of Culture

Social cognition gave humans the power to manipulate and detect manipulation in group situations, but it also opened the doors for humans to cooperate and communicate. Upholding these traits, however, would require the further overcoming of the freeloading problem. This time there is a challenge to maintaining reciprocal altruism in acts that involve group members working together in cooperative behaviour and not merely sharing the same space. If cooperation were to become an established part of group

living, humans had to somehow guarantee that everyone would willingly invest and benefit from such behaviour, and that freeloaders were not tempted to take advantage of the cooperative willingness of others.

If we assume that social cognition is the very basis on which humans could start to create social conventions and knowledge transmission (see chapter 2.3), then I believe there is a clever story to tell that explains how we evolved from creatures who could use cooperation to the full-blown cultural creatures I introduce in 1.2.1 (this is stage 3 in the table above). There are, of course, other important cognitive mechanisms such as memory and learning that are also important for this story, but I will set these aside for the time being, and later I will also explain how I think the FL is also an important aspect. The point is that cooperation, as underpinned by social cognitive mechanisms, opened a door that had great potential to promote human survival, one that triggered a co-evolutionary relationship between human cooperative behaviour, the human environment, and human biology that ultimately built a kind of construction niche that kick started the existence of what would become cultural heritage in humans.

The basic thought is that human cooperation transformed the human environment in a way that changed the selection pressures that act upon the human phenotype. Cooperation between humans meant that it was possible for humans to share workloads in important tasks like hunting, gathering, and childcare. This also meant they could access more food than before, have more protection than before, ensure the survival of their children, and even have more time for other tasks. Since cooperative behaviour has such a positive impact on human survival then surely there would be a pressure to maintain it and even promote it. Evolutionary processes would simply select the children of the more cooperative humans because they were more likely to survive and reproduce than the children of humans who were less cooperative.

Here is a more precise example of this effect. Humans who can cooperate—that is, mind-guess at the third level of intentionality—can work out a mutual agreement and work together to collect berries. Whilst one reaches up to pull down the higher branches full of berries, another picks them. This is far better than picking berries alone because, first, they gain easy access to the berries on the higher branches which is a whole new resource of food; second, these berries are more nutritious than the ones on the lower branches as they get more sunlight; and third it is safer to roam the berry bushes in pairs. All that

is required to maintain this practice is the one who picks the berries shares their harvest with the one that helped them. This practice has an impact on the environment because it gives these humans access to larger and more nutritious food resource which will help this pair and their children survive, thrive, and reproduce. Thus, those phenotypes that are better equipped to maintain this practice—those who are perhaps more prone and open to mutual behaviour—are more likely to be selected and have more offspring.

Overall, the introduction of cooperative behaviours into human behaviour results in the natural selection of those humans who, overall, are more willing to share activities for gathering food and protection, which can result in access to even more food which will, again, result in adaptation to further cooperation. This co-evolutionary relationship triggers a further and even greater benefit to humans as knowledge transmission of useful practices (cooperative or not) across and down generations also becomes essential. Social cognition is not only the basis of creating social conventions like berry-picking, it is also the basis of passing down useful conventions to the next generation so they do not have to work it out for themselves. This is a starting point for cultural inheritance. This is the main lesson from Stereny's recent book on human evolution: *The Evolved Apprentice* (2012).

In this book, Sterelny argues that this process creates strong selection pressures for humans to become good teachers and learners, to ensure that the children of the next generation can learn the tricks and strategies of the older and wiser generation before them. Many aspects of the mind are said to adapt as a response to an environment that changed due to social interaction (for example planning, material manipulation, and freeloading management), but it is the ability to teach and learn that is fundamental to explaining the rise of culture, and thus the great survival strategy for mankind. The advantage of knowledge transmission is that children do not have to reinvent the wheel and work out how to survive in their environment from scratch. They are prepared for survival in their early years as they learn from their parents and cultural environment. A further benefit is that this knowledge *is not* rigid like the innate knowledge of the beaver's dam-building. This means that the knowledge that they learn is specialised to the environment they will grow up in, but it is also entirely possible for it to change. If it turns out that the berry bushes die out and the human group is forced to find a new food resource, such as digging for roots, the social behaviours around gathering will change,

and it is this new knowledge that is passed down to the next generation. Cultural knowledge is flexible knowledge, and therefore it is not restrictive when the environment goes through a change. This means that humans have the power to adapt quickly (or at least more quickly than their biological make up can) and still ensure their children are well equipped for survival.

In fact, the point about adapting to a cultural change in the environment is also another factor in the feedback loop that concerns the rise of our cultural behaviour. Sterelny argues that human cognitive traits are also selected for their more 'general' approach to interacting with the environment. The dispositions to learn, teach, and interact with others do not provide any specific solutions to problems posed to humans, but give us the power to work it out as we go. Our 'working it out' culturally, rather than biologically also causes a rapid change to our environment, because culture is subject also to evolutionary processes and the gradual accumulation of improvements (see cultural evolution in 2.3.1 and the ratchet effect 2.1.4). Any cultural innovation has the potential to change the environment and thus change selection pressures in that environment. Since culture moves more quickly than biology humans can use cultural solutions to respond to the selection pressures which also has an impact in creating further selection pressure. Thus, humans can cause an environment to go through a rapid change even in the space of a lifetime. This reality further prompts the selection of these more general traits that support the creation of cultural innovation and transmission as this method of meeting selection pressures can 'keep up' with the rapidly changing environment.

The rise of culture is also the rise of an adaptive feature, an evolutionary strategy that helps humans cope and manage not just in the environment they are born into, but many other possible environments they could be faced with. Social convention and cultural innovation also give humans a way of managing intergroup conflicts and cheating problems which can change and move with group size and dynamics—this provides further defences against the freeloading problem we were discussing above. They are also the foundation to word creation and word-use which emerge to further improve human communication (this is stage 4 on the table and something I discussed in more detail in chapter 3.3). What is left to explain is the emergence of full language and how I envision a domain-specific faculty (which goes against Sterelny's view that it is all

'general'), with the power 'to make relevant what is not salient', continues to support the rise of culture as an evolutionary strategy.

4.3 The Evolution of the Linguistic Creature

4.3.1 The Co-Evolution of Language and Culture

By now my reader will understand how I envision evolutionary processes that got humans to stage 4 on the table I introduced above (keeping in mind I discuss the emergence of word-use in 3.3). What is left to do is knit together my understanding of the emergence and evolution of the FL with my understanding of its primary function that I introduced in section 3.4. What I hope to also demonstrate is that the primary function 'to make relevant what is not salient' is a part of the package that made the rise of culture so powerful and useful to human beings, and therefore is ultimately implicated in the same evolutionary process I introduced above. In this section, I will be turning to the process of gene-culture co-evolution (see 4.1.2) to explain this event, but first, it may be helpful to compare my approach to language to other evolutionary theories of the FL.

Appreciating that there is a relationship between biological and cultural evolution is not unheard of in other theories about the evolution of the FL. There are views that will argue that culture holds has no impact on the shape that the FL was to become; like, for example, the Chomskian 'non-functional' approach (see.2.2.3). This is where one genetic mutation basically meant the emergence of language, and it is thought this mutation is selected because it was useful for general cognition, not communication (Berwick and Chomsky, 2017; Reboul, 2017). Others, however, argue that language and any biological mechanisms that underpin it would not have the form and shape it does today without the influence of culture.

An example of such an approach becomes clear when we consider that culture makes human life a whole lot more complicated. The FL may have emerged to help better navigate an increasingly complex world of not just the physical and biological, but the psychological, social, and cultural brought on by group living (Mithen, 1999; Carruthers, 2002; Spelke, 2003). Thus, it may be that the internal object was selected to help us deal with the mental landscape that social living and culture creates. On the flip side of this line of thinking, the FL would not emerge in non-cultural landscapes because the pressure for complex thinking would not be present. Here, we could say that language evolved to help one navigate a cultural world and that the function of it is a selfish one as it helps to

ensure the survival of the individual within the group, rather than as part of a group. This is where my approach to language evolution is different. The FL evolves, not for selfish reasons, but for mutualistic reasons.

On my view, the FL evolves to aid an individual to cooperate or communicate with their ever-growing social landscape made up of other individuals. In chapter 3 I argued that the evolution of the FL is responding to a selection pressure to 'make relevant what is not salient' in communicative discourse. Where other cognitive mechanisms, such as social cognition and memory, may help establish such communicative connections in the first place, FL enhances the connection by making it more possible for humans to communicate more successfully in contexts where they lack their usual dependence on pointing and panto and mutual-knowledge. The point of the internal object is to support this connection to other humans, and not just cope better with a social landscape (as a cognitive function view may suggest). This very evolutionary process, however, is implicated in a broader evolutionary process to make us better cultural creatures and, therefore, may be implicated in motivating the rise of culture in the first place.

The function 'to make relevant what is not salient' could be described as a 'narrow' function in the sense that it works within the 'broader' function of communication and cooperation. Above, I explained that culture, overall, provides an excellent evolutionary strategy for humans. It allows humans to pass on tried and tested knowledge to the next generation; it is a sort of knowledge that can change and adapt quickly to the environment; and has its own evolutionary trajectory that is separate from biological evolution. The narrow function to 'make relevant what is not salient', however, could have an important role to play in this 'broader primary function'. I think this becomes clear when we consider the rapid change that culture has caused to the human environment.

As cultural accumulation and rapid change in the environment happens the pressure to 'make relevant what is not salient' becomes more and more important as humans are more and more likely to find themselves in contexts where they will need a method like language for communication and pre-linguistic forms of communication become less helpful. The cultural evolution of the canoe, for example, will allow humans to access new and unexplored lands. The human phenotype that is better equipped for 'making relevant what is not salient' when they are sharing their thoughts in the exploration of these new lands are more likely to survive and thrive than those that do not. The cultural evolution

of practices and rules that promote social bonding may also allow groups to grow larger, but this also means humans are unlikely to know everyone who lives as part of their group. Again, the humans that are better equipped to communicate without full dependence on mutual-knowledge (that is, to communicate about things that are not salient at the moment!) are more likely to do well within the social environment, and therefore more likely to be selected.

Furthermore, the power to 'make relevant what is not salient' is also good for knowledge transmission in and of itself. To have the power to explain to a child something they need to know when the relevant context is not available is hugely beneficial. For example, it will always be better to teach a child how to fish through directly showing them how to do it because they will receive very direct instruction about how to perform a skill that will help them feed themselves and their families. It is also important to teach a child to avoid any dangers associated with this activity, which may not be something a teacher can communicate through showing, pointing, or pantomime. It may be that there is a certain type of fish that is poisonous to the touch, and it is safer that the child learns to avoid it. If, during their lesson, they do not come across the poisonous fish the teacher will need to explain this danger in its absence. Language gives the teacher the power to do this: 'Do not touch the fish that are large and red' or 'Do not touch the fish that are smaller and faster than these fish'. Language means that there is a way to make sure the child is aware of potential danger even before meeting it. At the very least this means if the child meets the poisonous fish during further instruction with their teacher, they will know not too go to near it, even when their experienced teacher has pulled it safely out of the water. At the very most it means if the child meets the poisonous fish whilst their teacher is not around, they will know to release the line or look for help. The latter scenario also has two advantages in that the child can fish alone safely, and that the teacher can leave the child to practice as they get on with other activities.

To further support my argument that the narrow function (to make relevant what is not salient) is implicated and ultimately supports the broader function (to communicate, cooperate, and depend on culture) it is worth asking what human life might look like without the narrower function—without the emergence of the FL. In other words, what would our cultural innovations look like with words alone? My thought is that we would be limited to successful communication only in situations where we can make relevant what is salient (unless, of course, words alone are satisfactory in certain acts). What this

implies is that it would be harder or a lot slower for us to push the boundaries of our current situation. Without sentences we would find it far harder to communicate and explore new lands; to share information with a member of the group we do not personally know; or to teach the next generation vital information we cannot directly show them. The FL aids communication in all of these situations as well ass the on-going advancement of cooperation, knowledge transmission and culture.

To finish this section it is worth comparing my arguments to the view that language is a learnt phenomenon and that there is no FL (Sterelny, 2012; Tomasello, 2014). On this approach language is part of the set of things that are created by human interaction and knowledge transmission—it is a *product* of those things that make us cultural creatures. On my view, however, language is part of those things that underpin culture, and plays a fundamental role in creating culture—it is *an integrated part* of what makes us cultural creatures. With all of this in mind, I will now attempt to describe the process of language evolution in deeper detail.

4.3.2 Co-Evolution of Words and The Faculty of Language

I should have now set the stage in three major ways. First, I have given an argument for the primary function of language, which was 'to make relevant what is not salient' (this was the topic of chapter 3). Second, I have sketched out the background on which language emerges. This was the task of section 4.2 which shows how social cognition and culture comes about in humans prior to language. Third, I have introduced the concept of gene-culture co-evolution to explain how the FL emerged. What remains is to give a more exact description of how, following this, language evolved to become the entity we see it as today. What is most important to keep in mind is that both biological and cultural evolution play an essential role in explaining its emergence. Natural language syntax is ultimately the product of biological processes, but the process does not start until it is possible for humans to communicate, create conventions, and pass knowledge down to the next generation—in other words until human culture is established. On this story of language evolution, the FL is adapting in an environment where culture, and therefore cultural evolution, already exists. Biology and culture are, therefore, deeply intertwined in this dimension of human life.

To help explain my story it will help to make use of the ratchet analogy that I introduced in section 2.1.4. The ratchet analogy helped to describe how the process of evolution

created complex traits through an ongoing accumulation of new innovations building upon old innovations. In 4.1.2 I also argued how this could be applied in gene-culture co-evolution. In the progression up the ratchet—toward the resolution of a selection pressure—a latch has *two* ways in which it can release, progress, and latch at a higher degree. Either when a genetic mutation is selected and passed to the next generation (e.g. lactose tolerance), or when a cultural innovation is selected and learnt by the next generation (e.g. farming cows). What should be kept in mind, however, is that the most recent biological latching will always pre-determine the space of the cultural latching. The biological latching can always release and change a state of affairs, whereas cultural latching can only do this within the confines of biology. In other words, it is not possible to fully integrate dairy farming into the life of a human group if there is a general biological intolerance to dairy[38].

In the case of language evolution, the progression up a ratchet represents the evolutionary response to the selective pressure 'to make relevant what is not salient', and the latch on the ratchet represents where humans are with using this power in their communicative discourses. Any degrees below the current latch position represent the situations where communicative acts are clear and unambiguous when communicating about things that are inconspicuous. Any degrees above the latch represents situations where communicative acts are unclear and ambiguous about things that are inconspicuous. In other words, someone could easily communicate that a tiger—unseen by others—is approaching the group, but could not communicate from what angle and how soon that tiger may attack the group. The latch represents both how we can utilise the power, but also where we are limited with it. In this section, I will argue that this process of releasing and latching the ratchet happens as a coordination between the cultural development of word-use and biological development of syntax until we get something that represents what we refer to as natural language today. I will demonstrate

[38] This, of course, changes when cultural innovations, such as medicine and technology, can change biology before the natural processes of biological evolution can. This is demonstrated today through long life as allowed by our knowledge of health and disease. Here culture can predetermine the space in which biology goes. But this is not something that is happening at the time in evolution we are interested in (medicine is post-language emergence!).

this by suggesting a potential storyline for the evolution of language. I would like to make clear here that this is not meant to suggest how language actually evolved as the process is obviously a lot more complex than this, but it is meant to demonstrate how both culture and biology are needed to spur the process along. A story that is more appreciative of the linguistic technicalities, however, is given in the next chapter (see 5.3.2).

The discovery of words initiates the power to 'make relevant what is not salient' and is also representative of the first latch on the ratchet (see section 3.3.1). The use of a word brings to mind a simple object or action (e.g. 'chicken' or 'hold'), however, words are limited when it comes to sharing information that is more complex or represents some activity. This power lies beyond the current position of the latch on the ratchet. The solution, as discussed in 3.4.1, is to bring an agreed order to multiple-word-use. This, if done well, allows the latch to release and move further up the ratchet. Thus, once such a genetic mutation is available the process of natural selection will react to it. Let's use the subject first rule as an example where a genetic variation predisposes a speaker to utter a subject before an object. The initial appearance of the subject-first rule is like the releasing of the latch as it offers a human group a strategy or tool to enhance their power of 'making relevant what is not salient'. If we assume it has succeeded in filling this role it is selected for and becomes established in all word-users. This will represent a new latch at a higher degree on the ratchet.

This, however, is not like the case of the 'long-necks' I explored in 2.1.4. Here a genetic mutation was followed by further genetic mutations as the necks grew longer and longer in response to a selection pressure to reach the leafy food source high up the trees. With bringing order to word-use the next step for improvement is not so clear. This is where *cultural* innovations come in. The subject-first rule now gives the human group a new platform on which to explore their word-use. It may allow them to venture into situations they have not ventured before, and further dominate their environment. They could perhaps give clearer directional instructions or more specific hunting instructions in the absence of the whereabouts and details of a hunt. These new situations and altered environments will surely call for new words to be added to the group's vocabulary. The exploration of the new environment and the successful creation of words counts as a further release and latch on the ratchet as it also enhances the power for humans to communicate information that is not salient.

What is likely to happen here, however, is that the human group are met with a new limitation. When there are no more words to be created, and the subject-first rule has carried them as far as it can go the pressure for a further strategy to enhance their ability 'to make relevant what is not salient'—for the latch to release—is back on. The new strategy that is (biologically) selected for could be a tendency to 'categorise' words into noun- and verb-like categories. Thus, when someone utters multiple-words there will be a tendency not only to assume that the subject is spoken first, but that if a verb is also uttered that it indicates *how* the subject was acting on the object—something that was not possible before. If this tendency to categorise is successful and remains clear it will be selected for and provide a new latching at a higher degree on the ratchet. The human group, once again, can explore this new power along with its likely impact on the environment. This will also spur the cultural creation of new words, but this time taking full advantage of noun and verb distinctions—these cultural innovations also count as a further release and latch on the ratchet.

Once the tendency to categorise can no longer help humans expand upon and manipulate their environment, they will meet another limitation and further pressure to release the latch. Even though the introduction to speak in these nominal and verbal categories allows them to quite clearly explain an action, they cannot further elaborate on that action. They can explain 'the dog chased the cat', and all the possible versions on that formula. They, however, cannot do other potentially useful things like describe the white colour of the dog and nervous tendency of the cat. And so, the pressure to introduce more 'rules' continues until this is satisfied, or until genetic variations on the biological form can do no more. And, so the story continues in this fashion.

Thus, a cycle between a biological innovation on syntactic structure followed by a cultural overhaul on word-use within the new structure is followed by a further pressure to do it all over again. In this story, the biology is always adapting to what is invented by culture, and the culture makes full advantage of what is made possible by biology. When a genetic mutation or cultural invention does not enhance it is simply filtered out or overcome by a more useful mutation or invention.

In conclusion, I hope to have described and demonstrated how I view not just the evolution of language, but the evolution of humans in general, and how our linguistic ability should be appreciated as part of the bigger picture and our being cultural

creatures. There is still one more large task to tackle and that is to make clear how the FL fits into and operates as part of the human mind. This is the goal of the next chapter.

Chapter 5 – Mind

5.1 Generative Grammar

5.1.1 Grammar and Mind

In this chapter, I intend to delve into the human mind and explore the 'seat' of language—or, at least, the seat of natural language syntax. Understanding and theorising about the architecture of the human mind is important for any naturalistic theory of language as it is this internal environment that gives rise to the possibility of language in the first place. Advocates of the linguistic creature view (see 1.2.1) need to explain the mechanisms that underpin the structure of language; whereas advocates of the cultural creature view (see 1.2.2) need to explain the domain-general learning mechanism that can pick out the structures of language from other structures in the external environment. It follows, therefore, that one's theory of the structure and shape of language will reflect one's theory of the human mind. Exploring the human mind, therefore, requires exploring the grammar of the world's natural languages. As a reminder, the term 'grammar' often overlaps with the term 'syntax' because they both concern the overall structures of language. I use 'grammar' when referring to any general rules of language, and particularly what a speaker knows, and 'syntax' when referring to word distribution in a sentence (see chapter 1.1.1 for further explanation).

There are a number of theories concerning the grammar of natural languages, but what I will introduce in this chapter is the most prominent version of 'generative grammar', a theory which is associated with the thought that our linguistic abilities are underpinned by the FL. This may seem the obvious 'go-to' for an advocate of the linguistic creature view, but even before considering how this describes the human mind it is worth pointing out that the theory is well established in the field of linguistics due to its success in describing and predicting the structures of many of the world's languages.

Generative grammar is dedicated to explaining this is and theorises that linguistic structure is not serial, but hierarchical. This means the grammars of language are not about one word following the next, but about one phrase nested in another phrase and so on and so forth. Sentences only *appear* one-dimensional when they are uttered, otherwise, they are two-dimensional phenomena with a far deeper structure to what we initially experience (see 5.1.3 for more detail). There are other theories about grammar

that are important in the debate (such as construction grammar[39], the 'go-to theory' of the cultural creature view), but I will not be addressing these in this thesis.

The field of generative grammar—and of linguistic syntax in general—however, is a minefield[40]. The complexity of the details and range of debates over small and large technicalities are often confusing and infuriating. What I aim to present here is a simplified version of generative grammar which avoids getting tangled in this complexity and these issues. That is not to say that they do not have a place in this discussion as they certainly do. Without even the minor details on language being known and explored we lose out on valuable input about the very thing we are interested in. I keep things simple to ensure our focus is where it needs to be: on that larger question of language evolution and the primary function of the FL.

I will show that even within this narrow field there are ongoing disagreements and tensions, particularly between the 'minimalist program' (or MP) and the more complex 'government and binding theory' (or GB). The story of language evolution I have given in the thesis supports the latter view as the theory that captures the messy and 'kluge'-like nature of the FL—which has emerged through a process of gradual and accumulative evolution. GB also directly reflects the idea that language has the power to 'make relevant what is not salient' as the FL reflects the sort of formula that was useful to enhancing human communication (see 1.3 and 3.4).

The main aim of this chapter, therefore, is to explore this linguistic background and explain why and how GB fits into my viewpoint of language and human evolution. I will also explain how and why I think the MP view is misguided when it comes to language evolution—despite their claims of going 'beyond explanatory adequacy'—and give an account of the FL which fits with evolutionary theory.

5.1.2 Beyond Explanatory Adequacy

Generative grammar has a complicated history. It has been through a number of theoretical changes and phases as linguists have tried to offer a theory which is successful in describing all the world's grammars as according to UG (see 1.2.1), but also has success

[39] For construction grammar I reference the works of Goldberg (2006) and Tomasello (2003).

[40] Especially for someone (like me!) who is trained in philosophy and not in linguistics.

in explaining language acquisition and evolution. In order to understand this perspective on language evolution it would help if we also understand this history in linguistic theory. The story starts back in the 1950s at the beginning of the cognitive revolution and with Chomsky's response to behaviourism (see 1.2.1).

The initial goal for linguists was to find 'descriptive adequacy' in their theory of grammar. A descriptively adequate theory is one that: '*provides a comprehensive description of the full range of structures found in a given language*' (Radford, 2016, p. 8). In the early days all that it seemed necessary to do was produce a list of 'phrase structure rules' (PS) which defined how the words of language were combined into phrases, and then also how those phrases combined with other words or phrases to make ever larger and more complex phrases and sentences (Lasnik and Lohndal, 2010; Smith and Allott, 2016). Ultimately, they described the creative aspect of language—the capability to make infinite use of finite means (see 1.2.2)—because a phrase structure rule could describe how one phrase was embedded within another phrase, which was embedded in another phrase and so on and so forth.

In 1.3 I introduced the fact that all sentences are made of a subject and predicate, but also mentioned that this formula is more complex as sentences come in many different forms (e.g. declarative, interrogative, imperative, and exclamative). In PS the formula is far more complex as sentences are built in many different ways. Here are two examples (example adapted from Carnie, 2013, pp. 82–6)[41]:

- Language makes infinite use out of finite means

This sentence contains a 'noun phrase' or NP ('language') and 'verb phrase' or VP ('makes finite use out of finite means').

- Humboldt said that language makes infinite use out of finite means

[41] Please note that I have purposefully blurred some facts about linguistic theory here for the sake of simplicity. The formations of sentences or 'S' that I have used here are better known as 'clauses'. 'Clause' is a linguistic term which is very close to the definition of a sentence and refers to a phrase that contains a subject and predicate. Unlike a sentence, which is usually treated as a complete unit in itself, clauses can contain (like in the example I have given) or appear alongside (with 'conjunction words' words like 'and' or 'or') other clauses. In linguistic theory, there is an important difference between clauses known as 'tense phrases' (TPs) and complementizer phrases (CPs) that I do not go into here, and lump both under the unit 'S'.

This sentence (Humboldt said that x) contains another sentence (language makes infinite use out of finite means). The larger sentence or phrase is connected to the smaller sentence or phrase by means of the complementizer word (C): 'that'.

Respectively the phrase structure rules for sentences can be formulated in this way:

- S→NP VP
- S→ C S

The capability to embed phrases within other phrases describes the creative aspect of language. If an S is contained within an S, then there is nothing preventing that S being contained within another S. Thus, we can continuously and infinitely build a sentence:

- Chomsky said that Humboldt said that language makes infinite use out of finite means.
- Pinker said that Chomsky said that Humboldt said that language makes infinite use out of finite means.
- Annie said that Pinker said that Chomsky said that Humboldt said that language makes infinite use out of finite means.

PS, however, was only the start of a long journey of describing the structure of human natural languages. It had many difficulties in its task of predicting which phrase structure rules should be used at which time. One such difficulty was its inability to predict which phrase structure rules should accompany the use of any one verb. For example, the use of a transitive verb like 'paint' or 'hits' is only grammatical when it is followed by an object (these are known as two-place-predicates). So 'John paints the table' or 'Bob hits Bill'. Whereas intransitive verbs like 'sleep' or 'stumble' are ungrammatical if they are followed by an object. They can either stand alone or be followed by a prepositional phrase (PP). So, 'John sleeps' is grammatical, but 'John sleeps the bed' is not; and 'John stumbles over the fence' is grammatical, but 'John stumbles the fence' is not (these are known as 'one-place predicates') (Smith and Allott, 2016, pp. 76–7). This leaves the formulation of these verb phrases as any one of these formula (simplified from Carnie, 2013, pp. 80–82):

- VP→ V NP
- VP→ V
- VP→ V PP

Furthermore, PS not only requires a set of phrase structure rules that described how to build a sentence, but also 'transformation rules' that described how the formation of any one sentence transforms into another as with the example of 'Wh-movement' briefly introduced in 1.2.1 (Lasnik and Lohndal, 2010, p. 44; Carnie, 2013, pp. 290–1; Smith and Allott, 2016, pp. 68–9). Overall, the PS approach to try and explain every possible grammatical formation by means of a phrase structure rules was creating a lot of redundancy in the theory.

This also meant that PS did not make much sense when it came to language acquisition. When children are acquiring their target language with the help of the FL this early theory seemed to suggest that this large list of phrase structure and transformational rules was somehow present in their head, with no clear guidance on when to use which rule with a verb, etc. PS also struggled to explain the nature of linguistic diversity because, as expected, not all languages adhered to the exact same list of rules. Overall, the theory failed to explain how language and the mind work, and so by the 1980's linguists worked on a theory of generative grammar that had an 'explanatory adequacy': *'which is to be attained by a theory that explains how language is acquired*' (Smith and Allott, 2016, p. 55).

From this emerged the theory of Government and Binding' (GB), which is often also known as 'Principles and Parameters' (P&P)[42]. GB reduced the redundancy by uncovering further generalisations that were still capable of explaining UG, and they also uncovered a tidy theory that explained the variety in languages (see 'parameters' below). This is the theory I advocate in this thesis, and so I will come to explain this in far more detail in the section below (5.2.1). For now, it is enough to say that GB suggests the FL is not a list of rules but:

> …a number of autonomous systems (sometimes called 'modules'), each of which is maximally simple, but whose interaction accurately characterizes our intuitions in all their complexity (Smith and Allott, 2016, p. 79).

[42] There is some tension about the use of the term 'Government and Binding' for this theory (this is because the precise technical concepts of 'government' and 'binding' may not be important or relevant for linguistic theory) and thus preference to stick to the term 'principles and parameters' instead (Smith and Allott, 2016, p. 79). In this chapter, however, I use 'principles and parameters' to also explain aspects of the strong minimalist thesis, so prefer to keep these terms separate (similar to the approach in Lasnik and Lohndal, 2010).

> Apparently complex phenomena were seen as the result of the interaction of simple modules (Lasnik and Lohndal, 2010, p. 44)

'Modules' here means roughly the same thing as the concept I introduced in 1.2.1, except where I was indicating that the FL was a module, I am now indicating that the FL is a set of modules which interact with one another and are specific to the domain of language. There are seven postulated modules in GB theory, two of the most important being 'X-Bar theory' and 'α-move'. I will introduce these in more detail below (5.2.1), but it is worth mentioning here that α-move greatly simplified the need for transformational rules:

> …the transformational component of the grammar of a particular language was thought to be a long (partially) ordered list of very detailed transformations, some marked optional and others marked obligatory, specific to the language in question. In such a framework, explanatory adequacy is a very distant goal. The GB framework replaced these transformations with very general optional operations, Move α (displace any item anywhere)… (Lasnik and Lohndal, 2010, p. 44)

This move from PS to GB involved moving some of the 'explanatory weight' of grammar away from the internal mechanisms that bring the words or 'lexical items' together, and onto those words or lexical items. In particular, the lexical items which are categorised as verbs were assigned 'theta-roles' which determined if they were treated as one-, two- or three-place predicates and what sort of lexical items could occupy those places when processed by the internal machinery that created sentences. The verb 'thought', for example, is a one-place predicate that only needs one argument (like 'stumble') but that argument has to be of a certain 'type' in that it needs to be 'animated' or 'minded' thing. Thus, 'the man thought' sounds grammatical, but 'the table thought' does not (I will come back to this when I introduce theta-roles and another module known as 'theta-theory' in 5.3.2). This started a shift from an entirely 'top-down' explanation of grammar, to a partly 'bottom-up' explanation (Lasnik and Lohndal, 2010; Smith and Allott, 2016).

GB was largely successful in its efforts to explain the complexity and structures of natural languages, but in the 1990s there was a further push to minimise the theory of generative grammar (Chomsky, 1995). The thought was that GB conflicted with a sensible explanation of language evolution and that linguists should seek to give a theory of

grammar that was 'beyond explanatory adequacy': to '*seek a level of explanation deeper than explanatory adequacy, asking not what the properties of language are, but why they are that way*' (Smith and Allott, 2016, p. 55).

The apparent trouble with both PS and GB was that these theories made it difficult to explain how and why, with that shape, the internal object came to be that way. No one could make sense of a large list of phrase structure rules evolving, and GB theory was accused of not making sense of the evolutionary steps that prompted the emergence of multiple modules:

> [T]he proliferation of modules… appeared to be a problem because it made it hard to see how the language faculty could have evolved. Each of the modules should have its own evolutionary history: they might all have arisen at different times and served different functions. But it is hard to see what each module could do in the absence of the others.' (Smith and Allott, 2016, p. 197)

This prompted the rise of the 'minimalist program' (MP) which suggests simplifying and reducing the number of 'descriptive devices' needed to explain language. The general idea was to place even more of the 'explanatory weight' on the lexical items, to go with a theory that was more 'bottom-up', rather than 'top-down'. This followed the thought that the fewer descriptive devices there were, the less complicated the FL would be, and therefore the more sensible the evolutionary account. What has emerged from this, however, is the rather extreme view known as the 'strong minimalist thesis' (SMT).

SMT claims that language could be described not by several descriptive devices (like the seven modules of GB), but by a single descriptive device known as 'merge'[43] (Smith and Allott, 2016; Berwick and Chomsky, 2017).

The advantage of this approach is that it made the evolutionary explanation of the FL far easier because only one descriptive device needs to be explained:

> If there was a single evolutionary step which took place at some point in human evolution which gave rise to language, it is unlikely to have been a step in which a whole range of different properties idiosyncratic to language were acquired at the same time. Rather it seems more likely that some genetic development gave

[43] This has other terms or names to describe it. Such as 'recursion' (Hauser, Chomsky and Fitch, 2002) or 'the basic property' (Chomsky, 2015).

> rise to one new type of operation which enabled humans to acquire language (Radford, 2016, p. 28).

I will explain how merge and a fully 'bottom-up' approach to language work below (see 5.2.2), but here I will point out two things. First, this act of minimising descriptive devices is the same as eliminating any need for phrase structure rules. Linguistic structure arises through that one simple operation 'merge' and the complexity and diversity is a matter of 'third-factor' constraints (see 2.2.3):

> The question which then arises is whether these are properties which are idiosyncratic to natural language, or whether they can be explained in other terms. Chomsky has argued that most (perhaps all) universal properties of languages are reducible either to interface conditions, or to more general properties of cognitive or natural systems (e.g. general principles of biology, or fundamental principles of the natural world such as computational efficiency) (Radford, 2016, p. 28).

Second, this means that SMT also looks to eliminate transformational rules, and thus has a very different way of explaining how transformations take place. PS and GB rely on a two-stage approach to explaining transformations. First, the phrase structure rules are applied to the lexicon at a level known as 'deep structure'. For PS theory, this was that large list of phrase structure rules; and for GB, it is the more generalised rule of X-bar theory (see 5.2.1). Second, the construction at this deep level then goes through 'transformation' to reveal a construction at a level of 'surface structure'. For PS theory this involves applying the transformation rules; and for GB, this involves applying α-move. It is this construction we use in linguistic discourse[44]. SMT, however, looks to have only one stage, and thus eliminates the need for an intermediary of 'transformation' between deep and surface structure. For SMT the equivalent 'calculation' for transformations is,

[44] The theories, however, are more complex as GB theory goes on to claim that the construction at this 'surface structure' goes on for representation in a phonological form (or PF)—that which is externalized in speech—and a representation in logical form (LF)—that which is represented in the conceptual system. For PS everything meaningful, including LF, happens in the construction built at deep structure, and the construction at the level of 'surface structure' (after transformation) only causes a change in what we externalise (roughly PF).

in fact, produced by the merge operation (described as a difference between 'internal' and 'external' merge) and is something I will come back to below (Lasnik and Lohndal, 2010; Radford, 2016; Smith and Allott, 2016).

This chapter is about GB and SMT and their respective approaches to the evolution of language. This is something I explored to some degree in chapter 2, but here I aim to tackle this debate from the more precise perspective of generative grammar, as it is here that we come to really understand what the FL is doing. Essentially, the debate comes down to what takes us 'beyond explanatory adequacy'. Is the FL a messy system made up of many moving parts (as in GB), or is if a simple and elegant system (as in SMT)? In this chapter I argue for the former as this follows the idea that the FL is a 'kluge', a product of the ratchet-effect (see 2.1.4), created and designed by the forces of natural selection in an incremental and gradual process that responded to a selection pressure to enhance and improve our communicative powers. The latter, however, I argue fails to go beyond explanatory adequacy because the goal should not be about reducing the number of descriptive devices, but about making sense of the evolution of the FL in the larger picture of human evolution.

5.1.3 The Constituency of Sentences

In this section, I explain how the basic units of language (words or 'lexical items') are arranged and rearranged into larger units of language (phrases and sentences) so that we have an account of language that can explain the structure of all sentences. Here, we temporarily suspend the question: 'why is it like that?' and just focus on 'what is it like?'. As well as explaining *what* language is like, I will also briefly address *how* linguists were able to come to the conclusions given below.

To explore the constituency of sentences is to explore what a speaker *knows* about them. Linguists who study grammar must keep this in mind because everyday language-use is full of sentences that contain 'performance errors' caused by laziness, tiredness, confusion, and various other human complications. This means that language *performance* does not always reflect language *competence*–that is a speaker's actual knowledge of language (Chomsky, 1965; Radford, 2016, p. 5; Smith and Allott, 2016, p. 30). Although linguistic performance is not fit for the scientific observation of a speaker's linguistic knowledge, linguistic competence is. Observing the linguistic competence,

however, is a challenging task. Where performance merely requires recording what a speaker says, competence requires asking what a speaker knows of their language, what they *intuit*.

To study a speaker's linguistic competence, linguists ask native language speakers if a particular sentence *sounds* sensible and correct or wrong and incorrect. In other words, if the sentence is grammatical or ungrammatical. For example, to an English speaker, a) 'the dog chased the cat with the fish' sounds like a sensible sentence, but b) 'the dog the cat the fish chased' sounds less sensible, and c) 'fish the cat the dog the chased' doesn't sound sensible at all. From this we learn that the organisation of words in a) reflect what the speaker knows and expects from their language more than b) and c), therefore a) is a better representation of English as far as the speaker sees it.

A linguist can check the intuition of a whole group of speakers in this way to gain an understanding of English grammar without worrying about performance errors. This tells us '*what you need to know to have native-like competence in the language (i.e. to be able to speak like a fluent native speaker'* (Radford, 2016, p. 5). The linguist can then proceed to point to the commonalities and differences between speakers and cultures to see what is universal and what is not (as well as what might be a 'parameter setting' – see 5.2.1) and gain an insight into the overall shapes and patterns that make grammar grammar. What follows in this section is an overall understanding of what linguists have learnt from taking this approach to studying language.

This approach has exposed some surprising insights into natural language syntax. One of which is that sentence structure is not dependent on serial word order, but a constituent structure in which words and phrases are organised in a *hierarchical* structure. That is to say, the actual structure of a sentence is not in the linear order in which words appear as we speak or hear them, but in a hidden level which has only been exposed through rigorous studies in linguistics.

I can highlight this with an example that shows that 'agreement' between words in a sentence does not depend on adjacent words but on hierarchical phrases. Take the sentences a)-c) and notice that c) is ungrammatical (ungrammatical sentences are traditionally marked with a *). This is based on an example in Adger's article called 'Syntax' (2015, p. 132).

a) Paris is beautiful

b) The girls from Paris are beautiful

c) *The girls from Paris is beautiful

The grammatical string of words in a) are found in c), yet c) is an unacceptable sentence in English. Why is this? The grammatical sentence b) exposes that the issue seems to lie with the form of the verb: 'is' or 'are'. In a) 'is' agrees with the noun 'Paris', but in c) it does not. This word-string 'Paris are beautiful' would sound ungrammatical if it weren't for its placement in the full sentence of b). Here, it seems that 'are' does not agree with the adjacent noun 'Paris', but with some other part of the sentence.

The issue is resolved when we consider there is more than one noun the verb could agree with in sentences b) and c): 'Paris' and 'the girls'. 'Girls' is a plural noun which agrees with 'are', and 'Paris' (or 'girl') is singular noun which agree with 'is'. The reason why b) is grammatical is because 'are' correctly agrees with the plural 'girls', whereas in c) it does not. This is the case even though 'girls' is two words away from the verb we are concerned with ('from' and 'Paris').

> The agreement phenomenon … is captured by saying that the verb agrees with the whole constituent *the girls from Paris* rather than the adjacent noun *Paris* (Adger, 2015, p. 134).

Constituents, therefore, are sentence-parts that are independent of one another, and two constituents can combine to form a larger constituent. The more constituents a sentence has, the more hierarchical levels it has. What becomes an important task for the linguist is to work out where the boundaries between constituents lie. There are several ways to test for this (Radford, 2016, pp. 133–46), but a good rule of thumb is that they lie where a string of words sound grammatical when they standalone (Carnie, 2013, p. 98; Radford, 2016, pp. 133–46).

For example, the words 'is' and 'beautiful' can be combined to make the grammatical sounding phrase 'is beautiful', and therefore this is probably a constituent. When 'Paris' and 'is' are combined together they make the ungrammatical sounding 'Paris is', and therefore this is not a constituent. 'Paris is beautiful' is, overall, grammatical and therefore forms the larger constituent that contains the smaller constituents, 'Paris' and 'is beautiful' (and not 'Paris is' and 'beautiful'). We can demonstrate constituent boundaries using square brackets like so:

[Paris[is beautiful]]

*[Paris is][beautiful]]

This constituent structure helps to explain the agreement phenomenon observed in the sentences above. We can confirm this by looking into a new sentence:

d) The girl from Paris is beautiful.

This sentence has two singular nouns that could agree with 'is', but by exploring its constituency we expose, once again, why it is the phrase 'the girl from Paris' that agrees with 'is', and not the singular and adjacent noun 'Paris'.

If 'Paris' were to agree with 'is' then we should expect both 'Paris' and 'is' to be a part of the same constituent. If I underline the parts of the phrase that play a part in the agreement the sentence looks like this:

*[The girl from [Paris is beautiful]]

This bracketing, however, does not reflect the constituency of the sentence because 'The girl from' sounds like an incomplete phrase. 'The girl from Paris' however is a complete phrase, so it is necessary to change the bracketing like so:

[The girl from Paris]is beautiful]]

Here, we can see the phrase that agrees with 'is' is actually the larger phrase 'The girl from Paris', but it may remain unclear why 'is' does not agree with 'Paris' as the noun is still part of this larger phrase. If, however, we find the constituency boundaries in the phrase 'The girl from Paris' we will see why it is 'girl' that 'is' agrees with, and not 'Paris'. One interesting way to do this is to see that the smaller phrase 'from Paris' can be entirely removed and not affect the overall agreement in the sentence. This gives us bracketing that looks like this:

[The girl [from Paris]]is beautiful]]

And the smaller sentence that looks like this:

[The girl] is beautiful]]

This shows us that 'from Paris' is an *adjunct*: that is some extra piece of information that is secondary or less important to the overall form of the sentence. Here, it occupies a different level of the sentence structure and is irrelevant to the overall syntactic relationship that determines the form of the verb. 'Paris', thus, is not related to the constituent that contains the verb, 'is', and so does not need to agree with it. The

constituent that contains 'girl', however, does. Once again, we see that the fact that the word 'Paris' is next to the word 'is' is merely a result of the order in which the phrases are said, and not because of a more direct syntactical relationship.

We can observe these syntactical relationships by means of two-dimensional constituency trees as shown below. These trees show the constituency boundaries between all words in the sentence, and not just the few I picked on above. These have also been categorised into their relevant word and phrase categories[45].

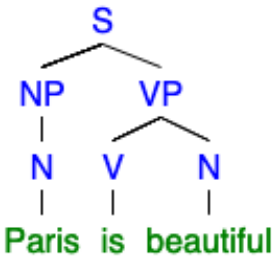

FIGURE 10 - SYNTAX TREE - PARIS IS BEAUTIFUL[46]

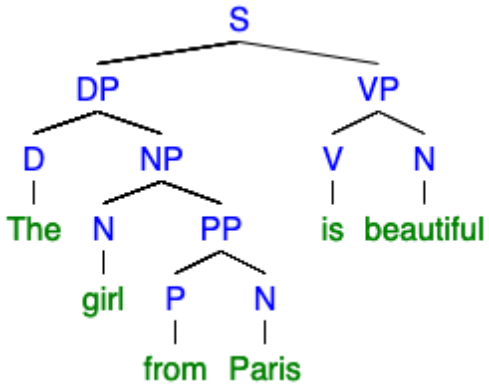

FIGURE 11- SYNTAX TREE - THE GIRL IS BEAUTIFUL[47]

[45] Again, this is kept extremely simple to keep the focus of the chapter to the point, thus these trees do not reflect an up to date version of generative grammar. Neither are they completely consistent with a certain version. 'S' and 'DP' (which means 'determiner phrase'), for example, should not appear together because they are concepts from different phases of generative grammar. 'S' is associated with the PS view and replaced with 'TP' and 'CP' (see footnote 41) by the time GB was established. DP is a concept established during GB, whereas in PS it was seen as a noun phrase or NP.

[46] [S [NP[N Paris]] [VP [V is] [N beautiful]]]

[47] [S [DP [D The] [NP[N girl][PP [P from] [N Paris]]]] [VP[V is] [N beautiful]]]

The first tree (figure 10) represents ‘Paris is beautiful’ and the second tree (figure 11) ‘The girl from Paris is beautiful’. Both trees contain the string ‘Paris is beautiful’ but when one sees this hidden pattern one can directly observe the difference of relationship between ‘Paris’ and ‘is’ in each tree. In the first tree ‘is’ is contained within a larger phrase that also contains ‘Paris’, but in the second tree it is not. Here, ‘Paris’ is contained in the larger phrase ‘girl from Paris’ which is part of ‘The girl from Paris’. Ultimately, ‘Paris’ in the second tree occupies a level of syntactical structure which ‘is beautiful’ does not, whereas in the first tree they are on a closer level.

Using syntactical trees in this way also helps to expose the differences in syntactical structure found in ambiguous sentences of the sort we explored in 2.2.2 and 2.4.1. Let’s take the example: ‘The dog chased the cat with the fish’ which, on the surface, has two possible meanings. Either the cat possesses the fish, or the dog does:

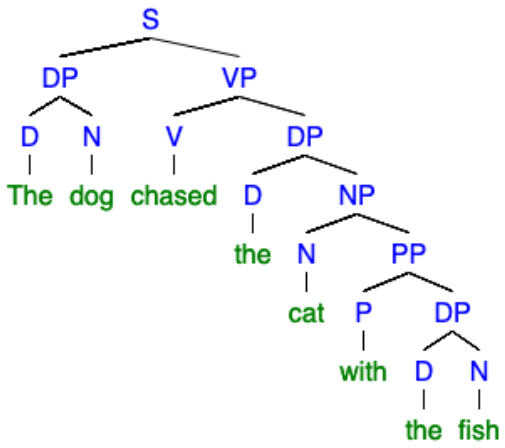

FIGURE 12 - SYNTAX TREE - THE CAT WITH THE FISH[48]

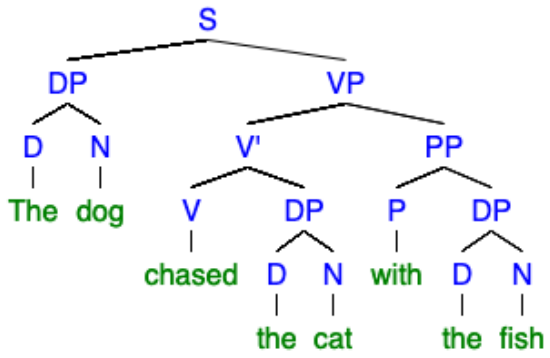

FIGURE 13 - SYNTAX TREE - THE DOG WITH THE FISH[49]

[48] [S [DP [D The] [N dog]][VP [V chased][DP [D the][NP[N cat][PP[P with] [DP [D the] [N fish]

[49] [S [DP [D The] [N dog]][VP [V'[V chased][DP [D the][N cat]]][PP[P with] [DP [D the] [N fish]

Where the string of words did not expose a difference between the two possible meanings, the syntax trees do. We can see the difference through observing the placement of the PP 'with the fish'. In the first tree (figure 12) 'with the fish' is part of the larger NP 'cat with the fish', whereas in the second tree (figure 13) the PP is part of the VP 'chased (the cat) with the fish'. In the first tree it is evident 'the fish' has some relationship with the cat and not the dog. In the second tree it is evident that 'the fish' has some relationship with the act of chasing and therefore with the subject, the dog, performing that act.

There are far more technicalities to syntactical trees that I will only scrape the surface of in this chapter, but here I hope the visual illustration helps to make sense of the hidden structures that are so essential to understanding natural language syntax. Further, there are some specific details regarding the way GB and SMT theorists build trees—I will attempt to expose these differences in the next section. Overall, we find that sentence structures are not comparable to beads on a string, but to Calder-style mobiles (Baker, 2006). This understanding of sentence structure gives us the basics of how languages, in general, build their sentences. With this background in place, we can now explore the details of GB and SMT.

5.2 Competing Theories

5.2.1 Government and Binding Theory

In 5.1.2 I gave a brief description of GB and explained that this theory took the first step toward a 'bottom-up' model of generative syntax, where explanatory weight was placed upon the lexical items; and away from a 'top-down' model, where explanatory weight was placed upon the machinery that combined those lexical items together. Overall, GB is largely a top-down model of generative grammar because some form of internalised rule exists to define how lexical items should be combined. On the other hand, SMT eliminates all rules (apart from merge) and is largely bottom-up. The top-down aspects of GB lie in the set of seven interacting modules (see 5.1.2) and the 'bottom-up' aspects lie in the way lexical items will define their behaviour in a sentence (e.g. if a verb is a one- or two-place predicate). In this section, I will attempt to explain this theory in more detail by introducing the two most important modules: X-Bar and α-move. I will also give

reasons as to why it is preferable for my overall approach to language evolution in this thesis.

X-Bar Theory

An important development of GB was that of X-Bar theory which invoked a general rule for the relationship between the lexical items that shared the constituent structure. Such a development recognised the redundancy of the list of rules developing in PS and replaced it with one rule which reflected a general pattern (Carnie, 2013, p. 173; Smith and Allott, 2016, p. 78). That is, all phrases had heads. So, for every XP the most important lexical item was X that would, overall, define the behaviour of the phrase (in verb phrases, that was the verb, and in noun phrases the noun, etc.). Further, these heads were accompanied by a 'complement', but also preceded by a 'specifier':

FIGURE 14- X-BAR[50]

The complement modifies the head by giving it more information and lies within the same phrase. For example, in 'from Paris': 'from' is the head, and 'Paris' the complement, therefore 'Paris' complements and gives more information about the preposition 'from', and not any other lexical item in the sentence. The existence of and relationship between head and complement is the case for all phrases. Some phrases, however, also have a specifier that precedes the head but are still part of that phrase. X-Bar theory also accounts for this 'intermediate level' of syntactical structure as represented by the X' in figure 11.

In the sentence 'Bob went to the pub', 'to the pub' is a PP. We know this because 'to' is a preposition, but it is also the head of the phrase. This is then part of the VP 'went to the pub', and so on. In the sentence 'Bob went straight to the pub', however, something else has happened. We have the same set of words 'to the pub' as a PP, but we do not want

[50] [XP [Spec] [X' [X] [Comp]]]

to say that the introduction of the adverb 'straight' is a head that makes 'straight to the pub' an AdP (an 'adverb phrase'). This is because 'straight' seems to be telling us about the PP 'to the pub', and not that 'to the pub' is telling us something about the adverb 'straight'. X-Bar recognises that, although on a syntactical level above the PP, the adverb is not the head of a phrase. It is, therefore, a 'specifier' that '*modifies the head, specifying how it is to be understood'*(Smith and Allott, 2016, p. 78). 'To the pub' is, therefore, labelled as a P' (highlighting the intermediate structure) and 'straight to the pub' is labelled as PP.

This rigid structure makes room for specifiers, but also prevents the sentence set up from being any other way—complements and heads can't swap roles, or complements can't be mistaken for specifiers—and therefore strictly defines the overall structure of phrases and sentences[51]. Thus, X-Bar theory defines the nature of phrases which tend to build around a central core, the head. It is this underlying structure that affords the power to help human communication in the way I have been advocating in this thesis. In other words, it provides a means of 'making relevant what is not salient' in communicative discourse. If a speaker is in a situation where the context fails in helping to get the message across that Bill hit Fred (see 3.3.2), then X-Bar theory as part of the FL, can (see 3.4.1). Let me explain:

'Hit' is a word that describes an action and it can occupy the head position within a VP. In this position it has space for a complement. If 'Bob' occupies that complement position, then the two words gain a syntactical relationship which defines a meaning beyond the stand-alone words. Since 'Bob' occupies the complement slot, this means 'Bob' tells us something more about the head, 'hit', and not the other way around. Semantically this tells us Bob was the one who was victim to the act of the hitting.

'Hit', however, can also be part of a larger unit, a whole sentence[52], with an NP as the parent phrase over our VP ('hit Bob'). If 'Bill' occupies that noun phrase, then it becomes the head of the larger constituent. Here, 'hit Bob' complements 'Bill'. Bill 'projects' over or governs the VP and describes an overall direction of the phrase. This suggests Bill was

[51] Keeping in mind that in GB they do not use the term sentence, but TP and CP – see footnote 36

[52] Or 'TP' in more up-to-date terminology.

the hitter, rather than the hittee. The underlying X-Bar structure, therefore, describes the whole action by means of the relationship the head has with its complement (and any specifiers).

Provided everyone has their mind 'set up' with this X-Bar module as part of the FL then it becomes entirely possible for one to use the utterance 'Bob hit Bill' to deliver the message that Bob was the one who did the hitting, and Bill was hit, even in a context that lacks the salience of Bob, Bill, or the act of hitting.

Move-α

Another important module in GB is known as move-α and that describes the nature of transformations in linguistic structure based upon the model X-Bar has offered. Without going into the technicalities linguists recognised three different 'types' of transformations (Carnie, 2013, pp. 289–390). These are 'Head movement', 'DP Movement', and 'Wh-Movement (the latter refers to the example used in 1.2.1). Despite some differences between these transformations, theorists saw that they also shared similarities enough to generalise them to a single unified theory of movement:

> Notice that while there are significant differences between the motivation for the various types of move, there is one overwhelming similarity. The movements all occur so that one item can appear near another…All the motivations for movement, then, seem to be *locality constraints*….if all movement types are motivated by locality, then there isn't really a significant difference between rule types. Perhaps we can unify them into a single rule: *Move.* Move says simply "move something" (but only if you have to) (Carnie, 2013, pp. 393–4).

As a very brief note 'locality' and 'locality constraint' relate to another of the seven GB modules which concern constraints around the relationships within embedded phrases. This module informs the syntactic structure that cases of agreement are *'bound to some local domain'*(Smith and Allott, 2016, p. 83). Again, in avoiding technicalities this points roughly to the facts that 'himself' in 'Bill thinks John likes himself' must agree with John (which is 'local'), and not Bill (which is non-local) (example in Smith and Allott, 2016, p. 83).

As a reminder to my reader GB implies a two-stage process in the generation of sentences that includes the application of move-α. The transformation 'happens' at the shift from Deep (or 'D-Structure) to surface structure (S-Structure) as suggested in figure 15

(extracted from Jackendoff, 2002, p. 109):

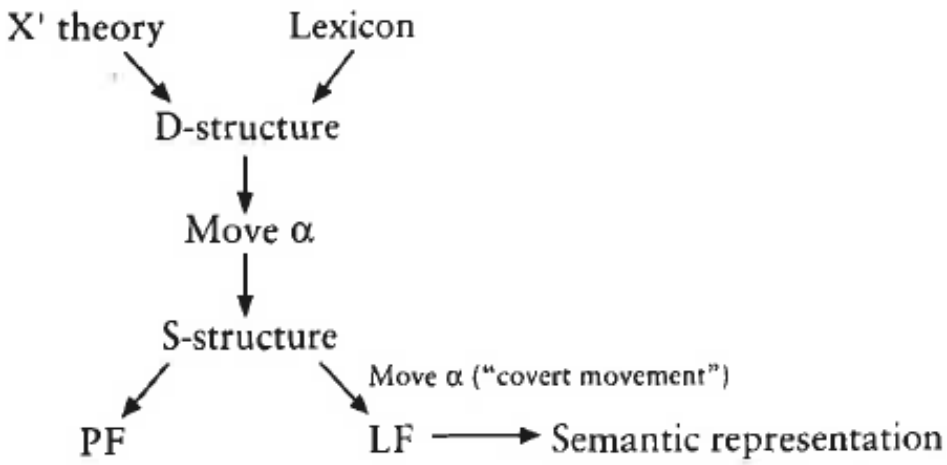

FIGURE 15 - GB MODEL FOR TRANSFORMATIONS

I will come back to the discussion of transformations and move in the next section when I compare this approach to the SMT approach.

Parameter Setting

What requires more explanation, however, is how GB explains the nature of variances throughout the world's languages, as a theory of how a child is able to acquire one of these many varied languages is also an important part of generative grammar:

> The answer is that not only X-bar structure and Move-α, but also the various sub-modules of the grammar … are innately specified, so do not need to be acquired at all. Syntactic differences between languages are explained as relatively minor differences in the way these modules function and in the different properties of individual lexical items (Smith and Allott, 2016, p. 80).

The thought is that syntactic variances are entrenched in the differences in '*the way the modules function and in the different properties of individual lexical items*' (ibid), but what does this mean? The way into describing grammatical variances in languages is broadly known as the 'principles and parameters' (P&P), with a focus on *parameters*. Later, I will also explain how this notion of 'parameter' is important in SMT.

P&P appears to be the same theory as GB but it tackles the nature of these interacting modules from a different angle. Where GB was very much focused on how the overall syntactic structure of language was rigid and where it was flexible; P&P focused on what aspects were common throughout all languages (UG or 'the principles') and which

aspects were not (the variances or 'the parameters'). In GB those aspects that were not common were described by the different ways in which the modules interacted, in P&P they are described as different 'parameter settings'. They are essentially telling the same story, but P&P offers a simpler way to explain the differences in language.

UG suggests that '*languages don't vary arbitrarily - 'there are universals underlying the superficial diversity'* (Smith and Allott, 2016, p. 56) and this is what P&P has set out to explain. A basic way to think about parameter setting is to imagine there are 'switches' that can be turned between one setting or another. Which position a switch occupies is dependent on the way the mind experiences the world; or in this case, what linguistic input it receives. The way switches are 'set' influences the overall 'output' of the FL and, thus, the overall shape of one's linguistic knowledge. Through this method '*grammatical learning will be limited to parameterised aspects of grammar (I.e. Those aspects of grammar will vary in parametric fashion from one language to another*)' (Radford, 2016, p. 33).

This quote from Chomsky (1991, p. 41) helpfully adds that:

> Notice that change in a few parameters, even one, may have dramatic phenomenal consequences as its effects filter through a fixed network of principles, so that historically related languages might look rather different in their surface properties, in ways that do not seem closely connected; correspondingly, an unrelated language might share structural properties over a substantial range because parameters are set in the same way.

In the modular approach of GB, these parameters could be seen as the different but limited ways in which the seven modules could possibly interact with one another.

An example of such a parameter setting is reflected directly in the discussion of the 'head' of the phrase above. All of my examples have been English where, when uttered, the head is always followed by its complement, but this is not the case for all languages. Other languages work in the reverse order where the complement is, in fact, followed by the head. So, where we would say 'from Paris' in English; the Japanese would say the equivalent of 'Paris from'. English, therefore, is a 'head-first' language, and Japanese is a 'head-last' language (Baker, 2001). What is important here, is that the head is either always first or always last, and never sometimes one or the other. The thought is that

once this 'head' parameter is set, it accounts and predefines all possible linguistic sentences. Or all possible linguistic sentences of *endocentric* languages.

Before the head-last or head-first parameter is set, an 'endocentric' or 'polysynthetic' parameter must be set. Where endocentric languages rely on word-order to define the head-complement relationship, polysynthetic languages rely upon the use of prefixes and suffixes (Baker, 2001). What is important to note here is that all languages adhere to the X-Bar theory but have been set up to utilise it in different ways. Through this example, we can see that even with just a couple of parameters the FL can potentially provide a large number of different languages, all of which could be traced back to this same set of internal principles and parameters.

The theory of P&P, as well as GB, still has many theoretical issues to iron out. For example, this leaves open questions like what does it take to select a parameter: is it an automatic or gradual process?; how much experience is required to do this?; is there an initial 'default' position?; and can the flip be switched back? These questions, however, are central to a fairly successful field of language research that takes seriously that language acquisition is a mixed dichotomy of both innate and experiential input (Yang, 2002; Lidz and Gagliardi, 2015).

With GB and P&P explained I hope to have shown how, overall, this ties in with my approach to language evolution, and I will give a deeper explanation of this below. First, however, I will explore the more recent theory of generative grammar that has come to counter this more communicative understanding of language. That is the view of SMT.

5.2.2 Strong minimalist Thesis

Merge and Binary Branching

In 5.1.2 I explained that the overall goal of MP was to minimise the descriptive devices that explain the complexities of language. So, although the theory of GB was shown to be very successful in explaining the complex structures of the world's languages, it was argued that the seven interacting modules that underpinned language did not provide a theory that was 'beyond explanatory adequacy'. I will provide an argument against this approach to language shortly (see 5.3.1). But first I want to visit the motivating factors for the extreme version of MP in more detail. This is known as the 'strong minimalist thesis' (SMT).

A key property of the linguistic structure we explored above is that it is *binary branching*. This is most obvious when we look at the syntax trees and see that phrases are consistently built out of only two constituents, and not three or more. A phrase either contains two words; a word and a phrase; or two phrases; and never three words, or two words and a phrase (Adger, 2015; Radford, 2016; Smith and Allott, 2016). This property is extremely important for several reasons, but it is also a driving factor for the SMT—one cannot get more minimal than binary. A focus on this aspect of language has brought about an approach to generative grammar which was very different to the X-Bar approach of GB, and one I will briefly introduce here.

SMT argues that language is essentially down to one operation—a single descriptive device—known as 'merge'. Merge simply takes two elements (lexical items or phrases) and combines them together to produce a larger phrase. In the sentence 'Jen eats marzipan', for example, 'eats' and 'marzipan' are merged together to build a phrase 'eats marzipan'. Then 'Jen' and 'eats marzipan' is merged together to build the larger phrase 'Jen eats marzipan'. And so on, to build larger and larger sentences (Smith and Allott, 2016, pp. 110–1).

SMT theorists suggest that this operation takes place in a sort of cognitive 'workspace' where the operation 'merge' works to create these phrases from the building blocks: the lexicon. This then gets 'sent to' either our conceptual-intentional systems (the C-I interface) or our 'sensory-motor' systems (the S-M Interface) in whatever tasks the mind needs it for. The S-M interface refers to our use of language when speaking, signing or hearing it—basically, when using it in communication (I will revisit this point shortly). When it is sent to the S-M interface the structure is 'flattened' into the one-dimensional form that is used in expression (beads on a string). The C-I interface refers to our use of language in constructing and organising thought (and thus closely related to LOT – see 3.3.2). When it is sent here, the C-I might use it in its hierarchical form (thus capable of distinguishing between the different structures of the ambiguous 'the dog chased the cat with the fish'). The point here is that even though the 'sentence' might look or function differently in either of the two interfaces, it is the same 'sentence' built in the initial 'workspace' that they share (Lasnik and Lohndal, 2010; Adger, 2015; Smith and Allott, 2016).

This approach, however, leaves open the question as to how such a simplistic model can account for the phenomena of transformations in language, as well as for linguistic

diversity and complexity. The answer lies in this concept of third-factor constraints (introduced in chapter 2.2.3) which suggests that syntactic structure is a product of general aspects of mind and world (such as physical, mathematical, and cognitive constraints) as opposed to a natural selection (and therefore something that has developed with a primary function). All aspects of language are explained in the model below, which is a simplification of the model introduced in the GB theory (extracted from Jackendoff, 2002, p. 110):

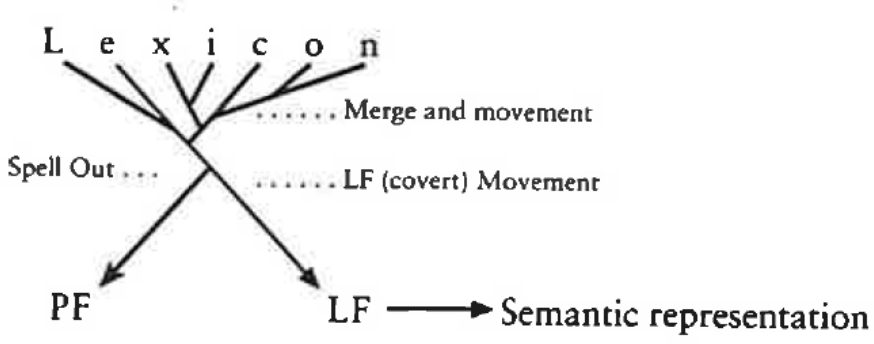

FIGURE 16 - SMT MODEL FOR TRANSFORMATIONS

Notice that there is no longer a need for deep structure and surface structure and, therefore, a separate space or level for transformation to take place. They 'take place' in the same space as merge. Furthermore, without the constrictions of the more specific X-Bar theory and Move-α (as well as the other modules of GB theory), this also means that linguistic constraints are explained mostly by the state of the lexicon. SMT, therefore, is a wholly 'bottom-up' model of generative grammar. Much of this is made clear when we introduce 'features'.

'Features' are carried by a lexical item and are the parts of it which place constraints on how lexical items are merged. It is not the case that any old lexical item can be merged with any other to create any sort of 'word salad', but that they are merged with other lexical items that fit. On this conception of the process of sentence building it is rather like puzzle building: where only certain puzzle pieces will fit with others. Sentences take on the form because of the way puzzle pieces or lexical items are, and not because of the puzzle-builder or FL.

SMT suggests that, in order to build grammatical sentences, it is required that features 'agree' with and 'delete' one another. If this does not or cannot happen, then the derivation 'crashes' and creates an ungrammatical sentence. In an oversimplified example, the lexical item that concerns the word 'eat' would carry features that tells the

merge operation that it is a verb. To 'delete' the verb feature, 'eats' needs a noun. If it is merged with the lexical item 'marzipan'—which has a noun feature—then the verb feature is deleted, and the derivation is either complete or continues to be built. If, on the other hand, 'eat' is merged with 'eat' the derivation crashes because the second 'eat' does not agree with and delete the feature. In other words, 'eat marzipan' works, but 'eat eat' does not. The features that 'eats' and 'marzipan' carry in actual linguistic theory will be far more complex than this. They will also include if the lexical item is a count or mass noun, transitive or intransitive verb, or a whole variety of syntactical elements (Radford, 2016, pp. 99–103; see also Smith and Allott, 2016, pp. 101–2). What this introduction to features does highlight, however, is how transformations and linguistic variety work in SMT.

Internal Merge

In GB 'Where is Ethiopia?' is established in 'surface structure' *following* the application of move-α in 'deep structure'. In other words, 'where is Ethiopia?' is a transformation of the sentence 'Ethiopia is in x'[53]. In SMT, this act of movement happens as part of the building process and the need to delete the features of the phrase 'x'. The thought is that 'x' is not resolved by merging further external lexical items or phrases, but by moving the phrase to another position further up the tree where its features can be deleted. This very process is still the merge operation at work:

> Chomsky has argued that Merge comes in two flavors: External and Internal Merge. External Merge is when items are first-merged in the syntactic tree, whereas Internal Merge is when a copy of an item is made and remerged elsewhere in the tree … The conceptual advantage of this view is that there is only one basic operation, Merge, and not e.g., two basic operations Merge and Move (Lasnik and Lohndal, 2010, p. 47).

SMT not only rids of the need for X-Bar theory but also α-move. In fact, it is the overall goal of the theory to have no rules in language whatsoever—everything is explained by merge, the features of the lexical items, and their interaction. Further explanation is needed, however, to explore how SMT understands linguistic variety.

[53] See the intro of 'wh-movement' in 1.2.2

Parameter Settings and Lexical Features

In GB, I explained that linguistic differences (such as head-first and head-last languages) were described by the different ways in which the modules interact with one another. This theory made further sense when we took the P&P framework. In SMT linguistic differences are also explained by P&P, except that rather than talking about a course of interacting modules, we are talking about a far finer set of parameters or features. Features on the lexicon *are* parameter switches. 'Eat' is positive for the nominal parameter, and negative for the verbal parameter. 'Marzipan' is positive for the verbal parameter and negative for the nominal parameter (Radford, 2016, p. 102).

It is the variation in these switches that accounts not only for the differences between lexical items, but the differences between languages overall. Once again, SMT explains the nature of natural language syntax by further generalising their overall linguistic theory into just a handful of working parts. The big question that remains open here, however, is where do these parameter settings come from, if not from the interaction of modules? In linguistic theory there are a number of responses to this question ranging from arguments that there are no parameter settings at all (Boeckx, 2014), to that they are a case of third-factor constraints defined by the 'states' or inputs of the S-M and C-I interfaces (Hauser, Chomsky and Fitch, 2002; Chomsky, 2005). I will come back to this point in 5.3.1.

From this analysis we can see that the SMT approach of natural language syntax stands in opposition to my proposed view on language evolution. Nothing in this model of language could have evolved for social or communicative reasons except for the externalisation of sentences that is considered an element of the S-M interface. The existence of this interface, however, does not seem to have had anything to do with the rise of linguistic syntax or the merge operation. If anything, the externalisation of language was something that happened after the emergence of syntax (Reboul, 2017), and therefore a secondary function of language (see 2.1 and 2.2). On this view the communicative and social pressures may influence the S-M and C-I interfaces, and thus perhaps the shaping of features, but not the FL.

SMT appears to argue that the FL is just the merge operation as this is the thing that describes UG (everything else is described by features on the lexicon) and what makes humans unique. This was what was referred to as the FLN in 2.2.3 (to distinguish from

the FLB) and was the very aspect that gave rise to recursive and hierarchical structures. With no further top-down instruction beyond merge, the FL is only responsible for creating recursive and hierarchical structures. Further, and as the SMT argues, recursive and hierarchical structures appear to do nothing obvious to help human communication (see 2.2.3). Hierarchical structure, for example, allows the creation of the sentence 'Bill who was sad hit Bob who was angry'. Here, the phrases contain more information because those associated with Bob contain the information that he was angry; and the ones associated with Bill describe that he was sad. However, nothing in the FL helps define who was the hitter and who was the hittee (this will be wholly down to the features carried by 'hit'). The sentence remains counterproductive to human communication as it offers no power in helping to disambiguate between the two possible meanings behind the utterance (either Bill hit Bob, or Bob hit Bill). In GB, however, X-Bar theory (as part of FL) took on some of this responsibility: mainly by ruling that every phrase has a head and compliment (see 5.2.1). I will come back to the discussion of hierarchical structure and communicative function in 5.3.2 – stage c).

5.3 Evolution of the Faculty of Language

5.3.1 Problems with SMT

In chapter 1 I explained that I was committed to the idea that we were 'linguistic creatures' because theories advocating this point can explain a child's ability to acquire language, UG, and its idiosyncratic nature (see 1.2.2). I also pointed out, however, that the approach had several issues with giving a satisfactory account of the emergence and evolution of FL (see 2.2). In this chapter, I have introduced technical theories and issues around this question in the linguist's goal to give an account of natural language that goes 'beyond explanatory adequacy' (see 5.1.2). The argument is that it is better to reduce the number of descriptive devices needed to explain language—the goal of MP. In this section, I will clarify why I disagree with this. Later, in section 5.3.2, I will give an account of the evolution of FL that goes 'beyond explanatory adequacy' without the need to so dramatically reduce the number of descriptive devices and that also aligns with the larger account of the thesis.

I explained above that SMT leaves much of the linguistic complexity down to 'third-factor constraints', and that the 'features' carried by the lexicon exist due to the conditions of the workspace, S-M and C-I interfaces, and the interaction between them. This theory of

language, however, continues to raise the questions: where, why and how? The very same questions I have been trying to answer throughout this thesis. To me, it seems that just minimalising the FL does not take the theory 'beyond explanatory adequacy'. If anything, it leaves the theory of SMT as equally stuck and open to difficulties as the theories that preceded it. Ultimately, I see two overarching problems with SMT which I think should push one to agree with a more GB inspired approach to language, or, at least, perceive it as equal to the SMT approach.

Firstly, that the features that describe the complexities of language exist because of third-factor constraints and are not products of learning or natural evolution. This means their origin is simply down to the physical constraints that govern what has become the set-up of the human mind (see 2.2.3). This thought is closely tied to Chomsky's scepticism with respect to natural selection, particularly when it comes to the evolution of complex organs like the spine or brain (Chomsky, 2015; Berwick and Chomsky, 2017). It is far from clear, however, that this takes us 'beyond explanatory adequacy'. When it comes to how evolutionary processes shape FL, brains, or spines, all theories are left in the dark. In other words, anything Chomsky has to say against the process of natural selection and thoughts about primary functions can also be said about the emergence of third-factor constraints.

The fundamental problem with evolutionary accounts of any natural phenomena isn't our 'need' to find function and purpose for everything (and therefore risk telling 'just-so stories'), it is simply that we lack the fossil record and a detailed evidential basis at all. We do not know about the environment, conditions, and evolutionary selection pressures that impacted humans at the time the FL emerged because no one was there to record it. This issue is as much a problem for a non-functional (or 'non-selectionist') account of language as it is for a functional or adaptive one. Here, I would argue that GB is actually better off because of the efforts made to explain an evolutionary history (see further discussion in 5.3.2), rather than claiming that a single genetic mutation is responsible for language (see 2.2.3).

Secondly, the SMT's argument that a single descriptive device gives a better account of language and language evolution than seven devices is problematic: a thought that supports Chomsky's overall scepticism of natural selection. One wonders, however, if this is the case. On one reading, the explanatory weight that is required for describing language has simply been a move away from the device (or FL) that creates sentences, and onto the lexicon which the device manipulates. This simply changes the focus of the

apparently difficult question of 'how does the FL give rise to all the complexities in language?' to 'how does the lexicon give rise to all the complexities in language?'. From this angle, SMT is no better off than GB because they are both stuck with the same issue of explaining where complexity and diversity came from.

Another way to look at it is to recognise that the shift between GB and SMT is not the same as the shift between PS and GB. GB was revolutionary because it removed the redundancy in PS, but it is not clear that this is the case with SMT and GB. Here, both theories may give a satisfactory explanatory account of language (interacting modules vs features on the lexicon), but neither is more preferable in so far as reducing redundancy is concerned. SMT has only simplified the shape of the FL, but it has not simplified language overall.

Therefore, SMT does nothing particularly special in the claim that it goes 'beyond explanatory adequacy'. In fact, its main argument that it is more sensible to reduce the number of descriptive devices brings no obvious solution to the question 'why does language exist?'. SMT is as empty as GB. It brings nothing more nor less, and both theories are somewhat 'stuck' at how to sensibly answer this question. It seems, however, that part of the problem for GB was that it lacked a sensible evolutionary story that described the emergence of seven interacting modules, and not its trouble with explaining language (in this I have argued SMT and GB are equal). What I hope to do here is give a sensible evolutionary story that seems to be lacking from the GB account, one that ties in with the larger picture of human communication evolution I have been advocating throughout this thesis.

5.3.2 Evolution of GB Modules

In chapter 4 I explained how I envision the overall process of language evolution, starting from group living and ending in the emergence of the FL. This involved describing the rise of natural language syntax as an effort between cultural *and* biological evolution. I described this process with the help of the ratchet effect which explains the accumulative nature of natural selection and gene-culture co-evolution (see 2.1.4 and 4.1.2). Here, a change in the biological object also enacts a change in the environment which involves a process of cultural evolution, and also enacts a change on selection pressures, which enacts a further change on the biological object (see 4.3). All of this was a response to the selection pressure to 'make relevant what is not salient' in communicative discourse.

In this theory, the FL also had a larger functional role in aiding cultural transmission. On this picture of language evolution, the GB approach to language fits.

In this section, I aim to explain how the FL is made up of modules that were naturally selected to enhance human communication. As I mentioned before, the goal is to go 'beyond explanatory adequacy', but as I argued this should not be about reducing the number of descriptive devices, but about making sense of the evolution of the FL in the larger picture of human evolution. In chapter 4 I presented a table which described the stages of language evolution, here, I present that table again but updated with the specifics that I aim to explore in this section. Stage 5, that was the rise of natural language syntax as underpinned by FL, is more finely defined through stages 5A-D (this is highlighted by italics):

TABLE 2 - HUMAN AND FL EVOLUTION

Stage	Thing emerged	Underlying Mechanism	Selective Pressure
1	Group living	E.g. Tolerance of others	E.g. Safety in numbers
2	Mind-guessing	Social cognitive mechanisms for group maintenance	Social living and cheating detection
3	Social Conventions and Culture	Social cognition for cooperation	Social Interaction
4	Word-use (preceded by pointing and panto)	Social interaction/social cognition	Sharing information that is salient
5A	*Theta-Words*	*Social cognition + 'proto-theta-theory'*	*Sharing information that is not salient through theta-roles*
5B	*Protolangauge*	*'Proto-X-Bar theory'*	*Sharing information that is not salient through semantic relationships*
5C	*Hierarchical Structure*	*X-Bar theory*	*Access to phrases use, not just serial words order*
5D	*Further grammatical relationships*	*All GB modules*	*Sharing information that is not salient*

The extra 'sub-stages' are inspired by an approach to language evolution that was suggested by Ray Jackendoff (1999, 2002; see also Fitch, 2010, p. 411). He argues:

> '…grammar is not a single unified system, but a collection of simpler systems. Many of these systems are built up as refinements of pre-existing interfaces between components. Hence the evolution of the language capacity can be seen as deeply incremental, adding more and more little tricks to the cognitive repertoire available to the child faced with acquiring a language (Jackendoff, 2002, p. 264).

For Jackendoff, the evolution of language is a slow incremental process that starts with the call and conceptual abilities of primates and ends with modern language. See figure 17 (extracted from Jackendoff, 2002, p. 238).

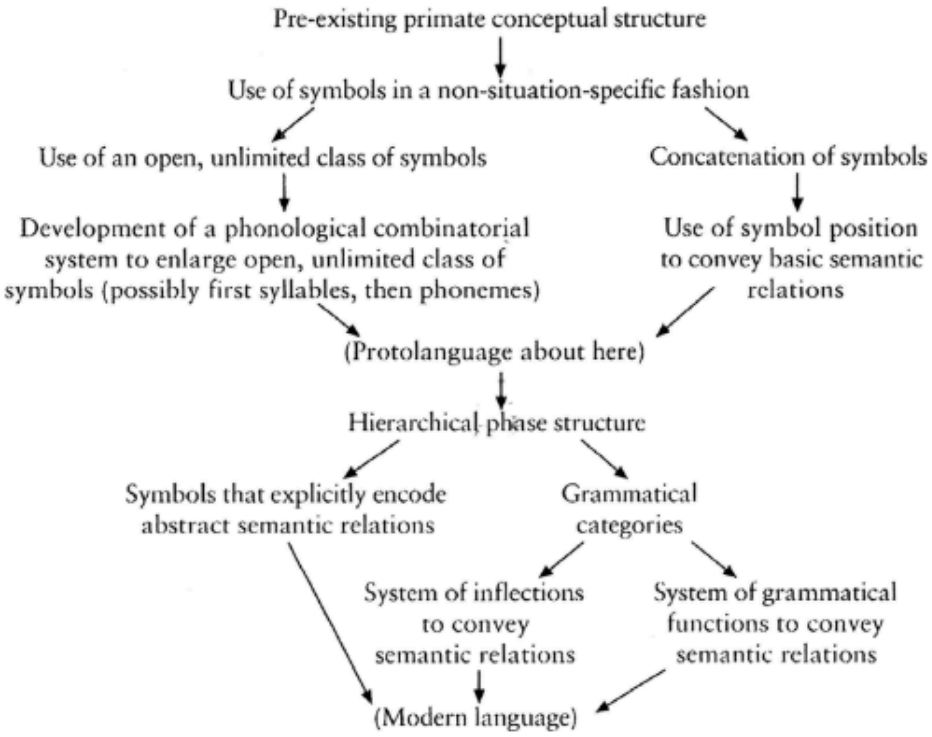

FIGURE 17 - JACKENDOFF'S STAGES OF LANGUAGE EVOLUTION

I have picked Jackendoff's approach to help guide us through this section because, for the most part, I agree with it. Like myself, he argues that language has a communicative primary function and is the product of natural selection. However, where Jackendoff's work goes deeply into both the syntax and semantics of linguistics, I am only able to make some suggestions about the evolution of a few of the GB modules and how they might interact. My goal here, however, is not to give a precise account or to get bogged down

in linguistic technicalities, but to offer a fresh approach on the evolution of these modules with Jackendoff's theory as a basis.

My reader will remember that previous communicative based theories of the FL have been problematic due to their commitment to the code-model of communication (see 2.2.2) and that my theory offers a new angle from the ostensive-inferential model that dissolved these problems (see 2.4.1). With that in mind, I will point out where I think my approach diverges from Jackendoff's as I take us through the potential stages of FL evolution.

Stage A: Theta-Words

As with many theories of language evolution the emergence of words precedes the emergence of syntax, as syntax requires basic units to combine together in the first place. In Jackendoff's theory, word-use evolves out of 'pre-existing primate conceptual structure'[54] to allow for the 'use of symbols in a non-situation-specific fashion'. These are akin to expressions like 'oops', 'tsk', and 'shh' that are often used in English speaking cultures; and are the sort of 'words' that work as standalone meanings (Jackendoff, 1999, p. 273). This shift involves the important conversion from iconic to symbolic communication which I have already discussed in 3.3.1. Like Jackendoff, I agree that this is an important stage in the evolution of language, but not one to discuss here.

From 'use of symbols in a non-situation-specific fashion' evolves the 'use of an open, unlimited class of symbols' alongside the ability to use the symbol or words in combination with one another (that is the 'concatenation of symbols'). Jackendoff argues that this shift involves an adaption to store more words in long-term memory as well as an adaption to create new words with the evolutionary goal to increase vocabulary so humans can communicate about a wider variety of things. This also involves the 'development of a phonological system' (a shift from 'holistic words' to words made out of smaller phonological units) that may involve changes to our vocal tract and the brain machinery that control it. I do not disagree with these adaptions in the early stages of language evolution, but argue that there is more to tell as word-use also requires the

[54] Consideration of conceptual structure and the semantics of language is an extremely important part of Jackendoff's theories of language, but something I do not have the time to explore here. It is something I briefly refer to in 1.3.1 when discussing word-meaning.

evolution of social cognitive abilities that allow humans to share mutual-knowledge in their communicative acts (see 2.3.2). It is only when this is established that humans can create, learn, engage with, and use words.

A parallel trajectory in Jackendoff's theory is the ability to 'concatenate' or combine the words or symbols together in any one communicative act. If I am able to use the word 'duck' in communication, then I am also able to use the words 'duck' and 'egg' in communication. I also agree with this and was something I discuss in detail in section 3.3.1 and 3.3.2. I conclude, however, that although word-use is the first step toward a power to 'make relevant what is not salient', it also came with a set of limitations that set up the selective pressure that prompted the evolution of FL. This was because, at this stage, the only thing that disambiguated the meaning or reduced 'pragmatic possibilities' of multiple-word-use was the context in which they were uttered. The use of the words 'duck' and 'egg' could refer to a duck egg, or a duck and an egg, or an egg that was near a duck—unless something in context (in the immediate environment or in mutual-knowledge) could help point out which meaning the speaker intended.

Jackendoff seems to agree with this general idea (see his quote in 3.3.2), but his focus and reason for developing to the next stage—the combination of words with semantic relationships—are quite different from mine. For Jackendoff, developing a further relationship between symbols (that goes beyond contextual cues) has something to do with clearly and precisely expressing one's thoughts, whereas I argue it is about the function to 'make relevant what is not salient' (see 3.4.2 for further discussion of this difference). It is therefore here that I would postulate the evolution of the first GB module: theta-theory, or what I refer to as the emergence of 'theta-words'.

To make sense of this proposal I will start by briefly explaining theta-theory as we understand it in terms of modern language. As I mentioned in 5.1.2 a starting point for GB theory was to deal with the unpredictable behaviours of verbs that PS was struggling to explain. The successful suggestion was that the behaviour of a verb was partially stipulated by the lexicon as opposed to the machinery that combines the lexicon together. The lexical entry for 'hits', for example, requires two arguments (the one hitting and the one being hit), whereas 'stumble' only requires one (the one who stumbled). This set in motion the idea of a module known as 'theta-theory', which had the verbs designate a set of predefined 'theta roles' that influenced sentence construction (Lasnik

and Lohndal, 2010; Smith and Allott, 2016). This allowed that different verbs could generate sentences in different ways.

Theta-roles not only define how many arguments a verb has but also their 'thematic relations': that is the sort of words or phrases these arguments should take. 'Hit', for example, requires an 'agent'[55] as an *'initiator or doer of an action'* (Carnie, 2013, p. 229); and a 'theme' which are *'entities that undergo actions'* (Carnie, 2013, p. 231). In 'Bill hit Bob', 'Bill' is the agent and 'Bob' the theme. In 'Bill hit the table', 'the table' is the theme. Here, both 'the table' and 'Bob' work as themes because they are both the sort of thing that can be acted upon. 'The table hit Bob', however, sounds odd because 'the table' does not work with the agent theta-role: it is not the sort of thing that initiates an action. 'Stumble', on the other hand, only requires an agent. Theta-roles, therefore, constrain the form of the sentence by dictating the sort of words and phrases that can accompany the use of a verb

I argue that a theta-theory module, or a 'proto-theta-theory' module, may well have a function in this early stage of language evolution, and could be a key starting point to making human communication capable of 'making relevant what is not salient'. The suggestion aligns with the fact that theta-roles are often obvious in that they reflect the meaning of the verb. Both the verb 'hit' and the actual act of hitting require an agent and a recipient. The act of hitting cannot be an act of hitting unless someone is doing the hitting and something is there to be hit. In fact, the act of hitting doesn't make sense if it is missing an 'agent' or 'theme'. The same can be said for 'stumbles'. The act of stumbling requires an agent or a 'stumbler', but it would be odd to suggest if stumbling had a theme. It does not make sense to say that Bob or the table was a direct target that underwent the action of stumbling.

The very activity or meaning of the verb presumes a number of arguments ('hit' has two, 'stumble' has one) and the sort of things those arguments must be (agent, theme, etc.). Theta-roles, thus, also have the capability of pointing a hearer towards something that is not immediately obvious, even if other words are unexpressed. I, for example, could utter the word 'hit' to a hearer in the presence of Bill who has a bruised face. The utterance,

[55] Other thematic relations include 'experiencers', 'goals', 'source', 'location', and 'beneficiary' (Carnie, 2013, pp. 230–1).

along with its theta-roles, points the hearer toward what happened. It may not tell my hearer who did the hitting, but it does 'prompt' my hearer to infer that Bill was hit by someone (an agent) and therefore consider who that someone might be. This also informs them that Bill's bruising was not the result of something like an accident, which the use of the word 'stumble' may have inferred.

My thought is that a proto-theta-theory could evolve to maintain these 'theta-words' because they enhance human communication and are more effective than relying on memory or learning alone to 'hold' these forms in place. 'Theta-words' gain these forms because they directly reflect those activities and things in the world that are useful for a group of humans to talk about. Bringing this point back to the theory of natural selection, I suggest that the genetic variations that promote the use of these theta-words will be selected for because they respond to a selection pressure to 'make relevant what is not salient' (see 3.4). Humans that evolve 'theta-roles' or forms that are not helpful—that do not reflect their activities in the world—are less likely to be selected for. This process, therefore, counts for the initial emergence of the mental module that is to become theta-theory.

The main point of suggesting such a stage is to highlight a difference in my approach from Jackendoff's. I would expect Jackendoff to argue that theta-theory would emerge after a syntactical relationship between words has been established because it would provide some function in bringing more precision and clarity to phrases which are evolving to express our thoughts. For Jackendoff, theta-theory has no function in this until verbs are already able to carry arguments in the form phrases. For me, however, it provides a way of expanding the functionality of words (in 'making relevant what is not salient') even prior to any systematic combination of them.

Such a suggestion for the evolution of theta-theory needs further research as many questions are left open. Is it possible that the evolution of theta-roles takes place before the evolution of nouns, verbs, and adjectives? Or does the early development of proto-theta-roles prompt the evolution of further syntactic categories? A similar thought, however, exists in the works of Sperber and Origgi when discussing the evolution of linguistic structure within a model of ostensive-inferential communication:

> a language faculty that leads to the internalisation of a grammar that attributes more structure to utterances than they superficially realise (that project onto

them "unexpressed constituents" for instance) may facilitate inferential comprehension (Origgi and Sperber, 2000).

Stage B: Protolanguage

Once word-use is established the next stage is to find a way of combining them. Although Jackendoff and I express different opinions on the selection pressures that prompt the evolution of FL, I imagine the story is similar when we consider the evolution of the GB modules. In 3.4.1 I discussed 'the use of symbol position to convey basic semantic relationships'. In that section, I used the 'subject-first rule' as an example of this as it demonstrated how a rule over symbol position had the power to disambiguate the meaning of multiple words like 'Bob', 'Bill', and 'hit'. If 'Bob' is uttered before 'Bill', then it suggests that Bob is the subject, therefore Bob who did the hitting. In this section, I argue that using symbol position to convey semantic relationships reflects the function of X-Bar theory (which I introduced in 5.2.1), and therefore, at this stage (5B) the initial emergence of the X-Bar theory module.

X-Bar theory defines the overall structure of phrases as having heads and compliments (as well as an optional specifier). At this early stage of FL evolution, one could suggest that this module starts to emerge as a 'proto-X-Bar theory' to cause an underlying structure that ensures words are, for example, 'connected' in a way that represents a 'head-like' to 'complement-like' relationship. Thus, one word compliments the other. This means that when speakers and hearers use multiple words they also 'pre-empt' or 'expect' them to share this sort of relationship. Under Jackendoff's view, proto-X-bar offers a way for humans to more clearly share their thoughts (which presumably contains this sort of relationship), under my view it offers a way to infer meaning from multiple-word-use beyond the contextual cues in which they are uttered.

Again, such a suggestion leaves open many questions that I cannot address in detail. For example, if a 'subject-first' or 'head-first' rule evolved initially, then why is it we have languages that do not follow this rule? When does the parameter setting, that apparently defines this set up (see 5.2.1), come into play? What about the recursive and hierarchical nature of natural language syntax that seems so central to linguistic theory? Does that not pre-exist these semantic relationships? I will, however, briefly address this last question as it is central to the debate of this chapter.

The emergence of a 'proto-X-bar theory' supports the idea that a protolanguage pre-exists the full languages that we see today. The primary difference between protolanguage and full language is that protolanguage lacks hierarchical phrase structure that is so definitive to our understanding of language (see 5.1.3). Jackendoff argues, however, that:

> one need not advance to full generative syntax, replete with recursive trees, in order to improve the [communicative] situation (Jackendoff, 1999, p. 275)

This thought that a non-hierarchical language came first is controversial in the larger field of generative grammar. This should not come as a surprise when one considers the debate I explored above. The MP angle that the FL is made up of the single hierarchical phrase structure making operation: 'merge' (see 5.2.2) obviously clashes with this claim. The question seems to be: if a hierarchical phrase structure did not happen in the same instance the FL evolved to combine words, then when and how did it come about? This very question is worth keeping in mind as it highlights one of the contentions which keeps the field from unifying on a top-down or bottom-up view of linguistic theory (Dąbrowska, 2015; Newmeyer, 2017). This is something I attempt to answer in the next stage of FL evolution (stage C).

Despite this issue, there is evidence of a protolanguage stage in the evolutionary history of FL. Jackendoff argues that 'living fossils' of protolanguage are still observed in the modern day uses of language. For example, adult second language learners who are picking up a language without direct instruction have a strong tendency to follow a subject-first or 'agent first' rule. This 'protolanguage', known as 'the basic variety' is thought to reveal a subcomponent of UG (Klein and Perdue, 1997). Furthermore, a similar pattern is observed in the creations of pidgin and home sign languages (Muysken and Bickerton, 2006).

Finally, before I discuss the emergence of hierarchical phrase structure I will also point out that, at this stage, there is an argument for the co-evolution of 'proto-x-bar theory' with 'proto-theta-theory'(introduced in 5A). Although they are defined as separate systems, it could be that the proto-X-Bar (as a structure with heads and complements) was dependent on the existence of proto-theta-theory (as an innate expectation of how certain words will behave). If we keep the process of gene-culture co-evolution in mind we see that the suggestion is not that proto-X-Bar adapts to a mind that has a proto-

theta-theory, but to an environment and culture that uses 'theta-words' in communication. Theta-words—which could become the sort of word that typically behaves as a head—would affect the cultural evolution of words as it introduces new ways in which words could be used as well as new words to create. It is then this environment that prompts the evolution of proto-X-Bar into combining these words for the further power 'to make relevant what is not salient'. If this were the case then, at this stage, we could have a protolanguage which initiated linguistic structure by connecting words in a head-like to complement-like relationship in a way that is predefined by theta-roles.

Stage C: Hierarchical Structure

According to Jackendoff, once protolanguage is established the next evolutionary step is the rise of hierarchical phrase structure. He suggests that the structure which inserted words into linear semantic relationships, evolved into a structure that inserted words into phrases with heads, so *'the principles of word order to be expanded into principles of phrase order'* (Jackendoff, 1999, p. 277). This would mean that the subject-first rule did not apply to word-order, but to the order of embedded phrases (see 5.1.3), thus *'yielding a major increase in the complexity of conveyable messages'* (ibid). This move could be reflected in the evolution of the proto-X-Bar module to the full X-bar theory module (see description under stage B). The head-word, now, not only has a certain relationship with a complement-word but 'heads' an entire phrase and has relationships (as either head, complements, or specifiers) with other phrases. This shift meant one could utter something like 'Bill who was angry hit Bob who was sad' whilst still conveying that important semantic relationship between Bill and Bob, as well as semantic relationships at the level of the phrases that give more information beyond the main core of the sentence.

The rise of hierarchical structure out of protolanguage, however, raises some interesting questions with regards to the primary function of FL. I mentioned in 1.2.1 and 2.2 that several theories of language evolution (including MP) tend to argue that hierarchy points toward a cognitive enhancing primary function, rather than a communicative one. Hierarchy, in general, seems to be at odds with the overall claims of the thesis that language has a communicative primary function. To this matter I have three possible responses.

My first response is to take into account Pinker and Jackendoff's arguments that the FL evolved to aid humans in more clearly and precisely expressing their thoughts (see 3.1 and 2.2.2). Here, hierarchical structure has a function in, as I already mentioned, *'yielding a major increase in the complexity of conveyable messages'* (Jackendoff, 1999, p. 277). The rise of hierarchical structure reflects this well because it provides a means to express thoughts in a way that protolanguage could not. Although this clashes with my claim that the FL evolved to 'make relevant what is not salient' I do not deny that the expression of thoughts was a function of language, it just was not the fundamental driving point. I could argue, therefore, that *at this particular stage* of the evolution of FL the driving point was the function for clear and precise expression, and not to 'make relevant what is not salient'.

In this response, I would be quick to remind my reader to consider it within the larger picture I am presenting. The overall driving force and selection pressures that built the FL may, indeed, oscillate between more than one primary function, but that to 'make relevant what was not salient' would certainly be the most important factor. For a start, a selection pressure to convey clear and precise messages is less important when humans already have a good means of doing this (through pointing and panto - see 3.1).

My second response is to give an argument where hierarchical structure does, indeed, provide a primary function to 'make relevant what is not salient'. I will do this through assuming that human thought is defined by a connectionist theory of mind, and not a language of thought (see 1.3.2 for definitions). Protolanguage gave humans far more power and capability to communicate outside of contexts they were used to. Humans could do this because protolanguage made them more capable of 'making relevant what was not salient' in their communicative discourses, and therefore they did not need to so consistently rely on the immediate environment and mutual-knowledge to cooperate and work together. This meant that they could explore further regions outside of their usual comfort zone and conduct more tasks than they could with standalone word-use. Protolanguage also had a huge impact on the way in which humans can think, and therefore what humans can think and communicate about (remember, on the connectionist model language plays a big role in determining human thought).

We can imagine, therefore, that this growth of human cooperation and culture meets a limitation at the same time as the evolution of the FL. It may be that the FL is saturated and can evolve no further in conveying useful semantic relationships despite the ongoing

selection pressure to 'make relevant what is not salient', to continue pushing the limits and growth of culture. Thus, natural selection is open to another solution, another evolutionary strategy. My thought here is that human culture and thought had grown so much in content and complexity, that a hierarchical rather than linear solution to underlying structures of multiple-word-use would be the next natural step in the evolution of the FL. Hierarchical structure is, therefore, selected due to its function to 'make relevant what is not salient'.

My final response is to take seriously Chomsky's scepticism about natural selection at least in explaining the evolution of hierarchical structures and agree with him that this innovation is down to one genetic change which is the product of third-factor constraints as opposed to a process of natural selection (see 2.2.3 and 5.2.1). This would suggest, in an indirect way, that I agree, in part, with Chomsky and MP on the evolution of language. Although we disagree on the overall nature of the FL (modules vs a single operation) we would agree that a fundamental aspect of modern language is the product of a single genetic mutation that gave rise to binary branching. There is, however, a fundamental difference between these views that we should keep in mind. For Chomsky, a single genetic mutation seemed to transform the entire way the human mind worked, having a direct impact on human thought and human communication. For me, a single genetic mutation transforms the FL which has previously adapted the mind for protolanguage. For Chomsky, this is the whole story of the FL. For me, it is only part of a much bigger story that is dependent on the existence of the selection pressure 'to make relevant what is not salient'.

A continuation of this discussion requires the consideration of topics that go beyond the limits of this thesis, but I hope to have provided enough argumentation to show how it is that hierarchical structure, through the evolution of X-Bar theory, continues to serve a function to 'make relevant what is not salient', even if this is not directly associated with its primary function. To wrap these arguments up I refer to the final stage of language evolution which does continue the story of 'making relevant what is not salient' in a more direct manner.

Stage D: Further grammatical relationships

The final stage counts for many moves in the overall evolution of the FL, but in keeping with Jackendoff's framework, they all suggest a very similar role; and that is to convey

further semantic relationships between linguistic units (similar in fashion to the suggestions in 5B). What is different here is that we are no longer working with linear-word-orders, but a far more complex picture of phrases embedded within phrases.

The rise of hierarchical structure and headedness surely enhance human communication and impacts the human environment. It, subsequently, introduces new challenges and pressures that need to be resolved to continue successful and efficient communication. Jackendoff suggests the rise of three further properties which, when operating together, gives rise to what we understand as modern language today (see page 176 and figure 17 for reference). These are:

- 'grammatical categories' (emergence of nouns, verbs, prepositions etc)
- 'symbols that explicitly encode abstract semantic relationships'
- 'systems of grammatical relationships to convey semantic relations'
- 'systems of inflections to convey semantic relationships'

I will not go into how these innovations relate to the modules of GB as this is a task that requires its own thesis, but what I hope to have demonstrated here is a theory of the evolution of FL that goes 'beyond explanatory adequacy' without having to minimise linguistic theory. The idea that the FL is made up of interacting modules fits comfortably into a thesis that advocates a view that language is about enhancing the cooperative and communicative capabilities of humans as hybrid creatures. Ultimately, I conclude that what we need for a theory that goes 'beyond explanatory adequacy' is a more holistic picture of human evolution and not the further isolation of language from language-users as the MP view suggests.

Chapter 6 – Conclusion

6.1 Thesis Review

In chapter 1 I explained that natural language remains the centre of much debate and controversy in linguistics, philosophy, and other fields that have an interest in this ability that is unique to the human species. The questions I have raised in this thesis not only concern the underlying nature of our linguistic abilities but also explore how and why they came into existence in the first place.

The challenge and controversies start in the simple act of explaining what language *is*. In 1.1 I explained that I am committed to a view that puts syntax—the arrangement of words and phrases to create well-formed sentences in a language—at the centre of our definition. This, in turn, encourages a commitment to the view that humans are 'linguistic creatures' and that our linguistic abilities are underpinned by an innate system known as the 'faculty of language' or FL. The FL is a stand-alone module that exists in the mind of all human beings and informs the acquisition of natural languages. Without it, we cannot expect to have created and built this complex phenomenon that is so important to us today.

The thought that there is an FL is a contentious one in today's debates in language, but in 1.2.1 I argue that this must be the case as it explains the circumstance for UG; how and why it is children are so capable of acquiring language in spite of their impoverished experience of it; and also, its idiosyncratic nature. What I do point out, however, is that theories of FL are lacking when it comes to describing its primary function and, in turn, the primary function of language—that is why and how it came into existence in the first place. Current theories appear to have problems within evolutionary, communication, or linguistic theory. One of my main claims, however, was that such theories of language were out of sync with the bigger picture of human evolution. In particular, they did not take into account human's unique dependence on sociality and cooperation. Thus, the overall goal of the thesis was to give a more adequate account of FL that embraces a more integrated picture of human evolution.

Doing this required looking into a view that is usually seen as opposing the thought that we are linguistic creatures. That is that we are cultural creatures (see 1.2.2). Here, language is wholly learnt from the environment, and not through any innate system that is specific to it. The cultural creature view is based upon the fact that we are essentially

social animals that depend on social interaction and cooperation for our survival. This informs our understanding of how humans communicate (upon the ostensive-inferential model, instead of the code-model), and has us reconsider what innate faculties or system are unique to humans. Here, we learn that the mechanisms that underpin social cognition and our ability to 'mind-guess' are essential for understanding human sociality. This way of thinking about humans does embrace our unique dependence on cooperation, and also explains how important culture is for humans. It is from this angle that I suggest that we start exploring the use and primary function of the FL.

In section 1.3 I postulate the viewpoint that we are 'hybrid creatures', and that humans have both social cognitive mechanisms and the FL to thank for their ability to use language. Further still, I argue it is our being cultural creatures that prompts the emergence and evolution of the FL in the first place. My thinking is to ask what new powers the FL brings to human communication; what is different between human communication with language and human communication without language? It is here I conclude that the FL gives us the power to refer to events and things that happen outside of current context, or to 'make relevant what is not salient'. Since this power would bring so much to human social life I argue this is *why* it exists. This *is* the primary function of the FL. Our being linguistic creatures, therefore, supports and is part of our being cultural creatures. The rest of the thesis (chapters 2-5) is dedicated to supporting this view point on language and dealing with any direct objections.

Under this hybrid theory the existence of language depends both on processes of biological evolution and cultural evolution. The FL is a biological object and therefore needs to have evolved biologically, and language emerges within a picture where culture and cultural evolution is taking place. It is the goal of chapter 4 to tell this story in more detail, but in chapter 2 I explain how primary function is intertwined with the process of natural selection; and so, how biological and cultural objects are said to have primary functions. It is in this chapter I show how the hybrid creature view does not suffer from the sort of problems that other FL based views advocate, and I also expose the essential role that mind-guessing and social cognition has for language-use. For a start, the theory is more integrated with that bigger picture of human evolution, and we are in a better position where we can account for various evolutionary problems that seemed to plague pre-existing social views (see 2.2.2). These were the problems of continuity, freeloading, bootstrapping, and counterfunctionality.

With the more foundational details of language evolution set out in chapters 1 and 2, the rest of the thesis was dedicated to giving a richer picture and understanding of what the hybrid creature is.

In chapter 3 I argued that the FL was responding to an evolutionary pressure caused by the communicative behaviours that existed before it. This started with a deeper understanding of the nature of human communication (through the relevance theory) and an exploration of the powers that pointing and pantomime, word-use, and language all bring to human communication. I conclude that language (that is word-use with syntax!) maintains and enhances the power to 'make relevant what is not salient' that was initiated by word-use by providing a way to deal with the risks and limitations it also brings to human communication.

In chapter 4 I showed that the FL is the product of gene-culture co-evolution and how its primary function to 'make relevant what is not salient' has a larger function in fundamentally supporting human culture and sociality. Thus, there is an argument that natural language syntax is not a stand-alone or odd phenomenon of human evolutionary history but a necessary and integrated part of it. This chapter served to support my point that the evolution of language should be considered in the larger picture of human evolution, and therefore should 'fit' into the emergence and evolution of other parts essential to the human creature (including our dependence on social living and social cognitive capabilities).

In chapter 5 I argue in support of a 'government and binding' (GB) approach to the FL. This is in response to the minimalist program (MP) which argues that it makes more evolutionary sense to opt for a picture of FL that requires fewer 'descriptive devices' as possible as it was embarrassing to have to try and explain the selection and evolution of each one. I argue, however, that this is precisely how we should understand the FL and that this is mirrored in in chapter 3 and 4, as well as the overall approach I advocate in this thesis.

6.2 Further Work

As an interdisciplinary effort, the options for further work on this research question are far-reaching. In this thesis alone, I have dipped into several different fields including linguistics (syntax and pragmatics in particular), evolutionary biology, evolutionary

psychology, and cognitive science. Since the work is stimulated from the research of several different fields my approach to language evolution is very much a 'generalist' account. This is a necessary factor for the questions of language evolution as no one field has a monopoly on the question (Christiansen and Kirby, 2003; Fitch, 2010). It would be interesting and, perhaps helpful, however, to take the angle of language evolution into these fields and look at the theory from the point of view of a 'specialist'.

What would syntacticians make of the argument that syntax was designed (by natural selection) to enhance a form of communication on the ostensive-inferential model? Will this differ from the usual way of thinking about it as based on the code model? What would a pragmatist make of the argument that a biological system (the FL) is designed to make human communication more capable of referring to things that exist outside of the current context—of 'making relevant what is not salient'? What would the evolutionary biologist say to the idea that the evolution of the human mind is heavily influenced by human culture, which is also a product of the biological evolution of the human mind? What would the evolutionary psychologist say to the thought that language syntax (as the FL) is ingrained as part of human psychology for similar reasons as social cognition? What would the cognitive scientists think of the claim that the human mind and language is the way they are because of their cooperative interaction with other human minds?

Each question may the cause of controversy, but the generalist input into the specialist's field could be a valuable perspective and resource for furthering the research and scope of that field. Furthermore, the specialist input on the generalist question is also valuable, not only because it keeps the research question grounded in evidence-based science, but because it guides a generalist toward a holistic theory that is streamlined by each respective field. One also hopes the generalist is able to get past those controversies and disputes that prevent some fields and research opinions from working together at all.

Following this last point, there is also more research to be done on this question when it is compared and contrasted with the view that language is a wholly social and cultural phenomena that is learnt from our environment, and that nothing in our biological set-up is specific to the domain of natural language syntax (Tomasello, 2014). The tensions between the biological and cultural based views on natural language syntax are often the

cause of quarrels and disputes as opposed to opportunities for collaborative work[56]. In this thesis, I have attempted to 'break the barrier' in one direction by suggesting that we take on the 'hybrid creature' account of human evolution as a way of enhancing and forwarding our understanding our being 'linguistic creatures'. I did not, however, 'break the barrier' in the other direction, and argue for how our being hybrid creatures enhances or forwards our understanding of our being 'cultural creatures'. I explain how and why the FL makes more sense when we take inspiration from the cultural creature account of human evolution, but I would have liked to explore further how our social and cultural tendencies make more sense when we take inspiration from the linguistic creature account of human evolution. The arguments of this thesis, therefore, work towards convincing advocates of a cultural creature view that there is FL underpinning our linguistic capacity.

I tackled this point in only two ways. The first point was to simply argue that the FL is better placed to explain our language acquisition experiences and the idiosyncratic nature of language (see 1.2.1), but these points are less interesting as they have little to say about the evolution and primary function of language. The second point illuminates further details. I argued that the FL is designed not only to 'make relevant what is not salient', but to ultimately support human cooperation and cultural transmission—*to make us better cultural creatures* (see 1.3 and 4.3). I feel that, on this point, there is an opportunity for further research and line of argumentation that would be extremely interesting to explore: does a biologically based, but socially motivated, account of language (the hybrid creature) provide a better *functional* theory than the culturally based account (the cultural creature)? In other words, can a biological account of language (as designed by the more rigid process of natural selection) make more sense of a social linguistic function than the cultural account (as designed by the more flexible process of cultural evolution)?

Finally, there is much more to say about the more philosophical topic of the relationship between language and thought. At various points in the thesis, I explore the role of

[56] You only have to look as far as recent articles that have tag lines like: *'I took on Noam Chomsky's ideas about language and unleashed a decade of debate and ridicule. But is my argument wrong?'* (Everett, 2017); and at book titles like: *The language myth: why language is not an instinct* (Evans, 2014), or articles titles like: *The many errors of Vyvyan Evans 'The Language Myth'* (Rey *et al.*, 2017) to get a flavour of the sort of tension I am referring to.

human thought in language, mostly as the source of linguistic meaning and semantics. I argue, as with many philosophers, that words are paired with a meaning that is based in some sort of mental representation or concept 'in' the human mind (see 1.3.2). There is, however, two ways in which I have explored mental representation: either as a unit in LOT (Fodor, 1975) or as a pattern formed by a connectionist network based upon the mind's experience with the external world (Clarke, 2001). The idea that the syntactical rules that underpin LOT exist and interact alongside the ones that underpin natural language (as the FL) has been explored and researched in the past (Jackendoff, 2002; Pinker, 2005). Here, the tendency is to argue the LOT pre-exists the FL and that natural language gains its meaning from the conceptual structures that are already innately entrenched in our minds.

What is there to say, however, if there is no pre-existing LOT, but there is an FL? What if the FL is selected for the reasons I have argued for here, and human thought is left to the whims of the connectionist network? Here, the shape of human thought is largely dependent upon its experience with the external world as well as with the social interactions with other humans (like with how social conventions and words are formed) *and* the shape of the FL as it is used through those social interactions. Here, we get a theory of thought that sounds almost Wittgenstenian (the idea that social interaction and language-use *is* the basis of human thought), but also heavily influenced by a syntax that is biological and designed by natural selection (and therefore not wholly formed by the movements of society). I do not think this way of looking at human thought has been postulated before, and so would also provide a very interesting (but perhaps deeply controversial) opportunity for further research.

6.3 Final Words

The greatest challenge of this thesis was the task of bringing together theories and ideas from fields and perspectives that are often diametrically opposed. Although I am aware that my philosophically novel account of language evolution will be subject to resistance (that is, the primary function of language is 'to make relevant what is not salient'), I hope to have clearly conveyed the interdisciplinary effort and coherence of a hybrid creature view. This was the larger goal in this thesis that I believe I have been successful in. A theory which aims to provide an integrated account which takes seriously lessons from theories of evolution, linguistics, and human culture should be the goal of all theorists that are interested in this question.

It is in this final point that I think it is worth pointing out that one trained in philosophy, like myself, is well-positioned for the role of the generalist I mentioned above. Language evolution and other questions in the evolution and function of mind requires an approach which takes seriously specialist input from a variety of crucial fields and perspectives. Philosophers, as keen knowledge workers, have the skill to step back, observe, and analyse theories that can be unified and seek out those concepts that conflict and confuse. Overall, there is a role for us not only in the philosophical questions that surround language, evolution, and mind (like describing the notion of 'primary function', 'language', 'thought', or 'meaning), but also in the interdisciplinary research required to answer these questions in the first place.

Overall, I hope any academic in the study of language evolution finds it as fun and rewarding as it is difficult and challenging. Any perspective or theory will have a horde of oppositions to overcome, but will, at least, guarantee an enlightening and inspiring experience as one continues to try and seek out and understand the essence of what makes us human.

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