**DOCTOR OF PHILOSOPHY**

**Overlap not Gap: conceptualising natural language and its co-existence with non-human communication and cognition using Prototype Theory.**

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# Overlap not Gap: conceptualising natural language and its co-existence with non-human communication and cognition using Prototype Theory.

PhD Dissertation Submission

Linguistics

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**Acknowledgements**

'τῶν ὄντων...σοφώτατον χρόνος· ανευρίσκει γαρ πάντα.'

'Of all things...the wisest [is] time, for it brings everything to light.'

—Thales of Miletus, 6th Century BCE

**A Note on Bias**

It may not yet be established as best practice for author bias to be acknowledged at the outset of a work, but I feel it incumbent upon me, given the contentious topic, to state

explicitly my own personal feelings on this subject, so that they may not cloud the reading of this dissertation. I am a vegan and believe in the equality of all animals, inclusive of humans. Yet, I do not want to ruminate on non-human ethics within this dissertation, as it obfuscates the important science that needs clarification. Additionally, I believe gradualist evolution to be a credible account of how life has been established and develops on this planet. I believe that humans are a part of nature, however awkward our species feels in relation to it at times. I also believe in the purity of the inductive method of research. As such, I would like to defer to observation of nature and use academia to account for what we witness, without any a priori assumptions or prejudice – a tall task given the millennia of years in which humans have tried to dominate and judge the world around them, including one another.

It is a considerable fact that we have not yet agreed upon a definition of what language is. I argue here that a definition in the strict classical sense may not be appropriate and a search for one may cloud the issue. Furthermore, it is the contention of this work that we cannot fully explore language without recourse to simultaneously exploring non-human communication and cognition. To achieve this, we need to revise our views on the relationship that other species may have to language and the conceptual framework developed here aims to help with just that revision.

**Declaration**

I hereby declare that this thesis is the results of my own investigations, except where otherwise stated. All other sources are acknowledged by bibliographic references. This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless, as agreed by the University, for approved dual awards. I confirm that I am submitting this work with the agreement of my Supervisor(s).

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Yr wyf drwy hyn yn datgan mai canlyniad fy ymchwil fy hun yw'r thesis hwn, ac eithrio lle nodir yn wahanol. Caiff ffynonellau eraill eu cydnabod gan droednodiadau yn rhoi cyfeiriadau eglur. Nid yw sylwedd y gwaith hwn wedi cael ei dderbyn o'r blaen ar gyfer unrhyw radd, ac nid yw'n cael ei gyflwyno ar yr un pryd mewn ymgeisiaeth am unrhyw radd oni bai ei fod, fel y cytunwyd gan y Brifysgol, am gymwysterau deuol cymeradwy. Rwy'n cadarnhau fy mod yn cyflwyno'r gwaith hwn gyda chytundeb fy Ngoruchwyliwr (Goruchwylwyr).

**Abstract**

Language is ubiquitous and vital in our world. Yet, do we really know what this phenomenon is? How would we recognise language if we encountered it in unusual circumstances, such as the search for extra-terrestrial life? Plus, how can we best delimit the study of language without an agreed upon approach to the concept? There are multiple proposals for what language consists of or requires. Linguist Hockett's language design feature list is arguably the most extensive past treatment. But therein lies the problem: the definitional criteria are manifold and debated, encompassing a range of (often complex) features of various levels of import, from symbolic reference, to overt communicative intentionality, and to involvement of specific types of mental recursion.

One broadly, though not conclusively, agreed upon element is the consensus that language is unique to humans. However, it is questionable how we reached this consensus, when we do not know what language is. Additionally, there are conceptual issues involved in the two extant views on the relationship between language and other species. Both perspectives involve considerable limitations – the stark divide between language and non-human communication, or linear continuum from one to the other. Moreover, a definitional criteria list is not the only way to approach an understanding of what counts as language or account for typological diversity amongst the world's recognised languages, let alone non-human communication. Plus, other species should not be discounted from the discussion of language, given the increasingly complex findings of their cognitive capacities and communication. We could be missing key parts of the language puzzle. Yet, even if we agree to move beyond this species dichotomy, the problem remains of exactly how to integrate non-humans into a discussion about language in a systematic and conceptually coherent way.

Therefore, this interdisciplinary work first explores other options to traditional definitions and the categorisation approach these stem from, Classical Theory, and instead proposes that Prototype Theory presents a helpful basis for conceptualising language and how it relates to non-human communication and cognition. Such a move reframes the question from 'what is language' to 'what counts as language', thereby creating the basis for a quantitative methodology to answer the question, instead of basing answers on subjective assumptions. This Prototype Theory based approach also yields a potential solution: that there is a probable overlap rather than a gap between language and non-human cognition and communication in terms of multiple feature continua, without recourse to a species analysis. This approach also

enables us to reach an understanding of the features that are central to the language concept/prototype to progress awareness of this phenomenon and the diversity of recognised languages too.

The use of Prototype Theory for its macro application to this matter needs expansion. Hence, the dissertation explores not only the vertical and horizontal dimensions of the categorisation theory, with its hierarchical and family resemblance based graded typicality of features approach, but also builds in a third and fourth dimension. These dimensions cover the network of interrelated equivalent level concepts, like meaning, alongside context and the role of culture; as well as a dynamic aspect, given features evolve over time or change according to context. This dissertation also provides an outline procedure and hypothetical example to demonstrate how the framework may be applied in future investigations. In sum, both the study of non-humans as well as a Prototype Theory approach highlight the problems that co-relate, as well as form part of the solution to ultimately understanding the nature of language and language's place in nature.

**Keywords**: animal cognition, animal communication, animal language, categorisation, classical theory, definition, language evolution, non-human signals, prototype theory

**Contents**

## Chapter 1 Introduction

### 1.1    Motivation

Consider natural language (*language* henceforth). Consider the variety of ways and modalities in which it permeates a single day. Picture someone supposed to be critiquing the grammar of a bilingual email, that has been avoided to listen to the radio and watch the conventional road signs diverting drivers, except for the postman, whose visit sadly sets off the dog barking an alert, who then has to be coaxed back to bed. Language holds immense power too. Take Austin's (1975; 2006) speech act theory: we can do things with words from making requests to pronouncing judgements. How do we know any of this is language? Or indeed that any other species' communication is *not* language?

While language is undeniably integral in our lives, its essence – what language is – eludes definition. Defining the concept is even trickier because we have a subjective relationship to language and discuss language by using it. However, linguistics exists as the study of the phenomenon of language (or at least the structure and content of 'language activity', Firth, 1957, p.219), with numerous opposing factions working away at this very subject. Thus, it is difficult not to wonder why it is that this phenomenon, that is so ubiquitous, so powerful, and so thoroughly analysed, remains so little understood. Supervisors and study handbooks have impressed upon me the serious importance of asking a clear, focused, and essential research question, and of choosing a robust and appropriate methodology to address it. Therefore, should not the same be true for our approach to accounting for language?

Linguistics has focused on the big questions, including when language first originated, as with nineteenth century philological studies of the Indo-European languages (Radick, 2007); to its structure (e.g. Bloomfield, 1933; Saussure, 1966); language-dialect boundaries (e.g. Tamburelli, 2021) (though these boundaries are not as explicit as linguists might wish, c.f. Evans & Levinson, 2009); the phonetic (sound) systems of various languages, as with Jespersen's suggestion for the International Phonetic Alphabet (Britannica, 1998a); how language is learned or acquired by children (Clark, 2016); the quirks of the various recognised languages in the world since at least the 1800s (Whaley, 1997); the nature of sign languages (Stokoe, 1960), and so forth. Underlying all of these questions, is an even bigger one: what exactly is language (e.g. Chomsky, 1968, p.62)? Moreover, how do we go about answering

such a broad and implicating question, one that could easily become several lifetimes' work? How do we determine what language is?

It is the goal of this dissertation to attempt to resolve the latter methodological, or 'how', question, by examining various proposed definitions, models, and features of language, as well as its relatives non-human communication and cognition. What are the advantages and disadvantages of past approaches? Are there other models or approaches that could be used more effectively and/or more inclusively of the vast array of language(-related) evidence and theories? I argue throughout that only by paying more attention to the method of enquiry and by more seriously expanding the range of data employed to include that of non-humans will linguistics have a real opportunity to enhance knowledge of its eponymous phenomenon: what language is, how it works, and where it comes from.

## 1.2    Background

### 1.2.1   Range of Views on Language

Within linguistics, there are multiple branches and approaches, even before differentiating on a content level: theoretical and applied linguistics; general and descriptive linguistics, looking at language or individual languages respectively; synchronic and diachronic linguistics; functionalism and formalism. Each has a different focus on, and interest in, language.

Numerous individual authors, then, whether in linguistics or adjoining fields, have proposed fundamental elements without which they argue language could not function, which are scattered throughout the literature:

- anthropologist Deacon's 'symbolic threshold' (1997);
- cognitive linguistics Croft and Cruse's focus on 'the real-time perception and production of a temporal sequence of discrete, structured symbolic units' (2004, p.1);
- cognitive scientist Tomasello's pattern-finding skill and joint attention (in which two people focus their attention on the same object or event) (2005);
- functionalist Halliday's communicative intentionality and 'learning how to mean' (1975) (c.f. also Wharton, 2003);

- psychologist Corballis (2007), as well as evolutionary biologist Hauser, formalist and mathematical linguist Chomsky, and evolutionary biologist and cognitive scientist Fitch's recursion (repeated structures to make infinite sentences, sometimes with (centre) embedding of phrases within others) (Hauser, Chomsky, & Fitch, 2002);

- cognitive psychologist and linguist Pinker's primacy of syntax over meaning (1995);

- phonological and universal syntactic linguist Demers' (1988, p.333) focus on the 'unboundedness in scope' that other 'communication systems lack';

- and ethologist Zuberbühler's (2019) focus on compositionality as opposed to more basic combinatoriality, as apparently predominantly found in non-human communication (though c.f. recent findings of more complex multi-level combinatoriality of magpie vocalisations that seem to head in the direction of language's form-meaning structure: Walsh et al., 2023).

It is noteworthy how the proposed features tend to reflect the academic background and perspective of those proposing the features, as well as how each of these separate elements are tangents leading away from the bigger picture of what language is as a whole. Additionally, other scholars would disagree on the types of features as those listed above, as Perniss and colleagues (2010) note the oft neglected iconicity of language too. For instance, Caesar's sequential '*veni vidi vici*', 'I came I saw I conquered', shows an iconicity of the structure reflecting the order of events. The principle of gestalt provides another view to how meaning is constructed and that it is not just a compositional sum of its parts (Evans, 2007; Lakoff, 1987). In fact, Lyons' (1981) introductory chapter illustrates that the definition of language, to some extent, comes down to who is being asked to define the phenomenon, and in what context (Meijer, 2019), as will be demonstrated in more depth in Chapter 4. Salus (1969) also shows the range of foci across the ages of language study by collating key texts from Plato to Rousseau to von Humboldt on the nature of language. In this dissertation, therefore, all insights are viewed as potentially valuable but simultaneously incomplete.

A further complicating matter is the ongoing debate about what language is essentially for: whether language is primarily a cognitive tool (Chomsky, 2005; Fodor, 1975), later borrowed for communication (Reboul, 2015) as a 'secondary use' (Hoban, 1986, p.9); or whether it developed for communication initially (Bickerton, 2007, in the context of a critical

population mass; Evans, 2016b; Hurford, 2007). It is also important to note that language's original role and purpose nowadays need to be separated out (Aitchison, 2000, p.17), as they may not match up. Plus, language has other functions too, like ludic language used just for play (Crystal, 2001). Yet, while these types of language functionality proposals are acknowledged in this dissertation, especially regarding the exploration of key language features, the main focus remains the examination of how to conceptualise language as a phenomenon in its own right in terms of its features.

The broad scholarly variation outlined above explains why a language definition remains outstanding, but it clouds the issue too. Is it possible to select from or somehow unify the disparate insights we have gained through linguistics on the nature of language? From 1959 onwards, along with Altmann (Hockett & Altmann, 1968), American linguist Charles Hockett attempted to distinguish language systematically from other forms of communication, especially that of non-humans, while other scholars have presented briefer attempts, for instance Bickerton's (1996) chapter and Haldane's (1955) paper. Hockett (1959) itemised the design features of language that seem to enable language to operate, and examined non-human communication systems to see to what extent the language design features occurred therein. By way of introduction, Hockett's (1966) eventual sixteen language design features are presented in Table 1.

**Table 1**: Hockett's Language Design Features (taken from Hockett, 1966).

* Glosses were based on Hockett's explanations and embellished on by me.

| **Hockett's Language Design Features** | **Gloss of the Feature's Meaning** |
| --- | --- |
| *Vocal-auditory channel* | Relates to the predominance of the vocal-auditory medium of communication for humans, rather than other modalities. |
| *Broadcast transmission with directional reception* | This enables receivers to determine signal direction. |
| *Rapid fading* | This is a quality of vocal signals, given that sound does not linger. |
| *Interchangeability* | This relates to the notion that signallers and receivers can swap signalling turns. |

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|---|---|
| *Complete feedback* | The signaller receives the signal as well as the receiver, such as hearing the speech they are making. |
| *Specialisation* | The signal is specialised for the communicative function. |
| *Semanticity* | Signals have specific and stable meanings. |
| *Arbitrariness* | Signal meanings do not have an obvious link to the signal form, other than through convention. |
| *Discreteness* | Sound signals encode information in a combinatorial way. |
| *Displacement* | Signals can relate to objects and events not in the here and now. |
| *Openness* | Also referred to by others as *productivity*, this covers the development of new word coinages or grammatical patternings like idioms. |
| *Tradition* | Also termed *cultural transmission*, this relates to signals and their conventions being passed on to other people/conspecifics rather than being genetic. |
| *Duality of patterning* | Refers to both a phonological level and a grammatical level where abstract sounds can become words and words then become sentences. |
| *Prevarication* | Covers the fact that language can be used to lie. |
| *Reflexiveness* | Language can be used to communicate about communication and language themselves. |
| *Learnability* | Signals are possible to learn, so that humans can learn another language for instance. |

However, Hockett's 'defining set' of features for language would only include the following ten, partly due to the undisputed antiquity and universality of human (*Homo sapiens*) speech as a linguistic medium: openness, displacement, duality, arbitrariness, discreteness, interchangeability, complete feedback, specialisation, rapid fading, and broadcast transmission with directional reception (Hockett, 1966, p.12).

Hockett's insights should not be ignored, and indeed still hold sway (Anderson, 2017; Comrie, 1997; Engesser & Townsend, 2019; Gussenhoven, 2004; Hillix & Rumbaugh, 2004; Hoban, 1986; Malmkjaer, 1991; Mangum, 2010; Reznikova, 2017; Traxler, 2012). Yet, the feature list has been criticised in terms of both the features themselves (e.g. Wacewicz & Żywiczyński, 2015) and the list approach (Evans, 2014; Wray, 2005), which may lead to a random list of features that do not cohere (Aitchison, 2011). Meanwhile, obviously Hockett had not the access we do now to modern discoveries in ethology and psychology to help assess the features and their application to non-humans. For instance, we have since discovered that bottlenose dolphins (*Tursiops truncatus*) can communicate identity through their signature whistles (Janik, Sayigh, & Wells, 2006), and copy the signature whistles of absent dolphins (King et al., 2013), which would represent an instance of Hockett's displacement.

Of more specific interest to this dissertation, is the need to address Hockett's approach overall, given his intent to find the dividing line between language and (non-human) communication, rather than also include the similarities, while his work does not stipulate in detail how he itemised the design features, offering the brief justification that they are features found in all recognised languages but not (yet) found in any non-human communication system (Hockett, 1966), and examples for each of them. This is because the list was 'not originally assembled in a search for language universals, but rather through a series of comparisons of human speech with the communicative behavior of certain other animals' (Hockett, 1966, p.11). Nor does Hockett stipulate only exploring intraspecies communication. Although in the future interspecies communication will present an exciting opportunity for research, the focus here is mainly on intraspecies communication, as it is naturally occurring and would be most like language when viewed as a communicative tool (Evans & Green, 2006; Hurford, 2007). It also avoids influence from humans, such as experiments with technological interfaces that raise methodological questions, though they may be able to obtain useful data in future once we know more about the communication of other species (Herzing, 2016). Another confounding human influence would be the language teaching

experiments of last century (c.f. Hess, 2009), especially as the latter often used operant conditioning, which is not how humans learn their first language (de Waal, 2016). Focus on intraspecies communication also prevents issues, like wondering how much one species understands of another species' communication when it reacts to them, like alarm calls – is a coherent response to an alarm call by another species (e.g. Ouattara, Lemasson, & Zuberbühler, 2009; Randler, 2006; Templeton & Greene, 2007) just an instance of associating urgency with the signal, or is the detail of specific predators and so forth understood by the other species too? However, all this criticism of Hockett's work – as examined in more depth later, from the perspective of his list approach and the actual features themselves – is left hanging in mid-air: how do we fill the gap in Hockett's place? This dissertation addresses this very point: how we can approach the big picture of what language is, and the nature of its co-existence with non-human communication.

### 1.2.2   Human Language

As a clear starting point for understanding the big picture of language is the view that language is unique to humans (e.g. Campbell, 1996), which is often the way that language definitions are framed (Čadková, 2015). Throughout history, other animals have generally been seen by humans as not just 'other' but as inferior creatures. This includes Aristotle (Hawkins, 2017); the social climate that created Roman *venationes* (beast hunts of exotic animals for amusement and displays of power: Epplett, 2001), and the literature surrounding them like Martial's epigrams; Descartes' (1641/1996) famous dualism of mind versus the body and human versus animal automata; Thorndike's (1898) behaviourist view of reactive learning through conditioning rather than reflective thought; as well as the mass meat production and vast amounts of vivisection in today's world.

One particular way in which we view humans as segregated from other animals is the capacity for language (e.g. Lemmens, 2015 notes the human 'predisposition' for language). This view has persisted since ancient times (Heath, 2005). 'Human being language' is how the Taa people of Botswana and Namibia have named their common language, Taa-ǂaan, of the Khoisan family (Andresen & Carter, 2016, pp.284-287), which speaks at least to a species divide if not a sentiment that humans are the only species to have language. Even the exceptional few linguists who have seriously looked into non-human communication and

cognition for language comparisons (e.g. Hockett, 1959; Schlenker et al.., 2016) are explicit that the communication witnessed does not constitute language.

In fact, in lieu of a definition of language, phrases such as *human language* seem to act as placeholders, and are used quite broadly across disciplines (e.g. Baerman, 2016; Evans, Bergen, & Zinken, 2007; Fromkin, Rodman, & Hyams, 2014; Graham & Hobaiter, 2023; Liebal & Oña, 2018; Meyer, Magnasco, & Reiss, 2021; Miyaoka, 2007; Pietroski, 2017; Tallerman, 2012). Thus, the species descriptor of language forms a rare general consensus in linguistics (e.g. Penke & Rosenbach, 2007, pp.21-22). Haspelmath (2020) coined the term 'human linguisticality' as part of one evolutionary approach to the proposed human uniqueness of language.

Therefore, it is argued here that the phrase *human language* should be formally termed a collocation (as per Firth's (1957, p.11) comment 'You shall know a word by the company it keeps'; also c.f. Sinclair, 1991, p139, who oddly uses *human language* in a sample text he created about communication forms to show corpus linguistics in action). The frequency of this phrase in fairly recent linguistics textbooks alone (e.g. Bauer, 2017; Beattie & Ellis, 2017; Becker, 2017; Littlemore & Taylor, 2015; Sharifian, 2017) justifies its status as a collocation. Indeed, to the great majority across the disciplines, language is seen as the 'last bastion of human uniqueness' (Lawrence, 1998, p.121).

This brings us to the crux: what does this collocation mean? While a corpus study of this collocation was not felt necessary for this dissertation, although a corpus could be created quite easily using digital journals or by using a concordancer of academic texts like Kwary's (2018), the frequency of *human language* in the interdisciplinary literature highlights the conflation of both language and communication along with species similarities and differences. Furthermore, is it really the case that language is an exclusively human phenomenon? Or is the use of such statements more rhetorically stylistic in nature, because of, for instance, the apposition of the two elements: the quality of being human and language, being placed in such close proximity as to appear 'joined and equivalent in meaning' (Mulholland, 1994, p.42)? This is as opposed to a clear proposition of the kind 'X is Y', like the less common *language is unique to humans* (Bickerton & Szathmáry, 2011; Ghazanfar, 2008), which is more easily and discernibly contestable (Mulholland, 1994, p.44). Given that I could not always see a reference to another species, alien life form, or artificial intelligence in connection with the use of the phrase (e.g. Chomsky, 1965; or Evans, Bergen, & Zenken, 2007 in their first paragraph), emphasising the human quality of language seems questionable.

If language is human-only, why use the adjective unless in very technical or comparative passages? And if language is not exclusively human, then the meaning and context of such statements are immediately contradictory when used in terms of language as a definer of human ability. Plus, if placed alongside the social versus medical model of *disabled people* versus *people with disabilities* (Shakespeare, 2017, p.198), the collocation *human language* is perhaps equally shown to be a social construct and the adjective is not tantamount to the essence of the language any more than a disability defines a person.

There seems to be a tautological element too, given the lack of an agreed upon definition of language: language is human-only because it is only used by humans, which is what makes us human. Wacewicz & Żywiczyński (2015, p.29) address this matter in their footnote: 'While "human language" may be viewed as pleonastic, we do not stipulatively tie the term language to humans, i.e. we believe the exclusion of non-humans is contingent and not definitional', where: pleonasm refers to a redundancy in words, (Online Etymology Dictionary, n.d.a). This is opposed to a genuine usage of the collocation, like Hockett's (1959, p.32) response to anthropologists specifying speech in lists they make of human versus non-human behaviour: 'Until we can describe in detail just how human language differs from any variety of communicative behaviour manifested by non-human or pre-human species, we cannot really know how much or little it means to assert this particular human uniqueness'. Fair point. However, how do we also account for any non-human communication-human language (or other) divide combined with the fact that all humans are animals too, despite the many comments about technological behaviours of humans that separate us from other animals (Bickerton, 1996)? Moreover, how do we conceive of the similarities as well as the differences between humans and other species, especially where language is concerned?

This is important, because we need to work from observable data, and build a framework that fits this data, so all continuities as well as discontinuities need to be integrated into a conceptualisation of language somehow, though perhaps not solely on a species only basis. From one vantage point, it may be argued that some researchers fall foul of Dr Dolittle-esque anthropomorphism in forcing similarities with our own species (Kennedy, 1992), or in a bias towards one's subject species (a well-advertised concession at the Behaviour 2017 conference). But what of the other extreme, anthropodenial, as labelled in de Waal's (1999) extensive treatment? For example, if we assign human properties that non-humans do have, is it a mistake in interpretation (Fisher, 1998)? Is not a bias belied here, and potentially a fear, along the lines of the 'uncanny valley' eerie sentiment evoked by robots appearing too much

like humans (Mori, 1970) that perhaps extends to other species? Can there be common ground moving forward, so that the facts about non-humans are considered without any bias at all? Perhaps, if one were to take the viewpoint that the collocation *human language* is more neutral than argued here, the real issue is that we have no appropriate term for non-human communication that may be language-like. In any case, the use of this collocation is to be seriously reconsidered.

### 1.2.3   Other Terminological Issues

For precision and a full understanding of the nature of language, we need to take care over lay parlance and employ scholarly terminology. It is important to note, for a start, that throughout I provide brief glosses of key terms in situ, so as to assist an interdisciplinary readership. However, no formal glossary has been produced for the reasons that will be explored in Chapter 2, demonstrating that definitions are fraught with complications. Additionally, a glossary would limit the meanings of terms to particular viewpoints, without due respect for the complexities and nuances that each concept evokes.

We also need to take care over not conflating the comparison of language and communication with a species comparison, as occurs frequently in the literature; nowhere is this seen more than in the collocations *human language* as opposed to *animal communication*. Furthermore, *communication* and *language* are sometimes used interchangeably, but only where humans are concerned (e.g. use of *signal* in Clark, 1996, p.156; the range of uses in D. Everett, 2013, p.123; and Tallerman's casual use of a 'breakdown in communication' when discussing language, 2015, p.151). Thus, Hoban (1986) may have evaluated the 'promise of animal language research' in a linguistics dissertation, but such wording is unlikely to be acceptable to the discipline currently, without substantial conceptual alteration.

That there are two different terms, *communication* and *language*, ought to indicate that they refer to different phenomena. Thus, the occasional interchangeability demonstrated in literature about human communication and language raises questions: is this linguistic laziness? Or is the distinction between *communication* and *language* not quite so distinct after all? For example: can we use the term *communication system*, (e.g. in Barón Birchenall, 2016) if an alleged way in which communication is separated from language is the point that language is a structured system by means of syntax (e.g. Reboul, 2015)? Or what is the difference between *language* and *symbolic communication* (e.g. Grouchy et al., 2016) if

Deacon's (1997) symbolic threshold is the gateway to language? Yet, if we argue that several features need to be combined, we need to be clear on which features and if there is a particular way in which they are combined to contribute to language.

Other related terminology is problematic too. The term, *cue*, for instance, is used to refer to an unintended, inflexible (Hauser, 1997), unspecialised informational transfer (Lehmann et al., 2014). However, when used of humans, it adopts an active communicative intentionality: 'while a cough can be a behavioural reflex, it can, in a sticky situation <u>be deployed</u> and interpreted as a communicative <u>cue</u> by one's partner in crime' (Evans, 2015a, p.255). Conversely, *signal*, a term also used of plants (Babikova et al., 2013), is used interchangeably with *communication* (Reznikova, 2017, p.2), and used for 'deliberate actions' (Clark, 1996, p.13), or the specialised function of communication (Oller & Griebel, 2008).

How deliberate a pot of pansies are in themselves as plants is still a matter for debate. But these instances illustrate the extent of the disarray where terminology is employed in different circumstances, and the impact it has on our construal of the science behind the terminology. This is especially true of different disciplines utilising linguistic terminology in various ways. Two interdisciplinary conference titles test the boundaries of the field of linguistics with respect to species: *Linguistic investigations beyond language: gestures, body movement and primate linguistics,* ZAS in Berlin, March 2019; and *Animal linguistics: take the leap!,* École Normale Supérieure in Paris, June 2019. Plus, the use of linguistic terminology in non-human communication and cognition research (like that of *phoneme*: Engesser et al., 2015; *dialect*: Deecke, Ford, & Spong, 2000; or Campbell's monkey (*Cercopithecus campbelli*) call *morphology*: Ouattara, Lemasson, & Zuberbühler, 2009) call the terms' meanings into question. Such varied (if not imprecise) terminology use needs to be understood: is it used correctly, erroneously, or polysemously? If correctly, then other species need somehow to be integrated into a concept of language. If erroneously, work to streamline terminology across disciplines would be helpful. If polysemously, it is incumbent upon linguists to pin down the terms in their proper contexts for wider usage.

We also need to address the definition of *animal communication* as well as *language*, for the sake of comprehensiveness and respect for non-humans. This term covers a wide range of communicative behaviours, functions, and cognitive mechanisms, as well as species of many different taxa with very different evolutionary histories. As such, the term is not very helpful, especially given only 1.2 million of the predicted 8.7 million species on the planet have been described (Mora et al., 2011), and theoretically this term encompasses them all. Yet

the term is frequently used across disciplines. Therefore, one hoped for outcome of this work is that, where possible, terminology will also be specified, even neologised, as suggested by Hillix and Rumbaugh (2004, p.226). However, there are starting points we can use, such as Hockett and Altmann's (1968) approach: that an act is communicative if, from perceiver's point of view, it comes as one of a set of two or more acts that could all occur in that particular setting but are mutually exclusive, like indicating one direction over another or asking for one object instead of another.

Aside from considering the disparate notions about language, the species distinction along with Hockett's legacy, and terminological issues, construal is another serious factor to consider in any new approach to accounting for language: the way in which we select information and categorise it in our minds (c.f. Croft & Cruse, 2004). Or, to put it in a more poetic way: '…what a ship is, you know. It's not just a keel and a hull and a deck and sails; that's what a ship needs. But what a ship is…really is, is freedom' (Captain Jack Sparrow, *Pirates of the Caribbean: The Curse of the Black Pearl*: Sandberg et al., 2003).

Conceptualisation of communication creates debate and confusion for instance. Though Reddy's Conduit Metaphor (1979) and the renowned Shannon and Weaver Model of Communication (1949) depict communication as a process of transmitting messages, debates ensue about information transfer with respect to other species, raising the conflation of comparisons once more. Seyfarth and Cheney (2003) break the process down into calls responding to stimuli and, separately, listeners extracting information, while Dawkins (1986) argues that, where non-humans are concerned, we cannot know what information the receiver had prior to the signal, therefore we cannot measure any reduced level of uncertainty, so non-human communication cannot constitute information transfer.

Therefore, the method of conceptualisation of language needs to be seriously considered, and it must be questioned how much current models or definitions of language are construed rather than grounded in reality. As such, the next section will describe the two extant construals of language alongside non-human communication, before explaining their issues and why neither construal resolves the matter of how non-human communication relates to language.

### 1.2.4    The Divide and the Linear Continuum

There are two major opposing views of how language evolved in relation to non-human communication: a clear divide or a linear continuum between the two phenomena. These notions arose in the ancient world and reappeared in the Renaissance, but were conceptualised the most explicitly and in the most detailed fashion during the Victorian era, in which American linguist Whitney (1875, p.730) described the opposing ideas as the 'impassable barrier' (a qualitative difference) or 'impracticable distance' (a quantitative difference), as depicted in Figures 1 and 2.



**Figure 1** A divide between non-human communication and language
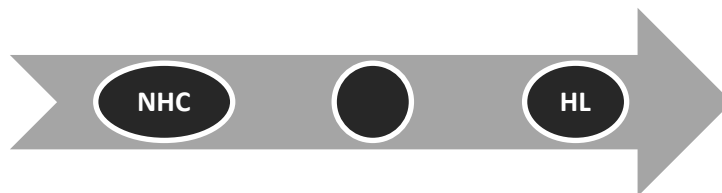


**Figure 2** A linear continuum from non-human communication to humans and language

It was an act of pure serendipity that I stumbled across Radick's (2007) *The Simian Tongue* – a historical and philosophy of science examination of the nineteenth century 'animal language debate', which formed a major insight for this project: the need to examine at least the approaches to, if not the actual study of, language origins, as well as how influential principles like psychologist Morgan's canon (1894) were born. This latter principle, for instance, stipulates that if a non-human's behaviour can be explained without recourse to 'higher' cognition then it should be understood as simple behaviour, which has seriously impacted on non-human cognition and communication studies (e.g. Buckner, 2013). However, notably this is not the approach to take exclusively with regard to non-humans, should there be a need to explain higher cognition that is exhibited by other species (Barrett, 2016). This is a point often missed in Morgan's work (c.f. the end pages of his chapter on

'Other Minds Than Ours', pp.53-59), in addition to the fact that Morgan seeks out simplicity not in the explanations but in the mechanisms we attribute to non-humans (Montminy, 2005). As a result of missing these points, it can skew the canon's interpretation leading to a view of non-humans with only lower or no cognition, rather than an approach that seeks to explain non-human behaviour without jumping to unnecessarily convoluted conclusions. Such nineteenth century notions, or popularised versions thereof, seem to have become fossilised as fact, without much reflection (c.f. Fitzpatrick's 2008 careful refutation of Morgan's canon as it is often adopted, proposing instead evidentialism and going where evidence takes us). This is despite the state of knowledge about non-humans constantly updating. Clearly, such historic thinking needs to be re-evaluated.

So, it became clear, through reading Radick (2007) and related material, that there were proponents in favour of a catastrophism, in which humans suddenly acquired language (Müller, 1861; and more recently Gould & Eldredge, 1977), or a more recent version including rapid as well as slow changes (Wolpoff, 2018). However, this qualitative stance with respect to other species was challenged by the notion of a gradual evolution, in which '*Natura non facit saltum*' – 'nature takes no leaps' (Darwin, 1859/1996, p.158), and of a continuum with a difference of 'degree' not 'kind' amongst species (Darwin, 1885, p.609). As such, it has been queried how language might have been born out of the blue (Bickerton, 1996). This linear continuum notion foreshadowed modern views, such as Hurford's (2014, p.15) point: 'maybe we're [just] the first species to evolve language', and it is consistent with biological sciences emphasising the integration of *Homo sapiens* into the animal kingdom (de Waal, 2016) (c.f. also works such as linguist Evans, 2014, p.59; Gardner, Gardner, & van Cantfort, 1989; Kershenbaum et al., 2014; and Westling, 2014).

A key reason for trying out different approaches to the conceptualisation of language's relationship with non-human communication in this dissertation is that, while the catastrophic hypothesis of the origin of language has been questioned (Corballis, 2017), and this dissertation tends away from the view, the hypothesis' position with respect to other species is at least clear: humans suddenly gained the ability for/access to language from one of several means, so this is what at once separates language from communication and cognition, and defines us as a species (Anderson, 2017; Chomsky, 1965; Zirin, 1980). Continua approaches (e.g. Barón Birchenall, 2016; Evans, 2014), instead, raise several questions. If language can be conceptualised as a continuum with (non-human) communication, why has the communication of at least some other species not been labelled as language? Given non-

human studies, such as those like the honeybees' (*Apis mellifera*) complex waggle dances relaying information about food sources (von Frisch, 1967), is the communication of at least some other species not consistent with what we expect of language? If it is not, how do we account for the similarity, which fits in with Darwinian principles? If it *is* consistent with current expectations of language, then how far along any such continuum might other species be included?

Moreover, can there really be a genuine continuum where one can say at some point along it that 'this is the threshold for humans and/or language', through which other species/features cannot pass? This is the sentiment seen in Deacon's (1997) symbolic threshold proposal, for instance. In fact, this point has been addressed in a text on building theory: 'measuring a continuum requires partitioning the theoretically unbroken whole into arbitrary units' (Shoemaker, Tankard Jr, & Lasorsa, 2004, pp.20-21).

An additional caveat is that continua models, where they are linear, imply that humans are at the apex. But there are potentially at least two issues with this viewpoint: firstly, the continual evolution of language and not knowing where this will lead, including for other species; and secondly, Deacon (1997, p.29) notes that many assume language is an evolutionary inevitability that humans have arrived at first/are at the pinnacle of, but that this cannot be the case because it rests on 'seeing the world in terms of design' (which might be just one more reason to do away with Hockett's *design* features). Furthermore, technology is cumulative, where biological evolution is not necessarily. Rather than a continuum as a linear concept, therefore, perhaps we need to seek or create theoretical models that allow for other 'shapes', which may be more practical in conceptualising language with respect to communication, and other species, for instance, as shown in Figure 3. We also need to take care over using the term *complex* for this 'continuum to an apex' reason. *Complex* can be used to mean not just multifaceted, but also more noteworthy and harder to achieve. However, within this dissertation, unless explaining a citation, the adopted sense of the term is to refer to a phenomenon's (anticipated) multiple (interlinked) parts, as simply an aggregate of different aspects, without any such value judgement over whether complexity is better or not. Nature and culture have much more efficient ways of determining the adaptive value of a phenomenon than any academic ever could, as demonstrated by the flourishing of simplified writing style 'text speak' for instance.
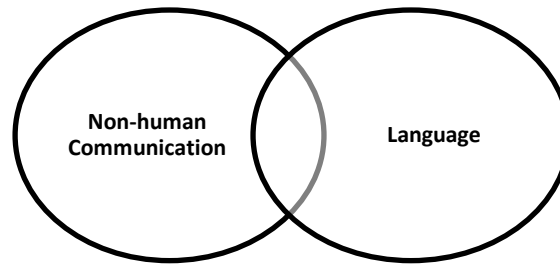
**Figure 3** An example of a non-linear continuum between non-human communication and language

Also stemming from the Victorian period, and pertinent to this particular discussion is the notion that there are two conventions of comparative analysis: explaining similar phenomena by similar features, and different phenomena by different features, which ought to be complemented by explaining similar phenomena by different features and vice versa (Pickvance, 2005). These options could be termed the 'Plurality of Causes' and 'Intermixture of Effects' respectively (Mill, 1882). Thus, it could also be that language functions differently for different species, or comprises different features, for example. Moreover, MacLean (2016) derives from work on theory of mind deficits apparent within the autism spectrum disorder, and proposes that chimpanzees (*Pan troglodytes*) possess more systemising traits e.g. tool use and spatial memory, as opposed to bonobos (*Pan paniscus*) with more empathising traits like gaze following, food sharing, and cooperation (though this interpretation has been questioned in other works on this topic: Cronin, De Groot, & Stevens, 2015; Nolte, Sterck, & van Leeuwen, 2023). As both species are so closely genetically related, and to humans, it would be very interesting to find this variation of abilities. Could this mean species, on a case-by-case basis, present different (or different levels of) language elements? This, already, presents a slightly more complex picture than that of a simple divide or continuum between language and communication as argued for in the literature up to this point.

Should language, then, be ultimately conceptualised by a solitary feature, a combination of features, degrees of particular features or traits, or a complex and context-dependent set of features, including perhaps functional variation, modal variation, content variation? What would be the nature of such feature links? Furthermore, should language, its features, and its relationship with non-human communication be presented in some kind of list, a hierarchical taxonomy, or a Venn diagram with some degree of overlap? This line of thinking will be developed in the next chapter. What is important, here, is to stipulate that we

start asking these types of questions. Radick's (2007) book also indicates how closely biologists and linguists worked together in the recent past, supporting the reprise of such cross-disciplinary discussions.

### 1.2.5   Cognition

Understanding the relationship language has with non-human communication, though, is no longer the limit of the necessary areas for exploration. Müller (1861) and contemporaries were convinced that language and cognition were inseparable. More recently the relationship of language with cognition has surfaced too, especially with respect to the enduring question of why we evolved language in the first place (Fitch, 2010), as well as in regard to its function.

Thus Chomsky (2005, p.10) argues that language is a 'free instrument of thought' 'associated with a specific type of mental organization' (2005, p.61), famously and insightfully condemning Skinner's *Verbal Behavior* (1957) on the basis of the cognitive aspect of language (e.g. Chomsky, 1968). Fodor (1975) conjectures a private internal language developed to organise thought or 'mentalese' (Evans, 2014).

Moreover, the growing branch of cognitive linguistics does posit the importance of pragmatics (e.g. patterns of intonation (rising and falling of the voice) forming part of the utterance in Evans, 2007, pp.217-8) and the prominence of meaning over syntax (e.g. Geeraerts & Cuyckens, 2007), as well as the communicative side to language (D. Everett, 2013; Scott-Phillips, 2015). Yet, the branch's very name and two driving principles – the Generalisation and Cognitive Commitments (Lakoff, 1990) – point to the cognitive nature of language, not to mention its theories like schematisation, in which a concept will arise from an abstraction (generalisation) of various separate instances (Evans, 2007, p.189). Croft's (2011) argument is that language is more of a cognitive process than a nominalisation. Harnad's (2017) argument and paper title that 'to cognize is to categorize' also ties in with Deacon's (1997) point that the 'threshold' to language is the understanding and use of symbols, i.e. sign-to-sign relationships, with abstraction up to the level of categorisation. Coming back to the human-non-human comparison, Ulbaek (1998, p.33) has also considered that 'language evolved from animal cognition, not from animal communication', again foregrounding cognition within a comparative assessment of language development, which

may have formed a 'communicative bridge between already-cognitive animals' (c.f. Fitch, 2019).

However, the conventionality aspect of symbolic reference and the tying of theory of mind with the development of language (Malle, 2002), the centrality of pragmatics and meaning to functionalist views of language (Grice, 1957), and the social brain hypothesis (Dunbar, 2009a), mean that both the cognitive aspects of language and its communicative capacity need to be considered and somehow reconciled, whether just in humans or in other species too. For instance, does communication also have any underlying cognitive principles, as explored in the Cognitive Discourse Analysis methodology (Tenbrink, 2020)? Or is it possible that the communicative quality of language is a later development in humans, and that we could be more likely to see language manifested in other species in a more cognitive capacity, expanding on Ulbaek's (1998) point (c.f. Reboul, 2017)? These kinds of questions necessitate, once more, reviewing our conceptualisation of language with respect to its phenomena relatives. It also necessitates that we consider non-human cognition when seeking language comparisons, as well as non-human communication.

Radick's (2007) book provides clues to how modern linguistics and other sciences like comparative psychology and ethology have honed their interests and research, including how the syntax-centric view of language may have arisen: less about its genuine prominence in the essence of language and more because – at the time of its first provenance – it could not be found amongst other species (Radick, 2007, pp.50ff). The same was true for reason (known as *cognition* today). As language and reason were thought to be inextricably linked, where no other animal appeared to exhibit reason – or their behaviour could be explained away by other means – and while contemporary physicians' study of the brain regions, namely Jackson, Bateman, Gall, and Broca, showed no similarities across species in terms of anatomy, placement, states, or function (arguments still used today e.g. Ardesch et al., 2019) other animals could not have language either, and there was an end to it.

Non-human communication and cognition research now shows otherwise for the cognition of other species (e.g. Emery, 2016). Yet, language somehow remains off the table for discussion where other species are concerned, regardless of the branch of linguistics one explores. This point crops up again when posed as follows:

- if we agree for instance that non-humans engage in pragmatics (e.g. following the point, Smet & Byrne, 2013; turn-taking, Takahashi, Narayana, & Ghazanfar, 2013; the Lombard (1911) effect – or call volume increase in ambient noise –

across species, Zollinger & Brumm, 2011; Demers, 1988; and gestural intentionality, Hobaiter, 2018),

- and we argue that pragmatics is tied up with language (Green, 1989; Lau's 2008 argument for the communicative value of the Lombard effect in humans; Schmid, 2012),

- then why is it such a stretch for non-humans to also have language?

Additionally, when we factor in 4E Cognition approaches, which take a more biological perspective rather than a strong focus on mental representations, there is greater scope still to explore comparative cognition. The heading '4E Cognition' subsumes four views on cognition: that it could be embodied, embedded, extended, or enactive, in that it can be partially dependent on the body, as well as extraneous social and environmental factors to differing degrees (Carney, 2020; Newen, Gallagher, & De Bruin, 2018). The details of this integration are being explored in scholarship, but generally all 4E Cognition perspectives hold that cognition is a dynamic interaction of the brain, body, and environment. 4E Cognition's links to language have already begun with embodied cognition as proposed within cognitive linguistics (c.f. Evans, 2007), touched on in this work. Also, the potentially graded and dynamic nature of cognition's integration from this 4E perspective fits in with the framework developed throughout this dissertation.

In certain ways, then, the limited view of other species' language capacity could be labelled as bias. In research, it is crucial to 'Be vigilant about bias' (Petre & Rugg, 2010, p.112), which can be quite subtle and subconscious, but is evident under closer inspection. So while Pinker (1995, p.334) for instance states that 'Language is obviously as different from other animals' communication systems as the elephant's trunk is different from other animal's nostrils', the trunk and nose perform a similar function, which makes the statement more an instance of a large difference in degree masquerading as a difference in kind. Nowak, Plotkin, and Jansen add (2000, p.495): 'few biologists worry about the evolution of the elephant's trunk (...a most complex organ...), whereas many philosophers, linguists and biologists have great difficulties in imagining how language could have arisen by Darwinian evolution'.

Furthermore, on only a few occasions when works introduce the notion that language belongs to humans alone do the statements include citations, and then they tend to be the tried and tested (and refuted) references to Hockett's design feature list or outdated non-human primate language teaching experiments (e.g. Terrace's studies with chimpanzee Nim, 1987), which can also focus too much on only primates and their human link, when convergent signs

of complex intelligence and communication also need to be considered (Gibson, 2012a). Mostly, though, the statements stand as conjecture only, somewhat flouting rigorous scientific convention, and mostly occur in the rhetorically persuasive positions of the opening or closing passages of text (c.f. ancient Roman Cicero and Quintilian's extensive works on oration and particularly their advice on the arrangement of arguments, or *dispositio*). Certainly, hardly any of the researchers making these statements have carried out direct investigations into the similarities and contrasts of non-human communication to language. So, whilst it is customary not to cite common knowledge, like Columbus sailing the ocean blue in 1492, we need to consider how we define common knowledge. Without going so far as to question how we can know anything, as philosopher Socrates did in his dialectics, it is worth considering that 'Strict common knowledge' is often downgraded to 'the weaker and more easily obtained condition of common belief' (Monderer & Samet, 1989, p.170), dare I say assumption.

If there is bias involved in the study of non-human communication and cognition, there could be multiple reasons besides discrimination, though certain texts leave little room for interpretation. These other reasons might include: not knowing how to associate other non-humans with language; a possible outcome of Festinger's (1957) theory of cognitive dissonance, in not being able to reconcile traditional thinking with challenging modern evidence; only looking for certain language features; a lack of interdisciplinary reading and investigation; uncertainty as to how to transcribe the communication of other species; the differences in semiotics because of species variation in their embodied and environmental experience of the world; a fear of redefining language because of the possible wide-reaching ramifications of this on our scholarship, rigour of the discipline, lifestyles, politics, economics; and so forth.

Brookfield (2017, p.6) notes that 'Paradigmatic'/'paradigmatic' assumptions 'are examined critically only after a great deal of resistance, and it takes a considerable amount of contrary evidence and disconfirming experiences to change them. But when they are challenged the consequences for our lives are explosive'. However, whatever the reason, this historical derogatory view of non-humans (even to the point of literally no longer asking questions as per *derogatory*'s etymology) and its conflation of the concepts of language-communication and human-animal, have real consequences for understanding language, and should therefore be discouraged.

### 1.2.6  Dualism

Also apparent in these discussions is a prevalent conceptual dualism, which may pose a problem for the way we describe language on the macro level. Polarisation is pervasive, certainly in the western world, as with agonism – two opposing forces or the ancient Greek for 'contest'. Polarisation not only reveals itself in political debate and academic discussions (Tannen, 1998), discrete and continuous variables in science, and addictive dramas, but it is also fundamental in linguistic theory. This includes the non-human language debate discussed above as well as Talmy's well-regarded Force Dynamics (2000), which is based on a conceptual metaphor of agonism (Lakoff & Johnson, 2003). Conceptual metaphors are linguistic expressions demonstrating the ways in which our experience of the world shapes our cognition and our language. Talmy proposed a common conceptual metaphor, that of Force Dynamics, that frequently manifests across languages and is the notion of concepts interacting in a way similar to that of entities in the world that are subject to physical force. For instance, words like *letting* imply restraint and release, while a phrase like *they pushed the relationship to breaking point* evokes an image of physically pushing an object off a table for instance until it literally breaks, though the concept being discussed is figurative and abstract, about a relationship rather than a plate or vase. The collocation *human language* is very polarised: human versus other animals, non-humans versus language.

Yet, when 'a problem is posed in a way that polarizes, the solution is often obscured before the search is under way' (Tannen, 1998, p.23), and 'areas of overlap or similarity are obscured as we look only for points of contrast' (Tannen, 1998, p.226). This compares with eastern Daoism. Although there exist Yin and Yang, a binary system in Daoism, the focus is on a cooperative relationship, or 'dialectic' rather than an adversarial one (Xu, 2018). Traditional binary code of computers is being superseded by the more complex quantum computers (Neeley et al., 2009). We even find hermaphrodites in nature, and 'If a stark male-female polarity, one of the bedrocks of our Western devotion to dualism, is a reflection more of our cultural view than of the natural world, how many other phenomena that we polarize can be understood in less dualistic ways' (Tannen, 1998, p.227)? Not only is this a challenging question, but it is at the heart of the thesis in this dissertation. Given the problems inherent in the major models of a divide or continuum between language and non-human communication, and also cognition, might there be another option, a third conceptualisation,

which obviates them? For this very reason, the word *alternative* has been excluded from this dissertation unless in quotations, as its etymology refers to a binary or dual choice.

## 1.3    Non-Human Communication and Cognition as Data

Attitudes towards both language and non-human communication and cognition are debatable, not set in stone. There are disparate but explicit comments that propose the consideration of non-human language (e.g. Slobodchikoff, 2012), or at least not to be prejudiced against it, as per Hockett's (1966, p.6) little noticed comment: we need to 'define language without reference to human beings. Then, if...only human beings talk, this becomes a significant empirical generalization'.

Non-human communication and cognition research also has a lot to offer to the discussion, and to discount it entirely could seem more like prescriptive linguistics rather than the descriptive linguistics commonly found in academia (c.f. McArthur, 1992, p.286). While we need to be cautious about the questionable examples, such as the opaque methodology surrounding Pepperberg's research into the African grey parrot (*Psittacus erithacus*) Alex, there is a wealth of exciting examples of non-human cognition, social complexity, and even communicative complexity that draw increasing parallels with humans. These include mental time travel (Correia, Dickinson, & Clayton, 2007), theory of mind (Hare & Tomasello, 2004), group decisions (Walker et al., 2017), and understanding of sign to sign relations of the kind Deacon (1997) argues for in baboon (*Papio hamadryas ursinus*) rank and kinship classification according to family groups like humans (Bergman et al., 2003), while Ribeiro et al.'s (2007) semiotic simulation study supports symbol use amongst vervet monkeys (*Chlorocebus pygerythrus*).

Typological evidence expands linguistic horizons too, and is a serious consideration for cognitive linguistics, especially in advocating environmental diversity for instance (Dąbrowska, 2015; Radden & Dirven, 2007). One interesting example to substantiate the points being made here is that of syntax. A major facet of formalist enquiry, there is however growing resistance to the syntactically-led depictions of language. There are notions of a syntax-lexicon continuum (Halliday, 1975; Hurford, 2012; Jackendoff, 2002). There is an exploration of the gradients as well as discrete elements of language (Bybee, 2007; Dobrovolsky, 1997). There are arguments that there can be no pure syntax without intentionality and semantics (Jacquette, 1990). The role of pragmatics in recursion (Levinson,

2014), and language succeeding with only minimal syntax (Jackendoff & Wittenberg, 2014), also challenge the primacy of syntax. Non-human communication and cognition evidence of syntactic traits are also evidenced, like the 'pyow–hack' structure of free-ranging putty-nosed monkeys' (*Cercopithecus nictitans*) combining predator-specific alarm calls to convey greater urgency (Arnold & Zuberbühler, 2006) or European starlings (*Sturnus vulgaris*) recognising syntactically formed acoustic strings with centre embedded recursion (Gentner et al., 2006), which, even for humans, is difficult to parse and has a low frequency in natural discourse (Corballis, 2007; Diessel & Tomasello, 2005).

Another intriguing lesson from typology is evidentials. This feature is part of a category of evaluative morphology, as one of the major ways in which humans signal their evaluation of an object or event (Grandi, 2017). These are an 'obligatory expression of information source' (Aikhenvald, 2007, p.185), such as whether an event was witnessed directly or reported to the speaker by someone else, shown by pragmatic means in English: 'words such as rumour...activate the notions of communication from third parties' as does the phrase 'I've heard that' (Carretero & Zamorano-Mansilla, 2015, p.147). In English there is no grammaticised evidential, nor in Mandarin or Maori (San Roque, Floyd, & Norcliffe, 2017). However, to some the term can be restricted to a grammatical category (Carretero & Zamorano-Mansilla, 2015), such as found in Korean morphology (Papafragou et al., 2007), with the sentence-ending morpheme *-e* indicating that the speaker has direct evidence for the statement, while *-tay* indicates that the statement derives from hearsay. In some other languages, evidentials can even be found in interrogatives, like Western Apache or Eastern Pomo, which seems quite 'paradoxical' (San Roque, Floyd, & Norcliffe, 2017).

For a long time evidentials went unnoticed or ignored, first noticed by Boas in 1911, but most work coming from the last three or so decades, having been overlooked in favour of 'the linguistic categories prominent in classical Indo-European languages' like gender and tense (Aikhenvald, 2018, p.2). Yet, evidentials are a key part of the morphology and semantics of multiple languages (Aikhenvald, 2007). Plus, they show us the wonderfully diverse ways in which language can manifest itself. What could we be missing in other species? Indeed we do not even know how much is truncated in non-human communication, as with German colloquial pronoun dropping, which would not be clear to someone who does not know the language well.

Additionally, something similar to evidentials can be found in the alarm calls of Campbell's monkeys. Their *–oo* 'suffixes' indicate a general rather than specific predator

threat (Ouattara, Lemasson, & Zuberbühler, 2009; Schlenker et al., 2014), suggesting a pragmatic show of uncertainty on behalf of the caller. It is possible, given that metacognition exists in at least some other species, especially monkeys, which exhibit both prospective and retrospective confidence judgements about their performance of various recognition tasks (Terrace & Son, 2009), that the Campbell's monkey *-oo* suffixes could represent, or at least be analogous to, grammatical evidentials.

What other features might there be that we have overlooked? Plus, who is to say cognitive processes like schematisation are to be identical across species, or individuals? Is it possible that inaccurate and/or incomplete models of language have occurred thus far because of the wrongful discounting of other species? Meanwhile, we need to consider all the various pressures and constraints on language evolution, potentially across species: biological, environmental, and cultural.

The theory of embodied cognition and experience (Evans, 2007, pp.66-67) is a particular instance legitimising this question, given the range of physical and environmental experiential restrictions that species face. This means that it is conceivable that at least some other species may have language but, as with the human typological examples above, it does not appear to be the kind of language we have been looking for. Could recognised languages of humans act as a triangulation point and not as a template for determining what language is and whether other species evidence it? Thus, it is argued here that we need to focus on understanding language rather than just our expectations of it, such as the variety of features and to what degrees they are required in languages, not to mention our approach to accounting for it as a whole concept, as focused on in this dissertation.

While it is not the goal of this work to philosophically or ethically justify the integration of other species into linguistics, the unpicking of the two conflated comparisons of species with communication and language means focusing less on the apparent species divide and more on the communication across all species, as per Hockett's actual viewpoint. And, if Firth (1957, p.225) would allow me to generalise his statement about mentalism and similar topics to other species, 'To exclude them specifically is to acknowledge them and even to admit scholars in other disciplines may be able to help us'. Therefore, this dissertation will not dwell on these issues further, but provides them as essential background information on how non-human communication and cognition is incumbent on discussions of language, its definition and origins, and indeed foregrounds these issues to an extent: there is no agreed upon definition of language as yet to determine who does/does not have access to language.

This explains the choice to explore non-human communication and cognition as additional data in this dissertation and the focus on the methodology of describing language: given the lack of a language definition, the questionable logic and evidence behind past and current views of language, the lack of consideration of where such views have derived from, the intriguing similarities that exploration of non-human communication and cognition has found to elements of what we think of as language, and especially the point that past models of language have inherent flaws, which will be discussed in the next chapter. However, it is important to clarify at the outset that where non-human examples are compared with hitherto human concepts, as throughout this section, and especially where humanocentric terminology is used, we need to remain cautious about whether some and/or any non-human communication or cognition counts as a (non-)prototypical case of a given linguistic phenomenon, or merely resembles it and would require a new term. Yet, we cannot determine which outcome is best until the procedure outlined in Chapter 6 is applied inductively and quantitatively.

## 1.4    Research Question

How can natural language be most effectively conceptualised in terms of its co-existence with the intraspecies communication and cognition of other animals?

To elaborate, this research question focuses on how we can close the gap on a lack of a definition of language to move linguistics forward (c.f. Davis's warning, 1990), as well as how we can integrate non-humans into a concept of language, given the apparent links across species but no clear systematic comparative framework for language as yet. The question word employed is *how*, as this takes a methodological perspective and posits a theoretical framework in answer. Natural language is used to stipulate that we will focus on languages as they arise organically and not through active invention, like Esperanto or computer code. Intraspecies communication is also used for its focus on the natural occurrence of communication at the greatest possible volume, as opposed to perhaps alarm or mutualistic signals that may be used and/or understood across species, or the way butterfly social parasites (*Maculinea rebeli*) can mimic the sounds of a queen ant (*Myrmica schencki*) to be nurtured by the other ants (Barbero et al., 2009).

A further note on terminology throughout this work, for the sake of clarity, is that as per usual in academia, *methodology* is used to incorporate both the theory and method of an approach to a given problem, just as the one developed throughout this dissertation, while *method* refers to the actual actions taken to pursue the approach, including the procedure outlined as a potential method in Chapter 6. *Framework* is used to describe the conceptual approach taken to understanding the nature of language, with graphic representations of the dimensions that features can be plotted into (a common analogy to real life might be a building site), while *model* is the term retained for the final outcome of completing this framework, once further theoretical and empirical application has been carried out, to determine what language ultimately is (the final building itself).

## 1.5    Methodology

### 1.5.1    Study Methods

There is very little literature directly applicable to this research area, of exploring language conceptualisation approaches and how we might integrate other species, as it falls between or rather across disciplines, and because the species divide has largely been treated as a foregone conclusion. Moreover, most accounts of language do not dwell on the phenomenon holistically, while theoretical approaches like Prototype Theory have not been systematically applied to language as a whole before. Conversely, it has also been impossible to be exhaustive as conceivably a multitude of works of a great many disciplines could have been incorporated somehow. Therefore, extra care has been taken in order to define the scope of the 'literature' under review and analysis, as both primary and secondary data.

The dissertation incorporates literature primarily from the fields of linguistics, anthropology, ethology, philosophy, (comparative) psychology, together with some historiographies. Literary diversity has persuasive value (Angouri, 2010, p.34), and validity in offering a triangulation of perspectives, as well as methods (Patton, 2002, p.556; Silverman, 2014, p.430). The vast majority of the texts chosen are written in English, my mother tongue, and also the predominant language of academia (Tardy, 2004; van Weijen, 2012), to the potential detriment of innovative thinking in other cultures (Amano, González-Varo, & Sutherland, 2016; Popova & Beavitt, 2017). However, it is imperative to have fluency in the

relevant terminology for full comprehension and correct interpretation, not just the language more generally; sadly, I lack this fluency for linguistics terminology in other languages.

To locate literature for the analysis of language features, typological evidence, and conceptualisations, which was an ongoing process throughout the entire duration of the project, scholarly bibliographies, as well as keywords were used on the search engines Google and Google Scholar, Amazon marketplace, and the Bangor University Library Catalogue introduced in summer 2016, limited to the first 500 entries where applicable. Keywords were chosen from initial exploratory reading (Creswell, 2009), the use of those mentioned in scholarly abstracts, and as awareness of terminology increased over time.

Search terms yielding useful results included: *animal alarm calls*, *animal cooperation*, *animal language*, *animal referentiality*, *animal symbolic communication*, *animal syntax*, *classification and categorisation*, *concept categorisation*, *language design features*, *human language*, *language evolution*, *language origin*, *linguistic prototypes*, *prototype theory*, *symbolic communication*, *theory of concepts*, *what is language*, and searches for particular species.

The search terms which yielded few relevant results include, usually because the results were too broad and lacked useful focus: *animal communication*, *language conceptualisation*, *language features*, *language versus communication*, *typological evidence*.

This approach was combined with locating material via the citation trail, classical texts like Darwin and Hockett's works, intriguing Twitter feeds, book and news article recommendations, as well as old-fashioned shelf surfing. In fact, the latter proved very useful, as the drawback of using keywords is that one is only searching for specific things, looking for particular information, and there is a risk of only using some of the labels that might be possible, whereas library shelf surfing, akin to searching latter day index cards, allows one to view all possible published categories in a multitude of subjects.

Works were then selected by a process of reading the titles and abstracts or headlines of texts to search for relevance, particularly if they presented a particularly innovative fact or contrastive viewpoint. The texts selected were then read and either excluded, or cited according to their relevance for this dissertation in terms of background review or data analysis.

As secondary data has been used, this prevented a role in the production of the data, but meant that the data was quickly and efficiently obtained and that the dissertation did not require ethics approval (Braun & Clarke, 2013). Moreover, typical analytical caveats sufficed:

such as being aware of the data's purpose, audience, and authorial bias (Charmaz, 2014), or the poverty of procedure or interpretation of results (Bitchener, 2010).

Eventually the category and citational value of works reached natural saturation points (Charmaz, 2014; Corbin & Strauss, 2015), in that works would repeat the information found in other texts with little added value, or provide no new language features or conceptual models for consideration. Therefore, as per the methodological approaches explained in the next section, these works were either added as multiple references to substantiate a point, or simply abandoned.

### 1.5.2   Methodological Approaches

A theoretical and qualitative work, this dissertation employs a number of methodologies according to need. To begin with, theoretical work (as described by e.g. Bowling, 2002; Brookfield, 2017; Murray, 2005; and Rasinger, 2010), has been chosen due to my academic training in *Literae Humaniores* and the theoretical side of linguistics during my MA, as well as for its capacity to make us aware 'there is a problem and it helps to generate a solution to that problem' (Biggs & Tang, 2011, p.45). This is despite theoretical work representing 'a formidable challenge' to fully familiarise oneself with the literature and areas of 'debate and controversy' (Brewer, 2007, p.42) and requiring 'excruciating attention to detail' and 'an ability...to synthesize disaggregated parts into a new whole' (Shoemaker, Tankard Jr, & Lasorsa, 2004, p.10). There is also a need to consider a theory's criteria for content, such as 'exhaustiveness, external coherence, and extendability' (Steiner, 1988, p.70), which might pertain, for instance, to consideration of the language features proposed for the framework, or the dimensions of the framework overall. The reliance linguistics places on theories stemming from the Victorian period, and its lack of an account for the phenomenon of language as a whole, justify the need to create a new theoretical framework, leading to an eventual model. Theoretical models are only 'a tool that can promote theory construction' (Shoemaker, Tankard Jr, & Lasorsa, 2004, p.107), though, and do not explain or predict like theory but can make concepts less abstract by describing and representing them, and implying key relationships to explain a concept.  Thus, with some minor adjustments, the productive and schematic nature of theoretical work suits the project and its goals of understanding a phenomenon in a more detailed and constructive way.

To this end, a loose Grounded Theory methodology co-opted from the social sciences has also been adopted (introduced by Glaser & Strauss in 1967; c.f. also Charmaz, 2014; Corbin & Strauss, 2015; Mills, Bonner, & Francis, 2006; Walliman, 2001), on account of several of its characteristics. However, it has been utilised more as a framework than a strict methodology, not least because it could not be rigorously carried out without collecting primary data, given this work is theoretical only. Plus, there are a range of variations of Grounded Theory (Braun & Clarke, 2013; Nathaniel, 2019). Indeed, Strauss (1987) describes it as more a style than specific method in his preface.

Nevertheless there are some elements that can be adopted generally. Grounded Theory's highly iterative quality (Charmaz, 2005) suits exploratory research, where one is not quite sure what might be discovered (Brewer, 2007), which is the very outlook of this dissertation on language. Indeed, while this dissertation appears organised, it conceals the aching efforts of moving backwards and forwards to develop and retrofit ideas and information, while there was a lot of reaching for extraneous material and new ideas before delving into the more traditional thought, which then all had to be unified somehow. Hence a qualitative methodology was also a positive choice for this research, in that it is 'useful when the researcher does not know the important variables to examine...because the topic is new' (Creswell, 2009, p.18) and not thoroughly researched (Corbin & Strauss, 2015). Moreover, Grounded Theory's process of constantly revising theory as analysis progresses (Charmaz, 2014) allowed for serious reflection on the construction of the theoretical framework as knowledge was amassed and contextualised. This is not to mention that there have been some key moments of reinventing this project: a *human language* collocation focus developed through observation, which then integrated, through illuminating reading, the historical meta-research about the study of language origins, and thus evolved into the evaluation of the two major views of language's relationship with communication and wondering about a third option, as well as other options to defining language, given conceptual models like Prototype Theory.

Grounded Theory's requirement for record-keeping, or memo writing (Charmaz, 2014), allowed for close analysis of the development of the dissertation, as sources were read and themes were reworked, and so as not to become overwhelmed by all of the emerging concepts (Corbin & Strauss, 2015). Furthermore, Grounded Theory's inductive stance is very appealing, given the import of the exploratory nature of this research: if we had defined language satisfactorily, there could not be ongoing debates between cognitive linguistics and

generativists, or the multitude of offhand descriptions of language, or the lack of knowledge of how to reconcile growing non-human communication and cognition evidence with somewhat dated concepts of language. Moreover, as typology has taught us, we cannot simply look for specific features of language, but we need to find them, inductively, as a 'theory-after' model (Punch 2005, p.16). Thus, this Grounded Theory methodology enables the creation of theory through analysing the data without recourse to inherited theories. While I utilised the works of others for analysis, and so engaged in discussions about others' theories, I did not ally with any until such time as building the theoretical framework, thus following the methodology where 'concepts out of which the theory is constructed are derived from data collected during the research process and not chosen *prior* to beginning the research' (Corbin & Strauss, 2015, p.7).

In this respect, Grounded Theory and qualitative research more generally (Braun & Clarke, 2013) use our natural skill at pattern-finding. This is a key feature of language, or as Tomasello (2005, p.28) puts it, one of the prerequisite skills for 'understanding...the symbolic dimensions of linguistic communication'. This is a general cognitive function found in many other species too, from the seven spot archerfish (*Toxotes chatareus*) recognising even human faces (Newport et al., 2016); to pigeons (*Columba livia*) sorting photographs of objects – novel and familiar – into sixteen human language categories (Wasserman, Brooks, & McMurray, 2015); a captive cuttlefish (order *Sepiida*) who only squirted streams of water at new visitors to the laboratory (Godfrey-Smith, 2016); and African elephants (*Loxodonta africana*) reacting more defensively to adult male Maasai speakers than humans of a different gender, age, or ethnicity, (McComb & Shannon et al., 2014), making a linguist wonder exactly what aspects of the vocal signal the elephants respond to.

Grounded Theory also focuses on naturally occurring phenomena rather than controlled conditions (Patton, 2002), and conceives of everything as evidence, not just academic journals and monographs, but also public records, autobiographies, documentaries, (Charmaz, 2014), videos, observations (Corbin & Strauss, 2015), and conference papers (Creswell, 2009).

Even anecdotes, if in large volumes, can arguably become data (Bekoff, 2002), while they show us that potentially science has not yet caught up with reality. One example would be the observation leading to study of South African tigerfish (*Hydrocynus vittatus*) catching barn swallows (*Hirundo rustica*) coming near the surface of the water due to limited food resources, opportunism, and honing the skill to catch the birds from behind, even from

underwater (Balcombe, 2017). Thus, where intriguing behaviour is witnessed, we need to follow up with appropriate investigations. We also need to allow for the fact that it is possible that such intriguing behaviours may be more widespread once the environment and lifestyle of other species is not so restricted by human encroachment and interference; or indeed, as with the tigerfish, because of the encroachment and need to adapt.

In order to analyse the literature on language as data, qualitative meta-analysis methodologies were adopted, as in Paterson et al. (2001), with the 'Key ingredients' of a 'clearly-stated purpose; a selection of appropriate and well-understood source material...; a clearly stated basis of analysis; and a good discussion' (Petre & Rugg, 2010, p.89). It is hoped that, contrary to the other language definitions and models proposed, such as Hockett's design features, the way in which the language conceptualisation is arrived at for this dissertation may be more replicable, although even experimental science is currently struggling with that facet of research (c.f. *Nature*'s survey, Baker, 2016 for more information on the low success rate of replication studies across disciplines).

Not only does a focus on operationalisation improve the general scientific standing of the proposed theoretical framework, but it encourages greater reflection on our conceptualisations, and it enables readers to evaluate the methodology and so move towards quantifying the approach to accounting for language. In further support of the quantifiable aspect, is the recent work on determining what constitutes a scientific breakthrough (Winnink, Tijssen, & van Raan, 2019). This concept of a breakthrough also eludes a fixed definition, like language, and the researchers resolve this issue by applying five algorithms to the Web of Science database to analyse citation patterns and detect papers with distinctive impact profiles that could be labelled as breakthroughs, including Nobel Prize research papers, papers continuously cited by review papers or patents, and those frequently mentioned in social media. Hopefully, therefore, this quantification approach will earn the framework developed here the opportunity to be adopted in applied research (Penke and Rosenbach, 2007; Shoemaker, Tankard Jr, & Lasorsa, 2004, p.120).

A further methodology employed for this work was Hockett's holistic approach to defining the nature of language. Hockett's work (1959 onwards) is an insightful template, especially with his open-minded attitude towards other species. However it requires improvement by essentially underpinning his language design features with a more cognitive and cooperative theoretical framework to conceptualise language (c.f. Evans & Green, 2006; Fauconnier, 1994; Gregg, 2013; Lakoff, 1990; and Wacewicz & Żywiczyński, 2015), rather

than a list of debatable features, as well as the integration of updated non-human communication and cognition, and typological research. Another key development on Hockett's work would be to consider a 'bottom-up', ecological approach to understanding language, in terms of both exploring what features may be seen amongst other species' communication and cognition, and in terms of adaptionist principles. This replaces a 'top-down' humanocentric approach of only looking for evidence of recognised languages among other species.

Lastly, this dissertation also takes on a non-polemical approach, given the caution introduced about dualistic stances, and the very antithetical perspective on language questioned in this work: a language divide from or linear continuum with non-humans. Thus, while the dissertation owns its slight functionalist tendencies, especially given the use of cognitive linguistics theories and Hockett's attempt to contrast (non-human) communication with language, there has been a purposeful intent to remain apolitical as it were, knowing that other branches of linguistics, as well as other disciplines, have a lot to offer. An open mind to non-human communication and cognition as typological data for language investigation may well be open too to the various notions of what constitutes language and how we might determine its nature.

One facet of this is moving away from an 'adversarial frame of mind', leading even to unhelpful 'unrelenting contention' (Tannen, 1998, p.5), as well as the dualistic frame of mind discussed in an earlier section. Another facet is being prepared to learn and reflect. In this particular dissertation topic area, it is not the case that 'Most expert readers will be thoroughly familiar already with the kinds of questions one can ask' and are therefore 'primarily reading your work to find out what substantive solutions' have been found (Dunleavy, 2003, p.86). In my opinion, it is precisely because of a lack of pertinent and incisive questions that this area of research has languished since the initial findings in the last two centuries.

This dissertation is not an invective against past scholarship, vituperating authors in the kind of 'demonography' Tannen refers to (1998); quite the reverse. There are a great many pertinent insights and theories but they need unification to determine what can hold and what needs development. What is needed is a big picture rethink, so that the outcomes are as rigorous and as considered as they can be.

There is also no false objectivity asserted in this work, as *all* researchers tend to 'seek out evidence that confirms rather than refutes our expectations' (Dey, 2010, p.175), though recourse to rhetorical stylistics (c.f. Hyland, 2013; Mulholland, 1994) has been consciously

limited as much as is possible, while adhering to the traditional argumentative style of a dissertation. Indeed, as Mulholland (1994, p.xvii) notes, 'persuasive tactics can occasionally rebound on the users' when the audience sees fault in the logic.

## 1.6    Dissertation Outline

Following the motivation, background, and methodologies set out here, Chapter 2 explores ways in which we can define or conceptualise language, from Classical Theory to Prototype Theory, to determine which offers the most effective categorisation approach to understanding concepts like language. Chapter 3 then explores the level of discussion at which language is being discussed, so that its foundational aspects from general cognition and communication are separated from features of language per se. Please note that the term *general cognition* is used at times in this dissertation, to refer to cognition in a generalised rather than just linguistic capacity. This is not to argue that language necessarily involves specialised cognitive mechanisms or processes, though there are some scholars who might, as with Chomsky's modularity approach. Nor does it negate the potential for multiple types of cognition, as discussed later in the dissertation. It is used merely to acknowledge that cognition in the given circumstances can relate to other functions than only language. This terminological usage follows the cognitive linguistic branch (e.g. Dąbrowska, 2016). Chapter 4 explores proposed language features that emerge in the interdisciplinary literature, including (centre embedded) recursion, symbolic signs, and repetition. Chapter 5 explores an expansion of the theory with two additional dimensions: the spatial and the dynamic. These respectively factor in context, spatial semantics that sign languages make use of, as well as a network of equivalent level, related but separate concepts like meaning; while the fourth dimension of language focuses on its dynamic qualities. Chapter 6 draws all the evidence and insights together, culminating in a theoretical framework of language, taking into account its multi dimensions and showing how to integrate non-human communication and cognition. This includes a section on some key caveats to consider when applying the framework to non-humans. The final chapter summarises the dissertation, details the study's limitations, yet articulates its impact, expresses the thesis guiding this work, and specifies avenues for further research. These future goals are namely to expand on the framework to build an ultimate model of language, understand its prototypical features, and how non-humans relate to this concept and prototype.

This particular dissertation layout has been carefully selected. Firstly, following Grounded Theory, adopted as part of the methodological approach in this work, evidence needs to be assessed and theory developed before one is impacted by what others have proposed in the literature, meaning that the exploration of conceptualisation options has to precede the language definitions put forth by others. Secondly, given this dissertation adopts a Prototype Theory based approach to conceptualising language in the second chapter, the rest of the dissertation is structured to explore the theory's application to language, first in the vertical dimension in Chapter 3, then the horizontal dimension in Chapter 4, before adding dimensions in Chapter 5. These chapters build up to the framework presented in Chapter 6. Moreover, given the theoretical nature of this work, there is an aspect of literature review in all of Chapters 1-5, ahead of the theoretical framework description, which is the dissertation's contribution, and so this work still follows the essential structure of a generic PhD dissertation.

**Chapter 2 What are the Modes of Conceptualisation that Could be Applied to Language?**

**2.1 An Overview of Categorisation Options**

As Calvin (2012) points out, we need to carefully consider the cognitive framing of a problem, rather than simply adopting someone else's, given that what is left out may not be as unimportant as it is made out to be. Could this be true of excluding non-human communication and cognition from conceptualising language for example? Therefore, as noted before, if language had already been adequately defined, there would not persist such debates over its fundamental nature.

De Bono's innovative text (1977) on lateral thinking has acted as a sub-methodological approach for this chapter, given the dissertation's aim of considering and generating new perspectives on language. The purpose of lateral thinking is to overcome limitations of the mind, a 'cliché using system' (de Bono, 1977, p.36), in order to problem-solve without self-imposed limits and by shifting attention to include aspects of a problem that might otherwise have gone ignored, to challenge assumptions and labels, to restructure thinking, and to generate new ideas. One of the main principles is that it is worth contemplating differing and new ideas for their own sake, as well as to assess legitimate knowledge gaps, and that multiple proposals should be made before returning to a logical progression of thought. There are dangers to a 'preset pattern information system in the mind' (de Bono, 1977, p.34), though it does offer the advantages of speed of recognition and reaction.

Among the dangers of a preset mentality that de Bono warns about, the key ones to be considered here are the ever more rigid establishment of patterns, difficulty in changing patterns once they are established, and a tendency towards 'centering', where phenomena with resemblance to a standard pattern are perceived as that pattern, which seems to imply the sense of typicality seen in Prototype Theory. Moreover, particularly pertinent for the 'difference in kind' or 'difference in degree' discussion of language's co-existence with non-human communication, de Bono (1977, p.35) states that 'Patterns can be created by divisions which are more or less arbitrary. What is continuous may be divided into distinct units which then grow further apart'. Thus, such differences proposed in the literature could be arbitrary and more distinctive than they first appear to be. De Bono (1977, p.233) also explains how

thinking can be blocked in three different ways: by a gap in information, by an obstacle, or by there being no block at all: 'Because the first way is adequate one does not even consider that there might be another way'. Yet, it is argued in this dissertation that, not only is it the case that the way in which we conceptualise language as opposed to non-human communication and cognition is not often explicitly considered, but the two major extant perspectives are also flawed.

This conceptual rethink is especially needed given the beginnings of serious interest from linguists in non-human communication and cognition research, such as the 2019 interdisciplinary *Animal Linguistics Workshop* held in Paris that I was fortunate enough to attend. Even as such cross-species linguistic interest begins to emerge, the question looms ever larger: just how can other animals fit into the discipline of linguistics, a study of a hitherto human-only phenomenon, which currently allows for only a 'difference in kind' or 'difference in degree' where other species are concerned? Moreover, how will we recognise it if we find language in other species? What conceptualisation would best fit language? And what makes language language and not some other phenomenon like communication?

Thus, this chapter appraises the key categorisation options that could be used to answer the research question of how we might conceptualise language the most effectively, though without exhausting the detailed debates of the merits of one theory (or theory version) over another. This brevity of attention is due to the fact that the following theories have been postulated predominantly to account for the existence and description of concepts, and categorisation principles in themselves, across philosophy and cognitive science, as well as to account for the mental structure and processing of categories. Whereas the aim, here, is to adopt and/or adapt (one of) these theories as a conceptual tool to conceive of language in the most efficient and accurate way possible.

To start with concepts as themselves, let alone the concept of language, Reboul (2017) sees concepts as the units of combinatorial thought, while in a similar vein, Löhr (2018) distinguishes the different usages of *concept*, specifying two distinctions: where categorisation devices contain beliefs but concepts constitute beliefs, across the psychology and philosophy literature respectively. In other words, concepts represent the ideas, objects, or phenomena, while category concepts or 'categorization devices' are a way of arranging those concepts in our minds so that we can better understand the world and its phenomena (c.f. Komatsu, 1992). Therefore, these 'categorization devices', the theories coming up shortly, could be very useful for the aim of this work.

As this dissertation is interdisciplinary, it might be helpful to begin with a simple table (c.f. Table 2) to compare the fundamental aspects of the major theory options from philosophy and cognitive science available for categorising concepts, before explaining each of the options in more detail, and then how the options can or cannot be used for application to the problem of understanding what the concept of language is and how it co-exists with non-human communication and cognition. It is important to acknowledge that a definition or short list of features like Hockett's are not the only means by which we can categorise and thus conceptualise language, while other categorisation options offer much more coherent framework foundations that will be elaborated on throughout this work.

**Table 2** Categorisation Theories Compared: is a definition the only option for categorising a concept?

\* This list and details have been created according to information in Earl (n.d.a); Komatsu (1992); Thagard & Toombs (2017); and van Melsen (1998), with examples embellished on or created by me.

| Classical Theory | |
|---|---|
| **Description** | Socrates onwards, this is the traditional way to categorise concepts, in terms of necessary and jointly sufficient conditions, or definitions. All complex concepts are analysed only in terms of the individual concepts contained within, like building blocks. Concepts are *a priori* as they are knowable by reason without empirical evidence. Home discipline: Philosophy and Cognitive Science. |
| **Benefits and Drawbacks of this Approach to Categorising Concepts** | This is a conceptually neat approach to categorising. However, the reality of classical definitions existing has been questioned as well as challenged by empirical evidence, while Classical Theory cannot account for concepts in which vagueness or encyclopaedic contextual knowledge is involved. |
| **Example of the Theory in Application to the Concept of** | A bachelor is (and is only) an adult unmarried male. |

| **'Bachelor'** | |
|---|---|
| **Neoclassical Theory** | |
| **Description** | Preserves from Classical Theory the necessary conditions but rejects sufficient conditions. Does not stipulate difference like Classical Theory.<br>Home discipline: Philosophy. |
| **Benefits and Drawbacks of this Approach to Categorising Concepts** | There is more flexibility with this theory than Classical Theory for categorising members into a concept, but that very flexibility can make differentiation of members more difficult too. |
| **Example of the Theory in Application to the Concept of 'Bachelor'** | Being an unmarried adult male is necessary for being a bachelor, but there can also be other features too, like eligibility for marriage. |
| **Prototype Theory** | |
| **Description** | Analyses concepts in terms of aspects like a gradience of typical features/characteristics.<br>Home discipline: Philosophy and Cognitive Science. |
| **Benefits and Drawbacks of this Approach to Categorising Concepts** | Empirical data show that we tend to categorise according to typical features of category members, given that more typical members of a category are sorted more quickly into that category than less typical members, with the example of robins and eagles for the category of bird. There are multiple instances of graded phenomena in nature, in line with the theory's views. Additionally, research shows that at least some other animals can think and categorise along the lines of Prototype Theory's vertical and horizontal dimensions.<br>However, the theory arguably stuggles somewhat when accounting for complex concepts, if one takes a compositional approach that is, while some categories or concepts might not be subject to a prototypical analysis like numbers. Yet judgement sorting tasks show that even here we can still conceive of categories in terms of |

| | their clear cases, that there are 'more typical' numbers, usually the smaller ones. Anther critique is that it is not necessarily easier to find the prototypical features of a concept than to find the necessary and sufficient ones, but this criticism stands as much for Classical Theory as Prototype Theory. This is also the reason that explanation based theories emerged, to fill the gap that family resemblance theories could not. |
|---|---|
| **Example of the Theory in Application to the Concept of 'Bachelor'** | A typical bachelor is an adult unmarried but eligible male, features which most bachelors share. A less typical bachelor is a septuagenarian unmarried male, a celibate adult male, or an engaged man. |
| **Exemplar Theory** | |
| **Description** | Analyses concepts in terms of a gradience of exemplary cases. Home discipline: Philosophy and Cognitive Science. |
| **Benefits and Drawbacks of this Approach to Categorising Concepts** | Exemplar Theory focuses on the boundary cases more than a centralised member of the category as in Prototype Theory. However, there is a lot of grading between categories that can make creating a boundary between concepts harder, in comparison to Prototype Theory, in which a prototype is not only most central representative to the category but also maximally distinct from other categories. Moreover, a prototype approach can be more representative, allowing for category hierarchies, knowledge not associated with a specific exemplar, and the need for living organisms to make inductions and predictions of novel objects and events, which is the purpose of having concepts, rather than recalling individual instances already encountered. |
| **Example of the Theory in Application to the Concept of 'Bachelor'** | A typical exemplar of a bachelor is someone crowned most eligible bachelor by the media. |

| Theory-theory | |
|---|---|
| **Description** | Analyses a concept in terms of an internally represented (causal) theory about the members of the extension of the concept. Home discipline: Philosophy. |
| **Benefits and Drawbacks of this Approach to Categorising Concepts** | Empirical evidence supports the theory, for instance in categorisation tasks where participants tend towards privilege matching by causal effects. However, the theory is often vaguely described because it is hard to pin down the meaning of theory in this context, while care must be taken with the strong view of this approach: concepts cannot be identified with theories and as theories at the same time. Nor can the approach easily account for how theories change over time and according to individuals. The weak version of this approach as concepts involving theories is easier to accept, but requires such explanations beyond features or exemplars to operate as a categorisation tool. |
| **Example of the Theory in Application to the Concept of 'Bachelor'** | 'Bachelor' is analysed in terms of, for instance, a male's single status and adulthood making him eligible for marriage, and so the unwed status is a key feature. |
| Atomist Theory | |
| **Description** | Rejects all analysis mentioned in above categorisation models, denying that concepts have analyses at all. Home discipline: Philosophy. |
| **Benefits and Drawbacks of this Approach to Categorising Concepts** | While perhaps an even tidier conceptual approach then Classical Theory, this approach involves a lot of problems for categorising concepts. Innumerable concepts could result from this approach, given there is no analysis involved; each concept must be a primitive, like a chemical element. Additionally, the majority of the categorisation literature holds that the mind does more than store individual instances, involving some kind of conceptual construction. The theory also necessitates that concepts are innate, which |

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|---|---|
| | stretches the imagination with a concept like a computer. |
| **Example of the Theory in Application to the Concept of 'Bachelor'** | 'Bachelor' might not be a concept in its own right according to this theory. Instead there would be an aggregate of indivisible primitive concepts that are identical in their real world or notional extension, like being unmarried, being male, and being an adult, without any explanation as to how those primitives relate other than through juxtaposition. |
| **Neurological Theory** | |
| **Description** | Concepts arise from patterns of activation in neural networks. Home discipline: Cognitive Science. |
| **Benefits and Drawbacks of this Approach to Categorising Concepts** | This theory focuses on the mental processing of lots of examples, thus creating activation patterns that correspond to typical features, as with Prototype and Exemplar Theories. This can be efficient if it is a correct depiction of the brain's processing, but does not provide much further clarity in terms of categorising concepts. |
| **Example of the Theory in Application to the Concept of 'Bachelor'** | When the term bachelor is used, the neural network activates the patterns made in the mind, in terms of both exemplars and typicality effects. |
| **Schema View** | |
| **Description** | This view suggests that a concept or schema consists of the concept's exemplars, of information about what the concept is like on average and so what would be included, as well as information about the different attributes of the schema. Home discipline: Cognitive Science. |
| **Benefits and Drawbacks of this Approach to Categorising Concepts** | Schemata include information both about relationships between the attributes within a concept and relationships among the concept categories, and as such this approach changes the focus from the attributes themselves to relationships, with an explanation-based view as opposed to a similarity-based one like Prototype Theory. The introduction of a level of explanation for the relationship of concept attributes makes this theory attractive, but this view is less |

| | |
|---|---|
| | of a fully-fledged categorisation theory than the Knowledge Approach. |
| **Example of the Theory in Application to the Concept of 'Bachelor'** | The schema for the concept 'bachelor' may include the culmination of information, such as eligibility of a bachelor, appropriate age, social status etc, that celibate teenagers are a subtype, and that a media-named 'most eligible bachelor' is a specific instance. |
| **Knowledge Approach** | |
| **Description** | Concepts form part of general knowledge of the world and are learned as part of our understanding of the world. They have an explanatory role as well as a storage list as it were of features. Home discipline: Cognitive Science. |
| **Benefits and Drawbacks of this Approach to Categorising Concepts** | This approach is more developed than the Schema View, and can be important for understanding abstract unobservable concepts like an atom. However, the explanation-based approach potentially leads to conceptual instability, as theories can change over time. Moreover, the theory is not economical, given that a concept in this view includes information about the relations among instances of the concept and of other things in the world, which could become unconstrained to include infinite information. |
| **Example of the Theory in Application to the Concept of 'Bachelor'** | The concept of 'bachelor' includes information about the interaction among bachelors and other concepts, such as being associated with wealth and freedom, as well as information about the (often, causal) relationships among the attributes of the concept, so a man is eligible to marry because he is still single, and thus unmarried, as well as being of an age when marriage is possible. |

## 2.2    Classical Theory

It is widely acknowledged that, according to classical philosophers, a definition consists of a list of necessary and sufficient conditions that limit the essence of a phenomenon. To reach a definition, and thus be a member of a category, in this theory, the phenomenon has to tick off all, and only those, specific conditional criteria, nothing else, and no other phenomena can only partially meet the criteria to join the definition/category. One

can imagine the cliquey behaviour of certain groups of people as a tangible – if superficial – example of this definitional approach in operation. Everyone that is in the group must behave and dress in all and only the accepted ways, and anyone outside of the group must remain outside. Any deviation would lead to redefinition of the phenomenon, so that the entity in question would come under the remit of a different category and definition altogether. Indeed, this exclusive and rigid nature is built into the term's etymology: 'from past-participle stem of *definire* "to limit, determine, explain," from *de* "completely" … + *finire* "to bound, limit," from *finis* "boundary, end"' (Online Etymology Dictionary, n.d.b). Therefore, it is easy to see how this theory supports the notion of a 'difference in kind' rather than 'difference in degree' with respect to perspectives on language as it co-exists with non-human communication and cognition.

Classical Theory's three propositions are that the: 'definition (*intension*) of a category is the union of the essential features that identify the membership (*extension*) of that category...[and] each member is equally representative of the category' (Jacob, 2004, p.520) without rank or grading. The situation is black or white; there is no grey area. Thus, on account of the 'binary, either/or relationship that exists between an entity and a category...the boundaries of categories are said to be fixed and rigid' (Jacob, 2004, p.520), or 'categorical' (e.g. Bird & Tobin, 2008).

It must be noted here, for clarity, that the use of *categorical* in this context is very specific and cannot be extended to qualifying all categorisation theories. In fact, there is a vast difference between *classification*, or a *categorical* way of distinguishing categories, and *categorisation*, which draws the common distinction between thinking along the lines of Classical Theory and perspectives like Prototype Theory respectively, that will be described shortly. There is a 'misconception' that the terms *classification* and *categorisation* 'are...synonymous', and this is 'reinforced by the fact that both are mechanisms for organizing information' – generally *categorisation* – and literature is 'riddled' with confusion of the two terms, including Rosch's work on Prototype Theory (Jacob, 2004, p.527). However, there is a pertinent distinction that Jacob (2004, p.527) draws: 'While traditional classification is rigorous in that it mandates that an entity either is or is not a member of a particular class, the process of categorization is flexible and...draws nonbinding associations between entities...based not on a set of predetermined principles but on the simple recognition of similarities that exist across a set of entities'. Thus, clearly, *classification* belongs specifically to Classical Theory, while *categorisation* refers to both Classical and Prototype

theories and, somewhat confusingly, the whole notion of organising information. The following table (Table 3) outlines the detailed differences.

**Table 3** 'Comparison of Categorization and Classification' (Figure in Jacob, 2004, p.528).

| **Categorization** | | **Classification** |
|---|---|---|
| | *Process* | |
| Creative synthesis of entities based on context or perceived similarity | | Systematic arrangement of entities based on analysis of necessary and sufficient characteristics |
| | *Boundaries* | |
| Because membership in any group in non-binding, boundaries are "fuzzy" | | Because classes are mutually-exclusive and non-overlapping, boundaries are fixed |
| | *Membership* | |
| Flexible: category membership is based on generalized knowledge and/or immediate context | | Rigorous: an entity either *is* or *is not* a member of a particular class based on the intension of a class |
| | *Criteria for Assignment* | |
| Criteria both context-dependent and context-independent | | Criteria are predetermined guidelines or principles |
| | *Typicality* | |
| Individual members can be rank-ordered by typicality (graded structure) | | All members are equally representative (ungraded structure) |
| | *Structure* | |
| Clusters of entities; may form hierarchical structure | | Hierarchical structure of fixed classes |

There are challenges to Classical Theory, despite it being a 'simple yet elegant explanation for both the internal structure of cognitive representations and the semantic meanings of words' (Jacob, 2004, p.521). Wittgenstein (1953/2009), for instance, famously challenged that definitions could ever be reached with their necessary and fixed boundaries and conditions. Firstly, Earl (n.d.a, Section 4a) notes 'few if any classical analyses of such concepts have ever been discovered and widely agreed upon as fact'. Lakoff (1987, p.577) argues this point following his three case studies; though he allows for minimally distinguishing properties, these do not play a role in language grammar, where a form and meaning pairing occurs instead. Classification is context-independent so can 'severely constrain the individual's ability to communicate with the system in a meaningful and productive manner' (Jacob, 2004, p.538).

Moreover, Earl (n.d.a, Section 4c) notes that vagueness exists and cannot be accounted for by Classical Theory.

> Terms like "bald," "short," and "old" all seem to have cases where it is unclear whether the term applies or not...For instance, it seems that there is no precise boundary between the bald and the non-bald, the short and the non-short... But if there are no such precise boundaries to the extensions for many concepts, and a classical analysis specifies such precise boundaries, then there cannot be classical analyses for what is expressed by vague terms.

This might, Earl (n.d.a) goes on, be because we do not know the precise boundaries for concepts. Instead, there are the views that scientific language is precise but everyday language is not, or even that the mind can conceive of boundaries but the world itself is 'fuzzy' (Geeraerts, 2006).

Earl (n.d.a) points out that there are empirical objections to it too, which shows that we tend to categorise according to typical features of category members, given that more typical members of a category are sorted more quickly into that category than less typical members, with the example of robins and eagles for the category of bird. Whether this truly reflects categorisation structure and/or processing is a matter of great debate in the literature but, to reiterate, the purpose here is to find a conceptual tool to conceive of language the most efficiently and accurately rather than explaining how categories work in the mind.

Classical Theory could also struggle to account for the wide variation across even recognised languages without either creating multiple definitions of language, or by largely ignoring such variation and reducing language to a handful of rules as with language in the 'narrow' sense (Hauser, Chomsky, & Fitch, 2002). Yet, multiple definitions would negate the purpose of trying to define language for scholarship to understand the nature of this phenomenon and for everyone to work with the same concept and terminology.

It is also worth mentioning that careful consideration of the original texts, such as the ancient philosophers, particularly Aristotle's work, could yield more than received interpretations, for instance by bringing the notion of such strict conditional criteria into question. Kung notes that 'Essential properties also have an important explanatory function to perform. Rather surprisingly, Aristotle's consideration of this function suggests that some properties may belong essentially to one thing and contingently to another' (Kung, 1977, p.376), meanwhile Aristotle does not dismiss complex communicative systems of other species but differentiates humans based on their ability to indicate perceptions of good and evil, that is a moral and rational agency focus as opposed to typical modern linguistic considerations like semantics and syntax (Louden, 2009).

Classical Theory does, however, highlight our use of terminology, especially given the points made in the dissertation's Introduction: that there is as yet no agreed upon definition of language. This creates a notional gap that must be filled. Is it that we have not yet reached a definition, or is it that a definition of language is not possible?

In place of dictionary Classical Theory-style definitions that separate lexical from pragmatic knowledge and are modelled with semantic features, cognitive linguistics has proposed the importance of an encyclopaedic view of meaning, in which 'word meaning cannot be understood independently of the vast repository of encyclopaedic knowledge to which it is linked', and in which it is grounded in interaction with social and physical experiences (Evans & Green, 2006, p.206). Encyclopaedic knowledge contextualises meaning in terms of general knowledge, rather than pinning it down in a fixed fashion (Lemmens, 2015).  Even dictionaries now contain a range of contextually based definitions, while Lakoff (1987, p.75) points out that each publication must list a primary meaning where there are several and they differ across texts. For instance, the concept of mother could occur within a nurturance model or genealogical model. Therefore, this dissertation will henceforth retire the term *definition*, unless used in relation to discussing Classical Theory or to explain another's linguistic theory. Instead, the more neutral term *conceptualisation* will be used to refer to how

we conceive of language, as opposed to (otherwise harmless) synonyms: *description* – relating too much to orthography; *conception*, which also evokes notions of creation and beginnings; *explanation*, which is inappropriate given our lack of detailed understanding of language; or *account* with its subjective connotation, to note just a handful of options. Furthermore, given the challenges raised here, we cannot commit to discussing the notion of a *classification* of language either, as like *definition* this is too rigid and tied to Classical Theory with all of its conceptual drawbacks. Thus, instead of a definition or fixed criteria list, à la Hockett (1966; Hockett & Altmann, 1968), we will explore other categorisation options to seek another cognitive framework for conceptualising language.

## 2.3    Neoclassical Theory

This theory stems from Classical Theory, retaining the requirement for necessary conditions in defining concepts but rejecting the sufficient conditions. In this way, there is more flexibility in allowing for what constitutes a category member, provided the basic stipulations are met. For example, a bachelor must be an unmarried adult male, but there can be a range of associated ages, he can hold a number of professions, and his eligibility for marriage may be considered, such as whether he may wish to become or even be engaged. It is quite an inclusive approach to categorising concepts.

However, as Earl (n.d.b, Section 3b) notes, this very flexibility can be problematic, as the relaxing of conditions for category membership can be 'insufficient for handling concept individuation'. Earl uses the example of two known-to-be distinct concepts that share necessary conditions, a parallelogram and a rhombus. He describes them both as a closed plane figure with four sides and opposing sides parallel to one another. However, as we know from studying geometry at school, the referents – or extensions in philosophical parlance – of *rhombus* and *parallelogram* are very different, and need to be conceptualised as such (Figure 4):



**Figure 4** A rhombus and parallelogram

Therefore, the Neoclassical means of conceptualising not only presents the same issues as discussed with Classical Theory, but is additionally found wanting in that the theory cannot account for member differences so well. Thus, while this approach may help us start to group language features that may comprise a conceptualisation of the phenomenon, it would not help us to determine the difference between language and communication, or whether other species would be included or not. Moreover, 'without an account of reference determination' it offers only partial conceptualisations in any case (Laurence & Margolis, 1999, p.54). Thus, this categorisation theory will be excluded from further discussion in the dissertation.

## 2.4    Prototype Theory

### 2.4.1    Prototype Theory in Detail

A well-known categorisation approach besides Classical Theory is Prototype Theory, originating in cognitive science, but expanding to other disciplines including linguistics, such as to help explain polysemy (multiple meanings of words and other linguistic units) (Lewandowska-Tomaszczyk, 2012). Prototype Theory is based on categorising via family resemblances, first alluded to by Wittgenstein (1953/2009) in his famous discussion about defining games. Wittgenstein 'defied anyone to think of a definition in virtue of which all and only the possible games could be picked out' (Armstrong, Gleitman, & Gleitman, 1983, p.269). Armstrong, Gleitman, & Gleitman (1983) explain that Wittgenstein conjectured a cluster concept, a variety of attributes, of which only some were instantiated in each game, thus challenging Classical Theory's requirement for necessary and jointly sufficient conditions. Rosch and colleagues refined and experimented on this idea exploring feature typicality variations across members of categories like birds and furniture. Prototype Theory thus seriously contends with Classical Theory as experimental results demonstrate family resemblance and typicality effects in categorisation judgements.

Prototype Theory presents 'the two general principles that are proposed to underlie categorization systems' (Rosch, 1978, p.27): that of cognitive economy and perceived world structure. The 'view holds that concepts should be analyzed in terms of a set of typical features of members of that concept's extension' (Earl n.d.b, Section 3a), with a probabilistic aspect in that concept relations are analysed as statistical relations rather than as entailment

relations as with Classical Theory: that is the probability that each of the typical features will exist – more or less – within each member in the category, rather than necessitating that each member has to have all of those features to be a member in the first place.

Importantly for categorisation theories, though merely background knowledge for this dissertation, is the fact that Prototype Theory explains categorisation structure in the mind *not* (necessarily) how categorisation is processed (Rosch, 1978, pp.36 and 40): as an analogy, we could think about a library catalogue as opposed to how the books are physically sorted and shelved. However, as this chapter is surveying categorisation theories mainly for use as possible descriptive tools to apply to language on a macro level, this particular issue is not a serious one per se.

It is, however, important to explain here what a prototype is. In lay terms, prototypes may be understood as the first (draft) occurrence of an entity or phenomenon (e.g. Cambridge Dictionary, n.d.), such as the initial design model of a newly invented product. It is in this sense that Matthiessen (2006) and others explore the possible evolution of language from a *protolanguage* phase, with increasing levels of complexity in later iterations. However, in Prototype Theory, a prototype arises out of typicality effects through a process of abstraction across instances, as in pattern-finding, rather than arising from a single initial creation on which other items are modelled. Moreover, though it can explain categorisation effects for concrete objects like fruit, which have been frequently studied, as well more abstract concepts like event structure and modal verbs, both linguistic topics that have been studied using Prototype Theory (Tsohatzidis, 1990), a prototype is not an entity. It is a central typical representative of more or less similar instances and features of concrete or abstract entities: it is almost ghostlike. A prototype is not meant to be reified as though it was a specific category member, as this would be just as categorical as a distinct boundary in Classical Theory (Rosch, 1978, p.36), though it is possible to use exemplars to represent the prototype and its characteristics, such as an apple for the fruit category rather than listing 'an entity that is usually a round, juicy, sweet seed of a fruiting plant'.

Prototype Theory has both a vertical and a horizontal dimension. The vertical dimension is a hierarchical system of categorisation as seen in taxonomy. Rosch's (1978) levels of categorisation are, top to bottom: superordinate, basic, and subordinate, with increasing levels of specificity working down the levels. For instance, one can have a very general superordinate 'means of transport', a basic level 'ship', and at the lowest level a much more specific 'clipper', a 19th century merchant sailing ship, or fictional touristic vessel '*The*

*Love Boat*'. This taxonomical system could be represented diagrammatically as an upturned triangle (see Figure 5), to show how vast the higher levels are in terms of their membership, compared to the lower levels.
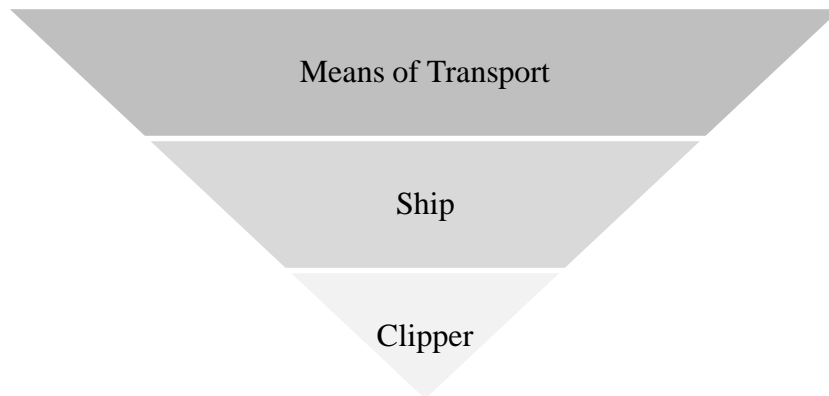


**Figure 5** The hierarchical arrangement showing category membership volume increasing with more superordinate general categories

Another example could be, working downwards again, 'construction', 'house', and 'bungalow'. The taxonomy content may change, depending upon the focus, unlike in biological sciences, where the levels are more fixed until research shows otherwise.

The superordinate, top layer in Prototype Theory is very abstract and general, and thus very inclusive in terms of membership, though – it should be stressed – there are very few features that all members share: what would be the similar features across a boat, a helicopter, and the Eurostar for instance? Moreover, how would you point to the concept of 'means of transport' or 'construction' as a whole?

Thus to view this vertical model in terms of the features of category members, rather than examples and category members themselves, a better way of representing the vertical dimension of Prototype Theory would be a pyramid (see Figure 6).
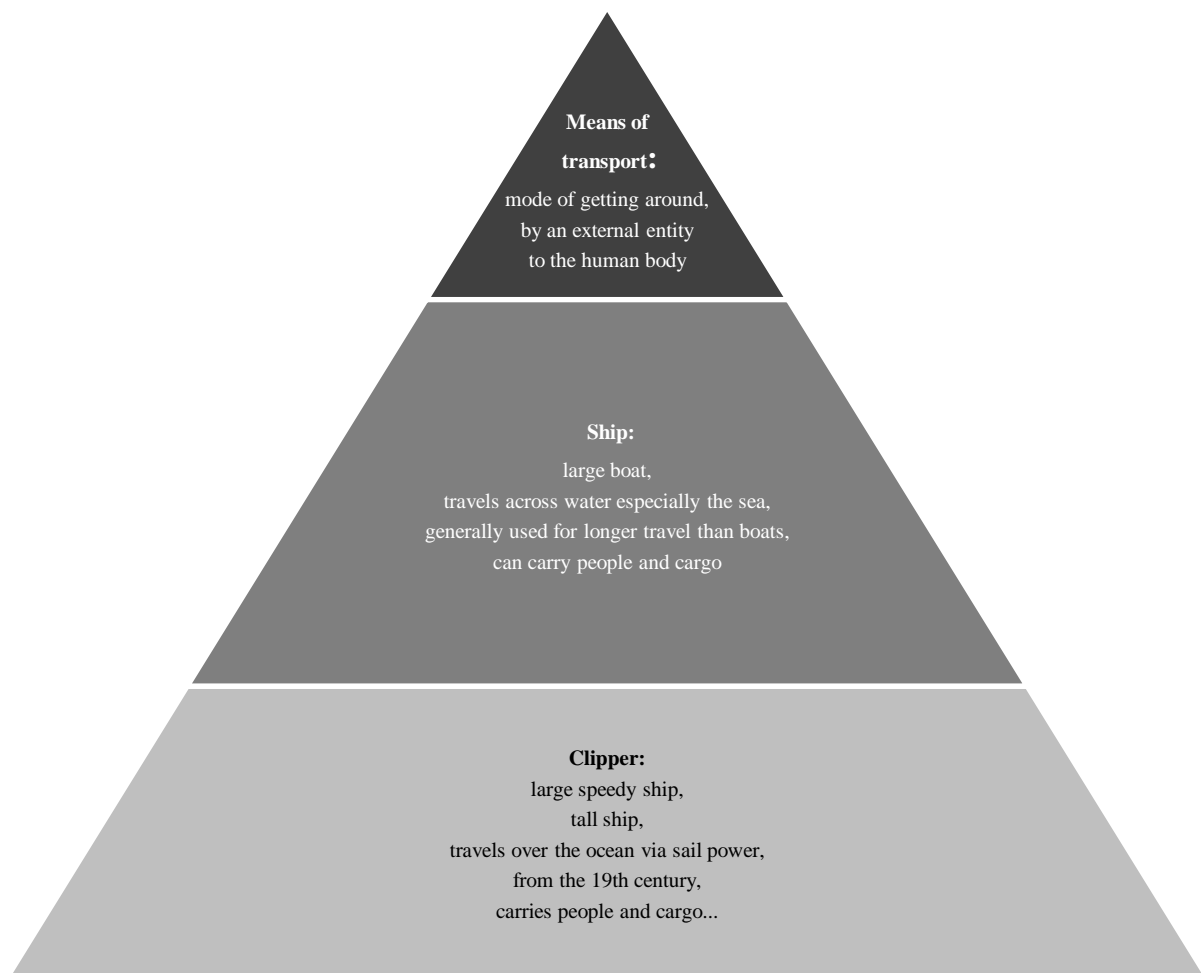
**Figure 6** The vertical dimension of Prototype Theory showing the increasing volume of features of category members with more subordinate specificity

The middle, basic, layer, then, is a bit more specified to a particular domain of life or thought, such as 'ship', 'house', or 'dog', and is 'the most inclusive (abstract) level at which the categories can mirror the structure of attributes perceived in the world' (Rosch, 1978, p.30). The shared features become more numerous and apparent too. This basic layer can then be subdivided, into much more specific versions of, for instance, domestic dwellings: such as bungalows, seafront duplexes, and even the odd castle, with a lot more specific features that may not have been found at a higher taxonomic level. Not all domestic dwellings will have a turret or stone walls for example, but a castle might. For 'dog', there might be subordinate level shih tzus, cavaliers, and huskies, each with their own detailed attributes from coat type to size to mannerisms.

In Classical Theory, 'any member of a category that is a subset of a superordinate category must exhibit not only the set of essential features that determine membership in the subset but also the set of essential features that determine membership in any superordinate category within which the subset is nested' (Jacob, 2004, p.521), which may give rise to proposals like recursion in language (Corballis, 2007; Hauser, Chomsky, & Fitch, 2002). Unlike this approach, however, in Prototype Theory the features that appear at lower taxonomical levels in Prototype Theory do not necessarily encompass all higher features and just add to those. For instance, a basic level dog might be described, amongst other things, as having four legs, but a more specific, subordinate type of dog might be a poor three-legged Labrador. This is an important difference. In fact, we can already see this effect among the various recognised languages where some have 'odd' features unknown to the mainstream studied languages like the Indo-European family, as with tonal languages like Vietnamese that vary their meaning according to the phonetic pitch of the word as well as its form.

As such, we need to clarify the conceptual approach we are taking, and follow it through to its conclusion, in order to fully understand language. For instance, it has a bearing on texts discussing language as a 'form of communication' (e.g. Bickerton, 2007; D. Everett, 2013; Hurford, 2007). This suggests that language might be on a lower taxonomical level with respect to communication. This would mean that the latter is a more general concept including lots of other aspects that may have little direct bearing on language, like the limitations of one modality over another that might affect successful communication at night or underwater for instance, but would not impede language from occurring. Simultaneously language could attain more specific and different features than communication, for example morphology to alter the meaning of words, like the plural *–s* suffix in English. This approach might be supported by Ungerer and Schmid (2006) highlighting the collecting but also functional attributes of the superordinate category level, certainly in industrial societies, so that the communicative, or other functions of language are found at a higher, more general level than that of language.

Instead, should we be discussing language at the superordinate category level instead, with recognised languages or their language features at the basic level, as this is what we perceive in the world, while it is notoriously harder to pin down language as it is a superordinate category? If so, would non-human communication and cognition evidence be included in this basic, or a subordinate level, too, as more specific instances of the very inclusive, very generic language? Moreover, though Rosch (1978) outlines just three levels in

the vertical dimension, it is not to say that the levels are limited to just three. Additionally, there also can be some degree of 'fuzzy' boundaries between them in the same way as the horizontal dimension perhaps. This discussion will be developed but it is important here to begin considering these types of questions to progress to a more effective conceptualisation of language.

Prototype Theory's horizontal dimension is possibly more familiar, even to those new to the theory by name. While the 'vertical dimension concerns the level of inclusiveness of the category...The horizontal dimension concerns the segmentation of categories at the same level of inclusiveness' (Rosch, 1978, p.30), or the differences between categories/concepts. Rosch (1978, p.30) goes on to explain that 'categories tend to become defined in terms of prototypes...that contain the attributes most representative of items inside and least representative of items outside the category'. 'Such typical features are not shared by all instances of a given concept, but are shared by at least most of them' (Earl, n.d.a, Section 4b).

What is termed officially as 'cue validity' then refers to these degrees of the differentiation of categories from one another, so that the higher the cue validity, the more different the concepts/categories are from one another (Rosch, 1978, p.31). For basic level objects, this horizontal cue validity is higher than for superordinate categories that have less commonality and thus more generality of attributes. For instance, Rosch (1978) points out that adult naming tasks demonstrate that basic level names are the most frequent in language as opposed to either higher or lower vertical levels: take 'dog' as opposed to 'mammal' or 'shih tzu'.

## 2.4.2   Prototype Theory as a Useful Construal Option

Now that Prototype Theory has been outlined, this subsection explores the theory's application to the language conceptualisation problem in this work. It is possible that Prototype Theory could be used as a tool to help conceptualise language and its relationship with non-human communication and cognition on a macro level. It would be possible and useful to do so for several reasons.

Firstly, to reiterate, Prototype Theory is already explored for abstract concepts as well as tangible objects. Therefore, there should be no conceptual barrier to using Prototype Theory to explain the phenomenon of language and how it relates to non-human communication and cognition. Indeed, prototypical effects within language have already been

discovered and discussed at length by researchers. As one example, Lakoff (1987, p.59) notes asymmetrical markedness, such as English's marking only of plural number with the morpheme *–s*, for example in *boys*, rather than marking a singular number. Additionally, Lakoff (1987) explains how Jaeger's PhD thesis (1980) suggests that phonemes are categories of (allo)phones and are understood through their prototypical members like /k/ from its phones [k], [kʰ], [k′], and [k′ʰ], where [k] is the prototype. Berlin and Kay's study (1969) on colour terms establishes basic level frequent central members like the concept of 'red' and that though the conceptual differentiation of all colours is universal as a part of the human neurophysiology, languages mark them differently in systematic ways, though there is no principle for predicting the boundaries between colour categories that languages will express.

It is worth noting that this classic study highlights a potentially interesting point of comparison with non-humans. Berlin and Kay (1969) proposed that each language distinguishes at least between white (or light) and black (or dark) and revealed a systematic pattern of including further colour terms across ninety-eight tested languages, based on their overall complexity. Stage 1 includes equivalent terms for white and black, Stage 2 adds red, Stage 3 adds green or yellow, Stage 4 adds both green and yellow, Stage 5 adds blue, Stage 6 adds brown, and Stage 7 is where other colours emerge, usually purple, pink, orange and grey. Given Gunnison's prairie dog (*Cynomys gunnisoni*) alarm calls seem to encode information like colour and shape labels for their different predators, each predator in turn stimulating their own individual alarm calls (Slobodchikoff, Paseka, & Verdolin, 2009, though c.f. Loughry et al., 2019 for challenges), we might expect to find that the apparent colour terms adhere to such a universal pattern as found by Berlin and Kay, though we would need to factor in any species' perceptual and environmental differences. For instance, the alleged call these animals have for the concept of 'blue' suggests that their communication has already reached Stage 5 in complexity, akin to recognised languages like Plains Tamil in South India and Mandarin, and we could explore to see if they have a call for 'white', 'black' and 'red'. Interestingly, though, green clothes that the experimenters wore in the prairie dog study did not elicit significantly different alarm calls from those humans wearing yellow shirts (Slobodchikoff, Paseka, & Verdolin, 2009), which may instead place the communication back in Stage 3, along with languages like Somali, Tongan, and Homeric Greek. It would also be useful to find out, if these prairie dogs are indeed encoding colour labels, whether they encode colour with a morphological arrangement within the call or as a separate lexical equivalent item, like a separate colour word. It could be a unique example of colour being represented

and encoded morphologically. For humans, colour is only represented lexically (Talmy, 1988).

Coming back to Prototype Theory based approaches to abstract concepts and especially linguistics, Winters (1990) mentions that the prototypicality of syntactic constructions can be seen by exploring historical linguistics and seeing how novelties either disappear or grow in frequency to become central to the construction's category, such as negation with *pas* in French. Taylor's book (1995) describes linguistic examples at length also, such as the morphosyntactic use of the past tense as past time, counterfactuality, and pragmatic softening across English, Italian, and Zulu; as well as prototypical effects in intonational meaning, transitive constructions (where a verb takes an object, like *I find X*) with realis verb forms (pertaining to actual rather than imagined events), and child acquisition of basic level categories before that of other levels.

Prototype Theory's graded boundaries also explains how grammatical categories are not always discrete, like adjectives, which 'draw some of their properties from nouns and some from verbs' (Cohen & Lefebvre, 2017, p.11). Both adjectives and verbs can refer to states like *buried*, while, like nouns, adjectives can be modified, in this case by adverbs, as in the phrase *very beautiful*. There are plenty of naturally graded categories, too, such as the colour spectrum. Thus gradience is ubiquitous, despite Hockett (1966) and others arguing for discreteness as a key feature of language (e.g. Berwick et al., 2013; Bickerton, 2007; Nowak, Plotkin, & Jansen, 2000). Moreover, all three of Peirce's sign types can be graded or discrete, for example the dimming light at a theatre performance which is both symbolic and graded (Dobrovolsky, 2011, p.554). Perhaps there is a range of typicality involved here.

Secondly, in lieu of a Classical Theory definition, Prototype Theory can be a useful tool to conceptualise language given that it fits the cognitive linguistics encyclopaedic view of semantics (Evans, 2007), involving contextual factors for instance. This is not to mention that Prototype Theory abides by the methodological intention in this dissertation to avoid dualistic tendencies of traditional arguments and perspectives. As such, from a Prototype Theory perspective, language could well be a much broader concept than previously assumed, encompassing a wide array of features to differing levels of typicality.

Thirdly, it has been shown in research studies that at least some other animals can think along the lines of Prototype Theory's vertical dimension, which would enhance the theory's applicability to non-human communication and cognition, though with the reiterated caveat that the use of Prototype Theory is for the conceptualisation of language and not the

cognitive process involved. Chimpanzees were requested to discriminate known conspecific faces in an experiment. After being presented with a photograph, they were presented with two conspecific photographs in a vertical arrangement, one matching the original that the chimpanzees had to indicate. The latency period for responding was greater where a higher ranking individual was placed physically below a lower ranking individual in the photograph arrangement, suggesting that hierarchical dominance is spatially represented in chimpanzees' minds (Dahl & Adachi, 2013). Border Collie (*Canis lupus familiaris*), Chaser, is reported to have learned three common nouns, each representing categories (Pilley & Reid, 2011). Meanwhile, pigeons learned to sort over a hundred photographs of objects – novel and familiar – into sixteen language categories (Wasserman, Brooks, & McMurray, 2015). Smith et al. (2016) outline non-human cognition studies on the horizontal dimension of Prototype Theory too. For instance, in two experiments, macaques (*Macaca* spp.) successively learned ten shape categories in relation to prototypes, and performed highly when including shapes into those shape categories that they had learned using family resemblance. Thus, although not primarily concerned with mental processing here, and the matter of whether Prototype Theory can account for how language works in the mind is a separate issue to using the theory to model discussions *about* language (c.f. van der Auwera & Gast, 2013), it still pays to be aware that Prototype Theory can be exemplified beyond the human species, which further supports its claims.

Even more importantly for understanding language's co-existence with non-human communication and cognition, the focus in Prototype Theory is not solely on the prototype at the centre, but the horizontal range outwards towards the 'fuzzy' rather than absolute boundaries (Lakoff, 1973; Rosch, 1978), at which point a phenomenon may perhaps be more typically categorised into the range of another prototype's category. So a ship's captain might at one time be less of a prototypical sailor and more typical of a managerial post. For the sake of understanding, one might represent this in terms of a horizontal range (Figure 7):
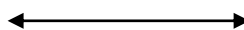


**Figure 7** A horizontal range of features

Or as concentric circles (Figure 8):
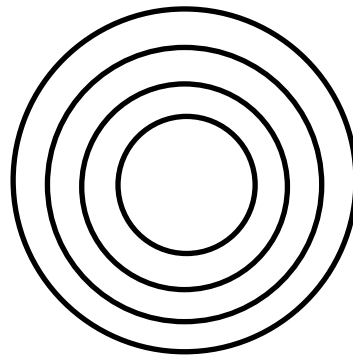
**Figure 8** Concentric circle range of features

Even as a venn diagram where other prototypes and their categories are involved (Figure 9):
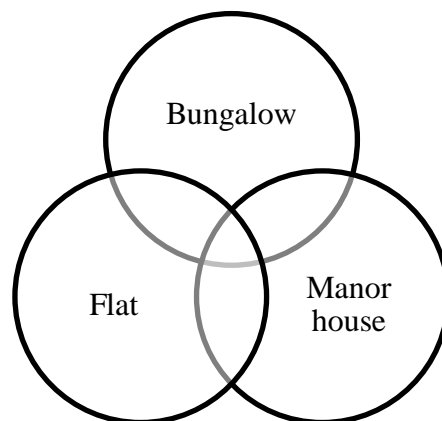


**Figure 9** Overlap of multiple related prototypes

This can help to explain variation and the lack of finite boundaries already seen in and across recognised languages, as explored within the discipline of linguistic typology (e.g. McWhorter's point about languages being naturally mixed, 2012).

Categorical definitions, in the sense of Classical Theory, may be useful for cognitive economy to parcel up the world neatly, yet as Rosch states (1978, p.36) we can still conceive of categories in terms of their 'clear cases' rather than their boundaries. For writing, the prototype might be the use of ink from a biro or a quill on paper or parchment, compared with stone-carved hieroglyphs, the use of a stylus on a smartphone app, or Morse code, though they are all types of orthography. So too could non-human scent-marking be considered an

atypical type of orthography, if focusing on the form of writing rather than the content of the message (which has yet to be ascertained). This is because the features of marking and retaining a lasting record are important for this prototype. Prototype Theory could account for particles also, which do not easily sit in any of the traditional parts of speech like noun and verb, which themselves have been questioned in cognitive linguistics.

Unlike Classical Theory and Neoclassical Theory (Laurence & Margolis 1999), Prototype Theory also accounts well for polysemy which cognitive linguistics argues is fundamental to language, from the lexicon to syntax (Evans, 2007), including where 'the 'same' word...used by speakers of different varieties of a language' is associated with distinct prototypes (Taylor, 1995, p.56). This is especially the case with the further development to Idealized Cognitive Model (ICM) theory, the organisational structure of knowledge in the mind, of which category structures and prototype effects are by-products (Lakoff, 1987). This questions Hockett's stability of meaning criterion of language through his design feature, semanticity (1966; Hockett & Altmann, 1968). Take the word *practice* for example, deriving from the ancient Greek for 'action', 'business', 'practical ability' (Liddell & Scott, 1889, p.666). In modern parlance, from the fifteenth century (Online Etymology Dictionary, n.d.c) *practice*, or *practise* in its verb form, can be used quite diversely. Students <u>practise</u> a skill to improve it, but professionals <u>practise</u> a skill to use and earn from it, like a medical or legal <u>practice</u>. This becomes a huge difference with something like open heart surgery: which type of practice would a patient prefer? Thus, the two meanings of this word are almost poles apart in one way, similar in another, and equally as valid.

Yet, if, as Hockett (1966) notes, words and their meanings have to remain stable, how do we account for such variation, unless we employ an approach like Prototype Theory that allows for this flexibility of use? According to this theory, we might argue for example that all skills require practice, as in reiterated action and learning, but while a prototype of this could be a student developing their skill, another prototype could be the more advanced version of the skill in action by professionals, or instead one of these uses could be deemed more frequent, and thus more prototypical than the other. Here, corpus linguistics methods would be very helpful at helping to determine the answers to such questions. Thus, this could be a way to reconcile stability in word meaning/usage with flexibility but through the construal of typical and contextual usages, rather than through one single unyielding definition of a word or concept.

Rosch (1978) does touch upon Prototype Theory being context based, while we could discern a subjective aspect to the theory also, in that different individuals could develop their own prototypes. Indeed, Jacob (2004, p.538) notes that the categorisation flexibility of Prototype Theory could 'prohibit the establishment of meaningful relationships because categories are created by the individual, not the system, and are thus fleeting and ephemeral'. However, evolution of phenomena is well established, while such points would add force to arguments negating essentialism, which will be discussed later in the chapter.

Consideration of how Prototype Theory treats category boundaries also shows how this theory mediates between the 'difference in kind' and 'difference in degree' notions hitherto guiding conceptualisations of language as it relates to non-human communication and cognition, though Prototype Theory also adds its own characteristics to present a third conceptual option: a 'difference in type'. It answers the 'difference in kind' notion, in that it would encapsulate the typological variety and thus difference of recognised languages (*type* is built into the term typology). Prototype Theory would also allow for any notable variation between human instances of language and that of the communication and cognition of other species, even for there being possibly multiple prototypes of language in a 'polycentric' view. Should there be separate prototypes, they would be separated by fuzzy boundaries rather than almighty 'Rubicon' type boundaries.

Prototype Theory could also contribute to a continuum notion of language and non-human communication and cognition in that it describes a range of typicality effects across instances, and so speaks to the 'difference in degree' notion too. Yet, it does so without a sense of a one-directional, or chronological linearity as conceived of by some (e.g. Bickerton, 1990), where non-human communication is at one end and language is at the other end of a continuum. Instead the typicality effect is based on feature frequency and on gradience with equivalent-level categories. Indeed, it may even turn out that peripheral features of recognised languages become more prototypical when incorporating non-human communication and cognition into the picture, or vice versa. Moreover, such typicality in Prototype Theory is decided based upon an analysis of the language features depending upon how typical the features are among non-human communication and cognition. Rather than a simple overall species spectrum, there is a continuum of, say, typical qualifiers, phonetic realisations, gestural reference, use of recursion, and so on.

Thus, Prototype Theory provides a different shape to our thought about language conceptualisation, and shows that neither the distinct divide nor the linear continuum need be

invoked in discussions about how to determine the nature of language or how non-human communication and cognition sit in relation to language.

### 2.4.3   Prototype Theory Challenges

As a theory of categorisation, there are several challenges to Prototype Theory proposed, and those that are pertinent to the aim of developing a useful theoretical tool for the conceptualisation of language, rather than categorisation processing, will be reviewed here. One commonly raised issue (e.g. Earl, n.d.b; and Laurence & Margolis, 1999) is that according to the formalist principle of compositionality, which is thought to explain both 'productivity and systematicity' in the mind and language (Fodor, 1998, p.104), complex concepts like 'pet fish' cannot be subject to Prototype Theory analysis, which could be said to apply to a complex concept like language. This is because the analysis must be made in terms of 'pet' and separately 'fish', only the syntax (re)combining the semantic primitives like building blocks that could 'give rise to an infinite number of complex units' (Evans & Green, 2006, p.251), an approach known as compositionality. It is argued that 'the list of weighted features for [pet fish] would not be the union of the lists of weighted features for [pet] and [fish]' (Earl, n.d.b, Section 3c). The same is argued for Exemplar Theory but in terms of exemplars rather than prototypes, such as a dog for 'pet', salmon for 'fish', and goldfish for 'pet fish'. Therefore, according to compositionality, Prototype Theory cannot capture complex concepts.

Yet, Laurence & Margolis (1999) argue that it is possible to possess a concept without knowing its constituent features. Moreover, in cognitive linguistics there is no such agreed notion that the whole is the sum of its parts. Instead, a whole is thought to be more than the sum of its parts, known as gestalt, part of a movement in psychology that arose as a reaction to atomism (Evans, 2007, pp.90-91), the latter of which will be discussed later. Instead, gestalt or holism, is 'the abiding recognition that wholes have properties not present in the parts and not reducible to the study of the parts' (Christakis, 2012, p.82). Moreover, Armstrong, Gleitman, & Gleitman state that 'not all feature assemblies add up to good Gestalts' (1983, p.303). The compound 'pet fish' might be understood in its own right, and only partially motivated by its parts (Lakoff, 1987, p.147). Plus, the details of compositionality are even up for debate by those who support it (Pelletier, 1994).

Another issue raised is that some categories or concepts cannot be subject to Prototype Theory (e.g. Earl, n.d.b). Numbers are such a proposed category. A number cannot be somewhat odd or not. A number is odd or even, in a very distinct classical analysis. Yet even these categories exhibit at least a level of typicality effect. Smaller odd numbers are viewed as more typical than larger numbers in experimental tasks. As a potential way to bridge the gap here, it is worth noting that Löhr (2018) points out that it is possible to combine any concept theory with any categorisation devices, so that, for instance, a bachelor may be analysed in terms of classical necessary and jointly sufficient conditions of being an adult, unmarried, male, and yet also show typicality effects through inference making. Laurence and Margolis (1999) discuss such Dual Theories combining Prototype Theory's fast categorisation with Classical Theory's account of categorisation structure with properties when cognitive resources are not limited, though this can compound the problems from each of the separate theories now combined.

Another challenge to Prototype Theory is the missing prototype problem (Laurence & Margolis, 1999) such as a 'US monarch', or 'problem of negative concepts' (Earl, n.d.b, Section 3c): 'what is expressed by negative predicates, such as the predicate of the sentence "Goldberg is not a cat."' The 'analysis of [not a cat] would be a list of weighted typical features of those things that are not cats. But it looks like there are no typical features shared by those things that are not cats...so prototype theories fail to account for an important class of concepts'. While the compositionality aspect of this challenge may be dismissed based upon the discussion of gestalt on the point above, also, as with Dyirbal, an Australian aboriginal language, conceptual systems can have 'an "everything else" category' which does not have to possess central members (Lakoff, 1987, p.96).

An additional objection is that Prototype Theory may not be needed at all, as Wierzbicka (1990, p.358) argues boundaries can exist though they are drawn differently across languages, such as the phenomena lexically encoded by German *Spiel* as compared with English *game*. Wierzbicka (1990) adds that, when intuitions are used to judge typicality of birds and a bat is not included, this seems to show that certain features are thought of as necessary not just prototypical. Thus, while Wierzbicka (1990, p.362) does allow for prototypes 'to define either natural kinds or cultural kinds' such as Chinese tea cups compared with Turkish coffee cups, she claims they are not needed for the concept 'cup', for instance, because though 'Concepts encoded in natural language are, in a sense, vague...this does not mean that their semantic description should be vague, too' (p.365). However, it must be

reiterated that this stipulates only one view of the categorisation possibility of both the world and linguistic encoding.

A final point to raise is about how the features of a category are discerned at all. Armstrong, Gleitman, & Gleitman (1983, p.272) state that 'it is not notably easier to find the prototypic features of a concept than to find the necessary and sufficient ones', while certain features or attributes in Prototype Theory parlance are suppressed. For example one might not mention the attribute of being a living thing or a physical object for a canary, seeing them as irrelevant or implicitly understood. However, this criticism stands as much for Classical Theory as Prototype Theory. This is also the reason that explanation based theories emerged, to fill the gap that family resemblance theories could not (Komatsu, 1992, p.500).

Still, the matter of determining language features is a fair point and we will come back to this in Chapter 4. Yet, it is not to say that if we took each of the various features of language proposed in the literature, and subjected them to the typicality effects of Prototype Theory, as with individual entities like fruit, that we could not glean an overall prototype, even a working prototype, of language until we gain more research data. This forms part of the thinking behind the development of the framework in this dissertation.

Despite all the challenges to Prototype Theory, even where they cannot be fully countered, we cannot ignore the empirical findings that support Prototype Theory. The positive aspects of this theory outweigh its criticisms, such as how it allows for conceptual flexibility, a different way of thinking about language as a phenomenon, and how Prototype Theory presents a useful option to the notions of 'difference in kind' and 'difference in degree' in how non-human communication and cognition could form part of the language discussion. Therefore, Prototype Theory stands as a viable option for a conceptualisation tool, albeit with caveats and possible adjustments, as well as potentially combining it with other theories and approaches.

## 2.5    Exemplar Theory

Like Prototype Theory, this theory also categorises concepts in terms of typicality, but rather than analysing them for features, the theory analyses based on exemplary cases or instances of a concept. Unlike Prototype Theory, though, even with its notions of cue validity and fuzzy boundaries accounting for differentiation of categories, Exemplar Theory focuses on the boundary cases much more than a centralised member of the category. This is also

called 'edge matching' (Komatsu, 1992, p.509), where 'one instance of the category may be similar to a second instance, which is similar to a third, but there may be little similarity between the first and the third instances'.

Komatsu continues to note that the danger with this is that, in extreme cases, all objects are similar to all other objects in some way and the theory does not provide prior constraint or specifications of the degree or nature of similarity required for a concept to be included in one category or another. This subjects this categorisation theory to Harnad's (2017) complaint, made initially about Prototype Theory but perhaps more pertinent for Exemplar Theory. Harnad (2017, p.52) claims that not all concepts will have prototypes, and also that matching is difficult as not all phenomena are a member of every category: 'It is not true ontologically that a bird is a fish (or a table) to a certain degree.' However, Prototype Theory stipulates that a prototype is not only most central representative to the category but also maximally distinct from other categories (Rosch, 1978), while Exemplar Theory seems to lack such theoretical refuge.

Nevertheless, when one factors in practicality, such as Geeraerts' (1990) discussion of the treatment of polysemy and the practical need to set limits to lexical entries in published dictionaries, and also theories such as embodiment (e.g. Lakoff & Johnson's work on conceptual metaphors, 2003), which explain how the body constrains perceptual experience and thus possible concepts and categorisation of said concepts, natural limits arise, so that a bird can be no more a type of fish than a table, regardless of the categorisation theory employed.

Still, if we are trying to determine what language is, it seems to be almost backwards logic to choose exemplars of language at the outset to stipulate what language is and any of its features, rather than determining what language is and then stipulating which are the exemplars of it. This is despite the fact that this is exactly how we have approached the study of language thus far: examining the details of already recognised languages, as spoken, written, and signed by humans, to determine the nature of language. It may be that 'we had to start from somewhere' so to speak, but does it necessarily follow that we should discount any consideration that this might not be the only dataset to examine? Non-humans ought to be studied for their contribution to the language concept too and not just in how they exhibit recognised human linguistic features. So rather than categorising in terms of best case examples, which can obscure the extensive diversity of both the languages used by humans

(Pereltsvaig, 2012) and the communication of other species, a more successful approach is via comparison their various features.

Murphy (2016) even argues that the prototype approach is much more representative, allowing for category hierarchies, knowledge not associated with a specific exemplar, and the need for living organisms to make inductions and predictions of novel objects and events, which is the purpose of having concepts, rather than recalling individual instances already encountered. Therefore, given the criticisms against this theory, and the far more extensive treatment of Prototype Theory, Exemplar Theory is not deemed here to be an attractive theory for conceptualising language per se.

## 2.6    Theory-theory

Theory-theory derives from work by Carey (1985) and (Murphy & Medin, 1985), and is a blend of critique towards Prototype Theory, towards Premack and Woodruff's (1978) article on chimpanzee theory of mind, as well as towards research into human cognitive development. In this view, concepts are organised within and around theories, (Weiskopf, n.d.).

Weiskopf (n.d.) goes on to explain that there are two versions of this theory: a weak 'concepts in theories' and a strong 'concepts as theories' view, in which the former proposes that mentally represented theories are composed of beliefs and concepts, and in which the latter posits that concepts are not only embedded in theories but are 'individuated' by theories, meaning that if the theory changes then so do the concepts. There is empirical evidence supporting the Theory-theory's major tenets, for instance in categorisation tasks, where participants tend towards privilege matching by causal effects (Weiskopf, n.d.). However, the challenges of this categorisation theory are manifold.

The theory is often vaguely described because it is hard to pin down the meaning of theory in this context (Weiskopf, n.d.). Moreover, care must be taken if concepts are to be seen as miniature theories, as concepts cannot be identified with theories and as theories at the same time. That is unless feature properties are connected by causal relation links, which could then be seen as theories.

In addition, there are stability issues borne of this theory, given that theories do change over time, and so concepts need to be revised as a result (Weiskopf, n.d.), while we have to consider how concepts might correlate or differ between different individuals (Earl, n.d.b).

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People can also represent incorrect information (Laurence & Margolis, 1999). The weak 'concepts in theories' view does not fail on this instability charge, however, since concepts only participate in theories rather than being distinguished by them.

Perhaps the best resolution with this categorisation theory is to accept the weaker view that concepts contribute to theory. Even so, this presupposes there being rationale within the development of concepts that implies almost teleological (end goal) thinking, which would need to be carefully considered. It gives us little to work with in the way of using the theory as a tool to conceptualise language, not to mention that it gives rise to the further question that if language exists within, or represents, a theory, what is that a theory of?

## 2.7    Atomist Theory

According to this theory, 'all or most concepts are such that they have no proper analyses in terms of any kind of "constituent" structure...and thus atomism takes all or most concepts to be primitive' (Earl, n.d.b, Section 3e). In other words, certainly in strong atomism, analysis in terms of conditions, features, or exemplars, as in other philosophical theories, is rejected: concepts have no analyses. In moderate atomism, there are some complex concepts allowed for, but most concepts are still considered to be primitives.

This theory supports the Platonic doctrine of nominalism and abstract objects, as opposed to realism, which upholds that there are universals across entities (Rodriguez-Pereyra, 2008). Nominalism is the view that: 'only singular things exist in the world. Species and genera...do not enjoy any existence of their own: there is no "horse in general"...no common properties such as redness' (Panaccio, 2017, p.1116).

A clear objection to Atomism is that the conceptualisations of language could be exponential, given that any variation in form and possibly function would be construed as a different instance and thus concept: 'since concepts have no structure...atomists seem committed to a view of concept identity that distinguishes concepts from one another solely by their extensions (or possible-worlds extensions)' (Earl, n.d.b, Section 2b). Instead, language might only be a complex concept, built up of a set of other primitive concepts, almost like a category label rather than a concept in its own right. Yet, we would still need to factor in a widely held belief that language in some way involves systematic structure, so we would then face the problem of understanding how the primitives relate to one another to build the complex concept.

Furthermore, Atomism necessitates that all (or at least most) concepts are primitive, as with Fodor's (1998) extensive doorknob example, so cannot 'explain psychological phenomena such as categorization' (Laurence & Margolis, 1999, p.71). The theory also necessitates that concepts are radically nativist or innate (Laurence & Margolis, 1999, p.62) – in that they are possessed or 'grasped' without learning or development (Earl, n.d.b). Potentially, in this view, early hominids had to possess concepts, from computers to gambling to civil laws governing employment in some sense, if taken to an extreme, which stretches the imagination somewhat, given we can trace the historic development and evidence the initial appearance of such concepts. Yet, even if we were to reduce the notion of innateness merely to that which is 'graspable via some innate faculty tailored for that concept' (Earl, n.d.b, Section 3e), language being innate in any serious way is a big source of debate within linguistics. Cognitive linguistics proposes theories such as entrenchment and abstraction that contribute to a usage-based account of language obviating the need for the innateness of language, for instance (Evans & Green, 2006).

'Conceptual Atomism is largely a negative view. It doesn't posit concepts with classical or neoclassical structure, it doesn't posit concepts with prototype structure, and it doesn't posit concepts with theory structure. It posits concepts with no structure' (Laurence & Margolis 1999, p.60). Again, this cannot help us build a picture of language as a structural system or as it relates to non-human communication and cognition.

Additionally, the majority of the categorisation and linguistics literature seems to contend that the mind does more than store individual instances, involving some kind of conceptual construction, as with the Knowledge Approach discussed below: 'if all information about every encountered instance were to be stored as part of the concept, no cognitive economy at all would be realized' (Komatsu, 1992, p.509). Therefore, as a way to conceptualise language, Atomist Theory introduces too many ideas that conflict with current linguistic theories to be of use as a tool to conceptualise language.

## 2.8    Neurological Theory

This theory is about mental processing. Thagard & Toombs (2017, p.425) state that if a neural network stores lots of examples, 'it may have a pattern of activation that arises when similar examples are observed', which is compatible with both Exemplar Theory as well as Prototype Theory, given that such activation patterns 'correspond to typical features'. While it

is worth noting such theories exist, and contribute to the notion that the mind in some way constructs concepts, this theory does not contribute anything further in itself to a tool for conceptualising language.

## 2.9    Schema View

This view of categorisation suggests that a concept consists both of representations of the concept's exemplars and of information about what the concept is like on average (Komatsu, 1992). Komatsu (1992, p.510) gives a short history of this notion's development and application and notes that 'The criticism of vagueness is fair, but I think it stems more from a too-liberal use of the term *schema* than from any problem inherent with the schema view.' Komatsu (1992), instead, proposes a schema as a single structure with characteristics of both the family resemblance view, abstracting information across instances, and the instance approach using information about actual instances, roughly the Prototype Theory and Exemplar theory taken together, with the information or attributes constituting the schema being called 'roles or slots' that are specified by the schema.

With a bachelor, then, the slots might be for age, marital status, and gender, for instance, and the most likely values for these slots would be an adult, unmarried, male, while actual instances of bachelors in the world suggest we need slots for wealth and solo habitation. Values can also be context-dependent, and can exhibit frequency effects also, such as the value of flying well being common of many birds, but not of penguins that are still categorised as birds.

Komatsu (1992, p.511) adds that 'schemata actually include information about two kinds of relationships: those that hold among the constituent attributes of a concept (e.g., that the wings of a bird are placed on the upper sides of its body) and those that hold among concepts, such as class inclusion (e.g., that canaries are a type of bird).' Class inclusion relationships can provide 'a straightforward route through which slots and slot values can be "inherited"... by "descendent" concepts'.

Schemata have slots for different attributes, class-inclusion relationships, and also for individual instances. So the schema for 'bachelor' may include the information that bachelors are adult, unmarried, males, that late teenagers are a subtype, and that whoever is lately crowned the most eligible bachelor will be a specific instance. The change 'from focusing on attributes (or slot and slot values) to focusing on relationships...among attributes and

categories is a relatively simple one, [but] it points the way to a restructuring of the view of concepts. This change in emphasis is what distinguishes the explanation-based views from the similarity-based ones' (Komatsu, 1992, p.512).

The amalgamation of theories and the introduction of a level of explanation for the relationship of concept attributes make this theory attractive. However, the theory is subject to the same kind of criticisms as examined for Prototype Theory and Exemplar Theory above. Moreover, as will be seen in the next section, this view is less of a fully-fledged categorisation theory than a move in the direction of one. Therefore, as is, it will no longer be considered as a tool for conceptualising language.

## 2.10    Knowledge Approach

In this categorisation theory, also known as the 'explanation-based view' (Komatsu, 1992), concepts are borne of knowledge that we develop about our world and are constructed so as to comprehend the world, having a crucial explanatory or theoretical role beyond just determining features, or the sense of a storage of examples or connections, as with many of the preceding theories. Concepts are 'theory-generated, rather than observed' (Thagard & Toombs, 2017, p.424). This fits abstract unobservable concepts like an atom particularly well, given how difficult it is to directly observe such phenomena. The theory also stems from the notion that 'categorization depends on conceptual change' (Thagard & Toombs, 2017, p.423), in a similar way to the Theory-theory, though it poses as one of the latter theory's key challenges as it potentially leads to conceptual instability.

The knowledge view 'tries to explain the simultaneous properties of coherence and flexibility by arguing that the specification of a concept includes information about how that concept is related to other concepts (or how its instances relate to other objects) and about the relationships...that hold among the attributes associated with its instances' (Komatsu, 1992, p.515). This is similar to the encyclopaedic view of meaning mentioned in earlier sections.

Komatsu (1992, p.515) argues that the 'explanation-based view is best seen as an elaboration of the schema view. The difference...is one of focus, with the explanation-based view having an increased emphasis on the inclusion of (in particular, causal and explanatory) relationships among...different concepts and the different attributes of a given concept'. The author goes on to describe a set of experiments run by other researchers involving 'cartoon creatures specifically constructed to fall into different family-resemblance-based categories'

to be sorted by participants but only when participants were made aware of the relations and family resemblances between the creature properties was categorisation successful (Komatsu, 1992, p.515).

However, there are some objections to the usefulness of this categorisation theory in and of itself. A small point, perhaps, but unlike a physical atom, language, or language instances at least, can be observed and so are more accessible for explanation without recourse to this theory. Plus, the strengths of the theory 'are gained at the expense of economy...a well-developed concept includes information about the relations among instances of the concept and of other things in the world. If totally unconstrained, this could mean that...a single concept might incorporate almost all information available to the person' (Komatsu, 1992, p.516), so it would make a model of language potentially unlimited. Additionally, as with Theory-theory, having a concept of language that is solely based on theory rather than its factual existence offers us nothing more than the situation we already have in which intuition and the latest theory lead the discussion on what language is.

Therefore, in terms of a tool for conceptualising language, this theory perhaps presents too many problems and little in the way of a conceptual 'shape', like a feature list or typicality gradient, to be useful. Yet, it is worth adopting its explanatory aspect, given that a feature list, even with aspects like family resemblances and gradience, cannot tell us more than what language might be made up of, like a list of ingredients, and the very basics of how those features relate to one another, for instance in terms of typicality. Furthermore, the fact that we still need to work out a way of determining what the language features might be, using some kind of knowledge approach could help with this aspect.

## 2.11    Natural Kinds

Connected to these matters, as well as to the background question driving this dissertation – how to effectively conceptualise language – is the issue of essentialism and natural kinds. The basic idea is that all phenomena have an essence and a natural way of being categorised in the world, thought to be an objective truth, irrespective of any human conception or categorisation of the phenomena in question.

For instance, Baehr (n.d.) notes there is a difference between analytic and synthetic propositions, dependent on whether the truth of a proposition depends on its definition, or on how the world is. Thus, claiming that bachelors are all unmarried results analytically from the

definition of the term *bachelor*. However, by comparison, the distance between the Earth and the sun depends not on the meaning of sun but on the actual distance. Linked to the latter synthetic approach, is scientific essentialism, which holds that 'members of natural kinds (like gold, tiger, and water) have essential properties at the microphysical level of description, and that identity statements between natural kind terms and descriptions of such properties are metaphysically necessary and knowable only a posteriori…[when] discovered via empirical science' (Earl, n.d.a, Section 4e).

Connected to essentialism is the notion of natural kinds, which raise the questions of how natural the kinds are, what natural kinds are, if they have irreducible essences like universals, and if there are properties that are essential for membership in a kind, again like Classical Theory in terms of necessary and jointly sufficient conditions (Bird & Tobin, 2008). Jacob (2004, p.520) notes that 'Until Rosch's...seminal work...research in the area of categorization had focused on concept formation not as a process of creation but as a process of recognition. The world of experience was assumed to consist of a set of predetermined categories, each defined by a set of essential features represented by a category label'. Thus, Hockett's language design feature list, predating Rosch's work, also follows the essentialist view of concepts and categories in this respect.

In a similar vein, Earl notes (n.d.b, Section 2a) concepts can be mind-independent: '*Ante rem* realism (or Platonism) about concepts is the view that concepts are ontologically prior to their instances—that is, concepts exist whether they have instances or not', as with Plato's theory of Forms, most eloquently expressed in his work *The Republic*. Yet, given the general cognitivist approach of linguistics, since Chomsky (2005) broke away from Skinner's behavioural account of language, it is unlikely for an effective model to propose language existing wholly separate to the mind, though, to what degree and how language and cognition are related, are matters for discussion as will be outlined in the next chapter.

Medin & Ortony (1989), from a different perspective, argue for psychological essentialism as distinguished from metaphysical essentialism, where psychological essentialism focuses not on whether things have essences and specific properties but that people's representations of things demonstrate a belief in such essences, which Komatsu (1992, p.516) states 'would explain why people often seem to believe in necessary and sufficient definitions' as with Classical Theory.

Plus, a move away from Classical Theory also means moving away from such objectivist notions, to that of an experientialist perspective, as expounded by Lakoff (1987).

This means that instead of reason being abstract and separate to the body and the world, the mind merely mirroring nature, viewing all categories as existing in the natural world and conceptual categories only reflecting them in the mind, we would take the view that 'meaningful thought and reason make use of symbolic structures *which are meaningful to begin with*' (Lakoff, 1987, p.372, emphasis in the text), including basic level concepts, as per Prototype Theory. This is not to say that phenomena have no reality in the physical world, just that their categorisation happens (mostly) in the mind and not according to classical analyses.

Moreover, the theory of conceptual embodiment, in which concepts are partly a consequence of the nature of 'biological capacities and of the experience of functioning in a physical and social environment' contrasts with the idea of concepts existing independently (Lakoff, 1987, p.12). This theory has been well established by works such as Talmy's force dynamics study (2000).

There is theoretical and empirical evidence for this change in perspective on categorisation and construal of the world, moving from objectivism. Of particular pertinence to this argument, to the involvement here of biological sciences within linguistics, as well as to this dissertation's discussion of whether language extends beyond the human species, is the following categorisation debate about the classification of the notion of species itself.

Bird and Tobin (2008) raise issues for species as natural kinds, as taking the Classical Theory-style necessary and jointly sufficient properties required for a member to be part of a natural kind. Such a perspective leads to views like '*biological species concept*' regarding interbreeding of natural populations as the isolating factor, or '*phylogenetic species concept*' distinguishing kinds by parental ancestry and descent. But, they state, the problem with species being natural kinds is due to lineage evolution, meaning that species are spatio-temporally restricted and the characteristic properties of a species change over time. The authors add that the gradual change prevents species from exhibiting clear categorical distinctions, so again they could not be natural kinds. This is similar to Darwin's (1859/1996) view, who discusses the difference of varieties in species in terms of degree. Moreover, as Lakoff (1987, p.192) points out, 'the biological species concept fails to be a classical natural kind' in seven clear ways, including that the concept has no homogenous internal structure, is defined relative to other groups, is not defined solely with respect to individuals' properties, and does not have clear boundaries. There is also a claim that species are individuals rather than kinds, and that because organisms are part of the same species they are likely to share

features, rather than them being part of a species because of shared features (Bird & Tobin, 2008).

Therefore, this reconsideration of natural kinds and essentialism has an important bearing on any theoretical framework built or eventual model to conceptualise language, in that it further clarifies the theoretical approach we ought to take towards language. Lakoff (1987, p.187) states that natural kinds seem to be 'part of our folk conception of the world' rather than part of a scientific one. Thus, rather than taking an approach that seeks to establish what language is, and how we can define and classify it, we should alter the driving question more towards the following: what counts as language? Utilising linguistic parlance, what '*instantiates* the prototype' (Taylor, 1995, p.59, emphasis in the text) of language? This would allow for both the notion that language is a real phenomenon but the conceptualisation of it is also possibly (partly) a result of construal.

This perspective also feeds in to the research question set out in the Introduction, which basically questions how we can best recognise language, especially given its close relationships to communication and cognition, possibly across species. Is there a line to be drawn, or a continuum, or some other conceptual shape that best frames this picture? Prototype Theory begins to reveal itself as a distinct and useful option in this respect, as the basis of a notion like typicality negates a single essentialist truth that we must discover in order to fully understand language. It makes discovering the nature of language much more attainable.

## 2.12    Discussion of Modes of Conceptualisation

This chapter has reviewed philosophical and psychological categorisation options, for the purpose of exploring the conceptualisation facet of categorisation, rather than how categorisation models reflect cognitive processing, as discussed for instance in Puglisi, Baronchelli, and Loreto's (2008) work on linguistic categories. We cannot choose and/or build a conceptual framework and eventual model of language that completely ignores this latter processing aspect, given the important role of cognition for language. Yet, this dissertation focuses more on how we talk and think *about* language, and how these approaches may be improved upon in light of the various data and theoretical insights we have encountered.

As can be seen from earlier sections, the two main categorisation options in the literature are Classical Theory and Prototype Theory, and variants thereof. Classical Theory centres around feature lists and fixed boundaries, fits many of the traditional notions of language, often formalist linguistics, as well as frames the 'difference in kind' view of language and its relation to non-human communication and cognition. Take the following, very eloquently argued discussion of non-human communication in just this very manner:

Linguists typically distinguish between natural languages and other systems of communication, for example, between Spanish, German, and Hindi, on the one hand, and vervet monkey calls, on the other... Now one could try to maintain that every system of communication constitutes a language and that linguistic theories ought to be as inclusive as possible, treating "Vervetese" and German as instances of a general kind that is the primary object of investigation. But there are sound reasons for not doing things this way. Natural (human) languages have distinctive properties. They are productive, they aren't tied to the here and now, and they are able to express an extraordinary range of contents—to name just a few. What's more, despite their enormous complexity, they develop effortlessly in all normal children within a biologically constrained critical period and in the face of significantly impoverished data. A theory of language that misses out on these features of human language just doesn't make enough contact with the very things that render it of theoretical interest. From an explanatory point of view, Spanish, German, and Hindi are all of a kind; Vervetese is only related to these in minor and explanatorily insignificant ways. Treating Vervetese on a par with human natural languages would make it impossible to draw any but the most superficial conclusions about "language", depriving the theoretical kinds of linguistics of nearly all of their explanatory power. (Margolis & Laurence, 2007, p.574, my emphasis).

However, Classical Theory has faced many challenges both in terms of and beyond describing language, and will therefore be rejected as a basis for the following proposed theoretical framework of how we can most effectively conceptualise language.

More complex, perhaps, is the 'difference in degree' approach to language and its co-existence with non-human communication and cognition, at least in terms of a linear

continuum, as with Langacker's (1987) lexicon, morphology, syntax continuum (see also e.g. Halliday, 1975; Hurford, 2012). While fitting the facts of a Darwinian gradualist view of evolution better than the notion of a distinct divide between humans and other species, and the idea of some type of 'difference in degree' can be seen within both Prototype Theory and Exemplar Theory, a linear continuum regarding language does not readily conform to any of the above categorisation models. One reason for this is that such a linear continuum is very indefinite and has no outer boundaries to allow for categorisation. Meanwhile, as mentioned in the Introduction, a continuum cannot really be a continuum if it has breaks in it, for instance to establish that non-human communication and cognition is not the same as language, contingently (Wacewicz & Żywiczyński, 2015) or otherwise.

Prototype Theory includes the notion of gradation of category member features, and thus allows for multiple simultaneous continua. However, the linear continuum notion of non-human communication and cognition to language, found within language evolution, functionalist, and ethology studies, tends to yield more of an all-or-nothing notion of difference, albeit in degree rather than kind. In other words, non-human communication and cognition as a whole, across all species, is expressed as not being on a par with language, whether in terms of grammatical and syntactic complexity, or lexical content, especially given the fact that the general term _animal communication_ is so frequently used. Yet, this overall, rather than feature, distinction heads more in the direction of a 'difference in kind', and thus Classical Theory, than it first appears. This is especially the case when, during discussions of non-human communication and cognition in the literature, there is a common recourse to Hockett's design features or similar criterial distinction between non-human communication and cognition and language (e.g. Reboul, 2017).

Prototype Theory, instead, aligns with empirical facts and a Darwinian view of evolution that both promote continua ahead of distinct Classical Theory boundaries. Prototype Theory also structures a clear conceptual frame for understanding what counts as language, in all its typological variety, and where the communication of other animals might fit in given the flexibility it offers, such as its graded typicality. Thus, non-human communication and cognition, in at least some species and some features, might end up as central, peripheral, or a blend to an ultimate conceptualisation of language, but in any case it can clearly become part of the language discussion. However, rather than simply multiplying the problem of 'defining' language, it must be restated that there are natural limiting factors to categorisation, as mentioned above, so Prototype Theory does not simply move the definitional goalposts.

In support of this approach, heading in the direction of the Prototype Theory based framework developed here, are two recent linguistics articles that were found after the majority of the theoretical development in this dissertation, but serve to substantiate the framework and its timeliness. Watson (2019) hypothesised that on a more macro level languages can be conceptualised as categories, and applied Prototype Theory to the description of multilingualism in Senegal. Meanwhile, Wacewicz et al. (2020) note that language evolution research is not hampered by the fact that the concept of language is fuzzy in nature and that there is little agreement on what we are talking about when we discuss language, and argue for a family resemblance pattern of approaches to language, which are much more promising than attempting one single conceptualisation. In fact, Saussure (1966) even uses the term 'prototype' about languages and tracing their history through their family resemblances before the categorisation theory was developed.

In sum, this chapter has sought to move past assumptions about how we define phenomena to explore a range of options available for the cognitive framework we could and perhaps should be using to conceptualise language. Prototype Theory, with backing from an explanatory theory like the Knowledge Approach, emerges as a ready candidate to frame future conversations about the phenomenon of language and its relation to non-human communication and cognition. Its typicality effects through member gradience, family resemblances, basic level categorisation and primacy, and metonymic reasoning, are psychologically real (Fodor, 1998). The theory is also empirically exhibited throughout studies of human cognition, and the currently common linguistic categories of lexicon, grammar, and syntax amongst recognised languages. Prototype Theory also provides a useful categorisation tool that we can use in place of attempting to reach an elusive – and possibly nonexistent – *definition* of language. One point to note is that features, known as *conditions* in Classical Theory and *attributes* in Prototype Theory, are used to categorise in both theories, but the way the features are grouped differs. *Feature*, then, is a theory-neutral term and it follows on from Hockett's (1966) work to determine the salient aspects of language, so will be used as the term in this dissertation. As a result of this chapter's exploration, we have also re-determined the big question, about what language is, to what counts as language. The next chapter now takes the insights gained from this chapter to continue to construct a theoretical framework of how we can most effectively conceptualise language.

## Chapter 3 Language's Relationship with Cognition and Communication

### 3.1    What Does Language Need?

In the last chapter, we established that Prototype Theory can be applied to conceptualising language and integrating non-human communication and cognition into this concept. This chapter concentrates on how we distinguish the boundaries of what we can count as language, as opposed to other phenomena it may be an instance of, namely more general communication and/or general cognition. Conversely, in the next chapter, the focus of the investigation is what may be included *in* a category of language: the features and member instances, as per Prototype Theory.

Why look at general communication and cognition to study language? These two phenomena in particular have been repeatedly interlinked with language in the literature for centuries, just as in nineteenth century linguist Whitney's (e.g. 1875) famous writings on the 'animal language' debate (c.f. Radick, 2007), as well as functionalist approaches to language, like cognitive linguistics. This link between language, communication, and cognition is not just raised with respect to other animals or evolutionary discussions, but also in terms of the daily function of language and its underlying cognitive patterns. Given that language is widely acknowledged as having a cognitive basis (e.g. Chomsky, 2005; Fodor, 1975; Kolodny & Edelman, 2018; Reboul, 2017) and is frequently argued as taking place for a communicative function (e.g. Halliday, 1975; Hauser, 1997; Pinker & Jackendoff, 2005), these are the two areas that really need to be examined in much greater detail to determine how they contribute to language.

Thus, the purpose of this chapter, in response to the research question and the theoretical framework being built within this dissertation, is to work towards establishing what makes language a standalone concept, and not simply a part of the phenomena of general communication or cognition. The outcome will then assist with working out the nature of the co-existence between language and non-human communication and cognition, which is one of the main drives of the dissertation. The reason for this is that, once we understand the relationship between the three phenomena more generally, we will have added insight into any species-specific differences.

This chapter, most importantly, considers the foundations of language: what language needs in order to exist in evolutionary terms, and what it makes use of to operate, as opposed

to what it might be per se, as will be explored in the next chapter on language features. This then provides a much clearer point for comparison with other species. It also approaches the much bigger question, 'what counts as language', which arose in Chapter 2, from another vantage point: that of language's core foundations.

Therefore, communication and cognition are dealt with briefly in themselves to establish the features that might co-exist with, support, or contribute to language. The links between these two non-linguistic phenomena are also explored, while later sections of this chapter are attributed to evolutionary discussions, the possible boundaries between the three phenomena, and the most effective way to conceptualise the relationship between the three using Prototype Theory as a theoretical basis. Throughout, the chapter addresses how we might begin to integrate non-human communication and cognition from the perspective of communication and cognition being foundational to language.

## 3.2    Communication

Daylight (2017) explores various models of communication, from Saussure's model, which forms a basis for Shannon and Weaver's (1949) signaller-channel-receiver model, to philosopher Derrida (1988) acknowledging the polysemy of the term *communication* and questioning whether context can determine the meaning range of the word. While models of communication themselves shall not be discussed in depth here, they will be discussed in light of notions of what communication constitutes, which is more central to the topic at hand.

Communication comes in many forms beyond language, for example, artwork, body language, and computer coding in artificial intelligence. Thus, the modalities of communication are broad and varied too, as they are in the non-human world. Some of the most intriguing examples of the varied communication modalities include firefly (family *Lampyridae*) bioluminescence (Greenfield, 2001); Pacific and Atlantic herring (Clupea *pallasii* and *Clupea harengus*) flatulence in non-digestive pulses (Wilson, Batty, & Dill, 2004); octopus (*Octopus tetricus*) colour displays (Scheel, Godfrey-Smith & Lawrence, 2016); Caribbean reef squid (*Sepioteuthis sepioidea*) ink alarm signals (Wood, Pennoyer, & Derby, 2008); California ground squirrels (*Spermophilus beecheyi*) flashing their tails with a radiation component to confuse infrared-sensitive rattlesnakes (*Crotalus oreganus*) (Rundus et al., 2007); jumping spider (*Habronattus coecatus*) vibratory courtship dances (Elias et al.,

2012); a hyena's (*Crocuta crocuta*) laugh (Mathevon et al., 2010); or giraffe (*Giraffa cameloardalis*) nocturnal 'humming' (Baotic, Sicks, & Stoeger, 2015).

Just as with Morse code, if humans used any of these forms of communication, language development might be possible (Gregg, 2013). Kershenbaum (2020a) does point out that there are some restrictions on certain modalities being useful to convey complex communication or language, such as the olfactory channel potentially not having the communicative range to be as useful as the vocal-auditory channel. However, we have not seriously investigated the olfactory channel as yet. Moreover, despite these caveats, it is – for the most part – not the modality itself that constrains what can or cannot be counted as language as opposed to communication. Meanwhile, language is also used in the same various ways as communication, for instance artistically in poetry, conveying emotions through song lyrics, and it is involved in writing computer codes.

The active aspect of communication is more central than its modality. Communicative *signals* are traits that have evolved for their communicative function, whereas *cues* have not and are incidental (Higham & Hebets, 2013; Maynard Smith & Harper, 2003), such as a prey animal leaving footprints behind that predators pick up on, or the way in which a human's nostrils might flare when they lie. Seyfarth and Cheney (2003) argue that non-human communication information is not actively signalled but is acquired by perceivers, while Proust (2016) adds to this view that humans involve ostensive communication to demonstrate that a signal was intended to facilitate more accurate interpretation.

However, generally, communication is thought to incorporate some degree of intent on behalf of the signaller, to influence the behaviour of others and render a certain outcome. Marriage counsellors will advise couples to communicate to learn more about one another. Telecommunications infrastructure is built and developed so that people can stay in touch over long distances. In a crowded restaurant, a customer only has to lift their hand while catching the eye of a server to gain assistance. Even within the non-human communication literature this is the approach taken. Communication involves coercion or active signalling, as well as a functional coherent behavioural response (Scott-Phillips et al., 2012), or the conveying of emotion to include a demand for particular types of response from the perceiver (Scarantino, Hareli, & Hess, 2022). A non-human example might be how dogs produce significantly more facial movements when a human experimenter is attentive to them in a situation with food, suggesting that the canine facial expressions are active attempts to communicate their desire for the food (Kaminski et al., 2017). This does not necessarily mean

to say that non-human communication includes the full degree of intentionality, meta-awareness, and theory of mind – the ability to conceptualise the mind of another, currently ascribed to just humans, which all link to language (e.g. Malle, 2002; Searle, 1983; Tomasello, 2005). However, there is more involved than simple automated responses to goalless behaviour.

Related to intentionality, communication is often associated with discussions of any meaning conveyed by the communicative signal, or *reference* in the non-human communication and cognition literature (e.g. Collier et al., 2020), both semantic and pragmatic. This respectively includes discussion of human representation via symbols, or arbitrary form-meaning pairings (Saussure, 1966), known as *(functional) reference* in other species (Townsend & Manser, 2013), and the context based act of meaning and intentionality (e.g. Grice, 1957; Scott-Phillips, 2015). Both meaning types also correspond to Austin's (2006) locutionary, illocutionary, and perlocutionary acts associated with utterances, as well as Tinbergen's (1963) famous four key areas for explaining animal behaviour: mechanisms and causation, an immediate or proximal function that can be thought of in terms of survival value, evolution, and ontogeny, which can all be demonstrated to some degree in non-humans (c.f. Bateson & Laland, 2013). Amphaeris et al. (2023) demonstrate how Austin's locutionary speech act relates to Tinbergian mechanisms, to look at the details of the signal or speech act itself and the surface meaning involved. The illocutionary act corresponds to Tinbergen's function (survival value), by exploring the implied meaning of a signal or speech act, as well as the intentionality and inference involved in a communicative setting. The perlocutionary act then relates to Tinbergen's ontogeny and evolutionary fitness benefits by focusing on the outcomes of communicative interactions. Yet, meaning is as much integrated into a concept of language as communication, even if the two linguistics orientations, formalism and functionalism (Newmeyer, 2000), choose to focus on separate aspects: structure and pure semantics, or the use of language and integration of contextual pragmatics as well.

Additionally, communication involves social interaction in some way, one example account of this being Grice's (1975) cooperative principle. This involves four conversational maxims to make one's contributions appropriate to the communicative situation. These maxims relate to the quantity of information, relative to what is required; truthful and adequately evidenced quality; relevance of any contribution; and that contributions are communicated in a manner that offers clarity, brevity, and order. However, it is important to recognise that this is just one theory that has been challenged (e.g. Townsend et al., 2017).

Nevertheless, a social interaction element is also evident in non-humans, such as the signal turn-taking of marmosets (*Callithrix jacchus*) (Takahashi, Narayana, & Ghazanfar, 2013). Some type of cooperative communication must also be involved in activities like the bubble-net hunting technique of humpback whales (*Megaptera novaeangliae*) too, in which some members of a pod coordinate to expel air underwater, forming a vertical cylinder of bubbles around prey, while others lunge in to feed on the gathered fish (Wiley et al., 2011).

Sometimes the communication is also culturally attuned, as even body language differs between nationalities and cultures (Pease & Pease, 2005), such as hand gestures that can be informative or insulting depending upon the specific part of the world they are used in. Cultural transmission, a feature from Hockett's language design features list (1966; Hockett & Altmann, 1968) can also be included here. For instance, conventionalised international maritime signal flags must be shared by sailors, and a key non-human analogy would be humpback whale song versions being adopted and spread eastward in Australasia (Owen et al., 2019). The interactive element of communication is also deemed more central to its meaning, with a prominence placed on individuals actively signalling and coherently responding to each other (Scott-Phillips et al., 2012). This coherence of response, leading to benefits gained by the signaller, ensures that the communication has success and can be maintained in evolutionary terms.

What exact benefit is conferred on the signaller is debated. From a biological sciences standpoint, communication may be described in two differing ways: in terms of information transfer or as a manipulation of others' behaviour (Owren, Rendall, & Ryan, 2010). This correlates with models of and perspectives on communication amongst humans too. For instance the Shannon and Weaver (1949) model describes communication in terms of signallers transmitting information to receivers, as highlighted by Reddy's (1979) Conduit Metaphor. This metaphor describes the language we use in this respect, including *sender* and *receiver*, or *message*, which comes from the Latin for 'send'. Scarantino (2013) argues for a blend thereof. Otherwise ignoring influence neglects the main driver of signal selection, which is to have fitness benefits conferred on at least the signaller, while ignoring information neglects the very point that communication is distinguished from other influence types *because* signaller benefit arises through the information transferred in the signal. From another, discourse analysis, perspective, communication can occur either for information transfer or for interpersonal purposes like expressing social relations and personal attitudes: 'transactional' or 'interactional' views respectively (Brown & Yule, 1983). Yet, information

can convey details about the environment and/or the signaller thesemlves, including their affective (emotional) states (Krebs & Dawkins, 1984; Heesen et al., 2022), so we need to take care over how we use the term *information*. Thus, while there is a debate in biological sciences about which approach accounts best for other animals, the content and function of human communication at least, including language, can be informational and/or affective (emotional) and interactional, as well as manipulative to effect certain responses from a perceiver.

Another prominent feature that characterises communication, and its evolutionary success, is efficiency. In a Tinbergian (1963) style adaptive account, statistical linguistic laws for communicative efficiency that apply to the world's recognised languages have also been found to apply to non-human communication. For example, gelada (*Theropithecus gelada*) vocalisations exhibit Menzerath's (1954) law, where the larger the size of a construct (e.g. the number of syllables in an utterance), the smaller the size of the individual parts (e.g. the syllables themselves). Longer vocal sequences that are produced by adult male geladas are associated with shorter individual calls (Gustison et al., 2016). Zipf's (1935; 1949) law of brevity accounts for the fact that frequently used words tend to be shorter. This law has also been discovered in vocalisation across species like African penguins (*Spheniscus demersus*) (Favaro et al., 2020), singing lemurs (*Indri indri*) (Valente et al., 2021), and chimpanzee gestural communication (Heesen et al., 2019). Both of these laws are linked to compression, energy efficiency, as well as linguistic economy, as in formalist Chomsky's Minimalist Program (1995). The fact that they can be seen to apply, universally as far as observed, across species and across communication and languages is another demonstration of the close relationship between the phenomena.

Therefore, communication across species is not constrained by modality, can be used to convey both information and emotions, is usually intended as an active means to inform or influence behaviour, its meaning can be arbitrary or more functional and context based, there is a strong social and interactive aspect, while communicative and linguistic efficiency appear to be universal. This is not a comprehensive description of communication, yet this section gives an indication of what communication involves, and that all these features are important foundations for language.

**3.3     Cognition**

**3.3.1    General Cognition**

Language, however, does not just involve communication but also cognition. While some argue that the purpose of language is the communication of thought (Bickerton, 2007; Hurford, 2007; Scott-Phillips, 2015), others argue that language has developed for the purpose of structuring thought (Chomsky, 2005; Fodor, 1975; Kolodny & Edelman, 2018). Saussure (1966, p.112) states, for instance: 'Without language, thought is a vague, uncharted nebula...nothing is distinct before the appearance of language'.

When we tell a friend that 'we will be back in five minutes, after running to the post office', or we are discussing the 'pros and cons of riding a unicorn as opposed to Pegasus', we are not merely communicating ideas to another person. We are also cogitating in very complex and specific ways, ways that involve all sorts of processes and concepts: an understanding of different interactants, plurality, time, sequences of events along with a sense of correlation and causation, displacement, intentionality, abstract and/ or imagined concepts, deliberation and argument, hypothetical situations and questions, alongside aspects like communicative turn-taking and conceptual metaphors, such as the force dynamics (Talmy, 2000) behind the phrase *pros and cons*. Therefore, we should be exploring non-human cognition as much as non-human communication for signs of language, given that both support language to some extent.

What types of cognition are there available for language to draw on? Firstly, there are important general cognitive processes. Tomasello (2005, p.28) considers the cognitive function of pattern-finding to be one of the prerequisite skills for 'understanding...the symbolic dimensions of linguistic communication'. This process enables the categorisation of speech into meaningful segments, for example.  Pattern-finding is found in many other species too. Seven-Spot Archerfish, with no evolutionary need to do so, can recognise human faces (Newport et al., 2016). Meanwhile, newborn ducklings (*Anas platyrhynchos*) can acquire the abstract relations of 'same' and 'different' through experimental manipulation of their natural imprinting, in terms of shape and colour (Martinho & Kacelnik, 2016).

Construal is another type of general cognition to consider. This explains how language users present conceptual representations within utterances that can be adjusted for a different focus on a scene or event (Evans, 2007). This process can be seen in the windowing of

attention on certain aspects of a situation, such as honing in on a particular object, quality, or action. For example, in a sports commentary, the commentator will probably ignore the weather and audience unless they happen to impact upon the actual sporting activity in some way. Similarly, the detail of various species' alarm calls will focus detail on the potential predator, rather than any other environmental aspects. Construal can also be manifested in terms of granularity, or 'cognitive zoom' (Tenbrink, 2020, p.118), which accounts for how coarse- or fine-grained a conceptual focus and any resultant linguistic descriptions are. This is a topic to which we return in Chapter 6, when discussing language feature identification in more depth.

Memory, both semantic (experienced objectively in terms of external dates and events) and episodic (experienced subjectively) (Tulving, 2002), alongside the ability to mentally time travel, is another general executive function that is an important basis for language in terms of both learning it and using it (Corballis, 2019). Some would argue that non-humans live in a continuous present (Suddendorf & Corballis, 1997). Elsewhere, evidence is provided for semantic memory, episodic memory, and mental time travel in other species. Zebra finches (genus *Taeniopygia*) have a fast and high-capacity auditory memory for identifying vocal signallers (Yu, Wood, & Theunissen, 2020). Crystal (2010) reviews a range of studies that seem to support the 'what-where-when' type of episodic memory in other species like rats (genus *Rattus*) and birds. In terms of mental time travel, a herd of rescued elephants in the Thula Thula reserve returned to the home of the man who rescued them on the anniversary of his death, for at least two years running, in the same way humans might in memorial (Moorcroft, 2014). Sheep (*Ovis aries*) have been shown to remember at least fifty conspecific faces after a period of two years (Kendrick et al., 2001). Dogs can recall past human actions when not expecting memory tests (Fugazza, Pogány, and Miklósi, 2016). Western scrub jays (*Aphelocoma californica*) can look ahead too, independently of current needs and motivations, caching the same food they were pre-fed despite currently eating a second type of food, suggesting that the first food would be desired later on (Correia, Dickinson, & Clayton, 2007).

Consciousness is a lesser understood aspect of cognition that nevertheless plays a subtle role in these discussions. Indeed, to Saussure (1966), meaning resides within the brain of language users so that isolating writing or utterances from consciousness also isolates them from meaning and linguistic status (c.f. Daylight, 2017). Nagel (1974, p.436) notes that 'fundamentally an organism has conscious mental states if and only if there is something that

it is like to be that organism – something it is like for the organism.' This sentiment is evoked in von Uexküll's (1934/2010) notion of *umwelt* too, by which species' sensory perception differs and thus their experience of the environment does too. Dennett (1991, p.31) refers to the conscious mind as not just the place for thinking and witnessing perceptions that become concepts, but also it is 'where the appreciating happens. It is the ultimate arbiter of why anything matters' and it is not therefore the same as the brain itself but active use of the brain. Dawkins (1993) notes the need for care over confusing thinking with consciousness, such as using grammar without knowing the rules. To Romanes (1883, p.18), consciousness is the distinctive element of the mind that can be tested with choice, as evidenced by 'the antecedent uncertainty of adjustive action between two or more alternatives' that are not inevitable.

Neurophysiologist Damasio (2000) proposes a core consciousness, and an extended consciousness associated with reasoning, which ultimately includes the notion of self. In fact, his tripartite representation of emotions echoes the icon, index, and symbol hierarchy: 'an emotion, the feeling of that emotion, and knowing that we have a feeling of that emotion' (Damasio, 2000, p.8), where the latter of the three seems consistent with reference to an emotion separate to the emotion itself, in line with symbolic mental representation, or sign to sign conceptualisation as proposed by Deacon (1997). It is also understood that anaesthesia disrupts or impacts on consciousness, so this approach can be used to detect if consciousness is present in non-humans even including plants (Yokawa et al., 2017).

However, the extent to which language and consciousness are related remains to be seen. For instance, if language is a means of organising thought and expressing thought, it could be argued as being a tangible instance of consciousness and/or a way of enabling humans (if not other species) to access their own consciousness, or certainly that language expands the capacity of a conscious mind, human or otherwise (Dennett, 1991), just as metacognition rests on executive function to monitor memory and processes associated with consciousness (de Waal, 2016). Considering Hockett's (1966) reflexiveness feature, there seems to be a key link between these phenomena.

### 3.3.2   Social Cognition

Aside from the general cognitive processes, social cognition comes in many forms, not least in terms of the social intelligence hypothesis, also known as the social brain hypothesis (Dunbar, 2009a). This suggests that the more complex the society and its interactions,

hierarchy and so forth, the more intelligent the species has to be in order to maintain an understanding of all the social relationships (c.f. Freeberg, Dunbar, & Ord, 2012). This includes interactions with outsiders of the group (Ashton, Kennedy, & Radford, 2020). Potentially it supports other anthropological hypotheses like cooperative breeding leading to alleged human hyper-cooperation (Burkart et al., 2014). Added to this, evolutionary changes in grooming could have co-evolved with growing vocal repertoire size (McComb & Semple, 2005). The brain is thought to have developed and expanded in at least mammals from managing all of these complex social interactions.

It is important, though, to recognise another viewpoint to that of the social complexity hypothesis: that brain size evolution is better explained by primates feeding on highly calorific fruit (DeCasien, Williams, & Higham, 2017). This is proposed because of the involved need for spatial information storage and retrieval, and overcoming metabolic constraints, for example. The authors argue the statistical modelling results are more consistent too.

Connecting to social cognition, Tomasello (2005) has argued that the triadic (involving three entities/people) behaviour of joint attention is also a prerequisite for language development, on account of its link to the reading of communicative intent. In terms of establishing a joint attention frame with others, a growing number of non-humans have been shown to follow gaze or other body language cues, like the direction of mobile ears or a human pointed finger, to attend to another's focus of attention. This includes African elephants (Smet & Byrne, 2013), African penguins (Nawroth, Trincas, & Favaro, 2017), and ringtailed lemurs (*Lemur catta*) (Shepherd & Platt, 2008). Cognitive linguistics studies demonstratives like English *this* and *that*, or Japanese *sono*, *kono*, and *ano* with respect to this view: the argument is that demonstratives form a unique class of linguistic expressions with a fundamental joint focus of attention function within language (Diessel, 2006). Not all human interactions are triadic; greetings are only dyadic (involving two entities/people) (Hurford, 2014). However, joint attention is one important social cognition aspect of language. Additionally, negotiating common ground, like shared background knowledge between interactants, is important for language (Clark, 1996; Massaro, 1987) and demonstrates another key instance of social cognition. Thus, given the cooperative communicative aspect of language already touched on, the use of social intelligence for language is clear.

Collective intelligence is a specialist form of social intelligence, involving shared processing of information and making joint decisions, found amongst certain species, for

example the way in which ants (*Lasius niger*) can socially distance to avoid the spread of infection (Stroeymeyt et al., 2018), in the kind of effective way that humans could have emulated during the Covid-19 pandemic. Homing pigeon experiments have also shown how such collective intelligence can lead to cumulative learning of the group over time (Sasaki & Biro, 2017), in a similar way to that often posited of humans and their hominid ancestors. Thus, just as with the little understood distributed cognition throughout the body of an octopus (order *Octopoda*) (Grasso, 2014), where its arms involve semi-autonomous neural networks separate to the central nervous system, this speaks to the need to consider adjusting our conceptualisation of cognition, as well as possibly language, in a more species-specific way at times. However, we do need to consider any potential continuity too.

Machiavellian intelligence (Whiten & Byrne, 1997) is another form of social intelligence, albeit a more negative type. However, this needs only the briefest of mentions, because, while Hockett (1966; Hockett & Altmann, 1968) provides a prevarication feature in his language design feature list, what is arguably really relevant for language here is the ability to actively signal, to take account of others' minds, and to manipulate others' behaviour with carefully reflected on and selected communication for one's own gains, often to the detriment of others. For instance, how people lie to get out of activities they do not wish to be involved in. In non-humans, there is evidence of social tool use in chimpanzees, manipulating others to obtain a food source (Schweinfurth et al., 2018), and fork-tailed drongos (*Dicrurus adsimilis*) uttering false alarm calls to scare other animals from their food source in order to steal it (Flower, Gribble, & Ridley, 2014). All of these aspects have arisen through discussions of other communicative and cognitive features. Arguably, then, malicious manipulation or prevarication are complex features, subsuming a number of other more elemental features, which would make comparisons across species and situations more complicated to carry out systematically. Moreover, from an evolutionary vantage point, the success of communicative signals and behavioural manipulation would depend on such interactions being mostly honest and either positive or neutral for the one being manipulated or communicated to, otherwise, there would be a tendency for such negative signals and encounters to die out very quickly (Skyrms & Barrett, 2019).

To fully address the social aspect of cognition, though, we also need to consider the language comprehension side of communicative interactions, not just the production. This is not to say that there is a separate inner and outer communicative world, as with the differentiation Saussure (1966) demarcated with the notions of *langue* and *parole*, or I-

Language and E-Language (Isac & Reiss, 2013). However, we need to acknowledge comprehension. To some, perceivers are part of models of communication, but only to unpack the meaning that is sent by the producer (Shannon & Weaver, 1949). Yet what if the message, or part of the message, is mentally constructed by the signallee/perceiver as opposed to sent by the signaller? For instance, in Riau Indonesian (Jackendoff & Wittenberg, 2014) meaning is primarily inferred or interpreted by the hearer. Within the scope of a minimal syntax, the onus is much more on the audience to add context and meaning to an utterance, than in many Indo-European languages for instance. For non-humans, where a corvid call alerts conspecifics to a food location (Heinrich & Marzluff, 1991), this is comparable to a beacon. A beacon is a simple sound or light, unwavering or forming repetitive pulses, with a conventionalised meaning associated, like to 'head here'. However, none of that meaning is carried in the form or production of the signal itself, but is all in the comprehension. This ties in with those arguing that communicative comprehension is more successful for non-humans than production (Fitch, 2019; Ulbaek, 1998). Seyfarth and Cheney (2003, p.33) focus on cues rather than active signals, noting that 'Although listeners acquire rich information from a caller's vocalisation, callers do not, in the human sense, intend to provide it. Listeners acquire information as an inadvertent consequence of signaler behavior'. This focus on comprehension does not have to challenge active intentionality and meaningful signalling, but considers that interpretation can be equally as involved in meaning scenarios, like language, as the expression of communicative signals (Planer & Godfrey-Smith, 2021).

Overall, it appears that cognition has as much to offer language as communication, so both should be considered when exploring the necessary foundations of language. Moreover, clearly advanced cognition is exhibited across numerous species, despite different brain structures and ecological niches (Van Horik, Clayton, & Emery, 2012). Yet, what of topics that cross both phenomena? The next section focuses on how cognition and communication seem to combine to lead to or to become language.

## 3.4    Links between Cognition and Communication

### 3.4.1    Symbolic Cognition

One major topic and example of communication combined with cognition is symbols. On the more communicative side, perhaps, symbols are widely acknowledged as a criterion

for language across disciplines, though with nuanced views on the meaning of the term *symbol* (e.g. Deacon, 1997; also Barón Birchenall, 2016; Hockett, 1966; Tomasello, 2005). According to Saussure (1966), linguistic symbols are arbitrary form-meaning pairings, also known as symbolic assemblies in cognitive linguistics (Evans, 2007) or conventional form-meaning pairings, which is a more generalised approach, and the view taken in this dissertation. For example, the sound of certain words has no clear and obvious link to their various meanings: *mountain* in English, but *Berg* in German, and *kuahiwi* in Hawaiian. Moreover, such signs do not seem dependent on spatio-temporal coincidence with their referents (Planer, 2021), enabling us to plan next week's shopping list. This means that both symbolic representation and reference enable displacement, the consideration of and reference to objects and events not occurring in the present vicinity or even in the real world.

Symbolic reference may arguably be found within non-human communication. Gunnison's prairie dog alarm calls, which encode information like colour and shape labels for their different predators (Slobodchikoff, Paseka, & Verdolin, 2009; however, c.f. Loughry et al., 2019, contesting the value of the findings) can be seen as symbolic units partly because reference to colour is arbitrary in any vocal-auditory communication, without a cross-domain perception of colour, and this has not arisen from any previous study of this genus (c.f. Cain & Carlson, 1968). Additionally, as with vervet monkeys, playback experiments with prairie dogs exemplify the displacement element of symbols too. Queiroz & Ribeiro (2002) state that vervet monkeys' alarm calls represent symbols of specific predator classes because the calls refer to external referents absent during the playbacks, and thus refer to a general type of predator rather than a specific individual that can be found in the immediate vicinity at that very moment. The 'jump–yip' calls of black-tailed prairie dogs (*Cynomys ludovicianus*) could be symbolic signals too. These calls are used to assess conspecific alertness and group size in real time (Hare, Campbell, & Senkiw, 2014) and propagate throughout the group like a Mexican wave. As the call is passed from one individual to another, signal to signal, this is akin to the sign-to-sign relationship in the mind that leads to symbolic representation and reference (Deacon, 1997).

Yet symbols have a strong cognitive aspect too. For instance, a functional MRI study discusses how the anterior and posterior perisylvian areas of the human brain may function as a modality-independent system linking meaning with symbols, whether as words, gestures, images, sounds, or objects (Xu et al., 2009). Moreover, symbols may be found within manifestations of non-human cognition too. This is important in two respects: both for our

expanded understanding of non-humans and as additional support for linguistic theory. Specifically, despite the cognitive linguistics Cognitive Commitment, reflecting general cognitive principles rather than those specific to language (Evans, 2007), in cognitive linguistics texts the form-meaning pairing refers only to linguistic, communicated expressions. Even a study of conceptual metaphors as a cognitive principle utilises linguistic examples, like '"She's a block of ice"' for the 'affection is warmth' metaphor (Lakoff & Johnson, 2003). However, not only are there instances of symbolic cognition within other species but in order to substantiate the Cognitive Commitment, an understanding and expression of symbols in non-communicative contexts should also be considered (Amphaeris, Shannon, & Tenbrink, 2021). Examples include the male gift-giving spider's (*Paratrechalea ornata*) offering of collected objects to a potential mate, nearly three quarters of their food 'gifts' being empty and 'worthless' (Pandulli-Alonso, Quaglia, & Albo, 2017). Given the lack of function of these 'gifts', whether or not these objects are offered intentionally or as part of evolved adaptation to demonstrate foraging ability, this behaviour is an arbitrary social convention, so constitutes a natural form-meaning pairing of an empty gift and an attempt to mate, much like flowers given on Valentine's Day. Wild female chimpanzee juveniles have also been witnessed carrying sticks almost like playing with dolls, carrying them for up to four hours during rest, movement, and feeding times, without any obvious function (Kahlenberg & Wrangham, 2010). Then there is symbolic comprehension involved in experimental studies, such as those with horses (*Equus caballus*) touching different symbol boards to choose whether to wear a blanket or not, as appropriate to weather conditions (Mejdell et al., 2016).

Therefore, symbols have both a communicative and a cognitive aspect: they are conceptual representations of perceptual information, which can be expressed communicatively through numerous modalities including language or play objects. Moreover, not only non-human communication but also non-human cognition needs to be explored for symbols.

### 3.4.2   Communicative Intentionality

Communicative intent is perhaps where cognition and cooperation best come together, given the social interaction and cognitive elements involved. For instance, Grice (1957) explores meaning with respect to intentionality and how this is conveyed to and understood

by other people, though we have to be aware that the general approach to what intentionality is may be at odds to the more specific classical intentionality in philosophy (Meixner, 2006). So, for instance, Austin's (1975) notion of 'doing things with words' would not be the final story: we would also have to acknowledge, on the part of both signaller(s) and perceiver(s), that the words are active in this way too. In a similar vein, Tomasello (2005) and Halliday (1975) note that pre-linguistic infants have to learn not just what adults are saying but that they are trying to say something in the first place. Tomasello (2005) also explains that social understanding develops over time and is then manifested in terms of joint attention frames creating: a common communicative ground, an understanding of communicative intentions inside these frames, and engagement in role reversal imitation. This can take place through both gestural and linguistic means, as well as the intonational patterns for different speech acts, such as statements (declaratives), imperatives (orders), or questions (interrogatives), which exemplify complexity akin to grammar (Givón, 2002), as well as a sense of intention (Grünloh, 2011). More generally, though, Hurford (2007, p.184) states that 'ancient paralinguistic behaviour is interwoven with the more complex language'.

Elsewhere, a set of experiments demonstrates the relationship between syntax and intentionality judgments, where humans are more likely under time pressure to over-ascribe intentionality to ambiguously intentional grammatical subjects and under-ascribe intentionality to ambiguously intentional grammatical objects. When the people have time to reflect, these biases can be overcome, though there are different possible interpretations for why and how this happens (Strickland et al., 2014). Again, intentionality is closely tied with language and communication.

There is debate over this intentional ability amongst other species. Rendall, Owren, and Ryan (2009) argue that animals do not consider perceivers' informational needs, meaning their signals do not exhibit perspective taking or the theory of mind needed for language, therefore there would be no communicative intentionality. Moore (2018) notes that gestures like eye contact to attract attention to one's signal occurs across species in an active and frequent manner, alongside other relatively simple instances of cognition that pre-linguistic infants would share, but this kind of behaviour occurs without any of the following: reflection, attribution of communicative intent to signallers, or mental state inference.

Others propose that non-humans engage in goal-directed communication rather than intentional communication (e.g., Townsend et al., 2017; Zuberbühler, 2018), meaning that 'signallers communicate, but they do not communicate that they communicate' (Fischer &

Price, 2017, p.29). Another view is that only humans have shared intentionality for common goals rather than solitary ones (Tomasello et al., 2005). Instead, non-humans can act intentionally and in light of reasons, but they cannot reflect on them as reasons (Glock, 2019).

Warren and Call (2022) present an interim approach, that of inferential communication. This describes how signallers have goals, are intentional, and signal informatively, constraining the ambiguity as far as possible but do not make their communicative intentions obvious as with ostensive communication. Meanwhile, perceivers infer the goals through the signaller's behaviour, information, and context, and both sides use a degree of mental state attribution. However, there is no signal about the signal as it were, thus separating out what the authors call the 'informative intention' from the 'communicative intention'.

Conversely, there is potential evidence for non-human communicative intentionality as with the study demonstrating active gaze alternations of kangaroos (*Macropus spp.*) between unsolvable tasks and the human experimenters in order to enlist aid for solving the task (McElligott, O'Keeffe, & Green, 2020). The study of tandem running in ants (*Temnothorax albipennis*) not only fulfils all three of the criteria for the behaviour to be referred to as teaching: behaviour modification with an observer, at cost, to set an example for the observer to learn more quickly than they would otherwise (Franks & Richardson, 2006). Ants appear to teach conspecifics how to navigate to a new food source, by journeying in pairs and stopping at vertical landmarks on the way. The leader waits for the follower to make physical contact before proceeding to the next landmark, unless the follower took an unusually long time to re-establish contact, apparently also evidencing the necessary criteria of evaluation of (lack of) knowledge of a 'student' (Richardson et al., 2007). This also shows intentionality involving a non-self-directed goal. However, we must note, as any learning mentor would argue, that there may be no real teaching in essence, only learning, as with the writing centre ethos of guiding the writer to improve as a whole through discussion: 'In axiom form it goes like this: Our job is to produce better writers [or students more generally], not better writing' (North, 1984, p.438), echoed by the aphorism attributed to Galileo Galilei, that 'We cannot teach people anything; we can only help them discover it within themselves.'

Audience effects also suggest signallers have volitional control over their signal production, like ground squirrels producing more alarm calls in the presence of kin, or male domestic chickens (*Gallus gallus domesticus*) increasing food related calls in the presence of females (Coppinger et al., 2017). In an experiment, in which wild chimpanzees were

presented with a python model, two of three alarm call types showed intentionality characteristics, given they were socially directed to friends arriving, associated with gaze alternations and monitoring the audience visually, and goal directed, since the calling stopped only when conspecifics were no longer threatened by the python. These signals show that not only chimpanzee gestures can be intentional but also some of their vocalisations (Schel et al., 2013).

Furthermore, the Cambridge Declaration on Consciousness (2012: https://fcmconference.org/), states that 'Convergent evidence indicates that nonhuman animals have the neuroanatomical, neurochemical, and neurophysiological substrates of conscious states along with the capacity to exhibit intentional behaviors', which would support this capacity in at least some non-humans. Balcombe (2017) suggests that because fish were the first vertebrates and have been evolving for a much longer time than birds or mammals they potentially had consciousness first. Though evolution is not teleological, neurological evidence points towards consciousness in birds, nevertheless, with an arrangement of microcircuits in the avian brain analogous to the mammalian neocortex, as found in pigeons and barn owls (*Tyot alba*) (Stacho et al., 2020). In a separate experiment, carrion crows (*Corvus corone*) reacted to stimuli and their neurons were concurrently shown to fire in this region, suggesting they had consciously perceived the cues (Nieder, Wagener, & Rinnert, 2020).

Call volume modulation could also more specifically instantiate communicative intent. This is a growing linguistics and biological science research area, which includes, for example, research into anthropogenic noise impact, even though it is deemed 'strange' by some when it is discovered in other animals (Farina, 2014, p.151). For instance, there is the Lombard (1911) effect, named after French ear, nose, and throat specialist. This effect, which both reflexively causes *and* can allow for volitional volume increase in noisy environmental situations, has been discovered in all mammals and birds that have been tested for it (Zollinger & Brumm, 2011), as well as Blacktail shiner fish (*Cyprinella venusta*) (Holt & Johnston, 2014). The 'strangeness' of its occurrence in other species may derive from the fact that call volume modulation arguably involves meaning and the 'importance of intelligible communication' (Hurford, 2007, p.184; Lau, 2008), as well as intentionality (Lane & Tranel, 1971), which some dismiss of other species (c.f. Pinker, 1995).

Examples of call volume modulation comprising communicative intent include humans' content words, like agents, objects, and locations, being emphasised more when

environmental noise is raised to 90 decibels (Patel & Schell, 2008). Humans and even some other species 'whisper' to evade predators (e.g. Videsen et al., 2017). Nervous wolf (*Canis lupus*) pups use the 'poker howl' (Harrington & Asa, 2003), a low pitch modulation used in times of uncertainty or in the company of strangers. Humpback whale calves also issue quiet grunts and squeaks presumably to help avoid predation (Simone et al., 2017). Budgerigars (*Melopsittacus undulatus*) are shown to have voluntary control over the effect (Manabe, Sadr, & Dooling, 1998), and vocal plasticity speed is revealed by the onset times of the Lombard effect in canaries (*Serinus canaria*) (Hardman et al., 2017).

The Lombard effect exemplifies an ontogenetic communicative development. In both a story-telling and labelling experimental task, children increased intensity globally, but adults increased vocal intensity for the story-telling to a greater extent (Amazi & Garber, 1982). Moreover, Stowe and Golob (2013) found that the Lombard effect is particularly sensitive to frequencies that are key for speech, with discrimination from general competing environmental noise.

Thus, if call volume modulation can be described as an instance of communicative intent, then even further questions ensue. Does the Lombard effect ever occur in situations without a conspecific, which would speak against communicative intent? How often does call volume modulation occur? Will any one species exemplify both whispering and the Lombard effect? Moreover, matters like audience effects need further study and may well increase the complexity of the communication (Higham & Hebets, 2013).

### 3.4.3   Theory of Mind

Linked closely with communicative intentionality is theory of mind, which 'refers to the ability of an individual to make inferences about what others may be thinking or feeling and to predict what they may do in a given situation based on those inferences' (Schlinger, 2009, p.435). It can also help in assessing one's own thoughts (Happé, 2003). To some (Townsend et al., 2017), structured intentionality as well as theory of mind are key ways to distinguish language from other communication. In humans, at least, theory of mind manifests itself in ways like understanding the intentions of others, detecting the eye direction of others, and shared attention (Coolidge & Wynn, 2012). The human neural network supporting this phenomenon, though, also supports semantic processing more generally, while there are

multiple brain regions associated with it and thus more domain-general investigations might be required in future (Diveica, 2019).

The first usage of the term, 'theory of mind', as well as its first attempted application to another species, comes from Premack and Woodruff (1978). However, the concept, and varieties thereof, have had quite a heritage, as reviewed by Obiols and Berrios (2009), while there have been a multiplicity of approaches to, and studies of, this phenomenon, such as false belief tasks, gaze studies (c.f. a study on goats, (*Capra hircus*) Kaminski et al., 2004), empathy, intentionality, the concept of self, metacognition, personality (Obiols & Berrios, 2009, p.381), or Tomasello's joint attention frames (2005).

Consider, for instance, Hockett's (1966; Hockett & Altmann, 1968) prevarication design feature, which requires underlying capacities to manipulate someone else's knowledge with an active intent. It may even relate to self-deception that frequently occurs, both to protect oneself from threatening information and to help persuade others (Smith, Trivers, & von Hippel, 2017). While not perhaps as conducive to language itself upon reflection, as raised in an earlier section of this chapter, prevarication does illustrate theory of mind in action, albeit with negative intent. It is because of this conceptualisation that Adams and Beighley (2013) argue that no other animal besides humans are able to lie, as genuine 'false tokening' needs to be preceded by the concept of deceit, and this meaning cannot be learned through trial and error by, for instance, a false alarm leading to opportunism with abandoned food. Yet, Hurford's (2007) argument that meaning must precede language, in the form of pre-linguistic concepts and internal representations, seems to refute in a generalised sense Adams and Beighley's claim. Thus theory may assist where science seems to have reached a plateau, at least experimentally, on the topic of theory of mind (van der Vaart & Hemelrijk, 2014), as it seems too difficult to distinguish between 'mind readers' and 'behaviour readers', regardless of other potential experimental issues, such as the size of a mirror for elephants in the well-known self-recognition tests (de Waal, 2016).

Additionally, trial and error or reinforcement learning is becoming a well-established and acceptable form of – or at least support system for – complex cognition (Draw and Frank, 2009), and so can no longer be used as a precondition for dismissing non-human intelligence. Moreover, Knight (1998) and others argue that non-humans are not so communicatively complex as humans precisely because of their competitive scheming, and there are multiple behaviours that seem to suggest there are all sorts of Machiavellian behaviours in the natural world. The western scrub jay re-caches its food from prying eyes (Clayton, Dally, & Emery,

2007). The hooded siskin finch (*Spinus magellanicus*) shows no obvious adaptive benefit to its vocal learning in a natural setting of other species' calls (van den Elzen & Sternheim, 1992). So why should non-human deception, and the theory of mind leading up to this, be so far-fetched?

Another famous instance of potential theory of mind comes from the early twentieth century performing horse Clever Hans, though this historical example of a non-human cognitive feat of tapping out correct answers to mathematical questions has been much maligned for cuing effects (following externals cues to respond in acertain way). Cuing has been a recurrent criticism of non-human cognitive studies, and the 'Clever Hans effect' is now regularly anticipated in experiments (Samhita & Gross, 2013). Yet, while this famous horse may not have been much of a mathematician, his ability to pick up on subtle human communicative cues for giving his appropriate responses was praised even by his official critic (Pfungst, 1911). A theory of mind interpretation of this example can be substantiated by much more recent evidence of horse cue reading, showing, with a variation in levels of interested behaviour, that they can discriminate between human unwillingness and inability to give the horses food (Trösch et al., 2020).

Theory of mind also appears to be exhibited by artificial intelligence. A chatbot spontaneously developed what seems to be theory of mind as a byproduct of the language model improving its language skills, solving 90% of the false belief tasks it has been subjected to, and testing at levels commensurate with at least seven year olds (Kosinski, 2023). Moreover, its versions have improved over time with version GPT-3.5 being the most successful so far. This obviously raises further questions about the phenomenon itself, and who has the capacity for this.

Therefore, while theory of mind in other species remains to be properly tested, for either a positive or negative outcome (c.f. suggestions by Roberts & Macpherson, 2011), and some simply dispute its presence in non-humans (Povinelli & Vonk, 2003), or even the terminology for its too cerebral and rational sound when 'perspective taking' might be a better term (de Waal, 2016), the phenomenon is certainly present in some form within human communication and cognition and so seems to be one of those key cognitive yet communicative aspects that language is based upon.

### 3.4.4   Blended Communication and Cognition

If there are fundamental cognitive and cooperative necessities for language (Evans, 2015b), what is the exact nature of their blend, given both the communicative and cognitive aspects of language? Are there only certain aspects of communication or types of cognition involved? Is language cognition channelled communicatively? Furthermore, is there an order to the involved elements?

For instance, gestures might also be important from a cognitive as well as communicative perspective. They can be representational and support cognition by activating, manipulating, packaging, and exploring information that can be used in language or thought (Kita, Alibali, & Chu, 2017). Therefore, we need to be exploring not just communication and cognition for their links to language, but also how they might interact.

Additionally, is it necessary for a non-human to pattern-find (Tomasello, 2005), and categorise in terms of itself and then another (c.f. Mitchell, 1997), before being able to possess a theory of mind of the other? Is it necessary to infer full stop, as a well-behaved dog does when playing only with their own toys and not the rest of the house (Hare and Woods' preface, 2014), before inferring the thoughts and feelings of another? Turnbull (2017) offered a top-down hierarchical list in his talk for the comparative evaluation of ability: language, tool use, problem-solving, theory of mind, self-awareness, and emotion in both neuroscience and a behavioural sense. Romanes (1883) created a continuum of intellectual faculties and mental evolution, with twenty-eight levels up to anthropoid apes and dogs, culminating in indefinite morality, after memory, reason, communication of ideas as with ants and bees, birds' ability to dream and recognise pictorial representations, and an understanding of mechanisms and tool use. Or is there a more dynamic interaction going on, instead of a hierarchical list of abilities? It is this type of assessment that needs further examination in order to move towards fully describing (the foundations of) language, which is beyond the scope of this dissertation. However, situating such discussions and asking the relevant questions is part of the development of the theoretical framework proposed in this dissertation.

### 3.5   Language's Evolution from Animal Communication and Cognition

One major facet of the discussion of how communication and cognition relate to language, particularly where non-humans are concerned, is in terms of how language may

have evolved from one or both of these. One clear reason for comparing non-human communication with language is the strong communicative function of language within human usage (e.g. Halliday, 1975). Many also argue for a communicative origin of language, including Hauser (1997) and Pinker and Jackendoff (2005).

Certainly, there is some complex communication amongst both humans and other species, despite the fact that there is much yet to research, from the role of multimodality in complex communication, to species not yet studied. However, not only does it require considerable care when comparing across species (Graham et al., 2019), but we still have limited information on the communicative capacities of non-humans whence derives the *human language* sentiment.

Other scholars posit that language may have evolved instead out of non-human cognition (Fitch, 2019; Reboul, 2017; Ulbaek, 1998). This argument for non-human cognition origins of language is predominantly posited because, as Fitch (2019) argues, other non-humans know more than they can 'say', while not all possible concepts are expressed even within recognised languages used by humans, plus non-human cognition is evidently highly advanced. A key example is meta-cognition, as found in rats (Foote & Crystal, 2007). In a duration-discrimination test, experimental trials were divided into forced and optional conditions, with varying levels of difficulty across both, and context-dependent rewards offered. A large reward was available for accurate performance, a small but guaranteed reward for opting out of the test, and no reward was provided for inaccuracy. Amongst the findings of the study, in trials where the rats could decline the test, and where the test was also difficult, the rats opted out and gained a small reward, suggesting they could determine uncertainty of their own knowledge in relation to the task. Ulbaek (1998, p.33) also proposes that 'Language grew out of cognitive systems already in existence and working: it formed a communicative bridge between already-cognitive animals', such as 'calculation across symbolic tokens or mental representations' that can be 'wholly in the mind', as in the use of symbols within last century's non-human primate language teaching experiments (e.g. Premack & Premack, 1983).

While it therefore seems prudent to explore non-human cognition as well as non-human communication for origins of language, Hurford's (2014) point that humans may be the first species to evolve language may be adjusted to the notion that humans may have been the first species to make use of language in a communicative capacity. Instead, akin to human-wildlife mutualisms (Cram et al., 2022) might there be multiple evolutionary routes to

language as the phenomenon is manifested in humans today? This discussion speaks, again, to the need to combine both communication and cognition for the foundations of language. This discussion also requires greater consideration about the different forms of evolution, from biological to cultural, as well as how various species have adapted differently in differing circumstances. For instance, some species may have either similar outcomes via different means to that of humans, or vice versa, along the lines of the philosophical notion from the Victorian era of a plurality of causes and effects, discussed in Chapter 1 (Mill, 1882). These matters will be addressed in more depth in Chapter 6.

While it may be difficult to distinctly separate the three phenomena: language, communication, and cognition, there must be differences between them if they are not the same identical concept simply with three arbitrary names. Therefore, where and how can we draw the lines between these phenomena?

## 3.6    Boundaries between the Phenomena

### 3.6.1   Critique of Hockett's Design Features

One way to draw a boundary between the three phenomena, language, communication, and cognition is through a specific critique of Hockett's extensive treatment of language as compared with communication. Wacewicz and Żywiczyński (2015) argue that social transmission in language is more about conceptual content and semantic information being built up across generations, rather than vocal learning that Hockett focuses on, which is a communicative modality. These authors also state that Hockett's language design features focus too much on communicative means and structure, rather than the underlying cognitive aspects of language, from theory of mind to executive function. This point, therefore, comes back to the need for both communicative and cognitive elements for language's existence, but also shows a key limit to how much communication alone can provide to language.

### 3.6.2   Emoji Code

Emojis, or emoticons, which are little iconic pictures used in digital communications like email, to aid this socially distant form of communicative in an affective way, are a burgeoning form of communication that are currently being studied in terms of their relation

to language. As such, they provide an interesting example for the discussion here. According to Evans (2017, p.12), emojis are 'a set of glyphs, with rules, convention and constraints', but importantly forming a code and not language because of the difference in their organisation and use. For instance, Evans notes that emoji repetition may be used for emphasis but might have the opposite effect with words. The example given (Evans, 2017, p.13) is with a sentiment of love. Several heart icons can impress upon another person the depth of one's affection, whereas stating 'I love you' just once is more powerful than stating it several times over. Moreover, Evans (2017, p.17) notes that emoji sentences are hard to follow given it lacks a grammar or 'a system of rules that lets us combine the individual glyphs into more complex units of meaning'. Another demarcation between the two is that language evolves through individual use (Evans, 2017), whereas there are organisations that determine which emoji innovations may be allowed to enter into mainstream communication platforms.

### 3.6.3   Cooperative Mutualisms

One recurring argument about the evolution of language with respect to non-human communication and cognition is that humans are the only sufficiently cooperative species to have evolved language (e.g. Beecher, 2021; Scott-Phillips, 2015). Meanwhile, other species have to cope too much with competition (e.g. Knight, 1998; Ulbaek, 1998) to have been able to develop such a complex cooperative and conventional means of communicating and expressing their complex cognition.

However, there can be differences between non-human species that need to be factored in, rather than a blanket approach to all non-humans. Moreover, the fact that cooperative mutualisms exist, especially those between humans and wildlife (c.f. Cram et al., 2022), suggests there could be different language evolutionary stories requiring careful analysis and interpretation. For instance, dolphins help fishermen to hunt in Brazil and Myanmar (Gregg, 2013). Male dolphins also synchronise their acoustic threat signals in terms of tempo and production when coercing females (Moore et al., 2020). The African Greater honeyguide (*Indicator indicator*) birds regularly lead human honey-hunters to bee colonies, so that the wax and honey can be consumed respectively (Spottiswoode, Begg, & Begg, 2016). This latter example in particular not only shows clear and strong levels of cooperation across species but instantiates reciprocal and functionally meaningful communication, with both the humans and the birds using their own specific calls to recruit one another, distinct

from any other contexts or vocalisations. As a result, three quarters of the hives found by the humans involve these birds. This existence of such mutualisms leads to at least two possible reinterpretations of the proposed cooperative distinction between non-human communication and the languages of humans.

Firstly, it may be argued that non-humans may be unable to evolve/develop a language amongst their own species, but could be more able to do so with human influence. Hare and Woods (2020; c.f. Hare, 2017) show how both self domestication and human-influenced domestication, touched on by Darwin, have both led to more approachable and cooperative individuals across numerous species, from foxes (genus *Vulpes*) to chickens to bonobos. Indeed, this review shows that contrary to the popular aphorism, familiarity does not breed contempt, it breeds the opposite: tolerance, understanding, and harmonious relationships, not to mention a much better understanding of others, which could be invoked more in the methods for studies of other species.

Increased cooperation in turn leads to longevity success of both individuals and groups, where aggression and competition can be very dangerous and can threaten these. Moreover, the authors show that such domestication often involves greater oxytocin and less serotonin in the brain and that both the cooperative behaviour benefits as well as these chemical changes can enhance social as well as other types of intelligence. These include empathy, theory of mind, and problem-solving ability, along with greater flexibility in these types of cognition and increasing levels of affective self-control. Potentially, as the authors argue, humans have evolved these traits to a greater degree than other species, including the ability to feel bonded with those unknown to us based solely on identifying with a social club emblem or perhaps a country's flag. Some have also argued that the development of the larger white scelera of the human eye has come about in order to facilitate cooperation through increased eye gaze following and communication therein (Tomasello et al., 2007). However, I would add the caveat that individuality plays a big role in such interpretations of human social abilities.

This domestication theory could perhaps account for the occurrence of the honeyguide mutualism and the communicative complexity involved therein, and bears similarity to arguments about the enculturation of other animals influencing their learning of elements of language and symbol usage (DeLoache, 2004; Lyn & Christopher, 2020), where the typical abilities of non-humans are superseded by their potential abilities through the influence of humans and their environment (Lyn, 2017). Key examples of such enculturation are the

primate language teaching experiments of the last century (e.g. Premack & Premack, 1983; Terrace, 1987; c.f. also Hillix & Rumbaugh, 2004 and Hess, 2009).

Yet, we need to take care over the difference between correlation and causation. The existence of complex cooperative communication across species in the presence of humans does not necessitate that humans are the origin of this complex cooperation. We need to perhaps refocus the attention on the (self) domestication process and its effects per se, without recourse to human involvement. Thus, a second interpretation of such mutualisms is that complex cooperative communication might also be naturally possible for at least some other species, as evidenced by their existence where no humans have been involved at all. Alarm calls, for instance, can be quite detailed, as with dwarf mongooses (*Helogale parvula*) (Collier et al., 2020), which have at least three meaningful alarm calls: one for aerial predators, one for terrestrial threats, and a T3 call comprising the other two other alarm calls and used as a general threat call; or African elephants having different calls for human and bee predators (Soltis et al., 2014). Honeybee waggle dances (von Frisch, 1967) direct conspecifics to the distance, direction, and quality of food sources with the varied duration, orientation, and shape of their dances. Additionally, there is an interspecific communicative mutualism between coral trout (*Plectropomus leopardus*) or grouper fish (*Plectropomus pessuliferus marisrubri*) and other local predators. These fish point out prey hiding in crevices to the other predators with vertical distinct headshakes and a horizontal 'shimmy' to recruit them for help with hunting (Vail, Manica, & Bshary, 2013) reminiscent of deictic (pointing) gestures in human communication, arguably the most fundamental communicative act – attention directing (Tomasello, 2008). It is worth noting here too the proposal that the self-domestication of humans was arguably a key factor in language development (Thomas & Kirby, 2018), with relaxation of certain natural selection pressures and less aggression, leading to cultural transmission as well as recognition of communitive intent.

Therefore, whether it is the human influence or a naturally occurring socio-cognitive cooperation in other species that is responsible for these complex instances of communication, non-human communicative cooperation is evident. Moreover, cooperation and the convention that derives thereof could be key to language development. So it is worth exploring inter/intraspecies mutualisms further for their contribution to understanding the evolution of language.

In sum then, the boundary between communication and language seems to arise mainly in terms of the more cognitive aspects of language, like theory of mind and executive

function; an increased structure and cooperative conventionality; a natural evolution in language; and an influence from social cooperation, though there are rudiments of each of these within communication already. But what of the boundary between cognition and language?

### 3.6.4   Cognition Continuum

Another way to determine the distinction between language and communication comes from comparing language with what is so far known of non-human cognition. Fitch (2019) argues that language flexibility allows the representation of any concept or thought process, which cannot apparently be found in non-human communication, though he states that non-humans clearly possess the conceptual representations themselves. Language seems, therefore, quite uncontentiously, to be a representation of and window into cognition.

Moreover, Radick (2007) shows in his historiography of the nineteenth century 'animal language debate' how tightly interlinked cognition and language were considered to be. The cognitive underpinnings of language were then taken up by Saussure (1966) in his early twentieth century lectures, followed by Chomsky's (1968) refutation of a behavioural account of language (Skinner, 1957) in favour of language being a cognitive faculty of the mind. This cognitive view has also been adopted by other linguists, as in cognitive linguistics, which, amongst other foci, investigates language's links to domain-general cognition (Dąbrowska, 2016).

Then there is the study of consciousness. Consciousness ties in with the last of the language design features, reflexiveness (Hockett & Altmann, 1968), given the alleged relationship between language, thought, and the ability to reflect on one's thoughts and language, from talking to oneself in the shower to choosing the most appropriate way to communicate a message to someone. It is also studied within other species (e.g. Birch, Schnell, & Clayton, 2020), covering aspects like temporally integrated experiences, self awareness, perceptual richness, and evaluative thinking. Thus, in multiple ways the relationship between language and cognition is firmly established.

As a result, however, it might be difficult to distinguish a boundary between cognition and language. So with the account of the 'Man Without Words' (Schaller, 2012), Ildefonso, a deaf man who had been brought up without any form of language or communication input from those around him and only acquired sign language in his later years, could potentially be

said to have had elements of language already. He certainly retained the capacity for learning it, despite the alleged critical period for the ability to acquire language (upheld though revised since Penfield & Roberts, 1959). Ildefonso was able to adopt sign language as an adult, while he already had some concepts, though he could not articulate them to himself or others, such as symbolising the colour green with trouble, given the border control into the USA and his dubious status as a Mexican immigrant. Certainly primitive concepts are allowed for without language (Fitch, 2019; Reboul, 2017), but they may contribute to more complex concepts as facilitated by language. Perhaps, in the Prototype Theory graded boundary approach then, there is much more of a continuum between language and general cognition, than a distinct boundary between the two. From a species perspective, there may be greater overlap involved than allowed for in traditional scholarship too (Carruthers, 2013). Indeed, de Waal and Ferrari (2010) call for a continuum approach to cognitive capacities and the probable range of mechanisms involved, some of which may be exemplified by other species. Meanwhile the authors note that it might be possible that some species achieve similar outcomes with different cognitive mechanisms, or conversely different outcomes from similar mechanisms given different ecological needs.

However, there may well be cognitive features, which can be counted as more linguistic, such as those that share characteristics with communication, like theory of mind. This would be unlike other cognitive features like pattern finding, an ability used in multiple different scenarios other than language. Another potentially less linguistic cognitive feature might be mechanical intelligence, needed for tool use like that of aquatic animals (Mann & Patterson, 2013), meta-tool production of New Caledonian crows (*Corvus moneduloides*) (Taylor et al., 2007), or even the root fertilisation and cropping of southeastern pocket gophers (*Geomys pinetis*) in a low-level food production system. The latter of which might be termed farming if the gophers also began to sow or weed the crops like fungus-growing insects (Selden & Putz, 2022).

This appears to be true for the communication-language distinction too, that where we add more cognitive abilities, we start moving closer to language. Therefore, it seems that one way in which to determine at least the foundations of language is the very blend of communication and cognition, which brings this phenomenon into existence. As such, this would render moot the debate over whether language evolved for communication or for cognition. It could be that language evolved from the very blending of the two phenomena.

**3.7      The Vertical Dimension of Prototype Theory**

Yet, ultimately what is the relationship between the three: language, communication, and cognition? How can we best conceptualise their co-existence? For instance, given that language incorporates both of the other phenomena, we could describe their relationship in terms of a Venn diagram arrangement, with overlapping commonalities, especially given the multiple links between communication and cognition that were explored in the previous section.

However, the relationship between the three phenomena is generally asymmetrical. There are scholars like C. Everett (2013) who maintain the argument of linguistic relativity, often referred to as the Sapir-Whorf hypothesis, in which language depends upon cultural variation and can actively and strongly influence one's cognitive processes. Aside from these views, discounted by Reboul (2017), while communication and cognition contribute many aspects to language, language does not tend to reciprocate, or certainly based upon current knowledge. Language does present a window to cognition, as elaborated on, for example, in the methodology Cognitive Discourse Analysis (Tenbrink, 2020), where linguistic utterances can be analysed for patterns that reveal underlying concepts and cognitive processes. Moreover, language does facilitate complex communication, from writing letters to distant friends, to having detailed discussions about abstract concepts like time, which can be handy for physics lessons or travelling internationally. Yet, language does not contribute features to or change either of these other phenomena. To put it succinctly, it seems that language cannot exist without cognition or communication, as demonstrated in the literature on speech pathologies (e.g. Blank, Gessner, & Esposito, 1979; Fedorenko & Varley, 2016), showing its dependence on these other two phenomena. However, communication and cognition can easily exist without language, as demonstrated by body language or non-verbal problem-solving tasks.

This asymmetry not only yields a conceptual derivation, where language is founded on communication and cognition, but also explains the evolutionary relationship between language and communication and cognition. The latter two must have developed before language, though we have yet to determine exactly which (parts) of the two was (were) the main driving force for language's emergence, given the previously mentioned debate over whether language first evolved for organising thought or for the communication of thought.

Therefore, diagrammatically a Venn diagram does not best capture the relationship. Instead, the co-existence between these three phenomena is more aligned with a taxonomic hierarchy, genealogical tree, or more pertinently here, the vertical dimension of Prototype Theory, as described in Chapter 2. Using Prototype Theory then, both communication and cognition can be said to be the superordinate categories of language, the latter of which would be found at the basic level, as it is more specific than the other two more general and inclusive phenomena. It is important to note, here, that this does involve some expansion of Prototype Theory to allow for multiple superordinates to be proposed for one basic level prototype. The theory currently only streamlines taxonomy into one superordinate level category, for instance 'mammal' down to 'dog' or 'furniture' down to 'chair'. Yet, as has been discussed at length, language cannot exist without both its communication and cognition aspects, and is an amalgamated derivative of both, certainly in its manifestation today, if not also since its origin. Therefore, with this slight amendment, the vertical dimension of Prototype Theory provides a clear and apt conceptualisation of the hierarchical relationship between the three phenomena. Similarly, we need to save discussions of matters like individual idiolects for the subordinate layer.

One small but important point that is overlooked in these discussions about language, its evolution, and the general literature on non-humans, is that non-human communication and cognition has also evolved from whatever were its ancestors. Indeed, where the literature concerns other animals, if not also humans, all of their behaviour, interactions, and cognition need to be accounted for in terms of evolutionary principles, as famously outlined by Tinbergen (1963). All species have undergone some degree of evolution since the first appearance of (proto)language, given that not all are basal species close to their ancient species like the Japanese racoon dog (*Nyctereutes viverrinus*), the tanuki. Moreover, non-human communication and cognition is also, conceptually speaking, a specific instance of both more general communication and cognition. Therefore, non-human communication and cognition is just as derived from the superordinate categories communication and cognition as language is.

This means that comparing language and non-human communication and cognition should be an equivalent level exercise (Amphaeris, Shannon, & Tenbrink, 2022), rather than approaching the latter from a solely evolutionary origin perspective, as though non-human communication and cognition are merely simpler and older versions of language (c.f. approaches like Bickerton, 1990; Fitch, 2010; Hauser, 1997). What may add to the confusion,

here, is that non-human communication and cognition does not include new terms, like *language*, which would help distinguish it as a basic level concept from its superordinate categories of general communication and cognition. Yet, determining the most apt term to use needs careful thought. Whether non-human communication and cognition can be included as (a) member(s) of the same category/concept of language or is(are) a different but equivalent level category(ies) with graded boundaries to language remains to be seen. In the former case, we would simply apply *language* to non-humans; in the latter case, it is possible that neology might be required for future non-human communication and cognition research.

## 3.8    Summary

The relationship between communication, cognition, and language has always been palpable and has been extensively discussed, and yet not fully explained. The purpose of this dissertation is to work out ways in which to demarcate and accurately describe and conceptualise such phenomena, particularly as they involve the issue of potential species variation. This chapter has focused on these three interlinked phenomena, to determine not only where the boundaries between them might lie, but how to account for their co-existence in an evolutionary and conceptual way, indeed how the blend of communication and cognition might be what gives rise to language in the first place. This helps not only to work towards ascertaining how non-human communication and cognition might relate to language, the immediate topic and goal of this dissertation, and supports why we need to be studying both non-human phenomena, but also the bigger question about the nature of language as a phenomenon in its own right, given the absence of a unified conceptualisation.

As this chapter has revealed, there are five key outcomes of the discussion of the relationship between these three phenomena. Firstly, both communication and cognition are closely related to language, and language cannot be separated from one or the other – potentially language's origin is based on a blend of communication and cognition. Secondly, the probable graded boundaries between the three phenomena consist of a more serious blend of features of both communication and cognition, an increased structure and conventionality, a natural process of evolution, as well as increased cooperative social behaviour. Thirdly, this relationship presents itself as an asymmetric relationship, in that communication and cognition contribute to language but language does not tend to reciprocate. Thus, language is a derivation of both these other phenomena. Fourthly, the most effective conceptualisation of

this asymmetrical relationship is a taxonomical arrangement, which correlates with the vertical dimension of Prototype Theory, wherein language is a more specific sub form of superordinate communication and cognition. Lastly, non-human communication and cognition is as much a derivative and evolutionary inheritor of the more general communication and cognition as language is. Therefore, this sets non-human communication and cognition on the same basic level, according to Prototype Theory, as language. So non-human communication and cognition ought to be analysed on an equal footing with language, rather than solely as some more simplistic version and/or evolutionary ancestor, as has often been the approach taken in the literature.

Thus far, the dissertation has determined the need to explore non-human communication and cognition for its links to language to understand both other species and the phenomenon of language better. Recent chapters have demonstrated that Prototype Theory is a useful categorisation approach to this problem of what counts as language, and that non-human communication and cognition needs somehow to be analysed in an equivalent way to language. The next chapter discusses the multiple proposed features of language as proposed in the literature that must somehow be accounted for in an ultimate description of language.

**Chapter 4 Language in the Literature**

This chapter presents a review of the literature that addresses language as a phenomenon, and highlights the language features that emerge. This review comes after chapters outlining a Prototype Theory based approach to conceptualising concepts like language, as well as the theory's vertical dimension and how that applies to language: exploring the superordinate concepts of communication and cognition, from which language is derived. It naturally follows to move on to Prototype Theory's horizontal dimension next, and to explore the basic level phenomenon of language as experienced in daily life, as more specific than general communication and cognition, and as studied in disciplines like linguistics, cognitive science, anthropology, and even ethology for a species comparison.

This sequence of topics also follows the Grounded Theory methodological approach taken in crafting this dissertation, in that we have explored other scholars' approaches to language only briefly and have already scoped out an effective conceptualisation approach, ahead of delving into the literature, so as to ensure that the theory and details about a language concept being developed in this dissertation is free from scholarly bias and has a more inductive approach. It also makes us more aware that features might be raised at an incoherent level of discussion, where they are not features of language per se but more features with a foundational approach to language. This point was raised in the last chapter and is revisited later in this chapter, as it is important that these features are considered instead at the superordinate level of communication and cognition. Thus, this review aims to help readers to navigate the literature when seeking out and identifying the features that can be incorporated into the framework in later research.

It is important to be clear in this chapter that there are occasions in which the literature is explicit – however briefly – in stating what language is considered to be, or to consist of, like Hockett's works (1959 onwards). Elsewhere, the focus of any study of language(s), comparative or otherwise, can be considered an implication of what scholars deem language to be or consist of, as with features arising in typological studies. This is not unexpected, given the lack of an agreed upon conceptualisation of language or much work devoted to this very issue. However, as such, it makes it impossible to provide an exhaustive catalogue of sentiments and/or language features proposed. Yet this chapter serves to highlight the wide variety of perspectives, evidence, and a flavour of the debates that substantiate the need for a

more systematised and unified approach, as well as providing some raw feature material proposals to start the framework with.

This review chapter has been organised according to the approaches taken in the literature, such as proposing definitional criteria, a focus on the form or function of language, comparing language to other phenomena to establish how language differs, exploring the foundations of language, and the active invention of languages, which helps to elucidate what people assume to be the necessary characteristics of language to be developed. Though some scholarship could fall under multiple of these themes, the most prevalent or impactful aspect of the respective work's contribution to this topic has been chosen to give a general guide to the literature. This is by no means the only way to organise a literature review on language as a concept. One could, for instance, approach it solely through the perspective of the two major linguistics orientations of formalism and functionalism, via the varied disciplines, or even a chronological order. However, as this dissertation explores how we can best answer the question of what counts as language, this chapter is categorised according to the various approaches that the literature has already taken to determining what counts as language, while demonstrating the limited output that such approaches yield to understanding the full nature of language.

For a start, works may only touch on what language is in the briefest terms. One example is the introductory note about how past investigations into language have had the perspective of a framework of 'language – mind – reality' (Itkonen, 2013). Far fewer works go into extensive detail, like Hockett's language design features (1959; 1966). Some of the features, like call volume modulation mentioned in the preceding chapter, arise less through explicit study of language and more through peripheral research, like research into hearing difficulties and anthropogenic noise impact on other species' communication, but nevertheless need to be factored in due to their apparent typicality for language and its occurrence. Certain features raised, such as symbolic reference and (centre embedded) recursion, involve serious debate, undermining their status as the key features of language they are proposed as, while also showing that some approaches like language invention yield only small numbers of features to the detriment of a full understanding of language that comes with a wider search and a more open mind. This will serve to highlight the conversely productive as well as unifying qualities of the Prototype Theory based framework developed in the later chapters of this work.

There are some key caveats, before proceeding. This chapter's literature review is not intended to involve extensive incisive analysis of features or provide a comprehensive catalogue of approaches or language features, but forms an overview of the literature. This is due primarily to time and word count constraints, as well as there being a natural saturation point reached. This saturation point is where topics become repetitive across the literature, making it a useful time to stop searching and summarise, as per the Grounded Theory methodology adopted in this work. Inclusion of material was based on literature being deemed classic by the volume of citations across other works, or being more recently published, gaining a breadth of disciplines, as well as works offering innovative positions on major themes. Therefore, while features are discussed along with any key debates or nuances, this chapter's purpose is to give a sense of the feature options that may be available to an ultimate conceptualisation of language, should other researchers decide to investigate further. Finally, a summative table of features emerging from the literature is presented as a starting point for use with the framework and procedure developed in later chapters. The intention is that future research will properly determine the accuracy and typicality of such features, as well as their applicability across species.

## 4.1    A Definitional Approach

Some works, to a greater or lesser extent, provide explicit definitions of what scholars deem language to be. This section will survey a range of these definitions, to pull out any key and recurring features that may contribute to a language concept.

### 4.1.1   Difficulty in Describing Language

To begin with, though, some scholars are explicit about the difficulty involved in describing language, especially given that 'Language is the method and the material, the chisel and the stone' making linguistics a 'tough job' (Harris, 2021, p.5; Firth, 1957). It is not difficult to see why Hockett and Altmann (1968) retained reflexiveness as one of their language design features in their language design refresh and framework set up (c.f. Thorpe, 1974), because we need to use language to discuss language in linguistics. However, as a result, we need to be especially careful that we use more than our intuitions to determine the nature of the phenomenon (c.f. Dąbrowska, 2016). We need somehow to pin down the entity

in a non-arbitrary way for further study (Botha, 2000), hence this dissertation's intent to produce a framework to conceptualise language and close this gap.

### 4.1.2    Meta Studies of Language

Caveats aside, one clear way in which the literature treats the topic of what counts as language relates to the more traditional definitional approach, in line with Classical Theory, which was discussed in Chapter 2. Despite the limitations of Classical Theory and its fixed set of features or 'conditions' that determine the membership of a category/concept, this section will explore some key examples to illustrate how some have approached describing the nature of language, starting with Hockett's language design features, both a classic and critical source for this dissertation's main focus. The section will then explore a few other explicit approaches to defining language, to determine what insights other scholars have provided.

Hockett's (1959, 1966) extensive treatment of language, and species comparison, is a useful starting point for this chapter. The sixteen language design features were set out in the Introduction, and this section provides a detailed treatment of these. Though still widely cited across disciplines, the list is unsurprisingly outdated. Thus, on account of the list's age and Hockett's actual approach, criticism can be made of this feature list as applied to both humans and other species. To begin with, Hockett presents an internal fallacy. He starts with the vocal-auditory channel (1960, p.6) as the 'most obvious' feature, though acknowledging immediately after that there are other communication forms, such as gesture, and the courtship practice of sticklebacks (*Gasterosteus aculeatus*). Yet his overall intention is to determine the 'basic features of design that can be present or absent in any communication system, whether it be a communicative system of humans, of animals or of machines' (1960, p.5), so why ignore other modalities of communication?

A second problem, also stemming from this quotation, is that Hockett intends to differentiate between language and other communication systems, arguing that 'There is solid empirical justification for the belief that all the languages of the world share every one of' the features, while 'certain' other animal and other human communicative systems 'lack them' (Hockett, 1960, p.6), or perhaps exhibit some but not all of the features. Thus, it is acceptable for the displacement feature to be present in the honeybee waggle dance (von Frisch, 1967) referring to food that is 'out of sight [but] is *not* out of mind' (Evans, 2014, p.56), as Hockett (1960) himself notes, but also other examples even more symbolic-like, bottlenose dolphins

copy signature whistles of members absent from the group (King et al., 2013), but where the vocal-auditory channel feature neglects to factor in the widespread usage of human sign language across the world, Hockett's feature list encounters subsidence.

Arbitrariness is another language design feature which would benefit from additional linguistic and interdisciplinary information. In and of itself, it may be highly useful for its contribution to creativity in language (c.f. Chomsky's focus on the productivity of language, 2017) and as a complement to the feature of displacement – useful for survival (Hoban, 1986, p.19). Yet, arbitrariness is exemplified in direct comparison to the honeybee waggle dance. While some aspects of the dance do not possess the same abstract quality of language, Hockett has not factored in, whether intentionally or not, a specific element of the dances; reference to food quality. Longer-lasting waggle dances represent a better quality source of food (Mangum, 2010, p.266), which could be deemed as both arbitrary and symbolic, if quality of food is an abstract concept to bees as it is to humans. That there is no tangible quality, or increase of the food's quality, to point to means the movement cannot be simply iconic or indexical. Moreover, given the bees dance on a vertical plane to represent the horizontal location of food from the hive, this again appears to be symbolic, though Bronowski (1967) shows caution over this interpretation given that the bees are also sensitive to the polarization of scattered sunlight and so the sun affects bees and other insects as an overall directional field, which may impact on the bee communication in this respect.

Additionally, Hockett may be unaware of the iconicity found not just in animal communication, or in sign language (Liddell, 2003), but also in spoken language, including the succession of forms reflecting a sequence of events or onomatopoeia (Perniss, Thompson, & Vigliocco, 2010; c.f. Haiman, 1983). More will be said on this in a later section. Therefore, is arbitrariness a valid and/or comprehensive feature of language? From the perspective of the framework in this dissertation, it will be taken as a feature to be tested for its prototypicality without any such prejudgement.

Another problem with Hockett's design features, touched upon above, is the intention of defining language by a list that captures all of the features of language, suggesting universality, a principle which finds contention in linguistic typological evidence, as discussed in a later section. Take the feature of specialisation. This is arguably not a feature of speech, on account of the 'evolutionary trajectory' of apparatus like the lungs, originally developed for breathing rather than speaking (Evans, 2014, p.49). Duality of patterning is another problematic feature in terms of universality, being 'a fixed repertoire of meaningless

symbols which can be combined into meaningful units', except apparently in Al-Sayyid Bedouin sign language, whose grammar is being shaped even as we speak (Evans, 2015a, p.187). Thus some of the features, and the list approach, need to be approached with caution. Indeed, it is the objective of this dissertation to promote greater reflection on the nature of language and encourage more quantitative approaches to studying the phenomenon.

Some of Hockett's language design features do retain clear value however. Hockett's feedback feature highlights the issue of internalisation with which communication links to thought. Hockett (1960, p.6) also notes that even gibbon (family *Hylobatidae*) danger calls exemplify semanticity, regardless of whether their call is 'broader' than a shout of *Fire*, because the sense conveyed by the word, and reference to the actual cause of danger, are fixed as with the English word *salt* pertaining to the chemical compound/condiment commonly found on a dining table. Traditional transmission, or learning and teaching as Hockett explains, aligns with a growing usage-based account of language (Evans & Green, 2006; Tomasello, 2005), and the need to recognise how critical information is passed among generations, such as elephant matriarch's to the herd, making their untimely demise that much more tragic (Safina, 2016). Even Hockett's reflexiveness feature is important, as it relates to crucial 'underlying capabilities' of language (Hoban, 1986), language being used to discuss language itself. Only the actual term here may need some care, so as not to confuse with an automatic *reflex* as per biological sciences that has quite the opposite meaning to *reflection* (Seyfarth & Cheney, 2013), which is what Hockett appears to intend by this feature.

There may be examples of reflexiveness in non-humans, though rarely attested. Koko the gorilla (*Gorilla gorilla*), for instance, denied a silverback companion access to her caravan until he had repeated the sign she signalled through the window to him, eliciting 'good sign' from her in response (Evans, 2014, p.57). In a rhyming activity, the experimenter instructed Koko to point at toys with a name that rhymed with the word the experimenter spoke. When it came to the word *goose*, Koko used her human-taught sign language to sign, 'Think that', and proceeded to point to the moose (Hillix & Rumbaugh, 2004, p.108). Not only is it exciting that another species seems to comprehend the segmentation of the sounds of one of our languages, while communicating across two different modalities: sign language and vocal communication, but 'Think that' potentially indicates that Koko was considering the problem, as an example of metathought or reflection. This is especially the case if she has not heard '(I) think that' as a frequent introductory utterance by others which would make this more of a usage-based phrase learned in context (Tomasello, 2005). This potentially stands in direct

opposition to the persistent notion of conditioning mechanisms governing our every move, humans and animals alike, or other species as automata (Descartes, 1641/1996; Huxley, 1874/2011; Skinner, 1957), with anthropomorphism critiques of any comparison between the behaviour of humans and other species (Kennedy, 1992). In an even more meta study approach to language and complex cognition, it has been proposed that inner speech to talking aloud to oneself, writing things down, as well as hearing what we communicate to others all allow for a feedback loop and potentially lead to more complex cognition, which may be limited in others like skin colour displays in cephalopods given they cannot see their own displays (Godfrey-Smith, 2016). Once again this picks up Hockett's (1966) reflexiveness feature.

Further to Hockett's list, and a clear example of how his design features still maintain authority in the literature, Reboul (2017) focused on a reduced and slightly varied list of these features, namely: interchangeability, semanticity, decoupling, discrete infinity, traditional transmission, and a combination of these leading to human uniqueness and allowing for creativity in any context. Yet, these features and list approach adhere to the same critiques as above. Additionally, it echoes an earlier work (Aitchison, 1989, p. 290) that lists seven features based again on Hockett's design features, and citing that 'the principle difference' between non-human communication and language is that 'human language is much more creative and flexible than animal communication systems'. Is this productivity aspect ultimately a difference of degree, kind, or type across species?

Fitch (2011) provides a helpful table summarising the different linguistic proposals about potential language universals that could be considered further for such feature lists. For instance, of the many proposals put forth, we might consider Jakobson's (1990) distinguishing singular from plural entities or nouns from verbs, Greenberg's (1963) principle that if a language has gender nouns the pronouns will also be marked for gender, and Pinker and Bloom's (1990) note that all languages distinguish subjects from objects using linear order or case affixes. Ethologist Gregg (2013) also cites ten essential ingredients of language: limitless expression, discrete combinatorial system, recursion, special memory for words, displacement and mental time travel, environmental input (learning), arbitrariness, freedom from emotion, novelty generation, and social cognitive aptitude (intentionality and theory of mind), which can be seen to show repetition across literature as well as conflation of superordinate and basic level aspects of language. Memory, for instance, is crucial for language but cannot be said to be a feature of language per se.

Unhelpfully, it becomes a very subjective debate whenever one posits a list such as these, given that the lists need to keep being updated as our knowledge about languages grows and given that potentially any features could be heralded as the most prominent, especially when a scholar's theoretical perspective is taken into account. Reboul's (2017) main thesis is that language evolved for cognitive purposes and was later exapted for communication. Therefore, the features focused upon are more cognitive in nature. D. Everett (2013), conversely, sees language as a cultural tool, a form of communication and interaction, with a lot of human involvement in its development, like building up a lexicon. McWhorter's (2012) monograph entitled *What Language Is* is another prime example of a definitional approach to language, as well as an approach that focuses more on language use and its communicative manifestations. McWhorter summarises language with five key characteristics, which are used as themes to guide examples arising from actual language instances across the world. The five characteristics are ingrown, disshelved, intricate, oral, and mixed.

Ingrown is explained as the feature of languages being varied and complex until they become more mainstream, as with New Guinean Berik, with a reduced set of pronouns equivalent to English *I*, *we*, *you* (singular and plural), and a single pronoun to convey *he/she/it/they*. Yet, Berik's verbs have person, number, specify size of objects, exact number, spatial location of objects, and time of day, like the form *kitobana*, meaning 'gives three big things to a man in the sunlight'.

Disshelved explains how illogical or messy languages can be, as with Navajo that has a prefix to turn verbs about experience into having an effect on something, in a similar way as *rise* becomes *raise* in English, while Navajo has another prefix to make these active verb forms passive but not in any easy to tabulate manner, as they only have occasional functions. The same prefix has to be used in a number of verbs without any transitive or intransitive meaning, or any meaning at all sometimes, potentially because of historic semantic bleaching.

McWhorter's intricate feature covers the fact that conventionality, sometimes very specific conventionality, occurs over time in all languages eventually: in Akha, Southeast Asia, verbs translate more readily as past tense when they are about action rather than states and one has to add elements to turn the verb into a present tense, as common in analytic languages. Individual Akha adjectives have their own personal words for the equivalent of the English adverb *very* after an adjective that must be learned as they are so varied.

Language is also described by McWhorter as being oral given that written languages are just a different modality for recording the language and given that only two hundred of

around six thousand languages are commonly written. Finally, the characteristic of mixed has been proposed because pure languages do not exist: there are always loan words and contact leading to shared grammatical constructions, like English's use of *do* in questions like *...don't you know?* and negative sentences that have a Celtic origin. Another mixed example is the Wutun mix of Tibetan-like verbs at the end of phrases, with Mandarin root words and Tibetan and Mongolian suffixes attached. It becomes even more intriguing, McWhorter argues, when languages do not mix, like there being no Portuguese creole.

However, McWhorter's characteristics are very high level and while they serve well to create themes for a typological investigation into some of the quirks of the world's languages, and uphold the often latent sentiment that defining language is difficult, these characteristics cannot be used as language features in themselves. Yet, some of the highlighted examples of the various recognised languages, such as Indo-European languages being suffix-heavy or one of the complexities of languages being to include more than just endings, like tones, classifiers, transitivity, expressive particles and so on, could be adopted as potential features of language as a whole.

Rather than presenting a list of features, there are also those who focus more on a framework approach, much along the lines of the approach taken in this dissertation. For instance, Wacewicz et al. (2020) review approaches to language evolution study that should be upheld: the notion of a family resemblance pattern, in which language is a multimodal phenomenon, a complex adaptive system, a form of social interaction, and develops as a result of a language-ready brain. Austin (2021) even analyses the history of schools of linguistics and how theories relate to various disciplines, which can shed some light on how we can better approach the study of language. Austin presents a taxonomy based on two axes: humanistic versus biological; and historical versus systemic. Type 1, humanistic linguistics, covers approaches to language as a human invention, and mostly relates to social, historical, and psychological disciplines. Type 2 also focuses on the human aspect of language but more its system of signs, as semiotics. Type 3 covers the evolutionary study of behaviours and psychological traits. Type 4 is also biological in approach but language is not considered to be genetic but more indirectly biological, through biological mechanisms. However, while the frameworks enable a more reflective and potentially unified approach, to make use of all updated and interdisciplinary insights, the method in which they are applied to the study of language and non-humans is vague, so that, again, subjectivity in both approach and claims

leaves the interpretation of language open to dispute. This dissertation and the framework proposed aims to close that gap.

## 4.2     A Focus on Form

Aside from presenting a list of features that define language, or selecting a particular theoretical approach to how we interpret linguistic evidence, one of the major means of discussing the concept of language, is a focus on just its form, setting aside other aspects of its nature. For instance, linguists might study the phonology, grammar and syntax, and modality of various languages, while those studying non-humans compare the way in which the communication compares with such linguistic forms. Typological studies also fall into this approach to determining what language is, as they compare and contrast recognised languages in terms of the way in which the languages manifest themselves. The following subsections explore each of these topics in more depth, starting with perhaps one of the most obvious forms of language: the word.

### 4.2.1   What is a Word?

Without delving into the philosophy of language on this subject, as with Quine's famous work *Word and Object* (1960), words are a fundamental unit of discussion in linguistics and must be considered. There are multiple intuitions on what a word is, as Wray (2014) details: words are small re-combinable units for expressing ideas, are reflected by spaces in writing, are mostly nouns (though not usually proper nouns), are marked by the number and location of stresses when spoken aloud, can be stored in long-term memory as part of our lexicon (vocabulary), and so on. Hobaiter, Graham, and Byrne (2022) approach this from an ethological viewpoint, comparing ape gestures to human words in terms of the features of flexibility and ambiguity, first and second order intentionality, and interactive usage. Still determining the nature of the word is tricky (Kaplan, 1990), just as it is for language as a whole, and Wray (2014) argues that a Prototype Theory based approach might be best suited to resolving the issue. This forms more support for the approach being taken in this dissertation.

However we categorise words, they remain important forms of languages, potentially both conceptually as well as communicatively. Moreover, lexicon size, the inventory of such

words, is a sign of someone's education as well as articulacy (Brysbaert et al., 2016). Therefore, it is no surprise that one challenge to the possibility of non-human language has been the relatively limited repertoires of 'words' or equivalent that we have so far discovered (e.g. Anderson, 2017): around 5 for non-social non-humans to 40 for social vertebrates like primates and wolves as so far attested (Bradbury and Vehrencamp, 1998a), compared to the average 42,000 lemmas (uninflected standardised words) for adult Americans (Brysbaert et al., 2016). However, no detail is given about how these authors or the scholarship they draw from parcel out these non-human 'words'.

Additionally, aside from any comments about methodological limitations, there is a lack of investigation into close range communication that is harder to detect than distance signalling. There is a lack of consideration about the granularity involved, which relates to the level of detail at which we observe and analyse non-human communication. There are comments about the fact that even human phonemes are not always discerned on a spectrograph (Corballis, 2002). Meanwhile, Kershenbaum's (2020b) mathematical considerations about repertoire size provide a compelling counterargument to the need for a large lexicon for language to be possible. This innovative study shows that a vocabulary the size of just 64 distinct signals would be enough statistically to produce a NASA flight manual. So while the general 'vocabulary' size of other species has thus far been found to be lower than this threshold, there does not need to be a massive lexicon leap to be able to communicate in highly complex ways. In any case, this section shows how difficult it is to establish the scope of a word even for humans, so we must take extra care when applying this notion comparatively.

### 4.2.2   Phonology

Phonology focuses on the form of language, specifically its vocal-auditory modality. Unlike phonetics, the study of the physical properties of linguistic sounds and their perception, as with the study of how timbre or signature voice quality changes in child-directed speech across languages (Piazza, Iordan, & Lew-Williams, 2017), phonology also considers the cognitive processes involved. Textbooks and handbooks on this topic abound, covering both the sound patterns of languages and how they are organised in the mind and are associated with meaning. Even sign languages exhibit analogies for such phonological features, including the syllable, where hand location and movement are combined in hand

configurations reminiscent of a consonant combined with a vowel in sound units (Sandler, 2017). Thus, we can consider some of these features that recur in the literature as potential language features.

There are studies investigating potential phonology in other species too. For instance, notes of birdsong are often compared with linguistic phonemes (the smallest sound units that are contrastive to determine meaning) (Yip, 2006) but given that meaning is only recently being established and requires further exploration in non-human communication (Amphaeris et al., 2023), there needs to be an amendment to the standard minimal pair phoneme test for humans, like changing the first sound in English *dog* to *tog* to determine that it is not just a different form but also has a different meaning. Yip (2006) suggests for starlings, already known to learn new rules for temporal patterning of song motifs and potentially recursive structures, that their song motifs could be edited to differ in just a single note substituted with another motif's note, which may or may not affect the song recognition by other starlings.

Discreteness is another phonological feature that is explored with respect to non-humans, to discover if it is a human only capacity, as one of Hockett's language design features (1966; Hockett & Altmann, 1998). Discrete signals are indeed found in other species' communication. For instance, Campbell's monkeys have six different alarm calls, which even involve additional units consistent with morphology, given that they behave like suffixes to alter the meaning of the overall call (Ouattara, Lemasson, & Zuberbühler, 2009). There is a 'krak' call for leopards (*Panthera pardus*), a 'krak-oo' call for a general alert, 'hok' for crowned eagles (*Stephanoaetus coronatus*) or other monkey's eagle alarm calls, 'hok-oo' for general tree canopy disturbances, 'wak-oo' calls as a change from 'hok-oo' calls, though never for neighbours, and 'boom' calls for non-predator disturbances like falling branches, neighbour disputes, or to halt group travel. Notably, though, these were the calls that the authors noted were perceptually distinct to human observers, so there could potentially be more such discrete signals in this and other communication systems that are simply not observable to humans as yet. Despite this clear example of discrete non-human communication, Larter (2022) notes that though there is potentially a lot of graded communication amongst non-humans too, there is not the simplistic dichotomy the literature usually presents, while there can be additional benefits to graded signals too, like providing flexibility in negotiating an interaction, which could become more or less aggressive in real time. Therefore, we might need to add graded signals to the list of language features to

consider for their prototypicality too. Indeed, even amongst humans, we find graded linguistic elements, as explored in Chapter 2.

### 4.2.3  Grammar

Grammar is another very explicit and important way in which language is studied for its form, in terms of both morphology (word forms) and syntax (phrase and sentence structure). For instance, some languages might be studied for their inflection, which is how closed class information like plurality or the tense of a verb is expressed through changes in the form of the word, like an English suffix *–s* to mark the plural of *word* as *words* (Baerman, 2016). Not all languages inflect, for instance Hawaiian does not use morphology to represent plurals but instead uses additional words, while Hungarian and Indonesian for example do not express gender grammatically so there are not separate pronouns for a male or a female person for instance, as opposed to much older Sumerian that distinguished nouns into human or non-human categories, with the word for a slave falling between both categories (Deutscher, 2010). Thus, inflection can be seen as one form feature that might be considered for its prototypicality.

Parts of speech are also considered extensively in grammar texts the world over. As such, linguists are drawn to study particles that generally defy such clear categorisation into a noun or verb or adjective class, for instance (Weydt, 2006), yet can be the most frequent words in a language with central functions in syntax like Japanese (Siegel, 1999). From another perspective on grammar, though, Bybee (2007) notes that because grammar changes are gradual, the categories of grammar must also be gradient and not so discretely categorised, meaning that particles would be just one example of non-categorical parts of speech if this interpretation is correct.

The notion of grammaticalisation supports this outlook too: this is the process by which linguistic items develop gradually on a continuum from being more lexical to becoming more grammatical in form and subsequent constructions. In multiple world languages, for instance, demonstrative deictic words like *this* and *that* in English evolved into definite articles like *the*, while numerals for *one* developed into indefinite articles like *a*. Latin *ille* to modern French masculine *le* and *unus* to *un* would be clear examples of this process. Some evolved into third person pronouns, and then first and second person pronouns, becoming more abstract still (Blake, 1934), though Malay would be an example where this

stage has not been reached. Interestingly, as with the physics unidirectional 'arrow of time' (Cox and Cohen, 2011), the grammaticalisation change goes in one direction only. No languages have yet been found to evolve abstract articles into more concrete demonstratives or numerals. Thus, at least a capacity for abstractness might be a feature to propose for language too.

### 4.2.4   A Structural Approach

In some cases, the focus on the form of language is more specific still. Rather than focusing on language's different forms generally, the focus is solely on its structure. One such viewpoint is Givón's (2002, p.9-11): 'Grammar is a much more complex and abstract symbolic code than the sensory-motor codes of the lexicon', grammar in turn being divided into two levels: primary intonation contours and sequential order of morphemes for instance, and then grammatical roles including tense, speech acts, and so forth. Tallerman (2012) notes there are a number of syntactic features that languages all exhibit, albeit in superficially differing ways: compositionality, dependencies between items and rules to govern these dependencies like the order of particular linguistic elements, hierarchical structure, displacement, and functional vocabulary.

Some focus more on sequential structure in language and non-human communication comparisons. Schlenker, Chemla, and Zuberbühler (2016, p.894) state that 'it takes extraordinarily little for something to count as a 'language': any set of strings will do'. Frank, Bod, and Christiansen (2012) note the processing power of sequential structure without hierarchical structure being needed, based upon evidence from a range of disciplines and their study of a-grammatic aphasics struggling with sequential processing. A playback study of chestnut-crowned babbler birds (*Pomatostomus ruficeps*) also demonstrates how at least some non-humans can combine different meaningless sounds into meaningful sequences, as shown by the varied responsive behaviour of conspecifics, though the communication system apparently lacks the unbounded productivity of language (Engesser et al., 2015).

Other studies focus on a hierarchical structure of language, including in non-humans (e.g. Kello et al., 2017; Liao et al., 2022). For instance, recursion has been identified as the defining feature of language (Hauser, Chomsky, & Fitch, 2002), though certain types are more questionable like centre embedded recursion as with the example, 'The malt that the rat that the cat killed ate lay in the house that Jack built' (Corballis, 2007, p.698). Such features

should be quanitified inductively. Bolhuis et al. (2018) argue, as with the combinations of the words *smart*, *phone*, and *company*, that the possible meanings of any compounds thereof are not simple linear assemblies but that hierarchical structure is responsible for conveying the various meanings, more like a chemical compound than a mixture as an analogy, and as such they find no evidence of syntax among Japanese tits (*Parus minor*) or southern pied babbler birds (*Turdoides bicolor*). Given that there appears to be no evidence in non-human communication for the Merge recursion feature proposed in formalist linguistics, Townsend et al. (2018) also study non-human comparisons to conclude they exhibit non-productive, non-hierarchical syntax, while Schlenker et al. (2017) argue that titi monkey (*Callicebus nigrifrons*) calls rely on pragmatic context as well as some semantics with linear sequences, rather than complex syntax.

Garcia-Albea and Lobina (2009) note, however, that there is a discrepancy between notions of recursion in mathematics and computer science where the concept originated, and that of language and cognition studies. They argue that it is possibly more accurate to refer to any hierarchical structural complexity in language in terms of iteration, self-embedding, or nesting, because data structures are not the same as the mechanism of recursion. Pinker and Jackendoff (2005) argue that a focus on recursion ignores other important grammatical features like phonology, morphology, case, and agreement that are not recursive. They instead propose a gradual evolution from some phonological combinatorial properties in birdsong and cetacean song, and focus on how various languages manifest grammar in different ways. This would include English relying on order and constituency, but Australian language Warlpiri has almost a free word order but extensive case and agreement. Moreover, some note that the type of recursion or hierarchical structure that Hauser and colleagues propose (2002) is difficult for humans to parse and has a low frequency in natural discourse (Diessel & Tomasello, 2005; Morita & Koda, 2019). Meanwhile, it does not appear during first language acquisition for seven years (Karlsson, 2007); and it appears absent in the South American Pirahã language alongside quantification terms, colour terms, and creation myths (Everett, 2005).

Conversely, it might be a structure evident in some non-human communication. European starlings can recognise syntactically formed acoustic strings, including strings with centre embedding structure (Gentner et al., 2006). Brazilian free-tailed bat (*Tadarida brasiliensis*) songs also involve hierarchical sound structures with three types of phrases: chirps, trills, and buzzes, that are composed of four types of syllables (Bohn, Smarsh, &

Smotherman, 2013), while the bats can change their song structure in response to context, like mating to territorial songs (Morell, 2014). So it could be that both sequential and hierarchical syntax are options and could be more prototypical for different contexts, if not for different species.

Another type of potential structure comes in the form of multimodal structure. Seyfarth and Cheney (2017) argue that non-human primates introduce flexibility into their vocalisation production by combining call types with each other, with signals in different modalities, and with pragmatic context (c.f. Lameira et al., 2022 on orangutan (*Pongo spp.*) vocal plasticity). Waller et al. (2013) remark on the importance of approaching non-human communicative signals as composites, without separating out the modalities, which could lead to inaccurate interpretations. For instance a primate slap gesture, when paired with a play face, leads to play rather than an aggressive interaction. Yet we need to be aware of the methodological constraints in exploring multimodality. For instance, we need instruments to detect weak electric signals and chemical communication is poorly understood to detect, identify, and quantify olfactory signals as well as separating them from non-communicative chemicals (Bradbury & Vehrencamp, 1998b). However, chemical communication was potentially the first communication modality in evolution, and it exhibits energy efficiency, a range of functions, and can be adjusted to increase information transfer through means like adjusting fading time, use of multiple glands, and according to context (Wilson, 1968). Therefore, not only could chemical communication be a rich modality to explore further on its own, but it is possible that it combines with other modalities for an overall composite and complex communication in other species. For instance, if an animal amends its body language, based on environmental context, but also combines the gesture with various different chemical releases, this could vastly expand on the productivity that might be involved in the signals.

Further to these structural variations, there is also a sense of a structural continuum, in which some languages are more structured than others, from those with minimal syntax that rely more on pragmatic context for meaning to arise, as with Riau Indonesian (Jackendoff & Wittenberg, 2014), through to polysynthetic languages (a topic touched on by McWhorter, 2012). This fact can lead to the question of why any languages involve structure in the first place. Aside from contributing to meaning construction, structure can help us to discriminate between different sounds, as with the consonant-vowel syllabic structure across languages, with Hawaiian being one of the most extreme examples (Hurford, 2014). Syntactic structure

is thought to be the foundation of productivity in language too, whereby a finite set of language units can be combined to create an infinite set of sentences (Chomsky, 1957; 2005; Evans, 2014; Nowak, Krakauer, & Dress, 1999).

This generativity or productivity, dependent upon the terminology used, has been noted as a hallmark of language (e.g. Hockett, 1966), given for instance the alleged difference between non-human communication combinatoriality found in complex alarm calls as opposed to more complex compositionality (Zuberbühler, 2019), wherein the meaning of a sequence arises as a combination of the meaning of the individual units in the sequence. This compositional capacity apparently leads to an infinite number of possible sequences that can be produced.

There are those who debate that non-human communication units have individual meaning and therefore a new combined meaning cannot be achieved, except perhaps in instances with alarm calls that differ depending on predators (Tallerman, 2012), even with predator descriptions in some cases (e.g. blue monkey alarm (*Cercopithecus mitis stuhlmani*) calls encode predator type and distance: Murphy, Lea, & Zuberbühler, 2013). However, it is worth noting that there are those in linguistics who debate the prominence of compositionality in language, and instead favour the gestalt principle, which holds that not all meanings are the sum of their constituent parts. Idioms are a key instance, having their own standalone holistic meanings (Evans, 2007; Lakoff, 1987). Thus, gestalt can be used as a different way to interpret non-human communication, as with putty-nosed monkeys' 'pyow-hack' sequences that instigate group movement, while the individual parts are used as signals eliciting vigilance behaviour (Arnold & Zuberbühler, 2012). To come back to productivity, moreover, this characteristic might even be found in male humpback whale song that changes over time, with small transitions, and spreads across populations from west to east (Garland et al. 2011). If these song form changes lead to different meanings too, this would be an instance of non-human communicative productivity.

Communicative efficiency is another topic that arises when considering language structure. For instance, linguistic laws were explored earlier: Menzerath's (1954) law, where the larger the size of a construct, the smaller the size of the individual parts; and Zipf's (1935; 1949) law, where more frequently used words tend to be shorter. These laws have been found across all languages and species investigated so far. Traditionally such efficiency has been de-emphasised partly because of linguistic ambiguity, which arguably makes languages difficult to process and thus goes against the notion of efficiency, but more recently studies show that

context plays a strong role in disambiguation so ambiguity does not necessarily counteract the importance of efficiency. This gives rise to Zipf's law or dependence locality, where words that are structurally and/or semantically linked come together as close as possible in utterances, and even morphological redundancy like the marking of nouns for gender can help language processing in terms of predictability in contexts (Gibson et al., 2019). Some even argue that compression is a general principle of non-human behaviour and efficiency in coding is reflective of this (Ferrer-i-Cancho et al., 2013). However, too much efficiency can be at odds with expressivity and language needs both aspects to function, which is a consideration for comparisons with non-human communication too (Nielsen & Rendall, 2019).

Differently again, there are those who have argued that language is to be conceptualised as more of a process than a reification (a thing) (Croft, 2011). This implies a completely different approach to language's form and structure, given that we would need to look at not just what language 'looks like', but also how it behaves, what it is used for, and what it does in and of itself., i.e. what is the activity of language? In this approach, we would think less in terms of Wittgenstein's notion (1922/2021, p.86) that 'The limits of my language mean the limits of my world', and more in terms of how language is involved with how appropriately we behave in and respond to the world. Once more, this subsection demonstrates the stark level of variety in linguistic theories that require some type of resolution.

### 4.2.5  Modality

Another way in which the literature has focused on the form of language is its various modalities and aspects thereof, language forms in perhaps the most obvious sense. Taking the most prevalent human modality, the vocal-auditory channel, linguists study aspects like the variation in prosody and how it can influence the interpretation of linguistic phenomena. Prosodic prominence and phrase boundaries, fundamental frequency (pitch) variations, changes in volume intensity, timbre (quality), duration, and speaking tempo (speed) all contribute to a perceiver's understanding of syntactic attachment, disambiguating aspects like modifiers and negation, and an effective interpretation of the type of speech act or attitude, as well as any implicatures (implied speech meaning) (Hirschberg, 2015). Such modality features serve to alter forms and the meaning paired with those forms, which can impact on

language production and comprehension. Prosody aspects factor in during the study of non-human song too, like the worldwide 31% drop in frequency of all blue whale (*Balaenoptera musculus*) song types due to whaling practices (McDonald, Hildebrand, & Mesnick, 2009). So, prosody can be taken as a feature of language to be factored into the framework for prototypicality evaluation.

Another vocal-auditory study might include consideration of the acoustics and functions of ingressive phonation (speech or other non-human vocalisations produced on an intake of breath rather than on an outward airstream). This is used by ventriloquists, Nordic languages, paralinguistic responses to dialogue, such as an expression of surprise involving a concurrent sharp intake of breath, and other ape calls, that could make it a neglected universal phenomenon (Eklund, 2008).

Click and whistled languages have also captured the academic imagination in recent years and are studied from a modality perspective. African click languages, which are not related to paralinguistic utterances like tutting in annoyance but are natural languages using clicks as phonemes, involve regular patterned sound changes and transmission, as well as loss and borrowing across languages, and exhibit the language features of variation and innovation (Sands & Güldemann, 2009). Whistled languages, or rather 'whistled modes of speech', are phonetic adaptations of languages used for distance, during survival activities like hunting or agriculture, artistic reasons, as well as secrecy of information transfer, given not everyone will understand the modality. In short, they are natural languages that are also whistled as well as spoken. The voiceless melodies emulate characteristics of the voice and the language on which they are based, from Spanish, to Turkish, to Amazonian tongues. The pitch changes are dependent on whether the base language is tonal (where pitch change directly alters meaning), as in some Asian languages, where the whistles follow melodies inherent in the spoken sentence equivalent; or whether the base language is not tonal, in which the whistles mimic resonance changes that come with different vowel sounds, and consonants are determined by how abruptly whistles transition between notes (Meyer, 2015). Some similarities with wild orangutan leaf kiss squeaks are noted too, while the study could have implications for the study of other species like dolphin whistles and the different ways in which complex information might be structured and organised (Meyer, Magnasco, & Reiss, 2021).

In the gestural modality, co-articulatory beat gestures have been studied, for instance. These involve a biphasic movement, up and down, usually of the hands in humans, and align with the temporal prosody of speech, to stress that a syllable, word, or phrase is salient

(Bosker & Peeters, 2021). Thus the gesture does not have a meaning per se but has a pragmatic value (McNeill, 1992) to mark a new or otherwise inconspicuous point for others to pay attention to. Politicians frequently use this gesture. It is possible that other species might exemplify this gesture in some part of their body (Krahmer & Swerts, 2007) and this would help to distinguish gestures from instrumental action (Liebal & Call, 2012), and switches focus from the modality of production to that of perception too.

Moreover, such co-articulatory gestures contribute to a study of multimodality. Multimodality is becoming increasingly important in approaches to language (Perniss, 2018) and non-human studies (Liebal & Oña, 2018). Language comprehension is also affected by multimodal cues and their impact changes with their informativeness within a hierarchy: prosody has the strongest impact, followed by gestures, and then mouth movements (Zhang et al., 2020). Moreover, while synaesthesia (experiencing one sense through another) is a neurological condition for humans, it could be another way in which non-humans process information. For instance, echolocation in bats and dolphins may have been brought to life for humans by cymatics, an interdisciplinary field studying the visualisation of acoustic energy (Jenny, 1967), more recently developing digital techniques with Reid's CymaScope technology to visualise black cockatoo (*Calyptorhynchus spp.*) calls (Barclay, King, & Davis, 2022) for more fine-grained analysis of the vocalisations.

As this section demonstrates, dependent upon which modality is studied, various features emerge, though perhaps not all are appropriate to discuss at the basic level of Prototype Theory. Multimodality itself might be prevalent and general enough as a basic level language feature, especially in terms of structural options, perhaps even prosody or co-articulatory gestures could be used as a general catch all for the vocal-auditory and gestural modalities. However, tempo or beat gestures might be deemed much more specific instances and thus might be better suited to a discussion at a subordinate level, perhaps as part of determining which features ought to be identified as basic level language and/or non-human communication features.

### 4.2.6 Typology

Another part of the literature that focuses on the form of language is typology, the study of how languages compare with one another in terms of their features. Thus, evidentials, as discussed in earlier and later chapters, have emerged as a key feature of other

non-Indo-European languages. While it is impossible to list all possible features from typological studies here, not to mention the fact that this is a growing subject area, it might be helpful to provide a few additional examples to support the case for exploring as many recognised languages as possible for features that may form part of the eventual language prototype. It also supports the need to look beyond recognised languages to that of other species, to ensure that our eventual understanding of language and its graded boundaries are fully understood.

Dunn et al. (2011) have found that word order is based upon language family trends rather than underlying universal constraints. Language organisation can vary morphologically, with isolating languages like Vietnamese that do not involve hardly any morphology analysis, agglutinating languages like Turkish where each morphological segmentation represents a single grammatical category, and inflecting languages like Latin where morphological segmentation can relate to multiple grammatical categories like the case of a noun and its singular or plural status (Britannica, 1998b). Another morphological variation is ergativity in languages like Basque and Chukchi, in which both the subjects of intransitive verbs that take no object (c.f. an English verb like *live*) and objects of transitive verbs (c.f. an English verb like *throw*) are grammatically marked the same way, separately to subjects of transitive verbs (Nichols, 2012). Some languages like Hebrew or German use a vowel mutation with a grammatical function, in which the meaning of the word changes, such as the tense or singular/plural alternation (Deutscher, 2006). Another way in which languages can differ is in their phonology. Pitch is used to convey information via intonation in most if not all spoken languages (Ladd, 2008) but for a great many languages it is also used to specific grammatical distinctions (Yip, 2002). Languages vary in terms of their meaning representation too. English has a tendency, for instance, towards lexical expressions conceptualising macro events, while Highland Papuan languages break events down into sub-events; for example, language Kalam breaks down a notion like 'gather firewood' into the equivalent of 'go hit get firewood come put' (Evans, 2012).

One paper which gives a clear overview of how few universals there are, in terms of all languages exhibiting them, is that of Evans and Levinson (2009) though we might be able to learn more about any potential universals, or at least prototypical features from speech error patterns (e.g. Goldrick, 2011). Evans and Levinson (2009) discuss diversity at different levels of organisation: sound, meaning, and syntax. Indeed, they argue it is this very diversity that separates language from other species and communication systems, noting that languages like

Malay do not mark tense, do not have a word for connectives like English *or*, as with central American Tzeltal, while others in southeast Asia lack personal pronouns and use titles such as an equivalent to English *sir* instead. Sign languages use pointing instead of pronouns, which have shared characteristics of both pointing gestures and personal pronouns and are termed pronominal signs (Cormier, Schembri, & Woll, 2013).

Even fundamental concepts of space and time are not universally conceptualised in strict terms. Spatial and temporal expressions can change across languages. For instance, some languages use egocentric representations of space, as in English when we give directions or describe object placement in terms of *left* and *right*, or *in front of* and *behind*, which can be based upon our personal perspective looking outward, whereas other languages use more allocentric references as in Yupno in Papua New Guinea or some Amazonian languages, more in terms of *north* and *south*, or *uphill* and *downhill* equivalents, based on objective environmental reference points (Pitt et al., 2022). Plus, contrary to languages like English, which use phrases like *the past is behind us* and *tomorrow is ahead of us*, the Aymara tribe linguistically represents the past as being in front of the body and the future behind. This is due to the fact that the future is unseen and therefore unknown (Núñez & Sweetser, 2006). However, despite the fact that not all languages involve a metric approach to time, with calendars and clocks for instances, all cultures seem to have concepts and language for event based time intervals (Silva Sinha, 2019). Plus, even where tense is lacking, there is still a realis/irrelais distinction marked in the language, such as Burmese ongoing or past observed events expressed by final particles like *–te* and *–tha*, while other irrealis distinctions are hypothetical events (Mani, Pustejovsky, and Gaizauskas, 2005, p.4), and a sense of an underlying concept of time is still understood (Gell, 1992). For a more extensive overview of the variations among languages, Pereltsvaig (2012) is an informative read.

This broad diversity has partly led to the principle of relativity, in which people are thought not to build the same picture of the world with the same physical evidence, unless their linguistic backgrounds are similar or developed to be so (Whorf, 1956). Foley (1997) makes the distinction here between concepts that may be relative and the thinking process that is neurological and must therefore be more universal across humans. Relative or universal, though, there is something language-like applied to all typological instances, and we need to discern the nature of this and how we might integrate other species. Thus, to return to the purpose of this dissertation, when considering which features may be prototypical of language, it is important on the one hand to differentiate between language per se and

different languages, that is, the 'fundamental principles common to all languages, and not with the features which differentiate one language from another' (Waldron, 1985, p.37) but also the very fact that languages do differ so widely, so that we might think in terms of prototypes at the grammatical level (Cristofaro, 2012) as well as at the macro phenomenon level.

## 4.3    A Focus on Function

### 4.3.1    Functional Approaches

Another option to a focus on form in linguistics is a functional approach, and this also applies to approaches to determining the nature of language as a whole. Newmeyer (2017) explains the difference between the two approaches to linguistic theory, in which an explanation is formal if it derives language properties from a set of principles structured as non-semantic primitives, relying on a number of interrelated hypotheses, and functional if the language properties are structured from attributes not specific to language, and involve more focus on meaning.

One key instance of a functional approach is study of pragmatics, the study of language use in context (Huang, 2016). Levinson (1983, p.55) demonstrates how important this is by giving the example of someone finding a message in a bottle that is almost impossible to grasp without context: 'Meet me here a week from now with a stick about this big.' So, while grammar provides a code for language use, pragmatics provides context-dependent inferences, and it is important to investigate which aspects of language and meaning interpretations are encoded, or instead implied and inferred (Ariel, 2016).

Not only is this a growing subject in linguistics, as with cognitive pragmatics (Evans & Green, 2006; Schmid, 2012), but there are already studies revealing pragmatics in non-human communication. There is a range of intentional gestures of great apes (Levinson, 2016; Hobaiter, 2018), which require contextual interpretation. Additionally, the illocutionary force (implied speaker intention) behind many human utterances (Austin, 2006) has been exemplified by chimpanzees' elongated higher-pitched screams during recruitment calls, but notably only in severely aggressive attacks, and only if the audience includes group members outranking the attacker (Slocombe & Zuberbühler, 2007), to imply the chimpanzee being attacked needs assistance from authority figures in their group. The concept of 'face' in Politeness Theory, a key way in which we maintain social ranks and show respect for

people's self images, which even arises in linguistic expressions (Brown & Levinson, 1987) might also be exemplified by the deference behaviour de Waal (2007) describes about chimpanzees.

Beaken (1996, p.21) notes that 'Language is a social creation, originating not from the individual speaker, but from the interaction between speaker and audience' and defines it as (p.25) 'the exchange of symbolic meanings in the context of activity'. Thus, the social aspect as well as context are deemed just as important as other aspects like symbols and syntax.

### 4.3.2   Functions of Language

Some of the functional studies of language, and any comparisons with non-human communication, focus on the functions or purposes of language. As explored in Chapter 3, for instance, communication and language can occur for information transfer or for interpersonal purposes (Brown & Yule, 1983). The latter might include ludic language, the creativity of which should be considered seriously as part of any language conceptualisation (Crystal, 2001). This function of language, through means of pronunciation, rhymes and homophony, grammatical structure, polysemy, and awareness of idioms, serves a social function to evidence one's intellect, for a sense of fun or irony, or to engender affiliation. While there is not yet evidence of ludic communication among non-humans, there is evidence of play amongst even the most unlikely species, like reptiles (Burghardt, 2005; Dinets, 2015; Wilkinson & Huber, 2012).

There are those who focus on whether language and communication evolved for honest signalling (Skyrms & Barrett, 2019), associated with useful information transfer and cooperation, with some arguing that non-humans are only capable of such honest reliable signals and are not capable of deception (Rowell et al., 2006). Yet, Machiavellian behaviours do clearly exist among non-humans (Byrne & Whiten, 1988; Flower, Gribble, & Ridley, 2014; Knight, 1998). Some argue that communication and language evolved, conversely, for deceptive purposes (Morris & Rungapadiachy, 2008), as compared with body language that cannot be so easily manipulated. Some argue that deception is a by-product or a derived function in communicative interactions, given the possible range of social behaviours and personalities, including how deception like 'white lies' to save someone's feelings can be used for pro-social interactions (Oesch, 2016).

Language, and communication more generally, have also been considered from a human informative but non-human behavioural manipulation perspective (Byrne et al., 2017; Hare, Call, & Tomasello, 2006; Warneken & Tomasello, 2009), though instances like the honeybee waggle dance (von Frisch, 1967) clearly demonstrate at least some information transfer is possible amongst non-humans. Scarantino (2013) argues instead for a hybrid of the two, otherwise, conceptualising communication exclusively in terms of influence misses out on the point that communication is distinguished from other types of influence because of the very fact that signals benefit signallers via the information they transfer; or conceptualising communication exclusively in terms of information ignores the main driver of signal selection – influence, which has fitness benefits for signallers. Tomasello (2008) adds to behaviour manipulation and information transfer the function of sharing emotions and attitudes. Plus, potentially both language and communication systems can be used for all of these functions: honest and deceptive signalling, social interaction, manipulation, as well as information transfer, dependent more perhaps upon the context and individuals involved than the medium of communication.

Another key aspect of language is symbolic reference or semanticity (c.f. Deutscher, 2006; Hockett, 1966; Macedonia & Evans, 1993; Owren & Rendall, 2001; Suzuki, Wheatcroft, & Griesser, 2020). This is based on the assumption of two characteristics involved in communication using symbols as conventional form-meaning pairings (Deuchar, 1996), or 'symbolic assemblies' (Evans, 2007), which can be expressed through numerous modalities. These two characteristics are displacement (e.g. Planer, 2021) and arbitrariness (Bronowski, 1967; Saussure, 1966), though they are rightly separated out by Hockett (1966). As such, language is thought to enable communication across places, time, contexts, and at differing levels of abstractness. For instance, the one Maori *wa* word form can mean 'place', 'time' or 'so-and-so' (Holmer, 1966).

However, we do need to factor in non-arbitrary reference, given recent explorations of language into iconicity and sound symbolism, as well as systematicity (c.f. Monaghan et al., 2014; Sidhu & Pexman, 2018), though this aspect is debated by others (Lupyan & Winter, 2018). For instance, languages involve onomatopoeias like *bang*, where the word form reflects the sound referenced. Repetition of word forms connects to repetition in the meanings. Vowel lengthening represents physical length or longer duration of whatever is being referenced. The systematicity or statistical relationship between the patterns of sound for a group of words and their usage, like major word classes, are distinguished by differences

in stress, duration, voicing, and phonotactics (Dingemanse et al., 2015). Indeed, it is argued that language involves all these types of reference, given that a completely arbitrary vocabulary would be difficult to learn, a completely systematic language would not be flexible and expressive enough, and a completely iconic language could limit language's ability to abstract and involve displacement.

Another potential language function is to provide executive control over body based concepts in the conceptual system, given language can represent non-present situations (Barsalou, 2005; Evans, 2015a). This is another instance of displacement being raised as a feature (c.f. the prominence placed on this by Aitchison, 2011).

### 4.3.3   Functional Features of Language

Having established that there are also more functional than just formal approaches to language, and that language might have mutltiple functions, the purpose of this section is to explore some of the specific functional features arising in and around language. This includes looking at any potential non-human comparisons.

The previous section on functions of language revealed some key features that arise within the interdisciplinary literature, including arbitrariness, which can but notably should not necessarily be linked to symbolic signs. Arbitrariness could also account for language's known redundancy too (e.g. Pinker & Jackendoff, 2005; Sinclair, 1991), or ambiguity as with homophony seen in the word *bark*, which could relate to the sound produced by a dog or the protective outer layer of a tree (Trott & Bergen, 2020), despite the also widespread communicative efficiency raised in earlier sections. This combination of the two, redundancy and efficiency, might also point to the fact that language is a combination of both general cognition and communication.

Much less arbitrary is another functional feature that appears across languages. Demonstratives, like English *this/that* and *here/there*, arguably constitute a separate class to lexical expressions and closed class function words for four reasons (Diessel, 2013). Unlike other linguistic items, they closely align with deictic pointing gestures, eye gaze, and body postures. Children acquire them early on, even where grammatical items are omitted. All recognised languages in the world include them and they are very similar in their semantic and pragmatic functions. Meanwhile, demonstratives do not appear to have been derived from lexical items as grammatical items would through the process of grammaticalisation.

Therefore, we should consider demonstratives as a potential core feature of language, as well as seeking this out in non-human communication. For instance, thirty-eight wild raven (*Corvus corax*) pairs have been recorded in consecutive seasons to show and offer non-edible items like twigs to conspecifics. These conspecifics oriented more to the object and the raven with the object as a result, as well as the situation leading to more affiliative interactions between the ravens thereafter, as a potential demonstrative and social bonding behaviour in corvids (Pika & Bugnyar, 2011). Wilke et al. (2022) also provide video evidence of a female adult chimpanzee showing a leaf to her mother during leaf grooming.

Another functional feature that seems to occur with frequency is the category of person, such as pronouns. In over five hundred languages examined, roughly 10% of all known languages, all had a category for person (Forchheimer, 1953), so this could be another prototypical language feature to be seeking in non-human communication.

Perhaps linked to the notion of person, is the grammatical feature of agency. All recognised languages appear to have ways of representing agency, which is where entities are deemed to have some control over their behaviour, where their actions in the world affect other entities, and where their actions are the object of evaluation, such as people taking responsibility for an outcome, a key example being greetings as a form of recognition of another as an agent (Duranti, 2006). Thus it is interesting to note that other species have greetings rituals, like orcas (*Orcinus orca*), whose physical contact is increased after a time of absence from another familiar conspecific, as a type of mutual validation and social bonding (Anderson, Waayers, & Knight, 2016). This may represent a sense of agency in another species.

A feature very prevalent in non-human communication, like marmosets (Takahashi, Narayana, & Ghazanfar, 2013), that could also be considered in the functional category too would be turn-taking, or interchangeability (Barón Birchenall, 2016) or duetting (Pika et al., 2018) as it is sometimes referred to. This involves a rapid exchange of short turns between communicative interactants, with minimal overlap, which may explain why language is organised into short phrases with overarching prosody for easier processing (Levinson, 2016). Turn-taking has been found across the taxa of birds, mammals, insects, and anurans, and can vary in terms of the size and order of turns, techniques used to allocate turns to individuals, and overlap avoidance or domination (Pika et al., 2018). Given this is facilitative of communication more generally, and not just the ability to ask and answer questions and share relevant information for instance, it might be a feature more appropriate to discuss in terms of

general communication, though it has been suggested that this feature together with multimodality help bridge the gap to language (Fröhlich, 2017). Yet, there are important cognitive aspects involved too. In order to maintain the switching pace, interactants have to predict content and the timing of the turns, processing their signal production while still processing the incoming signal (Levinson, 2016).

To continue with the theme of cognitive as well as communicative functional features, vocal learning is another example of a feature found across species (Deecke, Ford, & Spong, 2000; Bruno et al., 2021; Vernes et al., 2021), one of the most well-known perhaps being passerine (song) birds, some of which can continue vocal learning or mimicry throughout their lives like lyrebirds (genus *Menura*) and parrots (e.g. *Psittacus erithacus*) (Emery, 2016). When two separate groups of adult chimpanzees were brought together at Edinburgh Zoo, the acoustic structure of the food grunts for particular types of food actively and meaningfully changed over a three-year period to align more across the two groups, as social bonds were established (Watson et al., 2015). This demonstrates vocal learning ability in chimpanzees as well as active communication, and the type of effect seen during language contact.

Another functional feature that arises within linguistic interactions is paralinguistics (Evans, 2017), which ranges from prosody of speech to use of laughter in different contexts. Hedges are another such instance. These markers of hesitancy are found even in published linguistics papers for the purpose of allowing for readers to check the veracity of statements and for politeness (Livytska, 2019), from using terms like *assumed* and *possible*, to phrases checking the degree of precision of claims or results. How might we recognise this feature in non-humans? A growl as opposed to a bite from a dog, perhaps?

In other circumstances, there is much more certainty involved, but in the negative direction. Hence the need for the feature of negation. According to Déprez and Espinal (2020), negation covers increasingly complex notions from refusal, to absence and non-existence, and even denial and falsity. Refusal is already seen in non-verbal communication and can be expected of non-humans, and one instance might be the brief honeybee piping signal they emit to stop a waggle dancer, though the function of this remains uncertain (Pastor & Seeley, 2005). Yet, Déprez and Espinal (2020) state that conceptualising and communicating about absence or non-existence is more debatable for non-humans. However, there are species like crows that have been shown to have a concept of zero, for instance (Kirschhock, Ditz, & Nieder, 2021). Denial and falsity are even more debated, as discussed in Chapter 3, although even at this stage of complexity there are potential non-human instances.

It is becoming apparent, throughout this chapter, therefore, that the types of features we would argue are important for language, might well exist within the communication and cognition of at least some other species, so that we too will need to negate: namely the concept of human uniqueness, which will need serious future revision. Though this revision will beg a very serious question for the topic of functional features that has not been addressed at all in the literature beyond one anecdotal spontaneous moment of Alex the African grey parrot's (Pepperberg, 2009, p.97): does any other species besides humans not just show curiosity about the world but ask questions? It is important to note that questions are not always marked in linguistic forms, and language users may rely on context instead to convey/interpret a question instead of a statement, or a paralinguistic feature like intonation. Central American Mixtec is an example of this, though some of the dialects use a question particle (Macaulay, 1996). Thus, we need to be aware that language features may come in forms we do not expect. Silence might be another such feature. It does not just break up sound segments but can also convey meaning, such as social power, emphasis, or uncertainty (Freeden, 2022). Yet, perceiving such pragmatic silence takes a great deal of careful observation, so this would be even harder to discern in the communication of species with which we are not so familiar.

## 4.4    A Status Approach

Another approach that the literature has taken to account for the nature of language has been a focus on the status of language. In other words, language can be described in terms of its status relative to other phenomena and/or its socio-political status. This can almost be conceived of as a 'what language is not' approach. Such approaches come by way of the proposed distinctions between language and dialects, creoles, and pidgins; or by way of the species segregation involved in the *human language* and *animal communication* collocations mentioned in the Introduction; even the comparison with plants, at a much further biological distance from humans. The following subsections delve into these aspects in more depth, to explore if any features emerge that could be adopted for consideration in the development of a prototype of language. Notably, artificial intelligence comparisons have been avoided here, given that currently computers of any kind are programmed by humans and so are subject to our ways of thinking. Therefore, artificial intelligence would not necessarily offer any more insight than invented languages, as covered in a later section.

### 4.4.1 Language, Dialects, Creoles, and Pidgins

Firstly, it is worth examining cases in which language has either been discovered, as with creoles being acknowledged as full languages, or where language has been distinguished from other statuses like dialects. For instance, Yanito is a dialect mix of Spanish and English in Gibraltar, but where do we draw the line between this and Spanish and English? Due to volume and time constraints, this section cannot review the great many linguistic works on creoles and dialects across the world, from which there could be gleaned numerous useful features to consider for what counts as language. However, it does focus on works that approach this matter in a categorical way.

Bickerton is one key linguist who has devoted multiple works to the topic of creoles, as well as language origins. Bickerton (2016) theorises in a more recent work that the question about the origins of creoles, the origin of language, and child language acquisition are interrelated, and so require a unified treatment. Bickerton notes that creole languages arose from European colonial expansion between the sixteenth and twentieth centuries, in which the early histories of the creole languages are usually unknown. However, it is assumed that a pidgin will emerge from a situation of speakers of different languages being thrown together to facilitate communication, as an ad hoc mix, which then expands to become a more complex and native creole language of that community. There is also assumed to be a lot of vocabulary adoption from the parent European language, albeit with some phonological and semantic shifts, where syntactic features are less traceable. Not everyone agrees with this perspective. For instance, Mufwene (2015) notes that the traditional view that creoles evolved from pidgins has been questioned, given that colonisation produced both language varieties. Nevertheless, we can examine the types of features that such creole and pidgin studies focus on to determine the types of features we would want to consider for the language framework, such as new lexical items and phonology. Perhaps once we have determined which features are more prototypical of language, we can then work outwards to determine which language varieties are more or less language-like to help resolve this categorical problem.

A similar issue is raised with respect to dialects, where their status with respect to language is questioned and increasingly quantitative approaches to the problem are proposed. Bonato et al. (2021), in a paper on plant communication, define a dialect as a variation of a language used by a particular group that is linked to geographical or social differences and

note that such dialects have been identified in the echolocation signals of bats and some marine mammals. This echoes a traditional position in the literature.

For instance, a language is traditionally and simply considered to be a superordinate entity, where dialects are subordinate varieties of languages, like Mancunian is a dialect of English or Kurmanji of Kurdish (Boga, 2020). Dialects can also be regarded as a deviation from a norm or even aberration of a standard form in more socio-economic terms (Adler, 2021). There is often a focus on the social patterning of dialects in terms of vowel system shifts, and phonological and grammatical variations, telling dialects apart by the frequency of particular variations that may exist across most if not all of them, like double negatives or the English alternation between *swimmin'* or *swimming*, depending on constraints like social class or phonotactics (Wolfram, 2017).

Chambers and Trudgill (1998) deem it difficult to define languages themselves in linguistic terms, instead deferring to the many socio-political influences. For instance, Norwegian and Swedish are linguistically very close but politically are counted as completely separate languages, while Chinese consists of at least seven different mutually unintelligible languages but they are considered to be dialects again for political reasons. Accent describes the way in which pronunciation differs and dialect refers to grammatical and phonological differences (Chambers & Trudgill, 1998), in a similar way to determining creoles from pidgins and other languages. These authors also note the multiple continua within and between dialects that should attract more focus, and use discrete labels as an 'ad hoc' or arbitrary approach to a 'fuzzy' matter, in which dialects can be more or less of a language. This is another subtle way in which the literature is heading towards a Prototype Theory based approach to the nature of language.

Yet, this sociological and derivative position on dialects has more recently been questioned, especially in terms of how the distinction is made: it needs to be more quantitative and focus more on the linguistic features (Boga, 2020), with which I heartily agree. Thus, the matter of dialects, for instance, shows there are research areas that involve potential interpretation dangers, where other disciplines simply adopt traditional linguistic perspectives without any delving into the associated complexities or various optional perspectives, like functionalist linguistic branches as opposed to formalist approaches to syntax. This is one further reason why it is important to streamline an approach across disciplines and species.

Regarding new approaches to determining how dialects differ to languages, then, Kloss (1967) distinguishes between *Ausbausprachen*, 'languages by development' that are

shaped sociologically, and *Abstandsprachen* 'languages by distance', which raise the matter of what is or not mutually intelligible. 'Intelligibility' refers to successful retrieval of the message content encoded in a utterance, as compared with 'comprehensibility', which refers to simply recognising an utterance (Tamburelli, 2021). Wichmann (2019) notes there are two ways to establish a quantitative distinction: apply consistent and objective measurement of differences between variants with in terms of phonology, morphology, syntax, lexicon, or a combination thereof; or by also measuring mutual intelligibility, which is often not symmetrical and sociologically constrained.

Tamburelli (2021) explores the intelligibility criterion in more depth, showing through three experiments with monolingual English speakers, that intelligibility does involve a scale to which meaningful segmentation may be applied and thus intelligibility can be used as an empirical identification of languages as opposed to dialects. Moreover, below 70% intelligibility, listeners' estimation of how much content they could retrieve becomes unreliable, while there is an intelligibility range between 34% and 71% within which listeners consistently fail to retrieve content.

Boga (2020) instead used the Needleman-Wunsch algorithm to apply a quantitative approach to the distinction of dialects and other varieties from languages. As with Chambers and Trudgill (1998), Boga (2020) emphasises a gradual scale between the phenomena, given instances like German speakers understanding Dutch more easily than the German 'dialect' Bavarian. There also emerge from the algorithm applied clusters of dialects. This work also speaks to the Prototype Theory basis adopted in this dissertation, as well as supporting the need for more quantitative approaches to these types of conceptual categorisation issues.

### 4.4.2 Non-Humans as Counterpoints

Another way in which language is described in terms of status, is by considering the species distinction, either as a strict divide or by way of a linear continuum, as outlined in Chapter 1. This section will give an overview of the various ways in which non-humans have been discussed in the literature relating to language, to give the reader more background on treatment so far, as well as how disparate the viewpoints can be. This substantiates the need for the inductive framework being developed in this work.

There are those who maintain that language is human only, and as such argue that any superficial similarity across species does not necessitate a genuine connection to language

(Schlenker, Chemla, & Zuberbühler, 2016), as with the structural patterns of communication. Therefore, Beecher (2021) argues that bird song is complex, and lacks three of four key design features for language: semanticity, arbitrariness, and productivity, though it does exhibit learnability. Bickerton (2007) compares non-human calls to language, claiming that calls are genetically rather than culturally based; calls are equivalent to propositions (whole messages) unlike words; calls cannot predicate where languages must, as even imperatives involve an implied subject; and calls are indexical and not symbolic, given that non-humans cannot exhibit displacement. Foley (1997) also argues that displacement is a critical distinction between humans and other species, and a feature of all languages, supported by deictics like tense and demonstratives. Context independence involved in semantic meaning is also thought to facilitate the displacement feature of language that frequently arises in the literature (Hauser, 1997). Kaminski et al. (2011) argue that dogs only communicate with humans to make requests rather than to share information, though this does not take account of the multiple anecdotes in social media in which dogs have alerted their human companions of medical conditions or have found other animals trapped and in need of rescue, before gaining the attention of nearby humans, for instance. Bronowski (1967) determines that language is characterised by a delay between input and output and compares it with non-human communication in four respects: a separation of affect (emotions) from content, prolonged reference, internalisation, and a double procedure of analysis and synthesis. The latter three have arguably been culturally selected for by humans only, so that humans have a layered structural system that is also capable of being a means of reflection, while non-humans have apparently only discrete signals that they exchange more as instructions than information.

Others study non-humans to explore similarities rather than differences across the species. Berthet et al. (2023) present their Animal Language Primer. Ujhelyi (1996) explores syntactic continuities. Pleyer and Hartmann (2020) actively argue for a usage-based functionalist linguistic approach to animal communication (c.f. also Prat, 2019).

White-handed gibbons (*Hylobates lar*) have been shown to be able to discriminate between song types and infer meaning from them (Andrieu et al., 2020). Bat cognition allows for symbolic communication on account of their willingness to interact with caregivers, associative learning, and advanced (socio-)cognitive skills (Knörnschild & Fernandez, 2020). Otter et al. (2020) meanwhile demonstrate that, while it is not typical for novel bird song variants to displace established regional variants, some songs shift rapidly in populations.

They give the example of white-throated sparrows (*Zonotrichia albicolis*) that traditionally sang a whistled song ending with a repeated triplet of notes across Canada in the 1960s but doublet note endings replaced these songs west of the Rocky Mountains at some point between the 1960s and 2000s, and then appeared east of the mountains across the rest of the continent from the 2000s. This change was probably due to song learning during winter breeding, where the novelty of such song variants served to attract female interest. This may be an instance of non-human signal productivity.

Prat (2019) compares acoustic analysis of human and non-human vocalisations and argues that we should have discerned more not less from non-humans signals: for instance, compared with vague human fear shrieks, some non-human alarm calls are far more detailed and specific, if not even symbolic; while segmentation and clustering of vocalisations is difficult without a frame of reference, such as with the difficulty of learning foreign languages, while machine learning algorithms and expert human speech analysts have been trained on pre-determined answers and are provided with transcribed recordings, lexicons, grammars, recognised spectrograms, and so on, which is not possible for non-human communication. Plus, Prat argues that if we subjected bird songs to the same measures as human speech, we might find more structure. This also raises the question of how related human non-linguistic signals and non-human signals might or might not be. Of course, to address this question properly, we would also need to consider how we determine what is or is not a linguistic signal. As such, this may need to follow the inductive research proposed in this dissertation to determine first what counts as language.

Heesen et al. (2022) create a comparative framework for conversational/interactive repair across species that facilitates communication and social coordination, at least in terms of basic building blocks that are shared by non-human primates, and what the researchers label as 'redoings'. For instance, other great apes repeat and elaborate on gestural signals, while gibbons (*Hylobates agilis* and *Symphalangus syndactylus*) interrupt and correct their own vocalisations mid-stream during duets with conspecifics to demonstrate self-initiated repair, some flexibility in signalling, and interactional contingency, as found with turn-taking behaviour already discovered in multiple other species. Other prompting, the last type of interactional repair, requires more behavioural and cognitive complexity, given that a perceiver needs to recognise the production of a communicative signal, monitor their own comprehension and determine that there is an error or insufficiency involved, recognise the signaller as a conspecific who may be able and willing to repeat or adapt their signal, signal to

the signaller the need for such repair, and the signaller has to comprehend this behaviour and function too. As such, other prompting may require ostensive-inferential communication, which Scott-Phillips (2015) has argued does not exist in non-humans. However, Heesen et al. (2022) show there are some potential continuities for this in non-humans, such as a look of puzzlement.

These and other studies also show that non-humans may well have mental representations, or concepts, consistent with what appears to be true of human cognition, which underlie complex communication. For instance, when Japanese tits hear alarm calls about predatory snakes they become more visually perceptive to objects resembling snakes like moving sticks, indicating that they retrieve its visual image in their minds from the snake-specific alarm calls (Suzuki, 2018). Newen and Bartels (2007) review some of the language teaching experiments and conclude that some of the individuals involved demonstrated evidence of conceptual representations that are stimulus independent, involve an object property structure, and are minimally semantic. Penn and Povinelli (2012), however, limit non-human capacity in terms of them only conceiving of instrumental relations, like honeybees navigating in relation to landmarks and their hives, while humans can reinterpret perceptual relations in higher order relations that cannot be perceived, like rules, analogies, and theories.

Then there are studies in the literature that reveal explicitly or otherwise how much we have yet to learn about other species. We are discovering that earthworms (*Eisenia fetida*) coordinate the direction of their movement via physical contact with one another (Zirbes et al., 2010), which points to at least basic communication in species where we may never have expected to find it. Robert Eklund has proposed in conference circles a non-human International Phonetic Aphabet, animIPA, in which to better capture analysis of non-human vocalisations.

Individuality is another important aspect highlighted in non-human studies. For instance, bottlenose dolphins each have a signature whistle (Janik, Sayigh, & Wells, 2006). Bumblebees (*Bombus terrestris*) discriminate between scent marks of other conspecifics (Pearce, Giuggioli, & Rands, 2017), showing identity recognition if not also identity communication. Ravens (*Corvus corax*) show individualised characteristics in their food calls (Boeckle, Szipl, & Bugnyar, 2012). Pigs (*Sus domesticus*) have apparent personalities (Marino & Colvin, 2015). Individual variation is abundant in language too, with different lexical choices and constructions, as predicted by usage-based theories of language, in which

language patterns are formed out of use over time allowing for variation not found in pre-determined universals approaches to language (Dąbrowska, 2016). Individuality in language change has also been studied for its interaction with change at the community level, range of possible language innovations, and its association with linguistic patterns (Anthonissen, 2021). Such individual variation can be found amongst non-humans too. Green-rumped parrotlet (*Forpus passerinus*) contact call learning in Venezuela was studied, to demonstrate that nestlings developed individually unique contact calls and the signature attributes were learned from both primary care-givers (Berg et al., 2012), while mother and calf (*Bos taurus*) recognition through individualistic contact calls is becoming well-known too (de la Torre et al., 2016). So we need to factor in individuality into any conceptualisation of language, given that one size apparently does not fit all, and we need to factor in a sense of who animals are, not just how they behave (Safina, 2016).

What non-humans communicate about is wider ranging than we may have originally thought too, showing greater detail as with descriptive alarm calls discussed in this dissertation, and a greater flexibility in communication overall. For instance, chimpanzees give a 'travel hoo' (Gruber & Zuberbühler, 2013) and red fronted lemurs (*Eulemur rufifrons*) grunt as signals for collective movement (Sperber et al., 2017). Western scrub jays collect and vocalise around dead conspecifics in a type of funeral-like gathering (Iglesias, McElreath, & Patricelli, 2012). In non-human language teaching experiments, linguistic creativity seems to arise too, once the individuals involved have learned some symbols/words, such as Alex the African grey parrot's spontaneous vocal combination *banerry* for a newly discovered apple that tasted to him like bananas but looked like a cherry (Pepperberg, 2005). Each month new discoveries of non-human communication and cognition are being published too, so this list should keep growing.

How close any of this comes to language is a matter worth further serious consideration. Most importantly, though, 'until we can agree on what language is, we cannot answer who (or what machine) has it and who does not' (D.W. M., 1987, p.310) – a statement just as true of non-humans as artificial intelligence.

### 4.4.3   Plants as Counterpoints

Plants can also serve as counterpoints for establishing what language is not, or more specifically how the communicative aspect of language might differ across life forms. Where

non-human communication has evolved to solve time-critical problems, such as competing for resources (Kershenbaum, 2020a), plants have a static niche and therefore it may be unsurprising that they communicate for more defensive outcomes. Mycorrhizal fungal networks, similar to neural networks, facilitate tree root communication via biochemical signalling for resource sharing and defence purposes, as well as kin recognition (Simard, 2018). These fungal networks also enable plant to plant communication (Gorzelak et al., 2015) to attract beneficial fungi or bacteria to help them absorb soil nutrients (Hanano, Murphy, & Murphy, 2022); or instead to communicate about herbivore attacks, abiotic stress like salt in the soil, as well as potential competition from other plants (Glinwood & Blande, 2016).

Yet, despite overt and perhaps expected differences, progress is being made on analysing the chemical compounds and blends used in plant signals to find discrete patterns that can be assigned a range of meanings, almost like words and sentences, while we are discovering more about the ways in which plants produce and perceive these chemical signals. For instance, plants can transmit chemical signals via the air as well as the root networks (Hanano, Murphy, & Murphy, 2022).

Bonato et al. (2021), additionally, explain the similarities between language and plant communication in three ways, as features that can be adopted into the theoretical framework of this work. Firstly, combinatorial structure is exhibited with the small number of basic 5-carbon units plants have access to being variously combined to create a larger number of volatile organic compounds that can be emitted with different communicative functions. Secondly, meaning making seems apparent through the plants' responses, showing that they distinguish between non-meaningful compounds like artificial chemicals or pollution from those useful for survival. One example the authors give is of orchids appealing for help during predator attacks by emitting chemical signals to attract wasps to hunt the herbivores that are infesting the plant. Meaning also seemingly emerges in plant communication through the way in which these signals, compared to symbolic units, seem to be tied to their specific context, though we must be wary about a conflation between context independence and symbolism discussed in more depth in Chapter 5, and we must be mindful of the assumed active intentionality involved in a concept and the use of terminology like meaning (c.f. Amphaeris et al., 2023) that may not be attributable to plants. Thirdly, the authors suggest the existence of plant 'dialects', given that, for instance, each species of orchid has its own chemical blend for its signals. As described in the sections above, dialects remain not only a way of

demarcating language but also a feature of languages as experienced in everyday life, while they can also be found amongst non-humans, apparently stretching even to flora as well as fauna.

Thus while the content and modality of plant communication differs somewhat from human and other non-human communication, it does so to a much lesser extent than perhaps we would have been assumed. As we learn more, we may well have to factor in this area of research into certainly models of communication, if not language, where we start to see, for instance, structured discrete signals being produced and responded to. Indeed, Bonato et al. (2021) call for a definition of language that is broader in scope and ecologically based. While we must be cautious in drawing parallels between plants and humans in communicative and linguistic terms, especially given the reticence that science has in attributing language even to any animals other than humans, still this research area highlights some interesting similarities and suggests, again, that there is a graded boundary across species and even kingdoms, which could push the boundaries of what we may come to recognise as language. This could be very pertinent if we were to take the SETI programme and potential xenolinguistics seriously.

## 4.5 A Foundational Approach

The literature also explores language in terms of its foundations: both conceptually, in how language is derived from general communication and/or cognition, but also in an evolutionary sense, to determine language's origins and (pre)history, as well as from a neuroscientific perspective. This foundational approach can be seen as a focus on what is needed for language to occur, either in the past or in a more contemporary sense, in terms of how its functionality is supported in our daily lives. As raised in Chapter 3, we cannot blend what supports or leads to language with what counts as language per se, so such an approach and the features that arise therein must be conceptually discounted from an ultimate prototype of language in the horizontal dimension. Yet, there are two reasons for noting these features here still. Firstly, it is important to address these features, as we need to situate further discussions of the different levels and dimensions of language more efficiently in future, as per the framework being developed here. It is important that they are no longer coalesced into a discussion of what counts as language per se. Secondly, it might be possible to adopt the more superordinate features of language, those belonging more to general cognition and

communication, into the framework at their appropriate level, in which to inform the language prototype and its origins to a more comprehensive extent.

Still, these particular features will not be added to the summative table at the end of this chapter, to make it explicit that these are not features of language or non-human communication or cognition at the basic level. However, given that both communication and cognition can be experienced in the world and will have their own more specific instances other than language, such as body language gestures and problem-solving, it might become difficult to determine which basic level features pertain to language, or communication/cognition, especially when we make it even more complex by proposing that some gestural emblems could be explored for their linguistic properties, such as their conventional symbolism; their being self-reflexive, glossable, and combinable; while there are iconic, indexical, and symbolic gestures (Haviland, 2006). This is another reason to study the features, to help elucidate which are identified as potential language features.

### 4.5.1   General Communication and Cognition Features

On the part of communication, we could consider features such as identity recognition. This is important across communication systems of humans and non-humans, to be able to establish group membership, distinguish between mating partners, avoid antagonistic interactions, determine hierarchy, and so on. Identity information can also be carried within communicative signals, as with Egyptian fruit bats (*Rousettus aegyptiacus*) (Prat, Taub, & Yovel, 2016) and bottlenose dolphins (Janik, Sayigh, & Wells, 2006), alongside the more complex human pronouns and proper nouns, though to what degree signals have evolved to signal identity specifically is under discussion (e.g. Tumulty, Lange, & Bee, 2022). Such signals can even be covert at times, such as for means of protection (Smaldino & Turner, 2022).

We can also look at the interactional aspect of communication. Some believe this to be psychologically significant in shaping the evolution of the brain, how signallers and perceivers both process signals and align their responses and goals interactively (Nusbaum, 2012). This interactional aspect potentially leads to the normative socially determined nature of language (Enfield & Sidnell, 2019), and the notion that language is a 'form of joint action' and 'coordination' sharing 'common ground', where both speakers and listeners collaborate to create meaning in a linguistic utterance (Clark, 1996, p.138; Tomasello, 2008). To

Dingemanse (2020) language is a filter between private and public arenas, but a mutual understanding requires negotiation between the interlocutors, or signaller and perceiver if we are to broaden our terminology to be more inclusive to situations and species.

In the *Glossary of Cognitive Linguistics* (Evans, 2007), there is no entry for either language or communication, but there is for communicative intention, which is described as being central to language acquisition and links to interactional communication. Talmy (2000) includes the conceptual structuring of volition and intention in his extensive work on cognitive semantics. Stegmann (2013) presents a book devoted to information, intentionality, and how both relate to communication. Seyfarth and Cheney (2014) also argue for the particular importance of social cognition for language's evolution, because of how it helps facilitate the concepts of agents, actions, patients in interactions that can be developed in communication.

This interactional approach is carried still further by others: 'Language's intentional nature has been highlighted as a crucial feature distinguishing it from other communication systems' (Townsend et al., 2017, p.1427). Language is viewed as 'strictly used and motivated for the communication of intentions' (Alonso-Cortés, 2007, p.55) and as such ostensive-inferential communication is the proposed leap from non-human pragmatic interactions to more semantic language among humans (Scott-Phillips, 2015). Čadková's (2015) interpretation of Hockett's design features, show how the features arguably neglect the impacts of culture on language, and the prominence of at least the human intention to convey messages over and above the system of abstract symbols and rules commonly focused on within linguistics. These are important considerations, in terms of other dimensions that influence language, as will be explored in the next chapter.

Given the importance of communicative intent for language, it might be considered that this is a capacity unique to humans. However, as already discussed in the previous chapter, it is quite possible for non-humans to display this capacity. African wild dogs (*Lycaon pictus*) engage in group movement via quorum voting (a certain number of votes are needed for action to be taken) through 'sneezes' (Walker et al., 2017). Honeybees manipulate their messages if sensing an external threat (Tan et al., 2016). Even chimpanzee alarm calls can be said to meet criteria for intentionality of goal-directedness and behavioural orientation to others (Schel et al., 2013), a remarkable claim given the extensive literature on non-human primate suggests that vocalisations are deemed involuntary as compared with their more flexible gestures. Moreover, both a philosophical outlook from a concentration camp survivor

and psychiatrist Viktor Frankl (2004), and Skinner himself in a personal letter from 1987 (Panksepp, 1998, p.12) note that there is an 'unavoidable' gap between a stimulus and the following response, given that at least humans can clearly choose how to respond to various situations. Thus, it is possible, certainly for humans, to manipulate their behaviour out of volition. It might also be the case for other species, and to adapt their communicative behaviour accordingly too.

This communicative intentionality topic links into general cognition considerations for language features. Some of these features have been noted explicitly, like conceptual metaphors (Lakoff & Johnson, 1980) touched on in the first chapter. One clear instance of these also highlight the principle of embodied cognition (Evans, 2007), wherein cognition is shaped by the body's interaction with and experience of the world. Thus, we can consider the experiment mentioned in Chapter 2, where chimpanzees were presented with photographs of conspecifics in a vertical arrangement, and they had to indicate to whichever of the two they had been shown before (Dahl & Adachi, 2013). The experimental participants often showed delays when the photographs were arranged in such a way that a higher ranking individual's photograph was presented physically lower than the other photograph. This cognitive processing delay suggests an understanding of both a spatial representation of dominance, as well as reflecting that the chimpanzees share our human conceptual metaphor of 'good [or important] is up', as in our aphorism *cheer up*. Thus, conceptual metaphors might be a feature of language to explore for their prototypicality, if they are not eventually deemed to be more features of general cognition rather than of language. Generally metaphors are frequent in languages and move from concrete to more abstract terms, just as a volcano and a conflict can both erupt, or a ship as well as productivity sink (Deutscher, 2006). However, the determination of whether this feature sits at the basic level, at the superordinate level, or somewhere in between would be the exact type of research needed to follow this dissertation.

Again, as with communication, others study cognition's relationship to language in terms of a theoretical framework (c.f. Love's review of classical approaches to the mind and to language, 2004). For instance, language can be viewed as a system of symbols and set of rules combining those symbols (Pinker, 1998). Jackendoff (2011) focuses on the need to account for speakers' ability to create and understand unlimited sentences, how they acquire knowledge of their language, and how humans acquired the ability to acquire language. Some argue that language's function is to convey meaning via emergent grammar (Dąbrowska, 2015), conversely others uphold that, while externalised language may be used for

communication, language itself is a computational operation and its function and mechanism should not be confused (Bolhuis et al., 2015). Language can be viewed as a system to map concepts to signals (Fitch, 2011), or instead it can be viewed as a dual representational system for symbolic encoding, combining both a conceptual representational system of words to world reference as with more concrete lexical items, and a more abstract linguistic representational system of grammatical items with a words to words reference within the mind (Evans, 2016a). Bickerton (1990, p.5) sees language as a system of representation 'for sorting and manipulating the plethora of information that deluges us throughout our waking life'. Croft and Cruse (2004) argue that language involves real-time perception and production of temporal sequences of discrete, structured symbolic units in a unique combination of more general cognitive skills.

Despite the array of approaches to language's cognitive links, once again, it is clear that there is a strong relationship between the phenomena. Therefore, we need to return to the purpose of this section and the chapter: identifying features of language per se, that could be tested for their prototypicality. Fitch (2010) addresses this point, by noting that laughter, music, and gesture for instance can all convey meaning, emotion, and be communicative, but that systems other than language lack the unlimited capacity for expression and displacement to enable us to represent and communicate any thought at all. It can only be hoped that this apparent human capacity of language can help us to determine more of the nature of language.

Instead, we can look for the evidence of such features in perhaps unexpected ways. Wild Sumatran orangutan (*Pongo abelii*) mothers exhibit displacement, for instance, by delaying their alarm vocalisations. Experimenters placed predator models that made the mothers suppress their calls for up to twenty minutes until the models were no longer in sight, at which point they gave alarm calls, with the extensively considered interpretation that this behaviour functioned to balance between not drawing attention to themselves while the 'predator' was present but to alert infants to and teach them of the dangers potentially lurking in the forest immediately after the 'predator' left (Lameira & Call, 2018); this shows higher cognition in both the mother to call about a displaced referent and for the infant to comprehend the call about the displaced referent.

The cognitive toolkit that would be specific more to general cognition but fundamental to language, then, might incorporate:

- causal reasoning, flexibility, prospection, and imagination (Emery, 2016);

- being able to distinguish figure from ground to focus attention, making contingency (causation and correlation) judgements, and consciousness (C. Everett, 2013);

- transitive inference and second order relational thinking (Hurford, 2007);

- and/or the combination of bipedalism, manual dexterity, neoteny, and social bonding (MacWhinney, 2008). This would lead to the evolution of vocal and gestural control through parent-child bonding and between-group identification, communicative intention through mimesis and lexical mapping, a fixed lexicon and patterns established, creativity into recursive structures and combinations, and perspective marking.

A communicative toolkit might involve conveying information about affective and environmental states, categorising information that involves cognitive perception, and manipulation of information and conspecifics (Hauser, 1997).

### 4.5.2 Evolution

The literature has proposed many different storylines for language (Johansson, 2005). Language may have evolved after complex cognition, like perceiving patterns in the world and learning arbitrary associations between signals and concepts to understand or use words (Burling, 2012), or language may have evolved beforehand to support more complex cognition like relational reasoning (Gentner, 2016). As touched on in earlier chapters, language may have been exapted for communication following its cognitive basis (Reboul, 2017), or originated for communication (Bickerton, 1990).

According to some, language evolved through tool use and technological development which helped boost human cognitive complexity to facilitate language (Dubreuil & Henshilwood, 2013; Morgan et al., 2015), leading to another species distinction. However, it is worth noting that tool capacity has been explored fairly extensively in other species, for example sea otters (*Enhydra lutris*) use rocks as hammers and anvils (Ralls et al., 2017), veined octopodes (*Amphioctopus marginatus*) off the coast of Indonesia use coconut shells for protection (Mann & Patterson, 2013), while chimpanzees modify leaves to sponge up water and strip leaf stems for termite fishing (Goodall, 1999). Australian bottlenose dolphins (*Tursiops aduncus*) insert their rostra (snout) into sponges to protect them from spiny stonefish (*Synanceia verrucosa*) and stingrays during foraging, with clear cultural

transmission involved (Mann et al., 2008). Plus, not all industrial signs might fossilise if cleaner energy is harnessed or more ephemeral materials are used, for us to know if there definitely has not been any industrial human activity prior to what is on record, or indeed amongst other species (Schmidt & Frank, 2019).

To other scholars, especially with a view of language as a form of communication, greater social coordination and information sharing experienced in hunting and similar activities instead led to more complex communication and language (Gibson, 2012b), including confrontational scavenging requiring collaboration (Bickerton & Szathmáry, 2011) and a range of other cooperative activities (Brinck & Gärdenfors, 2003; Stein, 2003). This approach is supported by the fact that just as with the level of species diversity, language diversity is at its highest level around the equator because potentially humans were able to be more self-sufficient in tropical regions than temperate climates that required more interaction and so more widespread shared linguistic conventions (Harmon & Loh, 2018; Nettle, 1998). The cultural evolution perspective is also taken in studies focusing on the role of learning in the transmission of the communication system and the ability to recognise the communicative intent of signals and actions (Thomas & Kirby, 2018). Indeed, the Cognitive Coupling hypothesis (Kolodny & Edelman, 2018) blends the cognitive evolution of language and tool use combined with social coordination.

Others propose that language evolved via gossip while grooming, to maintain social bonds and track growing relationships, also leading to an increase in brain size (Dunbar, 2003), though this gossip hypothesis may not have been possible until language acquired at least several hundred words (Bickerton, 2007). To further continue the social aspect, Miller (2001) argues for sexual selection rather than Darwinian natural selection.

In a different though related way, Locke and Bogin (2006) note another possible cause for and origin of language is the fact that human children are altricial, that is more dependent at birth than infants of some other species, those precocial species that are mobile and can source food themselves at birth or hatching. Human offspring take a longer time to reach adulthood, so that there is a greater extent of teaching and learning occurring to expand the mind if not also the brain. Instead, a reduction in aggression through a process of self-domestication enabled humans to use their full cognitive and interactional potential for linguistic turn-taking and inference making (Benítez-Burraco, Ferretti, & Progovac, 2021).

More cognitive again, though, Arbib (2005, p.37) argues for language as 'the change from action-object frames to verb-argument structures to syntax and semantics; the co-

evolution of cognitive and linguistic complexity', though resulting from cultural rather than biological evolution from protolanguage stages. A further cultural line of argument is taken by Beecher (2021), who claims that cognition and signal production mechanisms are not enough to develop language without aligned interests of signallers and perceivers, as well as strong cooperation across a range of contexts, which arguably sets humans apart from other species. However, as touched on earlier, natural mutualisms and self-domestication studied in ethology suggests otherwise.

Some take a multi-causal view of the origin of language, for instance noting the mix of adopting a bipedal posture and movement, so allowing hands to refine gestures, adaptation of the vocal tract for speech production, and brain regions to grow to allow learning and flexible signal production; along with increasing social interactions from food sharing to construction, requiring more complex social and general cognition; as well as a decrease in predation risk, which together contributed to a scenario facilitating language (Prieur et al., 2020). Could language have even had multiple separate evolutions? For instance, while Nichols (2012) states that cognitive capacity for symbolic behaviour and complex knowledge may have been present across all humans, the manifestation of these would have depended on population size, and singularities are one line of evidence to support this. These are linguistic phenomena attested in only one area or language family, hard to innovate and usually acquired by diffusion or inheritance, such as the click modality of southern Africa and some intrusive Bantu languages. Thus it might be that language arose in pockets at different times across certainly the *homo* lineage, if not different species too, and potentially spread and mixed over time, in the same way as languages in contact adapt around each other now.

The process and timeline of how language arose have been discussed at length too. There are those who favour a gradual or emergent origin of language, along the lines of Darwin's theories, or the idea that language has evolved from a blend of different cognitive mechanisms and independent subsystems, each with a different function and potentially a different neural and genetic substrate, though the details of these subsystems still require investigation and analysis (Fitch, 2010). Instead, some favour a rapid mutation or catastrophic hypothesis for the origin of language as seen in Chomsky's works, a threshold through which no other species may pass, to use Deacon's (1997) imagery, though Deacon takes more of a gradualist approach overall.

To some there could be a slow evolution with just one brief mutation that leads to language, the features of which vary according to the theory. 'Symbolic units and syntax are

the only real novelties in human communication, and are therefore the most salient (as well as the most difficult) of the things any adequate theory of language evolution must account for' (Bickerton, 2007, p.511). To Hauser, Chomsky, & Fitch, (2002), this one brief mutation is recursion. To Boeckx (2014), there is a minimal mosaic approach where most pre-existing cognitive abilities are shared across species and Merge is the only unique human innovation: the simple and primitive combinatory operation proposed by Chomsky that takes usually two objects and forms an unordered set of the objects, seeing this as the core property of language. This Merge operation allegedly forms the single infinite generative capacity of language (Tanaka et al., 2019). Representative speech acts, rather than directive and expressive speech acts that can be found in non-human communication, are seen as another human only trait, selected for via culture and brain size increase for a greater memory store and future planning (D'Andrade, 2002). The ability to communicate one's mental experiences and knowledge learned therein is another such potential human innovation (Corballis, 2017).

There are still further proposals, such as the notion that evolution can have oscillations of rapid and gradual periods of change (Wolpoff, 2018), or the integration hypothesis, in which language is an integration of two independent systems that already support general communication: the lexical system, as exemplified by alarm calls in other species, in which there are isolated utterance units with specific referents like predators; and the expression system, more associated with birdsong, which creates patterns without lexical items (Miyagawa, 2017). Language, in this theory, would be the combination of making patterns out of lexical items, and in some ways echoes Evans' (2016a) words to world and words to words reference approach. David-Barrett (2016) notes that evolution is necessarily slow because communication abilities have to develop across multiple individuals to be useful, though more complex skills can be developed more quickly once a threshold competence has been reached.

Depending upon what is read, the modalities in which language originated differ too. Language had its origins in gesture (Fay et al., 2022), especially given how a recent experiment has demonstrated that humans can understand and thus clearly share other ape gestures (Graham & Hobaiter, 2023), as well as the pantomime origin theory (Englefield, 1977) that ties in with the proposed prominence of mimesis, mirror neurons, and Tomasello's (2005) work on role reversal imitation, all apparently fundamental for language development. Otherwise, language originated via speech/vocal signals (Kendon, 2017), such as the proposal by Smit (2016) that words arise from infant babbling and similarly language arose from

gaining voluntary control over vocalisations combined with socially guided learning that draws the line between language and non-human signals. Other evidence for a speech origin comes from work on child-directed signal variations across the modalities of both speech and sign languages (Masataka, 2020). The hyoid bone being discovered in Neanderthal remains suggests a possible earlier onset of speech than previously thought too (D'Anastasio, R., et al., 2013). Separately, again, language has been argued to have originated via music (Mithen, 2005; c.f. Darwin's 1872 discussion of gibbon song and its links to language), or at least prosody (Brown, 2017); or even to have had multimodal origins (Fröhlich et al., 2019).

Not only does this summary highlight the highly diverse theories about the origins of language, which somehow need to be reconciled, but it is important to reiterate the need to explore language and its features at equivalent levels, as well as timeframes. We cannot equivocate what may have been an antecedent feature with languages as they are used now, or indeed as they may be in the future. So, for instance, we might approach the signs of language in two ways. We could take the evolutionary trajectory approach that Deacon takes (1997), in which iconic signs evolved to indexical signs and lastly to symbolic signs, so that language now comprises mostly symbols and any icons or indexes are traces of the phenomenon's ancient past. Instead, those that study sign types more recently have argued that each type offers a different function for language, and so all are necessary for the contemporary phenomenon (Dingemanse et al., 2015). This has a serious impact on how we approach non-human communication too. Many have focused only on searching for symbolic signals for comparisons with language (e.g. Grouchy et al., 2016). However, recent linguistics research suggests that all signal types should be compared to language.

The development of grammar is another key topic that the evolution literature focuses on. For instance, grammaticalisation is a language feature explaining the process in which open class lexical items develop into closed class grammatical items involving more metaphorical usage, such as spatial terms acquiring temporal meanings, and even semantic bleaching, so that the actual meaning of the items is no longer apparent (Carstairs-McCarthy, 2012). There is a debate over whether words evolved holistically, emerging from a breaking down of longer strings of sounds, or the more dominant theory of the synthentic approach where single words arose first and were later combined with the development of syntax (Tallerman, 2007). From another perspective, McWhorter (2012) postulates complexity like that of Russian Ket's verbal system as being more symptomatic of early languages, which

more modern languages might simplify, giving the example of Indonesian Keo's prefix and suffix dropping due to convention.

Then there are discussions about whether phonology or syntax emerged first, with those who argue phonology has its own discrete units and must support syntax (Studdert-Kennedy, 2005), while conversely there are those who argue that phonology is rarely found in non-human communication as compared with syntax, so that syntax must have evolved first (Collier et al., 2014). However, this claim works from the premise that non-human communication is just a simpler and chronologically previous precursor to language. If humans have evolved language convergently, for argument's sake, humans could have evolved phonology first and other species could have evolved syntax first, so this line of argument needs to be taken with care, as it may not offer any real resolutions to linguistics problems. More cautionary evidence comes in the form of fully functioning Al-Sayyid Bedouin sign language, which involves very little phonology or syntax, but a large lexicon and clear prosodic features relating to timing and intonation to organise the lexicon (Sandler, 2017).

Therefore, these types of debate show how we need to follow the evidence from as many different sources as possible before hypothesising about the history or nature of language. Plus, working backwards from what is known to the unknown is the fundamental approach taken in philology, which shows itself highly successful in tracing the history of linguistic forms and the relationship between the world's languages (e.g. Willi, 2018). In any case, we need to be especially reflective on our views of language and its features for us to be able to move forward on a firmer footing than this section has revealed.

### 4.5.3   Neuroscience

Another way that scholars have considered the needs for language is from the neuroscientific perspective. There have been considerations of the human brain's readiness for language, from specific language regions proposed, like the left hemisphere for speech perception and processing and right for processing prosodic cues (Ratcliffe & Reby, 2014), to the size of the brain (Schoenemann, 2009), the size of the brain relative to the size of our body ratio (Benson-Amram et al., 2016), the higher density of neurons increasing the cognitive reasoning power (Hart & Hart, 2012), or presence of specialised neurons called spindle cells important for at least social cognition (Emery, 2016). Malik-Moraleda et al. (2022) claim that

key properties of the neural architecture of language are universal across speakers of 45 diverse languages, ranging across 12 language families.

Studies have also considered the special functions that human brains can perform, such as sequence processing and processing of complex dependencies between sensory events distributed in time, to learn about the ordering of events and stimuli (Conway, 2012). This may or may not have links to the processing capabilities of other species, like songbirds discrimating linear strings where song units are arranged in different orders by using both ordinal position and item sequence (Petkov & ten Cate, 2020). Another instance would be the presence of mirror neurons (Arbib, 2012) and their importance for language development and processing (though the prominence of mirror neurons have been extensively debated and as such there is declining research in this area: Heyes & Catmur, 2022).

However, as we learn more about the brain's layout and operation, as with the symmetric hemispheric contributions involved in whistled languages, due to the combination of lexicon and syntax as well as important pitch and melody variations (Güntürkün, Güntürkün, & Hahn, 2015), it raises further questions about humans. For instance, once heralded as the 'language gene' (Penke & Rosenbach, 2007, p.30) the discovered FoxP2 gene has been reduced to a speech facilitating gene at best (Haesler et al., 2007; Vargha-Khadem et al., 2005). Plus, the more we learn about the brains and cognition of other species alongside their potential communicative prowess, as with the ability that even cats (*Felis catus*) can imitate the behaviour of humans, as demonstrated in the 'Do as I do' paradigm (Fugazza et al., 2021), it raises a query about the validity of these arguments as requisites for a species distinction for language. For instance, dogs have been shown via a head-orienting paradigm that they also have hemispheric specialisation for processing different components of human speech (Ratcliffe & Reby, 2014).

Such findings make us aware that there are greater complexities at play and we need to be open-minded about what more we have to discover. For instance, when signal producers are also perceivers, we can assume there will be a common processing system for both aspects but the principles derive not just from physical environmental and signal constraints, but also evolutionary ones (Nusbaum, 2012), so there might be two different systems involved. A key example referenced is electric fish, where timed electric pulses are used as a sonar system for perceiving the environment, and when two fish are close, their signals can interfere. To avoid this interference, the fish sending signals that are lower in frequency reduce the frequency and

the higher frequency sender increases the signal frequency simultaneously as part of a more complex and active system than anticipated (Nelson & MacIver, 2006).

## 4.6    Invented Languages

Since at least the creation of *Lingua Ignota* by a twelfth century German nun (Okrent, 2010), humans have felt the need or desire to invent signalling systems, like semaphore and baseball gestures, and even whole languages, including Esperanto and tongues like Elvish in J.R.R. Tolkien's famous *Lord of the Rings* trilogy of 1954-55. The output of and processes by which these languages were created deserve some consideration, as another perspective on what counts as language.

Okrent (2010) writes extensively on this topic in an amusing monograph and notes that, aside from personal aspirations or attempts to promote political peace as with Kisa's Toki Pona in 2001, involving only simple syllables and positive words, the primary purpose of invented languages seems to be to improve on natural language and eliminate its perceived design flaws: lexical redundancies, irregular verbs, and grammatical exceptions. The early attempts used logic and mathematical approaches, as well as analysing the conceptual world to account for the basic units of meaning, as with seventeenth century Dutch Lodwick's symbols, or Wilkins' philosophical language tables that formed an early type of thesaurus.

The swift demise of virtually all invented languages demonstrates that certain expectations about language do not always match up with features arising from natural languages. For instance, if there is too little convention, the languages are not self explanatory or universal enough to make them efficient as communicative tools. If there is too much negotiation needed to establish such a convention, the system becomes dubious and hard to use. This is the case with Ukrainian Bliss' Blissymbolics from the mid twentieth century (Okrent, 2010), in which symbol meaning is derived from pictures of basic symbolic elements like water, moon, pen, and these symbols are combined for more abstract entities but without any proper explanation.

It is important to note that the symbols in Blissymbolics were more efficient at enabling deaf children at a centre in Canada to communicate more than they had been able to previously. Beforehand, the centre had provided picture cards for them to point to, in a time before learning needs were as catered for as they are today. The problem with just pointing at pictures, though, such as a picture of a bed, is that this would have to cover meanings from a

simple a request to go to bed, right through to complaining about the bed, demonstrating a practical hierarchy of speech act/clause types (depending upon one's linguistic tendency), from commands and exclamations up to statements and even more abstract questions. The picture cards were limiting in the way potentially we have limited non-humans in language teaching experiments. However, though the Blissymbolics system gave a bit more flexibility, it still required a lot of convention to be established on an ad hoc basis between interactants, to convey more complex thoughts. Karl Pilkington (Gervais et al., 2010-2012) summarises this type of communicative frustration aptly when he visits China in the 2010 television show *An Idiot Abroad*: he remarks that where people do not share a language, and even the body language differs, to the point where there is a severe lack of convention between those native to the country and visitors, what is there to communicate with? Where species are wholly different and do not even share basic conventions that humans might with one another, can we really judge them for being slow to adopt such contrived conventions and the limited communication means we offer them, to be able to converse with us?

Convention thus speeds up communication, so that we do not waste time with follow up questions and misunderstandings. Gestuno illustrates this well too (Okrent, 2010). This is the sign language version of nineteenth century Polish Zamenhof's Esperanto language, and shows the importance of at least some syntax, as a sole reliance on context and feedback all the time to guess meanings can be difficult for effective communication, while symbols can help facilitate more abstract concept communication. In 1975 the World Federation of the Deaf chose for the Gestuno system the most iconic signs of all sign languages but these were not easy enough to understand, while sometimes signs are only really iconic once interactive participants know the meaning of the sign.

However, it is possible to go too far in the other direction and over-determine meaning, as with seventeenth century Wilkins' un-user-friendly extensive conceptual table system, or the six hundred page rule book of Lojban from 1988, which has a very fixed syntax, so that there is no ambiguity, no garden path sentences, but one is also stuck with a meaning once a particular syntactic string is chosen, like computer code.

Just as McWhorter (2012) lists as one of his own five key linguistic features, Okrent's (2010) work establishes, contrary to such a fixed syntax, that natural languages' messy quality gives them flexibility and power to facilitate thought formulation as well as communication of said thoughts, so that we can figure out our meaning as we go to be as precise and reliable in our communication as possible.

The two exceptions for invented languages that have seen some growing popularity are Esperanto, based on a blend of Indo-European languages, and Klingon, created by American linguist Okrand in 1984 for the science fiction television show, *Star Trek* (Okrent, 2010). Esperanto is governed more by flexible use than a predetermined mathematical system or universal standard of meaning, though its affixes never change form so that the parts of speech are always recognisable, unlike natural languages. Klingon has proved even more successful, given that it has a strong natural language basis, in the Native American language family, and involves a great deal of messiness. For instance, the proposed structure is object-verb-subject; however, Okrand made a mistake during a recorded toast using the language on one occasion, and therefore created the 'rule' that the word order changes during this particular social context. A similar case happened with plural suffix *–mey*, not normally allowed as a suffix for body parts but was later allowed for instances of poetry. Natural use, in terms of change and flexibility, then, are clear indicators of a language that can thrive and so could well be key features for consideration in the language framework.

Therefore, invented languages are valuable insights to see what does and does not hold in reality as opposed to our intuitions about language. This point is underscored by Nicaraguan sign language, whose origin and development have been witnessed directly – a rare occurrence, but has developed organically through the social contact of deaf children at education centres from the 1970s onwards. Here, the children created their own common communication system that became a rich sign language used by over 1000 people in subsequent decades. One study (Coppola & Senghas, 2010) demonstrates key linguistic features that emerge from this sign language just from a focus on a simple pointing gesture that transformed to a linguistic sign. Their pointing gesture's function moved from simple reference to locations and real world objects, towards more abstract participants in events, like the subject of a verb or a pronoun. This is an example of grammaticalisation as found in spoken languages, thus yielding just from this one study, the linguistic features of deictics, abstractness, and grammaticalisation. Indeed, Nicaraguan sign language is 'better described as a process of grammaticalization than of innovation' given its structured input as opposed to home signing (Morford, 2002, p.333).

Additionally, study of invented languages and their often ephemeral nature throws serious doubt over viewpoints like Dor's (2015), whereby language is viewed as a social entity and the first communication technology that humans invented. This argument holds that language provides a code (c.f. Saussure's approach, 1966) for reconstructing or imagining

experiences in a way not directly linked to the experiences themselves – echoing the feature of displacement already touched on by Hockett (1966) and others. However, given the difficulty that invented languages seem to face repeatedly in being adopted and persisting across different times and societies, it is questionable whether we can legitimately propose that humans actively developed language as a phenomenon (c.f. the humanistic linguistics approach noted by Austin, 2021), or that we can describe the phenomenon in such fixed terms as a code.

Not quite invention of language, but still requiring some degree of innovation, writing is an unusual means in which language users have a window on the nature of language. For instance, nineteenth century writing system inventor Sequoyah wanted to share this ability with his Cherokee people after rejecting the idea that a symbol could be invented for every single word, and he analysed words to the smallest units he could identify and created a symbol for each consonant-vowel syllable, though the symbols and the various syllables do not show any obvious connections to one another, as compared with those writing system inventors that were already literate (Daniels, 2013). Still what becomes apparent from this anecdote is the implicit understanding that writing conventions capture in a visible form the sounds of a language, including syllable segmentation, morphology, syntax to reflect the structure of the discourse, and pragmatics like capital letters or font changes for meaning emphasis.

## 4.7    Summative Table of Language Features

The following table (Table 4) summarises the list of features that derive from the literature reviewed in this chapter, which has taken different approaches to defining or conceptualising language, from actual definitions and criteria lists to a focus on the various structures, functions, or even attempting to invent language from scratch. All this shows how clearly multifaceted language is perceived to be, which may be difficult to reconcile if we were trying to achieve a classical fixed criteria definition. However, the Prototype Theory based approach allows for a broader scope of features that might be included into the prototype of language, to greater and lesser degrees. The features arising in the literature, then, can be used as a starting point for demonstrating how the framework developed in this dissertation might work, and be expanded on in any subsequent research to determine which of these features, as well as others yet to be identified, are in fact more or less typical of a

concept of language and/or non-human communication and cognition. We also need to determine what features sit at the basic level of language and which features might be more suitable discussed at the superordinate or subordinate, much more specific level.

It is tempting to categorise the different features presented here, just as Hockett and Altmann (1968) do with their frameworks of features relating to the channel of communication, the social setting, behavioural antecedents and communicative act consequences, continuity and change in communication systems, and the repertoire and messages for a single system, including matters like discreteness and gestalt. For instance, we could group the notion of person and negation into content features that are discussed within language, as opposed to productivity, syntax or pragmatic context, which facilitate language's operation. However, any such categorisation would be wholly subjective and debatable, and so yield little further insight at this stage in the investigation, ahead of us discerning which features are more or less prototypical to the concept of language. This prototypicality process could well provide clear feature clusters and so a more accurate and natural categorisation of them and of language as a whole. Moreover, Hockett and Altmann (1968, p.64) themselves note that one of the problems involved in their language design feature list approach is that each feature is presented in an 'all-or-none manner, although upon closer scrutiny some of them are surely matters of degree', which echoes the Prototype Theory based approach in this dissertation.

There are some caveats to the table, before it is presented, given that this chapter has been just a brief discussion of various proposed features of language:

- features are listed alphabetically to prevent any sense of bias or false categorisation in their presentation, as no judgement can be made on their prominence or their details until they are submitted to inductive exploration, as outlined in Chapter 6;

- features are grouped together where applicable based only upon how they seem to be presented in the literature; however, these groupings, and indeed the features and their labels may well – and should – be debated;

- no explanation or gloss has been provided, as the features have been discussed to a degree in the chapter above, while Chapter 2 gives us caution about trying to define terms; moreover, because this chapter has been brief, it takes no account of detailed nuances associated with such features that must be considered before they can be properly identified and then plotted into the framework, as detailed in Chapter 6;

- no mention of other species has been made in this table, as some scholars are reticent to apply human derived terms and concepts comparatively, while we have not systematically explored each of these features among other animals, and so to identify that a handful of these features may be found amongst non-humans would cause unhelpful debate and present skewed findings. The importance promoted in this dissertation, again, is to inductively explore such features in both humans and non-humans, to quantitatively assess if these and other features are evident and to what degree they are typical of communication and cognition;

- and lastly, the sole purpose of this table is to summarise what has been discussed in the literature above, and to give empirical researchers a starting point for determining which features to start selecting for study and then for plotting into the framework, as described in Chapter 6.

**Table 4** Language Features Derived from Reviewed Literature on the Nature of Language, with potential language features.

| Potential Language Features Derived from the Literature |
| --- |
| Abstractness |
| Allocentric and egocentric reference |
| Arbitrariness |
| Call volume modulation |
| (Centre embedded) recursion/sequential structure/multimodality (various structure types) |
| Co-articulatory gestures/facial expressions/paralinguistics |
| Combinatoriality/compositionality/gestalt |
| Communicative efficiency/linguistic laws |
| Connectives |
| Conventionality |
| Cultural transmission |
| Deictic signs/signals/demonstratives |
| Dependencies |
| Dialectal variations |
| Discreteness/Gradience |

| |
|---|
| Displacement |
| Duality of patterning |
| Expressive particles |
| Flexibility |
| Grammaticalisation |
| Hedges |
| Iconicity |
| Identifiers |
| Indexical signals |
| Individuality |
| Information transfer/behaviour manipulation |
| Ingressive/Egressive phonation |
| Lexicon |
| Locutionary, illocutionary, and perlocutionary force in speech acts |
| Meaning (making) |
| Mental representation, like conceptual metaphors |
| Morphology |
| Negation |
| Normative effects |
| Ostensive-inferential communication |
| Particles |
| Pitch |
| Plurality |
| Pragmatics |
| Prevarication |
| Productivity (also known as generativity, or innovation) |
| Prosody |
| Questions/interrogatives |
| Realis/irrealis distinction |
| Redundancy |
| Reflexiveness |
| Repair |

| |
|---|
| Segmentation |
| Semanticity |
| Social sphere |
| Subjects and objects |
| Syllables/phonemes |
| Symbolic signs/signals and reference |
| Systematicity |
| Tone |
| Transitivity/intransitivity |
| Turn-taking |
| Word classes, such as verbs, nouns, pronouns, and adjectives |
| Word order |

**Chapter 5 Additional Dimensions**

**5.1     The Need for Additional Dimensions**

As illustrated in the last two chapters, the vertical and horizontal dimensions that are already incorporated in Prototype Theory will capture a substantial part of the nature of language. Chapters 3 and 4 discuss how these dimensions apply to a study of language respectively. Yet, this is not a comprehensive account. Therefore, by analogy with the physical dimensions of the known universe and the imagery of the solar system planets orbiting the sun, it is not only possible but important to expand on Prototype Theory with two additional dimensions for the purposes of the theoretical framework being developed in this dissertation. Firstly, a 3D 'spatial' dimension, with a depth axis, refers to language's use, including the role of pragmatic context, while the dialect subsection of the previous chapter shows that the socio-political cultural aspect really has an impact on the study of language as well as actual features of language. The dimension also covers the physical semantic spatial aspect of sign languages, as well as the related network of other concepts, like meaning. Then a fourth dynamic dimension accounts for language's diachronic change and evolution, and its dynamic qualities, like the oscillations of polysemy across various contexts or how language use differs according to individual usage.

This chapter describes and presents these two additional dimensions as a proposed expansion of Prototype Theory for how it can be applied to a macro level categorisation of language. The two additional dimensions have been coalesced into a single chapter given that they are new considerations and ones not so central to the concept of language, given the focus of literature over the last two chapter topics, but nonetheless they are deemed necessary for inclusion into an ultimate model of language as will be explained. Thus, with regard to the research question of this dissertation, on how we can most effectively conceptualise natural language in terms of its co-existence with non-human communication and cognition, this chapter focuses on the aspect relating to relationships between concepts and also on the natural language part of the question: language as it exists in the real world and as it is used, rather than as it is theorised about within the discipline of linguistics.

## 5.2     A Third 'Spatial' Dimension

### 5.2.1   Context and Culture

One key facet that should be incorporated into a comprehensive account of language is the metaphorical sphere in which language manifests itself, specifically the act of language making or use, and the situation wherein this occurs: the pragmatic context. Explained in relation to the process of reference, context is not a feature of language but is arguably integral for language's communicative effectiveness, as with the encyclopedic view of semantics (Evans, 2007). In this view, concepts have a core semantic potential along with a dynamic but structured inventory of contextual factors and knowledge that narrow down the meaning of a given expression. Context is also crucial for determining meaning of the relatively small repertoires of signals that are used diversely in non-human communication (e.g. Beecher, 2021; Scarantino & Clay, 2015). Beecher (2021) adds that non-human signals like those of vervet monkeys can represent different things in different contexts, such as alarm calls or intergroup fights, yet the fixed sense and referent link remains within each separate context, just as with polysemous words like the English word *get*, relating to procuring an item or understanding a concept, as in the phrases *I will get a drink* or *I get what you're saying*. *Get* may be used differently across contexts, but within each context the meaning is fixed.

Context is therefore critical for an account of language, and non-human communication and cognition, but suits more the role of an additional dimension within which both language and non-human communication and cognition operate. Scarantino and Clay (2015) note that the term 'context' has multiple applications when discussing communication, from identity cues like social affiliation, to gestures, environmental situation, sequence combinations, and verbal collocations like the ones raised in Chapter 1 (c.f. *human language*). To keep matters simple, however, within this dissertation, context shall generally refer to all physical and social environments surrounding the communicative expressions of language and non-human communication and cognition, from time of day to cultural conventions, like which colours of the spectrum are represented lexically by various languages (Berlin & Kay, 1969), and other typological wonders.

However, cultural impact on language deserves a little more attention. Culture can impact on the meaning conveyed by language as with hard to translate phrases, which are

specific to a particular people. Examples include Easter Island Pascuan *tingo* meaning something like 'to gradually steal items from a neighbour's house by borrowing and not returning them' Evans (2017), and how emojis and gestures can be interpreted very differently across cultures. Culture can also impact on people's various concepts too, making it possible that the notion of concepts and categorisation in themselves might be basic level neighbouring concepts to language and non-human communication and cognition. For instance, Amazonian Pirahã represents neither colour nor numbers in its language, both of which are used to quantify and refer to abstract concepts beyond what is spatio-temporally experienced. For instance, plants are not referred to by colours or generic names but species names. There is also a very simple pronoun inventory, absence of creation myths, while individual and collective memory seems limited to that of two past generations, so that the language reflects a people living much more in the here and now and specific personal experience of the world than perhaps in the northern hemisphere. Moreover, it supports the earlier point, that certain of Hockett's (1966) language design features are not universal or certainly, as Hockett and Altmann (1968) note, not an 'all or nothing' occurrence. Displacement has been exemplified in Pirahã in terms of only referencing personally experienced objects, people, and events, rather than anything abstract or experienced by others. Productivity is also limited in this language in terms of both form and content (Everett, 2005). Culture can even impact on the evolution of language, as will be explored in Chapter 6. Thus the cultural dimension in which language finds itself needs consideration too.

**5.2.2    Spatial Semantics**

Further to context and culture, one linguistic area of research that shores up the requirement for additional dimensions in this theoretical framework, as well as a more literal spatial dimension, is that of sign languages. Not only is the medium of these languages gestural rather than oral, therefore taking place much more obviously within the spatial dimension, but also the meaning conveyed by the sign languages is partially built from the 3D space in which the signs are created (Klima & Bellugi, 1979; Liddell, 1990; Thorvaldsdottir, 2008). Additionally, in cognitive linguistics, there is also a theory called access semantics, claiming that words do not mean, but rather point towards meaning (Evans, 2006). Therefore, a third dimension becomes even more important to factor into the framework.

### 5.2.3   Neighbouring Concepts

Yet another facet that belongs to a third 'spatial' dimension of applying Prototype Theory to understanding the nature of language and its relationship with non-human communication and cognition is that of other 'neighbouring' concepts. There is considerable overlap of discussion in the literature about related concepts like meaning and symbols alongside language. For instance, take the statement that five functions 'can always be found in any meaning': reference, agency, structure, context, and interest (Kalantzis & Cope, 2020, p.2). Four of these: reference, agency, structure, and context, are often raised as topics in linguistics in one form or other, for instance Duranti's (2006) work on agency in languages. Given that there is such a strong crossover of basic level concepts like 'language' and 'meaning', and perhaps 'concepts/categorisation' per se, but these remain separate concepts from one another, they need to be factored into the framework to be consistent with Prototype Theory's horizontal dimension approach of not just grouping typical features into one category/concept prototype, but also of differentiating out concepts from one another. To put it another way, we need to factor in discussions about what does not count as language, as much as what does. Moreover, where increasingly we recognise concepts like meaning are multifaceted in nature (Amphaeris et al., 2023), this not only facilitates a prototypical perspective of comparing ranges of typicality of multiple features simultaneously, but this recognition also necessitates that we factor in those complex considerations. The third dimension of this framework is the place to do this, then, to acknowledge the network of related concepts. Yet, separating out the horizontal dimension of Prototype Theory and a third 'spatial' dimension allows us to discuss the features of language separately to the other related concepts that may share some features with language, hence the additional dimension to this framework development.

One key neighbouring concept to language, that will need to be considered within the framework, is meaning, given both the cognitive and communicative aspects of language. The term *semantics* is often used to discuss meaning as it relates to language and communication generally, including in non-human communication literature (Seyfarth, Cheney, & Marler, 1980; Suzuki, Wheatcroft, & Griesser, 2020). Yet, as mentioned earlier, semantics is also used as a term for three associated but importantly distinct phenomena (Amphaeris et al., 2023), and this can create confusion in the literature, as well as occlude important debates as to the nature of meaning and how it is constructed and/or expressed via language. This is why

we need to account for meaning's relationship with language in the third dimension of the framework.

Firstly, the term *semantics* is often coalesced in especially the non-human literature with the concept and term *reference* (e.g., Townsend & Manser, 2013). To clarify, reference stems from Frege's (1948) distinction between a cognitive *sense* and a real-world *referent*. So a unicorn can be a concept in the mind, and have a sense, but as there is no such animal in reality it has no referent. Frege's example of the planet Venus, called both the 'morning star' and the 'evening star', has the same referent in both expressions, the actual planet, but the conceptual sense changes. In this association, then, semantics is considered not only to discuss meaning generally but also to be the way in which we specify meanings in our communication.

Semantics is often linked to symbolic signs too (Speaks, 2010), out of Peirce's (1984) three noted sign types: icons or 'likenesses,' as when we outline the shape of a circle with our hands; indexes, whereby signs directly correspond to real objects, as with a pointed finger guiding one's attention; and symbols, which are conventional form-meaning pairings, as with written numerals and religious artistic emblems. Semantics is coalesced with symbols because the 'definite' fixed pairing of a sense with a referent (Frege, 1948) corresponds to the conventionalised form-meaning pairings that characterise symbolic signs (Deacon, 1997). Saussure (1966) and followers deem these form-meaning pairings to be arbitrary too, but Deuchar (1996), for instance, argues that conventionality is more integral to symbols than arbitrariness, given that not all language is arbitrary, and because, while arbitrariness develops naturally over time (c.f. Watson et al., 2022), conventionality is more crucial for symbol creation and usage in the first place (Barr, 2004).

Lastly, semantics is usually associated with an independence from context, and much of the literature separates out semantics from pragmatics (e.g. Devitt, 2021; Hockett, 1966; Gutzmann, 2021). This semantic-pragmatic distinction relates to the difference between *denotation* and *connotation* (Mill, 1882), thought to distinguish core semantic meaning from any further associations, context, attributes, or implications that enhance a meaning. This distinction also led to the creation of the term *functional reference* (Macedonia & Evans, 1993; Berthet et al., 2018), to describe how non-human signals appear to correspond to the referential quality of language, elicited in response to stimuli out of context, but only in a superficial way, given the uncertainty over the exact level of complexity of non-human cognition. One example is Slocombe and Zuberbühler's (2005) study of chimpanzee food

grunts. Another is the discussions of vervet monkey alarm calls, where each call seems to refer or at least relate to a specific predator but can be given in response to playbacks and so no physically-present predator (Seyfarth, Cheney, & Marler, 1980). However, the value of the term functional reference has been questioned (e.g., Wheeler & Fischer, 2012). More importantly, there are those who argue that context is always involved in meaning, as with the encyclopaedic view of semantics (Evans, 2007), and given that a referent will always be practically situated in a context. Research has increasingly turned to the investigation of *pragmatics*, including for non-human communication (Scarantino & Clay, 2015; Seyfarth & Cheney, 2017).

Scott-Phillips (2015) goes further, arguing that only pragmatic meaning may be found amongst non-humans because conventionalised semantics and the ostensive-inferential communication found in language evolved out of pragmatic communication. Ostensive-inferential communication involves the expression and recognition of communicative intentions (Grice, 1957; Sperber & Wilson, 1995) made possible by theory of mind (Premack & Woodruff, 1978), or the understanding of others' minds and intentions, that is still debated in non-humans (c.f. Krupenye & Call, 2019 for a detailed review). Given the well-supported evidence of semantic-like referential meaning demonstrated by non-humans in predator discrimination, food, and social contexts (c.f. Table 1 in Townsend & Manser, 2013), Scott-Phillips' (2015) view may be too limited. Yet, it shows the important relationship between meaning and context, as well as a third way in which key topics in language marry up to key topics in meaning discussions, that need to be accounted for in a framework of language. Language and meaning are not the same concept, and we need to be able to distinguish them systematically and coherently across disciplines.

The conceptual network, sphere of context and culture, and actual spatial semantic elements incorporated into this additional third dimension are not only related to language. They can also interact with language in a dynamic way. This brings us to the next additional dimension of Prototype Theory's application to a macro conceptualisation of language: the dynamic dimension.

## 5.3    A Fourth Dynamic Dimension

A dynamic dimension is required to account for the non-static, changeable nature of language. The following subsections explore ways in which language has a dynamic, and

sometimes temporal, dimension, which must be taken into consideration when determining how best to conceptualise the phenomenon and its relationship with non-human communication and cognition.

### 5.3.1   Dynamic Qualities of Language

Study of linguistics and language change via the sub-discipline of philology arose from the same era as the 'animal language' debate. Saussure (1966) briefly put an end to the study of diachronic linguistics with his paradigm shifting lectures on synchronic linguistics. However, language change is a fact, despite its instances being sometimes permanent, especially if written. Or rather, semi-permanent given linguist Sebeok's warning in response to a requirement by the Office of Nuclear Waste Isolation in the 1980s to create a message that could survive to warn people about the dangers of the waste for a period of 10,000 years. The warning was of the difficulty of this task, which would require translating the message across multiple languages and modalities, as well as requiring that the message be updated in contemporary language every few centuries (Okrent, 2010).

Language change can be viewed in a longitudinous evolutionary sense, as studied within philology and sociolinguistics. Boga (2020) notes how language varieties show diversification and convergence, with adaptations, borrowings, and lost features, in a constant evolution. Steels (2017) describes language change in terms of linguistic selection, given that changes are not always natural as with natural selection, and certain variants spread more than others due to more expressive power, improved communication, or less cognitive effort involved. On a paper about language attitudes, Adler (2021) notes that some languages have not always been languages but started off as dialects; conversely, some languages have stopped being languages and have become dialects. Deutscher (2006) notes the motives for linguistic change as economy, expressiveness, and analogy. Thus, the status of language varieties may change over time. Language change could even include multiple evolutions leading to the same or different outcomes. Might multiple convergent evolutions explain where other species might best fit into a language model? Language change can also occur with the lifetime of language users, which is a growing area of research (Baxter & Croft, 2016; Rossi & Diaz, 2016).

Language itself involves adaptability and dynamic oscillations. It has been argued that the importance of its diversity is part of a person's culture, identity, and their scope of thought

(Miyaoka, 2007). Others argue that language's very diversity is what separates it from the more fixed non-human communication systems (Malik-Moraleda et al., 2022). Therefore, when we conceptualise language, we need to think less in terms of mapping the land, a static scape to be described and located, and more in terms of perhaps forecasting the weather: the ever changing yet still constrained processes that affect us in various ways and can be caused by a multitude of contributing factors. We can look at changes in meaning, like the shift in the sense of *sick* from a state of ill health to a means of complimenting something, or neology as abounded in English playwright William Shakespeare's works for instance. We could also look at grammaticalisation (c.f. Croft, 2003) like a change in form, as with the phrase *I am going to*, which started life as a means of signalling only a spatial movement, as in *I am going to Paris*, but developed into a futuristic construction too, as in *I am going to finish writing this chapter*. Grammatical change is thought to be unidirectional, from more concrete to more abstract concepts and more context-dependent grammatical forms and structures, which may be used for functions they did not evolve for, partly because a driving force of language change is creativity, and partly because context is an important factor for determining language change too (Heine & Kuteva, 2012). Hence the need for a third dimension of context, as well as a fourth dynamic dimension of language.

Another factor is the process of normalising across multiple individual instances of say phonetic output, to generalise from the wide acoustic variety across individuals (Lee, Keating, & Kreiman, 2019). The fact that there can be such a range of individualised instances of language and that the brain already processes a standardised abstraction from these to create centralised (dare one say prototypical) concepts and mental representations, shows the dynamic interplay of instances of language use and language as a generalised phenomenon. Yet, while conventional phonetic and orthographical standardisation often occur within languages, isolated languages such as Ket and Navajo can resist facets of this (McWhorter, 2012).

Individuality is another dynamic aspect impacting language if not being a quality of language per se. This aspect of language is supported by Karmiloff-Smith (2009) discussing linguistic experiments with aphasic patients, noting that although it appears that impaired levels of language may not affect general cognition, no account is taken of what a 'normal' cognitive level for patients and their immediate family is, as compared to generalised norms. Individual variation must therefore be considered too, but not just for humans. Other species can be more or less 'loquacious': Alex the African grey parrot as opposed to Griffin

(Pepperberg, 2009). They have different mothering techniques, with some being more nurturing than others (Goodall, 1999), and show wide variations in skills and behaviour. This aspect of individuality can be accounted for in the dynamic dimension.

### 5.3.2  Language as a Process

Beyond general dynamic qualities that language appears to possess, cognitive linguist, Croft (2011), has additionally proposed that language is not just dynamic but ought to be considered to be a process rather than a reification: to put it simply, *language* is a verb not a noun. Commonly, the way in which language is often discussed is as a noun: a 'cultural <u>tool</u>' (D. Everett, 2013); a phenomenon 'only humans <u>have</u>' (Dunbar, 2009b); '<u>a</u> system' whether of symbols, representation, patterns, or other systems (e.g. Mulder & Hervey, 1975); or as in McWhorter's monograph, *What Language Is* (2012), with a listing of five adjectives including 'dishevelled' and 'ingrown'. This phrasing all implies that language is largely considered to be a nominalisation/reification, albeit an abstract rather than concrete thing like a bus. As such, linguists concentrate on either the form of language – echoing Plato's theories and cave analogy in *The Republic* – or the function of 'it'. In his first sentence, Croft (2011, p.241) states, 'There is a widespread assumption in linguistics that language is a static entity', a state achieved through the process of language acquisition. More generally, discussing metaphor diversity across languages, Mühlhäusler (2001, p.163) notes the European object-dominated interpretation of reality, and the

> strong tendency to convert processual verbs into abstract, object-like nouns. For example, the subject matter of linguistics is not perceived as the activity of speaking but as an object termed 'language'. One of the consequences for this area of enquiry is that, while speaking always involves people, and a spatial, temporal situation, the abstract term *language* suggests an object that can be analysed as something self-contained.

Indeed, syntax is about joining items: joining words and/or sentences, like building blocks – 'Lego language' if you will (Jackendoff, 1993, p.75) – and here there is a clear conceptual metaphor (Lakoff & Johnson, 2003) of language as a construction, complex

perhaps, but still a static object. This metaphor is even carried into the title of the cognitive linguistics research area of Construction Grammar (e.g. Hoffman, 2022).

Ought we to address language as a verb instead, *to language* in its infinitive form, and conceptualise it as a process rather than as a state or object? Croft (2011) certainly thinks so, as he describes at length. Langacker's (1987) work on the verb-noun process-state continuum further supports this perspective. Humboldt (Mueller-Vollmer & Messling, 2007) also perceived language not as a fixed entity or object, but as something transitory, something that is real only in the moment of speaking, as an activity. For a novelty supporting point, the derivation of *word* and *verb* are the same: Latin *verbum*.

This verbalised conceptualisation would allow for the impact of contextual factors. This could explain why particles float within linguistic analysis without adhering to fixed word categories. Indeed, in a study of ancient Greek particles (Bonifazi, Drummen, & de Kreij, 2016), which are a key feature of the language, the lexical category of particle is noted as being ill-defined. Certainly for ancient Greek if not other languages, particles cannot be characterised as being indeclinable, since many adverbs and prepositions are too. Nor are they always monosyllabic, while many other types of word can be monosyllabic. Meanwhile, conceptualising them functionally as not contributing propositional 'content' meaning is not fully accurate either. Therefore, the authors describe the boundaries as 'fuzzy', echoing Prototype Theory once again. If so many characteristics within languages are continuous, as shown also in Chapter 2, perhaps the whole phenomenon of language is too, further substantiating the approach in this dissertation.

The verbal quality of language additionally leads not to patterns in the mind (Jackendoff, 1993), such as fixed word forms or error patterns whether innate or learned, but pattern formations of the mind, derived through a process of language-ing. Thus, is language really a gerund – a verb masquerading as a noun? If it is to be construed as a process, this also implies that we should be looking for more than one linguistic feature, and thus more than a single point of comparison with non-human communication and cognition (i.e. a distinction between language and non-human communication and cognition cannot come down to species alone). Although Hockett created a feature list instead in his works, many of the actual features he raised have been challenged as discussed in earlier chapters, while we would also need to consider how the features operate together in a dynamic sense. So, in a different way to the critique of Classical Theory in Chapter 2, we still need more than just one or a list of features of language in the theoretical framework developed here, but we also

require an understanding of the feature interactions and any chronological ordering, like ingredients need also need a recipe to result in a meal. It is not clear if this perspective is entirely accurate or not as yet, until the framework has been built out with subsequent research; however, it does further substantiate the proposed dynamic dimension of language.

It has been highlighted in philosophy that how we ask a question limits our thinking about a phenomenon too (Ackrill, 1963; Thomasson, 2004). A 'What is X?' type of question fits the nominalised viewpoint of language well. Yet, to embrace this dynamic dimension more, we clearly need to develop a new line of questioning, as proposed in Chapter 2, to determine what counts as language. This again makes the Prototype Theory based approach more appealing than a Classical Theory approach to this topic.

### 5.3.3   Dynamism in Theory

Dynamism continues into Prototype Theory itself. In Chapter 2 of this dissertation, it was established that a prototype is not an entity but a central typical representative of more or less similar instances of concrete or abstract entities: almost ghostlike to provide mental imagery of this idea. A prototype is not meant to be 'reified as though it meant a specific category member or mental structure', as this then becomes just as categorical and distinctive as a category boundary as in Classical Theory (Rosch, 1978, p.36). Therefore, it is possible to see a dynamic quality involved within Prototype Theory. For example, if one were to watch a busy park long enough, one could discern a prototype of a dog out of all the various canines walking through, but this prototype remains flexible. On another day of observation, one may adjust the prototype in some way(s). Moreover, one person's idea or observation of a prototype might be different to someone else's, as when affected by culture, experience, and expectations.

This carries through to the 'fuzzy boundaries' that exist within Prototype Theory, too, which might also be explained by adding a dynamic aspect to the theory. For instance, if one is thinking in terms of granularity and/or familiarity, the boundaries and their fuzziness or sharpness may alter. So if one is comparing a dog and a cat and a dolphin, or even an inanimate object like a table with its own four legs, much more mental representational overlap will be involved between the dog and the cat. Instead, if one were to ask an expert like a veterinarian to consider a dog and a cat, the distinctions would be far greater and much less fuzzy. To account for all of these variations at one time, though, requires a dynamic

dimension. Additionally, a key benefit to building in this fourth dynamic dimension is the opportunity to grow the framework around the data that we may discover in the future, correlating to the dynamic nature of knowledge and life in general, which a Classical Theory definition would not allow for.

A further factor in support of a dynamic dimension expanding on Prototype Theory for its application to conceptualising language on a macro level is that of the consideration of conditions for theories in general, as outlined by Weiskopf (n.d.; c.f. Gopnik & Meltzoff, 1997). There are three categories for the features of theories: structural, functional, and dynamic. Interestingly, this mirrors not only the formalist (and/or structuralist) and functionalist orientations of linguistics already highlighted in research (c.f. Newmeyer, 2000), but also the dynamism aspects highlighted in this chapter. Weiskopf (n.d.) continues to note that theories have dynamic properties given that they are altered by empirical evidence. Therefore, clearly any theoretical framework and eventual model of language must encapsulate not just its form and function but also its dynamism, from the perspective of both taking into account the dynamic aspects of language but theories more generally too.

### 5.3.4    Challenges of Dynamism

Clearly, change, especially diachronous change, impacts on language. However, there also exist challenges to factoring in dynamism into a theoretical model. Flexible changes can 'prohibit the establishment of meaningful relationships because categories are created by the individual, not the system, and are thus fleeting and ephemeral' (Jacob, 2004, p.538), moreover, 'the very plasticity that is the creative power of categories may prohibit the use of categorization as a persistent information structure' (Jacob, 2004, p.531), or its efficacy as a well founded conceptual framework.

Yet, we can use the analogy of a fission-fusion society, found amongst many primates (Chapman & Teichroeb, 2012), in which social connections are multifariously created, broken, and recreated, with the more general societal structures and hierarchies maintained. So it may be that though dynamism does play a role in how language exists and is used, it does not alter language's core nature. Moreover, we need to recognise that the dynamic dimension of language is not just about changes – synchronic or diachronic – but the more fundamental transience too. Linguists may have a tendency to seek out static patterns, forms, rules, and functions of language. However, how can we conceptualise language with that

approach if those patterns, forms, rules, and functions do not always hold, either in every circumstance or for the long-term? Dynamism allows for this transience. Therefore, dynamism may still be factored in and, in fact, is a dimension that needs to be considered to some degree in a macro consideration of the nature of language.

## 5.4    Summary

This chapter has explored important possible expansions to Prototype Theory that would enhance our ability to conceptualise language, as well as its relationship to non-human communication and cognition. Here, we are no longer just discussing form or function, because there is no necessarily static 'form' of language as such, and because we are not just talking about the phenomenon in terms of why we use it, but also how it works. Firstly, a 3D 'spatial' dimension refers both to the related network of other concepts like meaning, and what does not count as language, as well as to language's use within the 'sphere' of context and culture, and the literal spatial semantics involved in sign languages too. The fourth dynamic dimension allows for language's diachronic change and evolution like grammaticalisation, and its dynamic qualities, like the usage oscillations of polysemy across various contexts. Features and their level of typicality change over time. A dynamic dimension captures these changes. This dimension also has the benefit of enabling a possibility for the model of language itself to evolve as our knowledge grows.

In sum, given that we have communication and cognition impacting on a language prototype in a superordinate taxonomical way, and that we will be seeking observable features to plot into the framework in the horizontal dimension, the sphere of context and the conceptual network adds a spatial, environmental, vivifying dimension, as with the third dimension of space in the physical world, while dynamism is an added dimension in which features can also change in time and/or circumstances. For instance, the neighbouring concept of meaning has been recognised as having a dynamic quality (Zlatev, et al., 2018), like language in this chapter. Yet, though there is this quality overlap, meaning must be separated out from language and the two additional dimensions proposed here allow for these considerations to be systematically factored into a conceptualisation of language. All of this contributes to the need for a new framework for language conceptualisation, to allow for the scope and flexibility of probable features of language, rather than a fixed definition, or blueprint to use Hockett's 'design feature' theme.

## Chapter 6 A Prototype Theory Based Framework

### 6.1    Establishing a Prototype Theory Based Framework

Conceptualising the co-existence of language and non-human communication and cognition has been approached from several vantage points in this dissertation so far. Earlier chapters explored general categorisation theories within cognitive science and philosophy that may be applied to conceptualising language on a macro level; the ways in which general communication, cognition, and consciousness relate to language in a taxonomic arrangement; the proposed features of language that arise in the interdisciplinary literature; the context and conceptual network, within which language is situated; and lastly dynamism. How can all – or at least the majority of – these facets and diverse insights be reconciled? For instance, how can language be considered a fixed innate code (Chomsky, 1957) at the same time as a learnable process (Croft, 2011; Evans 2014)? Clearly, any successful conceptualisation, or model of language, as well as its relationship with the communication and cognition of other species, must include some degree of flexibility, yet still be specific and systematic enough to be able to ultimately determine the nature of language and its existence with its relatives in quantifiable terms. This is where the application of Prototype Theory is particularly effective, as will now be demonstrated.

In some ways, this framework echoes a recent multidimensional framework created for comparing consciousness across species. This allows the conscious states of non-humans to vary in a graded way along multiple dimensions, yielding different consciousness profiles (Birch, Schnell, & Clayton, 2020). Clearly, Prototype Theory, though not always by name as with this consciousness study, is a plausible basis for describing a number of different complex concepts, as it is with language in this dissertation.

To return once more to the dissertation's research question, this chapter presents a proposal for a method and an ultimate model to answer the 'how' part of the query: how can natural language be most effectively conceptualised, especially in terms of its co-existence with the communication and cognition other animals? The foundation of this approach – its motivations and theoretical basis – has already been published (Amphaeris, Shannon, & Tenbrink, 2022). This chapter adds in the extra dimensions needed and elaborates on a potential methodological procedure required to build out the framework to a model of language in future research.

## 6.2      Incorporating the Vertical and Horizontal Dimensions of Prototype Theory

The two dimensions of Prototype Theory, the vertical and horizontal dimensions, have been discussed at length in Chapter 2 and applied to the topic of what counts as language in Chapters 3 and 4 respectively. However, there are some important aspects to draw out. One of two major contributions that the vertical dimension makes to this macro application to language is that it clarifies the levels at which we discuss the different aspects surrounding language. The superordinate, more generalised level involves discussions about the cognitive foundations of language (Fodor, 1975; Kolodny & Edelman, 2018; Tomasello, 2005), the communicative function of language (Hauser, 1997; Hurford, 2007; Scott-Phillips, 2015), and the evolution of language (e.g. Bickerton, 1990). This level would also include discussions of a metareflection feature of language (Hockett & Altmann, 1968) that helps us to realise our own consciousness: that is, thinking about and discussing thought and language, as well as just using language. Metareflection relates to the topic of consciousness in philosophy and cognitive science (Frankish, 2005), which plays a role in language (Itkonen, 2008), such as Hockett's (1966) reflexiveness feature of language being used to discuss language, which could be argued to be a basic or a superordinate feature. We could also coalesce consciousness into general cognition, rather than separate it out.

All these discussions about the basis of language and its past are more general or removed from the daily use and experience of language itself, which sits at the basic level according to Prototype Theory. Language per se appears to be a more specialised derivative of the superordinate categories of cognition and communication, while Prototype Theory only allows for a concept/category to exist at a single level, so language would sit below these phenomena in the vertical taxonomy. This approach might be further supported by highlighting not just the collecting but also the function-determining attributes of the superordinate category level of Prototype Theory (Ungerer & Schmid, 2006). For instance, as Ungerer and Schmid note, the linguistic labels of *Stationery* or *Bakery* help customers navigate a supermarket. Such superordinate function determination especially relates to newly experienced items, to help people to determine their purpose or function in the world, as with the common question: is this a fruit or a vegetable? Thus, the communicative, cognitive, or other functions of language are found at a higher, more general, superordinate level than that of language per se.

Therefore, any features we assess for their typicality within the methodology proposed here must not be pre-requisites for language, like memory (Corballis, 2019), but must naturally occur in language and/or non-human communication and cognition usage, like repetition, displacement, and identifiers. Another example of a feature more suited to the superordinate level would be communicative intentionality, which partly combines the communicative and cognitive aspects of language and non-human communication and cognition systems, and refers to active clear communication with the goal of one's signal being recognised and understood in a given context (Zlatev et al., 2018), as when we wave someone over in a room to chat. Communicative intentionality is an important area of non-human research (Townsend et al., 2017), if sometimes contested (Fischer & Price, 2017; Moore, 2018; Rendall et al., 2009; Zuberbühler 2018), and it is fundamental for language too. For instance, pre-linguistic infants need to learn not only the content of what others say but also the fact that they are trying to say something in the first place (Tomasello, 2005; Halliday, 1975). Grice's (1957) classic theory of non-natural meaning also centres around communicating intentionality: the signaller communicating alongside communicating about the fact that they are communicating, and the perceiver recognising that intentionality, which requires a theory of mind (Bar-On & Moore, 2017). Yet, communicative intentionality is too broad to be a feature of language itself. Instead, we would have to explore a more specific and observed instance of it, like call/signal volume modulation, as touched on in earlier chapters. Any increasingly specific instances of languages or non-human communication and cognition, then, like individuals' idiolects or the exact types of morphological affixes, would be discussed at the subordinate level below that of language as a concept.

The second major contribution that the vertical dimension of Prototype Theory makes to the understanding of language and its relationship with non-human communication and cognition is that it clarifies the equivalency of non-human communication and cognition and language. We need to consider the evidence of both phenomena on the basic level, because it is what we currently observe, just like features of French and vervet monkey alarm calls, plus non-human communication and cognition are as much derivatives of general cognition and communication as languages are. Therefore, comparing language with non-humans should be carried out as an equivalent level exercise, rather than approaching non-humans from an evolutionary origin perspective, as though non-human communication and cognition are simply older, more primitive versions of language(s), without any evolution of their own (c.f. Bickerton, 1990; Fitch, 2010; Hauser, 1997).

An additional if not so momentous value of Prototype Theory's vertical dimension can be found through a point of comparison with Classical Theory. In Classical Theory, category members at lower hierarchical levels necessarily encompass features of each of their higher level categories, and simply add to those. However, in Prototype Theory, lower category levels can also drop and/or change features from the higher category levels. One feature of a basic level 'wine glass' might be to have a rounded shape with a stem, but a subordinate more specific type of wine glass might be missing the stem in more modern designs. So it might be that the superordinate phenomena of cognition and communication potentially incorporate features that could have been exploited by recognised languages at the basic level, but were not, yet these features might be found used amongst other species, while additional features not included in the superordinate level might also be found once we explore more broadly. For example, while recognised languages contain sequential and hierarchical sentence structures (c.f. Hauser, Chomsky, & Fitch, 2002), there could be another structural option that certain other species utilise. Might multimodal communication integrate this, to answer Kershenbaum's (2020a) suggestion of a syntax that operates more spatially not just temporally, given the space-time continuum and the interconnection of these two dimensions in the physical universe?

As also explored in Chapter 2, Prototype Theory's horizontal dimension presents us with a more encompassing continuum approach for comparing language(s) and non-human communication and cognition, with graded boundaries and multiple simultaneous feature continua. It also importantly allows for a third conceptualisation option of their potential relationship, aside from the traditional 'difference in kind' or 'difference in degree' perspectives: a 'difference in type'. This enables us to explore the language and non-human communication and cognition relationship as two potentially different prototypes but with graded boundaries and based on feature not species continua, if we are not in fact discussing one prototype including all of these phenomena. However, as raised earlier, these two vertical and horizontal dimensions of Prototype Theory cannot account for all aspects impacting on language and therefore a comprehensive conceptualisation of it.

## 6.3    Incorporating the Additional Dimensions

As explored in Chapter 5, additional dimensions are required for applying a Prototype Theory based approach to a language conceptualisation, as we cannot plot for example

context or dynamism directly into the framework, though it is clear they are pertinent to language, just like communication and cognition. Rather the third 'spatial' and fourth dynamic dimensions situate discussion of other impacts on or facets of language. Context or culture can, for instance, inform how we assess the features that will be evaluated on a typicality basis: are the features enriched, even changed, by context? Meanwhile, neighbouring concepts, like meaning, need to be factored in, almost like satellites orbiting a planetary body. Where, and to what degree, do they crossover with language?

Rather than merely including this conceptual network into the horizontal dimension, which could be conceived of almost as an x-axis on a graph, we need to factor in that the features that overlap between the network of interrelated concepts. These concepts may overlap in ways that do not situate them nicely to one side or other from a prototype of language, in line with superordinates communication and cognition. It would also certainly confuse matters to try to envisage the features of language all lined up in one row, mixed up with other concepts entirely. Instead, we need to envisage also a z-axis, or a third voluminous dimension to account for where the neighbouring concepts may be situated with respect to one another. It is uncertain, ahead of applying the theory developed here empirically, whether non-human communication and cognition will ultimately be deemed a neighbouring concept to language or fall under the range of the concept of language itself. However, this framework enables an operationalisable means of finding this out.

Then there is the dynamic dimension to consider. Language changes, evolves, and oscillates in form and function. Viewed from this perspective, it is impossible to have a static description of the concept. Therefore, a fourth dimension is integral to a conceptualisation of language, and possibly non-human communication and cognition too. Yet, how can we study dynamism in language? It requires a different treatment from more intransient qualities like (centre embedded) recursion. For instance, we can explore the limits or constraints on, not just the features of, language, and non-human communication and cognition too. There appear to be natural constraints on language that may limit the impact of dynamism, such as the requirement of general cognitive computational efficiency (e.g. Chomsky, 2005). We can also set up different versions of the model to allow for a feature's change between contexts, or its increase/decrease in typicality over time, for example.

Therefore, a useful way to summarise the dimensions of a Prototype Theory based framework and ultimate model of language, might be to think of the vertical dimension in terms of what language needs above language's basic level, and in the horizontal dimension,

we can think about what features language consists of, to a more or less typical degree with non-human features variously along this scale too. The third, contextual and conceptual network dimension involves comparing language to other related but separate concepts, to discern to an even greater and lesser degree how similar they are, as well as how context impacts on the language features. Lastly, the fourth dynamic dimension concerns how any of the facets of a model of language might change according to context or time.

## 6.4    Proposal for a Prototype Theory Based Framework of Language, Non-human Communication, and Non-human Cognition

We can present these ideas in a diagrammatic fashion. Throughout this section, the framework will be depicted developmentally in a series of figures (10 to 21), to better elucidate the dimensions of Prototype Theory and how we can achieve an eventual model of language on a Prototype Theory basis. This will include depictions of how we plot features and establish key features clusters (demonstrated by Figures 17 and following). (Figures 10-14 and 16-21 were created for this dissertation by Gerard Doyle, Lead Environment Artist.)

First of all, take the vertical and horizontal dimensions of Prototype Theory, already illustrated by Rosch (1978) as well as described above. It is possible to view the two dimensions as similar to the Y- and X-axis lines of a graph respectively, shown in Figures 10 and 11.



**Figure 10** A graphic representation of the concept of a vertical dimension of Prototype Theory

**Figure 11** A graphic representation of the concept of a horizontal dimension of Prototype Theory

If we were to join them together, as Prototype Theory already describes, where a given concept has both a vertical and horizontal dimension of categorisation, like a plot point on a graph, we might see a cross, or even the radii of a circle (Figure 12):
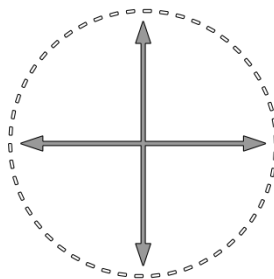


**Figure 12** A graphic representation of the concept of a combination of the vertical and horizontal dimensions of Prototype Theory

The notion of a circle can be particularly useful as a diagrammatic representation here, given that it metaphorically represents the unification of both dimensions, as well as its outer edge depicting that there are limits to the typicality effect range of any concept: a 'dog' concept may overlap with a 'cat' concept in terms of multiple features, but they are ultimately separate concepts.

Thus we have combined two separate though related one-dimensional proposals and developed them into a 2D representation. This is where it becomes more obvious how to situate the conceptual network, role of context, and also dynamism. One small step from a 2D representation is to a 3D representation, in terms of a sphere (Figure 13):
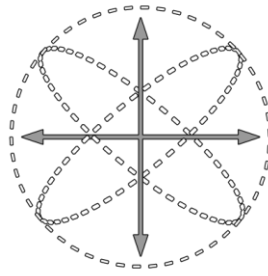
**Figure 13** A graphic representation of the additional 'spatial' third dimension to be added to Prototype Theory for conceptualising language

This representation again works on two levels. In geometry, the third dimension relates to space, but this can be understood here, as either literal as with the spatial semantic aspect of sign languages, or in a more abstract sense: that of context. This sphere also encapsulates the need to factor in neighbouring concepts and their often close relationship with language, such as that of meaning.

Therefore, in this 3D representation we can account for the various aspects that would arise in a discussion of context regarding both language and non-human communication and cognition: the environmental, the social, and even the literally spatial. Hence, respectively, we can now smoothly build into Prototype Theory discussions of species, situational, and cultural variation, as well as their similarities. This would include Berlin and Kay's (1969) landmark Prototype Theory-aligned study of patterns in colour term usage across known languages, as well as study of the various communicative modalities from vocal to gestural to electromagnetic. To come back to the ship examples in this work, if we were to ask a sailor for a prototype of a vessel (vertical dimension) or a ship (horizontal dimension), the sailor's answer is bound to differ to that of a landlubber (third dimension), particularly if their social echelons differed too.

A further innovation to this Prototype Theory based framework can now be made by adding the fourth dimension, as per the laws of physics in the known universe, and widely acknowledged development within language. This fourth dimension constitutes time, or more broadly dynamism, which includes change more generally, as represented graphically by the motion arrows in Figure 14:
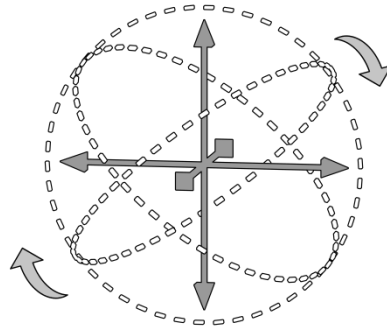
**Figure 14** A graphic representation of the fourth dynamic dimension to be added to Prototype Theory for the completion of the language concept framework

We could imagine the features of language surrounding the prototype of language as a sphere spinning around its centre, or perhaps planets moving on different orbits around the sun. To continue the ship example in the dynamic dimension now, if we were to ask a seventeenth century sailor for a prototypical 'ship' and its features, we could count on an answer different to that of a twenty-first century sailor. The same could be said when asking a sailor of a prototypical 'ship' that they would purchase following a hypothetical lottery win, to the ship they would hope to sail in the midst of a perfect storm. Such capacity for change and/or transience can be captured in this 4D representation.

Now we have established how Prototype Theory and its expansion might help us to conceptualise concepts, we can focus on the relationship between language and non-human communication and cognition, and develop a framework that can lead to an eventual model of what counts as language. As a basis for how this framework might start to shape up, we can look at the rudimentary layout shown in Figure 15. This figure illustrates the basis of the methodology being developed here, though it only includes the first two vertical and horizontal dimensions.
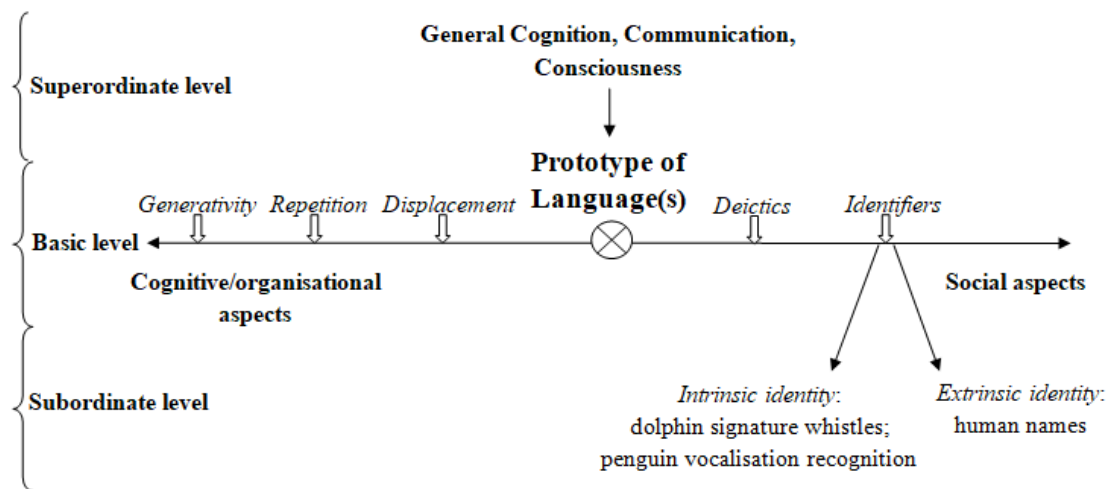
**Figure 15** Incorporating non-human communication into a prototypical model of language(s) (Amphaeris, Shannon, & Tenbrink, 2022)

The basic level can be visualised as a horizontal line, the horizontal dimension, while the centre could be conceived of as the eventual prototype of language. Here, the schematic has split cognitive/organisational functions from more social/communicative functions on the basic level, to show how the two vertical and horizontal dimensions interact and integrate within the basis of the framework, and also how we can build in the cognitive underpinnings of language as well as more communicative features. Features can then be quantified for their typicality and be plotted to the right and left of the centre of the line. The more frequent and typical the features are across non-human communication and cognition and recognised languages, the closer they are situated to a central prototype of language, as plotted hypothetically in Figure 15. This prototype should emerge naturally and on the basis of evidence, rather than on the basis of further subjective claims.

However, this depiction is rudimentary, as it requires not only additional dimensions to be factored in, as well as a more robust procedure for filling out the framework, but more importantly, this approach pre-empts where the prototype will end up, which negates the inductive methodology being developed here. So, while this layout is an accessible first step to understanding the framework, it is necessary to delve deeper now into the details, and factor in all of the dimensions, in the following sections of this chapter.

**6.5     Methodological Procedure for Completing the Framework**

The outline procedure for filling out the framework and ultimately completing the model falls into four stages, with multiple steps in each: 1) selecting features that may form part of a prototype of language, 2) weighting their typicality across languages and non-human communication and cognition, 3) plotting the features into the framework, and 4) determining what the prototype of language encompasses. This section is broken down into each of these four stages, with the proposed steps explained in process order. It is quite probable that a computer program will be needed to perform at least the later stages, and to create a 3D or 4D graphic representation of the framework and the final model, as currently presented in 2D representations throughout this chapter. However, it is possible to at least start applying the procedure manually. It is also possible, and may in fact be practically necessary, to run stages 1-3 iteratively. However, the fourth stage of assigning a prototype must be carried out once the other stages have already been completed, though early indications of the prototype(s) of language may well emerge as features are plotted into the framework.

**6.5.1   Stage 1: Features**

*Identification and Selection*

Before all else, the features being assessed and then plotted for their typicality must be identified and selected. This will firstly involve selecting features that are familiar and already recognised, for example repetition or displacement as mentioned in Figure 15, or the features that have been gathered into the summative table of Chapter 4, like (centre embedded) recursion, negation, and symbolic signals. However, we must be careful to select only features that could conceivably count as language per se, which are on the basic level within the horizontal dimension, and do not sit more comfortably in the vertical, spatial, or dynamic dimensions of this framework, as would communicative intentionality, culture, or neology. These phenomena impact on language, and might even act as pre-requisites for language, like a pattern-finding ability (Tomasello, 2005), but they cannot be considered as 'ingredients' of language, in accordance with the framework developed here. They could perhaps be plotted into the framework for a comprehensive picture of language but they would need to be situated, for example, well above the horizontal basic level, perhaps at graded levels up to the

superordinate level as appropriate. This again raises the question of how exactly Hockett (1959; 1966) reached his particular list of language design features; detailed justification is required for selecting the features for this framework.

Identification of appropriate features to assess on the basic level will also necessitate some exploration, in order to be able to incorporate potential features not currently known about and/or recognised, especially with respect to non-humans. This can be achieved in several ways. Firstly, it can be carried out by analogy with typological studies. As mentioned earlier, features like evidentials were neglected by scholars until the last few decades of research (Aikhenvald, 2018). Therefore, it might be possible to use linguistic typological approaches to observe and document novel features of non-human communication and cognition and recognised languages that could be considered for their typicality in terms of a prototype of language.

It is also possible to explore the multiple branches of linguistics beyond traditional formalism, in order to obtain different perspectives on what could be useful features of language to assess. One such example could be Talmy's (2000) force dynamics, or conversational repair across species (Heesen et al., 2022). We also need to take care over which languages we identify features within and also sample from, as discussed next, given that the categorisation of many languages or dialects is not based on linguistic properties but their socio-political status (Boga, 2020). This means that some languages may not be much linguistically different to others and so would present an unhelpful duplication of features, while key features in very divergent dialects might be missed.

Other ways in which we can explore for more potential features is by observing a greater number of species, and investigating other modalities, especially the so far neglected but potentially rewarding olfactory based means of communication. Another way to seek out novel features for weighting and plotting into the framework would be to carefully consider the granularity or 'cognitive zoom' (Tenbrink, 2020, p.118), which could increase the level of detail at which we observe and subsequently analyse non-human communication and cognition, as well as recognised languages perhaps. Currently, scholarship tends to group non-human signals using highly generalised terms like 'mating calls' or 'alarm signals', but as Safina (2016, p.90) notes, this level of analysis is like 'saying people "speak" or "scream" and leaving it at that'. Therefore, we need to break down observed non-human signals into more detailed categories, and pay attention to any contextual variation or enrichment – from a change to the meaning of the same call by a simple tail flick or a location difference – as well

as paying attention to any nuances within the non-human communication and cognition that have not yet been discovered. Mann and Hoeschele (2020) call for segmental analysis of non-human signals, for instance, determined as units divided by intakes of breath. Elsewhere, it has also been proposed that combinatorial systems in non-human communication should be analysed into more detailed transitional forms like affixation (Engesser & Townsend, 2019). We might find still more features simply by paying attention to patterns observed within non-human communicative or other more cognitive behaviours that may be related to language. Yet, these would need to exhibit enough of a generalisable and frequent pattern to be able to call it a feature. Is it even possible to create a field checklist along the lines of the one Aikhenvald (2018) proposes for evidentiality for documenting languages?

Amphaeris, Shannon, and Tenbrink (2022) examine how a range of potentially cross-species features could be investigated and plotted into the framework. As a brief summary, three of these will be captured here: repetition, displacement, and identifiers, which may support the understanding of Figures 17 to 19.

Repetition can be found not just amongst non-human communication and cognition but also recognised languages and is a useful feature to compare across species (Pleyer & Hartmann, 2020). For example, Homer's ancient works consist of a multitude of repeated passages as an aide memoire for oral delivery of the narrative, somewhat akin to modern song lyrics. Reduplication is a morphological instance of repetition, used to indicate tenses, create plurals and diminutives, and intensify words, among other functions. Moreover, cognitive linguistics' theory of entrenchment explains how linguistic units are established as patterns in the mind through repetitious usage (Evans, 2007). Therefore, repetition, including re-use of words and phrases, can be viewed as a feature that can be assessed for its typicality across species and contexts.

Displacement refers to events and objects that are not present in the here and now, like an absent friend or future holiday season. Displacement is often raised as a feature of language (Hockett & Altmann, 1968) and symbolic communication more generally (Planer, 2021), and it is also found within non-human communication, like the waggle dances of honeybees, which signal to other bees details about the distance, direction from the hive, and quality of external food resources (von Frisch, 1967). Even when the majority of recruited bees have been captured and released by scientists far from the hive, they still find their way to the food source, implying a mental representation has been created as a result of the waggle dance information (Wang et al., 2023). Such abstract representation is substantiated by the

finding that honeybees can comprehend the concept of zero and that it belongs at the lower end of the numerical continuum, during experiments with stimuli containing pictures of one to six basic shapes (Howard et al., 2018). Displacement is also demonstrated by the mental time travel of non-humans, including the past recollection of wild great tits (*Parus major*) choosing spring breeding sites to stay close to their winter flock mates (Firth & Sheldon, 2016), and western scrub jays anticipating future events by preferentially caching food in places where they have learned they will be hungry the next day (Raby et al., 2007), or great apes preparing tools for future use (Osvath & Osvath, 2008).

Identifiers or identity markers are another feature worth assessing. Humans use names for each other, which could be described as an extrinsic source of identity, because the name is given by someone else. However, other species tend to recognise each other through what can be described as intrinsic identity markers, similar to the way in which we recognise someone by the way they walk or their vocal quality, for example. One non-human example of an extrinsic identifier, like a human name, is the signature whistle of bottlenose dolphins (Janik, Sayigh, & Wells, 2006; King et al., 2013). Bruck, Walmsey, and Janik (2022) demonstrated, through presenting urine and the corresponding sounds of signature whistles from some recorded dolphins to other dolphins and assessing their behavioural responses, that these whistles act as a representation of the dolphin they belong to. Dolphins can also use the whistles of other dolphins to call them in a way consistent with how humans use names (Tyack, 1993). The dolphins can even adopt the whistle of absent or deceased dolphins while changing the use, in this instance to refer to human-related play activities the dolphins engaged in with visitors (Morgan, 2017). This is consistent with semantic polysemy, whereby a word can have multiple different meanings, as well as showing that the dolphins can give a name at least to an activity if not a conspecific.

Multiple other language(-related) features can and should be plotted into this framework. However, this dissertation intends to demonstrate how a Prototype Theory based methodology can work, ahead of further theoretical expansion and empirical application, rather than presenting the comprehensive end product of its implementation, so an exhaustive list will not, and cannot, be provided here. Chapter 4's summative table on language features proposed in the literature has though been provided to assist with the implementation of this framework.

There could be some features that present challenges. Features that are gradable, like productivity, in which they are not simply present or absent, but may occur to differing

degrees within languages and/or non-human communication and cognition, may be subject to their own prototypical analysis prior to being selected for plotting into the framework. However, they can eventually be included in the same way as any other feature. There may be non-human features with apparently little analogy to language(s) either. However, it is possible and important to plot these on the same basic level as the other features, so we can reach an objective indication of whether non-human communication and cognition are different to the wide variety of recognised languages, and if so, to what degree.

Feature identification and selection would be the first important step in the next stage of this research area in the future, too. As such, it is pertinent to spend a little more time on potential methods that could be employed at this stage. For instance, we could take Grounded Theory's approach to category identification and adopt it for language feature identification, given that it involves analysis as well as description when labelling or 'coding', constant comparative analysis across categories to ensure the complexity and diversity is fully considered, negative cases – those that do not fit the emerging identification – are acknowledged, collecting of further data to check the emerging category/feature identification against reality with samples, and the notion of theoretical saturation – the point at which data collection and analysis no longer contribute any updates, alongside memo writing to document the process by which identification occurs and reasoning involved (Chun Tie, Birks, & Francis, 2019; Tenzek, 2017). The same saturation point could be adopted for determining when enough features have been plotted into the framework to construct a clear prototype of language, if there are multiple repetitions of different features ending up in the same location within the framework, while the cluster should begin to take shape as features are plotted so that a prototype emerges organically, but can be altered as new information is discovered in future if needed.

*Labelling*

The step of labelling the features requires appropriate equivalence across species and contexts, for instance including human *productivity* into a more general non-human literature term of *signal flexibility*, or vice versa. This is important for being able to objectively compare and quantify the features. Hebets et al. (2016) take such a perspective with their systems approach to non-human communication, which involves, among other aspects, proposing broad and inclusive terms for features like *flexibility* and *evolvability* for greater

comparative application across species. So too the labels for features within this framework must be broadly encompassing, like *repetition* rather than say *reduplication*, unless established feature terminology, like *displacement* is already widely acknowledged for non-human communication and cognition instances as well as for language(s).

Once the features have been labelled, they also need to be annotated with metadata, as in discourse analysis. This information may arise prior to or post the sampling step, depending upon how familiar we are with the feature in question and how we come to recognise it as a feature. Such metadata should include, for instance, which species exhibit the feature in their communication and cognition, the details of the communicative/cognitive behavioural circumstance, including the duration of the unit of communication/cognitive behaviour used as a sample, the physical and conceptual context of the sample, which dimensional relationships the feature has, and so forth.

*Sampling*

When sampling the non-human communication and cognition and recognised languages, to seek out the occurrences of each feature in question, we need to consider in the sampling procedure which communicative modality is being studied, the volume of the communication or cognitive behaviour that will be sampled, the species, the context of the communication or cognitive behaviour, whether there is (created) equivalence across species in terms of volume of samplings, that a full range of available species is sampled, and the use of synchronic and/or diachronic samples/features are involved. We also need to consider how many times each feature will be explored within samples, and keep this consistent for exploration of all the features, so that no feature receives preferential treatment leading to a false sense of its actual typicality across language or non-human communication and cognition instances.

### 6.5.2   Stage 2: Weighting

In short, this stage involves quantitative analysis of the features. There are several ways in which feature typicality can be quantified. According to Djalal, Ameel, & Storms (2016), a commonly used method is typicality rating, in which participants judge the degree of typicality of phenomena in Exemplar and Prototype Theory based experiments on a

numeric rating scale. Instead, the authors propose a method based on ranking phenomena, whereby they are sorted in terms of typicality in relation to one another gradually. We could also approach this in the way of quantified relationships between language features already established, where for example, we can see relationships between grammatical complexity and the number of speakers a language has, where large population languages have larger phonological inventories but a simpler morphology (Nettle, 2012).

Another suggestion here is the counting of the frequency of the features occurring within a stipulated sample, in a similar way to Trott and Bergen's (2020) operationalisation of homophony in wordforms: looking at the maximum number of homophones in a word, the mean number in each word, and especially at the rate of how many wordforms have at least one homophone in a given lexicon, with more positive values representing more homophony in each language. We can use the same approach for each feature unit, to calculate its rate in various language/communication/cognition samples, to establish the feature's percentage of occurrence, and then when compared with other feature rates, we can see which are the most common.

It would be easiest to fully annotate the sample(s) for all of the various features they contain first, and then it will be possible to determine what the proportion of each feature's occurrence is, particularly if these are at odds with one another, such as iconic versus symbolic signs/signals. It is possible that certain statistical tests may need to be run to check for the statistical significance of certain feature frequencies. We also need to factor in other considerations. As with keystone species in biology, or even consumers driving the economy, there can be a 'disproportionate impact [of some features of language] relative to their abundance' (Jacquet, 2012, p.176). Thus, we will need to calculate not just the simple frequency of occurrence but also apply a typicality rating based on the importance of the feature within the communication and/or cognition instance/language sample: for example, a feature might gain a 40% typicality equivalency right away if the communication/cognition/language in the sample could not have occurred without that feature, such as the order of the parts of speech in English. Another example might include signal representation because language very often represents concrete entities and events. Expert opinion and the Knowledge Approach categorisation theory from Chapter 2 will no doubt play a key role in this stage as well as feature identification, though it would be preferable if this expertise could be quantified in some way. Once the frequency count of the

given feature in the sample is obtained, it will represent language and non-human communication and cognition as a whole, certainly for what is already known about each.

We can use the frequency count and turn it to an estimated percentage of total language and non-human communication and cognition instances. This will enable us to select an appropriate globe, a graphic representation for each figure that may be plotted into the framework. As shown in Figure 16, based on the typicality weighting of the feature, an aptly sized globe may be chosen.
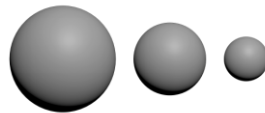
**Figure 16**: Graphic representation of the variously sized globes that will be plotted into the framework to stand for language features

The greater the typicality percentage, the larger the globe, and there will be a set of 100 sizes as will fit the parameters of the graphic/digital framework built. Each globe also needs to be labelled with a colour, symbol, or abbreviation, as in Figures 17 to 19, in order to indicate which feature the globe relates to. For instance, as with Figure 17, 'Re' can be used for the feature of repetition. This label can also be used to cross-reference with the annotated metadata stored in a separate part of the research documentation and/or computer program for use during a later stage in the procedure.

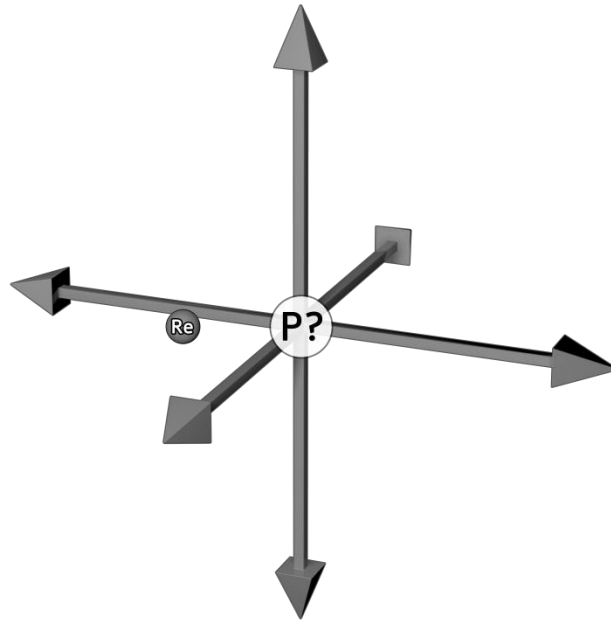**Figure 17**: Graphic representation of how to plot a feature globe into the 4D framework of language, as developed in Figures 10-14 (as mentioned above, the globe marked 'Re' refers to the feature of repetition, and the 'P?' is the arbitrary, yet to be established, language prototype)

### 6.5.3   Stage 3: Plotting

This stage involves plotting the selected and weighted feature globes into the framework to create the model of language and its related concepts, along with wherever non-human communication and cognition best fits. As per Figure 17 above, the globes will be placed into the 4D model based upon where the feature is located with respect to the four dimensions, as with the feature 'Re' or repetition, including multiple versions to account for any dynamism. This step is repeated until the features that are known and recognised have been exhaustively plotted. There is opportunity to add more features at a later date, upon their discovery, but the ultimate language model will only be as good as the volume of data plotted into it, which is why there is such emphasis placed upon the exploration and exhaustive selection of features earlier in this chapter.

It is crucial to point out here that the typicality of a given feature is currently represented graphically by the globe's size, and the feature globe must be situated as per its dimensional qualities, while the current centre of the framework is a hypothetical arbitrary

centre, rather than the actual centre of the eventual model of language. The whole point of this methodology is that the framework centre/prototype must be determined once all features have been plotted into the framework, not before this. This is because we cannot assign the prototype of language until we have adequate understanding to determine what counts as language. Otherwise, this approach is no different to the many speculations on language as currently found in the rest of the literature.

A final consideration for this stage is to reiterate that there is nothing in Prototype Theory to suggest that only three vertical dimension levels exist, and/or that there is no grading within this vertical dimension as there is within the horizontal dimension. Thus, it might be possible to have features plotted above and below the horizontal basic level line. To give a different category example, if we were to name different fruits on a basic level, we might include apple, pear, cherry, banana, but not food, as this is far too general and must be superordinate. However, if we were to use the term *edible seed of a plant*, which is more general than these named fruits but not as general as *food*, we can see how there are graded boundaries even in a taxonomical vertical arrangement.
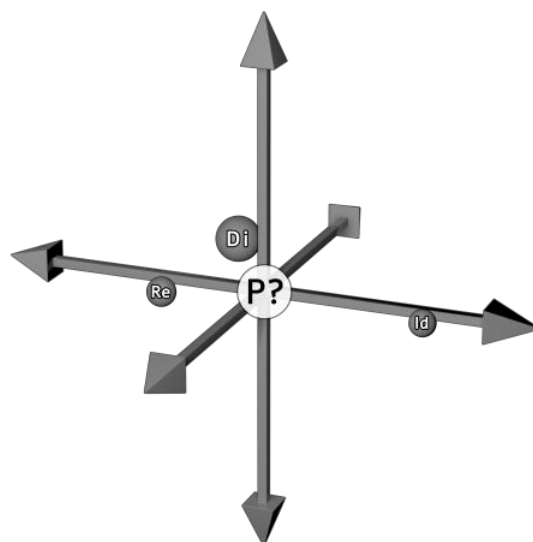
### 6.5.4   Stage 4: Prototype Assignment



**Figure 18a**: Graphic representation of plotting multiple feature globes into the language framework, here repetition, displacement, and identifiers, with 'P?' as the arbitrary language prototype

Figure 18a shows how the example features of repetition, displacement, and identifiers might be plotted in to the framework. Figure 18b shows the same representation but with a different perspective to enable readers to see more of the 3D aspect, rendered on a 2D page.
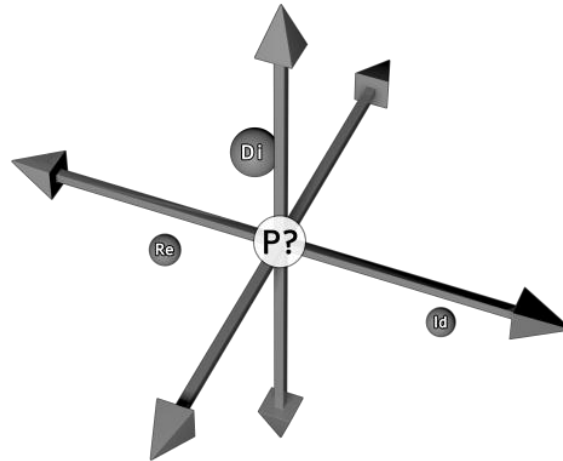


**Figure 18b**: A different perspective on Figure 18a, simply to demonstrate more of its third dimensional aspect

As such, multiple features may be located in different places within the framework based on their dimensional relationships: does the feature's horizontal placement align with the vertical dimension's superordinates of cognition or communication more, or are they further out from the arbitrary centre because they overlap closely with another concept, for example? Figure 18b serves to reiterate the 3D nature of the graphic representation, showing the z-axis in operation too. Figure 19 shows an increase in the number of the features plotted and how the graphic framework might start shaping up: centre embedded recursion, generativity, repetition, displacement, symbols, morphology, deictics, identifiers, and call volume modulation. Once the fourth dimension, dynamism, is factored in too, there may be oscillations to consider, potentially requiring mathematically based adjustments, or leading to different versions of the framework in graphic form.
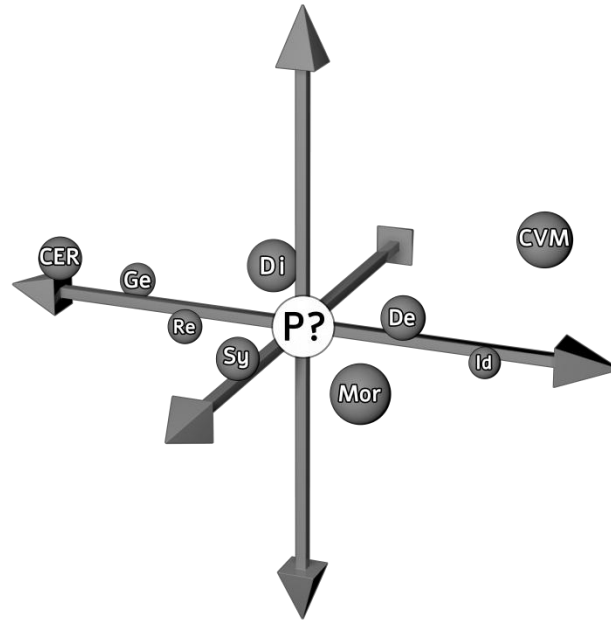
**Figure 19**: Graphic representation of ever more features plotted into the framework of language, here: centre embedded recursion, generativity, repetition, displacement, symbols, morphology, deictics, identifiers, and call volume modulation, with 'P?' as the arbitrary language prototype

After each feature has been plotted into the framework, Figure 20 shows that a cluster of features should form. This is important because this is the stage at which we can consider assigning the location of the prototype of language and thus determining what its most typical features are. This falls alongside the annotated information for those features, such as which species employs those features and which communicative or cognitive behaviours elicit them. Therefore, we will be able to get a literal picture of what counts as language. Thus Figure 20 demonstrates how we can determine where the actual, rather than hypothesised, prototype of language could sit, and this will not necessarily sit neatly at the arbitrary centre of the framework, hence the 'P?' symbol in Figures 17 to 19.

**Figure 20**: Graphic representation of a potential feature cluster and the situation of establishing an eventual prototype of language – here 'P' no longer comes with a question mark but is central to the feature cluster that has arisen through the plotting stage (all aspects are hypothetical for illustration only)
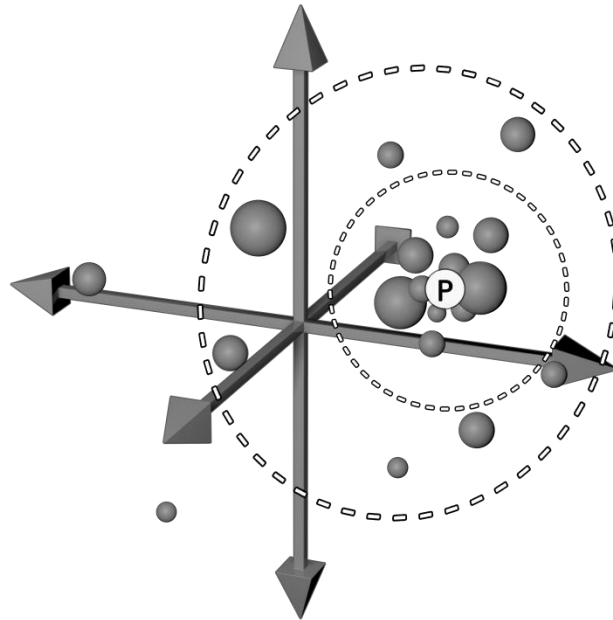
Figure 20 illustrates a hypothetical typicality scope for the prototypical features, with an immediate scope that is quite closely aggregated. However, as per Prototype Theory, it is expected, that there will be graded boundaries, and so the typicality scope will extend to embrace multiple other features, until we reach the utter outlier features that may even sit better within the scope of a peripheral concept, like meaning. This may be represented by concentric circles outwards from the prototype, like ripples in a pond or the various orbits of the planets around the sun.

What is more important still, is that the features that are contained within the immediate typicality scope of the prototype of language are also the majority of the largest globes, which individually represent the feature's higher typicality within the sampling procedures. Just because features cluster, it does not mean that this is necessarily indicative of a prototype and thus a concept. The cluster also needs to coincide with a strong feature weighting, otherwise the cluster could be construed as little more than coincidence, infrequent, and therefore relatively inconsequential to determining what counts as language.

Thus, as a combination of the cluster of features, and those features being fairly frequent in themselves, we can confidently conclude that the prototype of language sits in the centre of this cluster and conceptually encompasses these features. Should there be outliers with a high typicality level, the typicality scope, and thus language, may be deemed to be broad in scope, incorporating more features than may have been anticipated if the literature is anything to base such a conclusion on. Yet, even in this instance, we could still determine the central most typical cluster of features to be the scope of the prototype.
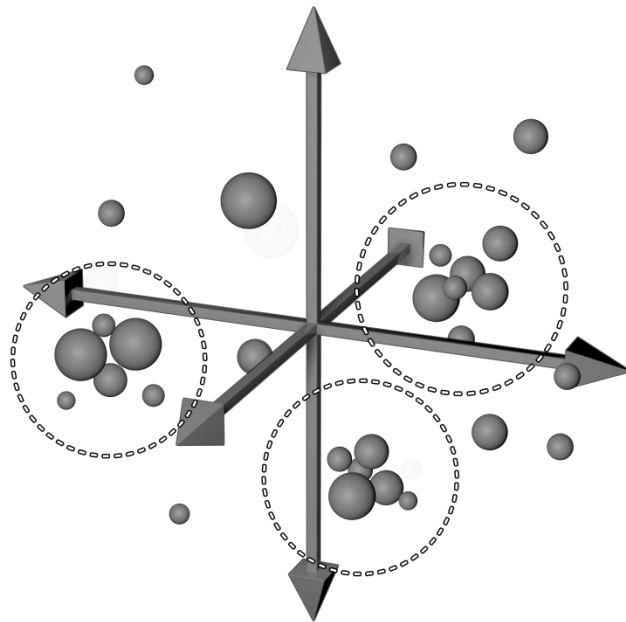


**Figure 21**: Graphic representation of potentially multiple language prototypes emerging following the plotting in of proposed and weighted language features

However, we cannot know what the ultimate model will look like until all the features have been plotted into the framework. We cannot know, as with Figure 21, if there will even be multiple clusters of typical features that emerge from this method. In this case, we might need to say we have different prototypes of language, or we would need to determine which of the clusters best suits the prototype of language and which concepts the other prototypes belong to. It may be these are newly discovered and/or recognised and may need new labels, or they are part of the already present conceptual network. In either case, discovering two or more clusters would still help us to reduce a broad umbrella term of *language*, which as

Chapter 4 demonstrates, could conceivably incorporate multiple to infinite features. Moreover, we can still be cognisant of the clear overlap between concepts across multiple features simultaneously.

Alternatively, we need to consider seriously the potential for multiple language concepts, as touched on in Austin (2021) and in discussion with one of the examiners of this dissertation (Wacewicz). As explored in Chapter 5, often the way in which language is discussed is in terms of a single entity, almost a reified thing. However, as Chapter 4 demonstrated, the term, if not the concept, of *language* involves a large volume of disparate phenomena. Thus, we need to consider the possibility that we might end up with multiple 'language' concepts, and therefore multiple prototypes, such as Language 1, Language 2, and so forth, before we even factor in non-humans. Perhaps this may be one of the reasons we have struggled with comparative analyses so far.

Then, when we really factor in the third and fourth dimensions of this framework, we need to consider the graphic representation more carefully. For instance, from an initial feature plotting, we may have one prototype model as a result. However, once we factor in that certain features are located differently in another context, for argument's sake a handful of features are more communicative than cognitive when in a group danger setting as opposed to a problem-solving setting, we might end up with two versions of the prototype model: one for each context. Then, when we factor in the dynamic dimension, perhaps one of the features not only adapts to different contexts. Perhaps it adapts over time, whether from millennia ago, or simply with societal change, and we may end up with three or more versions of the prototype model based not only on contextual variation but change over time too. This could potentially yield other models for hypothetical features. Lastly, if one subscribes to the notion of language as a process rather than reification as well, we would additionally need to factor this into the framework, as an addendum to the model, to account for the feature interactions, their impact on language's activities, and any (sequential) ordering for a full picture of language and how it operates. Again, much of this remains hypothetical until we begin applying the framework empirically.

To come back to the species distinction at the heart of this dissertation's considerations, it may be that one of two or more such overlapping clusters/prototypes includes non-human communication and cognition as opposed to language, if the feature annotation so demonstrates. This would be indicative of a 'difference in type' as mentioned earlier, rather than a 'difference in kind' or 'degree' as Darwin put forth. Instead, it may be

that some non-humans' communication and/or cognitive instances can be scoped in with some humans and their languages into one prototype, and other animals and other humans' languages fall under a different but close prototype. However, any such multiple prototypes and the concepts they would represent would be separated by graded not absolute boundaries, with features shared between them. So, in this vein, one hypothetical outcome, taken from Amphaeris, Shannon, & Tenbrink (2022), would be one prototype incorporating Indo-European languages as well as features of vervet monkey or Gunnison's prairie dog alarm calls, in which inflectional morphology conveys meaning. Another prototype might exist for languages or non-human communication instances that convey meaning more so through context based pragmatics, like Riau Indonesian (Jackendoff & Wittenberg, 2014) and primate gestures (Hobaiter & Byrne, 2014). Such separate but overlapping prototypes would need to be analysed in order to appropriately label and study them. Perhaps a new term like 'languoid' (Cysouw & Good, 2013) would be appropriate, introduced for a 'language-like entity' to account for the vast variety of language-like entities among even humans, but which could be adopted for non-humans. If there were multiple evolutions of language, this too could yield multiple prototypes. The key point to raise is that there may be no simple *distinct*ion made between species, whether as a clear divide or as a linear continuum with a break in it. Rather, it is posited, along the lines of the gradualistic tendencies of Prototype Theory in itself, that there will be an overlap between features of non-human communication and cognition and language. But how close this overlap is will be determined through theoretical expansions and empirical application of this framework. Data collection can be carried out for additional features especially amongst non-humans that might have been missed, once their communication and cognition showing overlapping features attract more credibility to be explored further.

Following the final assignment of whatever the prototype of language will turn out to be, the real world instances of the prototype and its features can be termed the *prototokens*, by analogy with the type/token distinction in linguistics, as with the phoneme/allophone distinction in phonology. So for instance we might have the feature repetition in some communication and languages as reduplication, a prototoken of repetition, and elsewhere in the prototoken form of emphatic iterated alarm calls. We would look at the feature assemblies of the various recognised languages and non-human communication and cognition instances to see which encapsulate (the majority of) the prototypical features of language. So, for example, if French and a particular non-human's alarm signals both exhibit repetition and this

is found to be one of the prototypical features of language, both French and that species' alarm signals could be termed as prototokens of language, specifically its repetition feature. They would be more pertinent prototokens if they incorporated a number of the prototypical features. Just how many prototypes and prototokens there are depends upon the focus of study and the findings across species respectively.

### 6.5.5   Hypothetical Example of Applying the Framework Procedure

To take this outline procedure a step further, to demonstrate how researchers could implement the theory, a hypothetical example will be presented with a fictional instance of the potential empirical application of the theory. While, the prominent aspect of this dissertation's contribution is the very use of Prototype Theory as applied to the problem of what counts as language and how it relates to non-human communication and cognition, a hypothetical example helps elucidate the theory.

The first step is feature identification and selection. We can and should include both communicative and cognitive features, like assenting, which can be achieved verbally or behaviourally, as in the quorum voting of African wild dogs (Walker et al., 2017), as well as features like displacement that can be demonstrated as much through the mental time travel of wild great tits choosing spring breeding sites to stay close to their winter flock mates (Firth & Sheldon, 2016), as through communicative reference to external food sources like the honeybee waggle dances (von Frisch, 1967). For simplicity, we will keep to a communication example only for now. Equally for ease of explaining the method by example, we will take a feature that has already been identified in a relatively uncontroversial manner across both recognised languages and non-human communication: *deictics*. These are words, phrases, even gestures, that refer to a specific time, location, or (in)animate object. This includes human pointing gestures or words like *tomorrow* or *that*, or the way in which grouper fish and coral trout frequently point out prey hiding in crevices to other local predators with vertical headshakes and a horizontal 'shimmy' to recruit hunting assistance (Vail, Manica, & Bshary, 2013), or the way in which non-human apes show objects, display themselves, or direct scratching during grooming by another conspecific, which are underappreciated forms of non-human deictics and joint attention (Leavens, 2011).

The next step in this method is to select a sample of languages and non-human communication and cognition to investigate. Empirical sampling procedures, including

ensuring a sufficient sample size, should be followed. For now, we could take a five-minute audio-visual recording of the communicative behaviour across modalities of groups of humans, grouper fish with the feature identified, as well as other species across a set number of contexts.

We should compare as best we can with equivalent contexts, such a hunting/military setting, but also we have to rely on the data we have available if we are not collecting for the purpose of applying this theory. Moreover, we need to consider that this method's purpose is not just about assessing the presence of a feature in the communication of various species, but how often it occurs in natural language too, an aspect not always accounted for. For instance, recursion has been discussed multiple times in the literature as being important in language in at least the narrow sense (Hauser, Chomsky, & Fitch, 2002). However, we need to avoid involving judgements in this exercise and simply work to quantify the features systematically and objectively.

In an effort to represent the prominence of the recognised languages over the communication systems of other species that we are still evaluating, we can retain a human majority across any sample group, such as a 60% occurrence rate: here, for the investigation of deictics, we could take English speech samples, human military gestures, and samples from the Aymara tribe which have cultural variations with deictic temporal relations as discussed in Chapter 4 (Evans, 2013; Núñez & Sweetser, 2006). These could be compared against grouper fish hunting interactions, and honeybee waggle dance communication that describes the way and distance to, as well as quality of, food sources.

Once we have the samples, we need to break the communication down into units, where a unit can be considered as a meaningful element of the communication. For instance, we can separate out deictics as the pointing gesture or words that function as pronouns. As another comparable feature, if we look at morphology, we can break words into their roots and endings that will change the meaning of the root word, as with the agentive suffix *–er* that turns a verb into the person who does that activity: *build* to *builder*. Otherwise, we might need bigger units for a different feature like identifiers: words/gestures that constitute names, pronouns, gestures to represent a specific person, and so on.

Following the distinction of the different units, we need to tag each of the units for whether it exhibits the feature in question, like deictics here. To interpret whether the feature should be tagged or not, we may need to use what is known of a wider data range beyond the sample and also intuitive inferences, though it is important for the scientific method that it is

noted in the metadata how and why units are tagged for specific features. For deictics, we could look at specific gesture/word/signal that corresponds to the 'pointing' aspect of the scenario.

After all the tagging has been completed for the feature in question, we can calculate the percentage of units that were tagged out of the total number of units for each dataset in the whole feature sample. For argument's sake, let us arbitrarily say that of all the English samples 40% of the units were tagged for deictics, the Aymara samples were tagged for 50%, human military gestures 80%, grouper fish interactions 60% (though only in the one hunting context), and honeybee communication 35%. Though we can and should study the species variations, so that we take an average across all the human datasets and a separate one across all other species to plot in and compare against one another and see how close non-human communication and cognition really gets to languages, (and we could even drill down still further to lead to a prototype of each individual language and other communication systems and cognitive behaviours), we also want to determine the overall calculation as the average across all the samples from the perspective that we are looking at language as having some type of relationship with non-human communication and cognition. So, all the data must be factored in to determine the nature of language and not just the nature of language as seen in languages recognised so far. Therefore, in this hypothetical example, the average across the whole sample of recognised languages and non-human communication and cognition would be a 53% frequency of deictics within the communication across all of the species sampled. This gives us a half-sized globe to plot into the framework, given that deictics are fairly common in communication across species.

The next step in the method is to plot the feature in relation to the four dimensions, which is independent of collecting samples. Given that deictics are quite obviously experienced in the world and in the communication across a number of datasets, we can plot the globe fairly close to the basic level line in the vertical dimension, as deictics do not appear to be too general and therefore superordinate in relation to world experience. As deictics occur more in a communicative sense than a cognitive sense, we would plot them to the right of the framework in the horizontal dimension. In this instance, we will state that, on the whole, context does not seem to impact much on the feature, nor do deictics connect much with neighbouring concepts like meaning, except for pointing to referents in a meaningful way. So, as regards the third dimension, again we would plot the globe close to the centre point of the z-axis. We also do not need to factor in much change as deictic communication is

quite longstanding in recognised languages and other species' communication systems, while deictics would usually occur in situations of reference, without much variability of context, so the dynamic dimension does not need to be invoked here. If this had been different, such as for a feature like inflection, depending upon the type of change – greater or lesser typicality over time for instance – we would either plot two different sized globes as layers or we could create multiple versions of the framework graphic, each with the different sized globe for that feature. However, this latter option certainly could become cumbersome without a computer program, depending upon how many different features variations there could be.

Once we have plotted this deictics feature, we would repeat the process for any number of other features and/or samples that we have at our disposal, and the eventual aggregation of frequent (large-sized globe) features would give us a clear indication of what the overall prototype of language would be. It may be that fresh data is not needed, because of the breadth and depth of studies on languages already. However, the processes of selection, quantification, and plotting all still need to be carried out somehow, plus we need to be observant of new features that may emerge from both human and non-human studies that would need to be included too. This could well be the case with ever more digital technologies and artificial intelligence supporting such exploratory research into non-human communication (Bakker, 2022).

Theories often require a name for ease of reference, and given that Hockett was the last researcher to seriously draw systematic comparisons between language and non-human communication, and provided key insights, the framework described here could be labelled as Hockett 2.0. However, Hockett's works have been refuted in terms of his list approach, the features themselves, the need to justify the language features proposed, his focus on only differences and not similarities too between language and non-human communication, as well as the need to test out feature typicality and move past researching via intuition alone, as occurs too often in linguistics (Dąbrowska, 2016). Therefore, I will opt instead for the label of '4D graded language framework'.

## 6.6    Caveats to Applying the Framework in Non-Human Research

It is important to bring some key caveats together for applying this framework and procedure to non-humans. These caveats have been touched on throughout the work, but they have been aggregated and highlighted here to provide some major ways in which we can

reduce the bias of our inherent and unavoidable humanocentric vantage point. Instead, this work aims to encourage an open-minded and fair approach to the study of what counts as language and the integration of non-humans into that concept and discussion. As such, we need to consider their various ecological niches, evolutionary development, as well as their own biological and cultural solutions to life's problems.

Firstly, we need to actively acknowledge the possible variations across species. This begins with retiring the collocation and associated composite concept, *animal communication*, as discussed in Chapter 1. We cannot stipulate that either all non-humans do or do not have language, especially before carrying out the empirical research encouraged in this work. Different species, even different individuals to be completely thorough, need to be examined separately, in the same way that we might approach their behavioural traits, physiology, and habitats. We also need to approach and apply the potential linguistic features carefully. We cannot assume there is continuity or no continuity – the whole purpose of the framework proposed is not to assume anything at all, but to investigate inductively and quantitatively. We must also consider that some/all species (including different human cultures) may exhibit the selected linguistic features with different forms, functions, with same or different developmental means and processes, and with differing degrees of prevalence, from no trace to frequent instances. To avoid both false-positives and false-negatives when making comparisons, we also need to consider phylogenetic relatedness, as well as the potential for convergent evolution, in which features can arise without connection in unrelated and/or geographically disparate species. There may even be additional features that are not seen within recognised languages among humans but are considered to be important to add to at least the periphery of the language prototype's scope, given their hypothetical prevalence among other species. It is important to add this point as, while it comes via the perspective of some degree of anticipated continuity across speciesm, with respect to language and its evolution, which may be challenged, it also constrains a humanocentric perspective that is equally challenged, certainly in the ethology literature.

Additionally, terminology again needs to be considered carefully in terms of taking care over comparison equivalences. As mentioned earlier, if a linguistic feature and its label are already established across the literature, like *displacement* is discussed across species, we can maintain this terminology for ease. However, where there are disparate approaches to features across species: their scope and their labels, we may need to improvise, as proposed in Hebets et al.'s (2016) systems approach. So, for instance, this work employs the term

*repetition* instead of *reduplication* or other types of repeated or *redundant* communicative units, in order to be more generalisable.

Aside from neology, we need much more detailed exploration on the identification and selection of features too, hence the detailed outline of this step in the procedure earlier in the chapter. For instance, some concepts and features are too broad to be useful or applicable comparatively, including but not limited to *cognition*, *communication*, *context*, and *consciousness*, some of which have been partially analysed to a degree in this work, but would benefit from even greater analysis to ensure all details are captured and categorised effectively (e.g. Montemayor, 2021 on types of consciousness). We also need to ensure that fair comparisons across species are made. It might be that each relevant concept requires its own prototypical description. In any case, such detailed exploration will enable us to establish and agree upon the scope and details of a particular feature, before we investigate its typicality in communicative and cognitive instances of various species. Using the prefix *functional* does not preclude any of these terminological problems, so I would encourage it to be retired.

Another way in which we need to carefully consider species comparisons for what counts as language is how both language and the various species themselves have evolved. As noted in Chapter 1, evolution cannot be viewed teleologically, as some type of act of design and with humans at the apex of a simple linear continuum, for example as *animal communication* up to *human language*. Biological evolution is about an individual and group's adaptive fitness to whatever niche and circumstances there are, and as these change over time. For instance, in some circumstances it pays to be more competitive, while in others to more cooperative, so aggressive behaviour may be increased and selected for or decreased in different species or different locations even. Another instance would be how feeding hours vary, so that for example birds and bats are not competing for the same insects in the vicinity at the same time. There is no predestined reason for these adaptations. This is simply biology, both in terms of behaviour and genetics, adapting around the circumstances that are often externally determined by factors such as weather, group size, or habitat destruction. So when considering language and its various features, we need to consider the adaptive fitness value for whichever species we investigate. We need to determine not just a feature's presence and typicality level objectively, but its form, function, causes, outcomes, and any variations thereof in relation to the ecology of that particular species. Volume intensity in communicative signals might be generally much less typical of a prey animal, for instance.

However, this does not mean that the feature of volume intensity is not a typical feature of communication and language, nor does it mean that this species does not exhibit (features of) language, but that this particular species does not want to advertise its presence to predators.

We also need to consider signalling theory, as raised in Chapter 3, but which needs more extensive and explicit treatment here to assist with establishing fair comparisons across species, but also to assist with establishing additional factors that will shape how we seek out the prototype of language. Put simply, signalling theory is a body of theory and detailed discussions that consider the adaptive environment shaping the evolution of both animals and the way in which they communicate, especially but not exclusively non-humans. The body of theory considers the question of honest and dishonest signals and their impact on both signallers and those to whom they are signalling. Cooperation and exploitation functions are discussed and debated. The purpose of signalling is also considered, for sharing information, behaviour manipulation, social cohesion, or some mix thereof. This is all studied with a view to establishing the adaptive fitness benefits to signallers and signal perceivers: in short to determine why certain signals, communicative behaviours, and species persist throughout natural and sexual selection as opposed to others. Hence the proposal that Krebs and Dawkins (1984) make in their classic text on this subject: that the manipulation by one party in a social interaction is matched by the development of 'mind-reading' in the other party. The recently published comparative framework on the multifaceted nature of meaning explores all these issues and links in depth (Amphaeris et al., 2023).

Thus when comparing species and their communication, we need to consider several additional factors. For instance, the notion of signalling being inherently honest without manipulation amongst non-humans derives from the fact that there are always costs incurred by signalling, especially for deceptive signals where they are not successful at deceiving others (e.g. Akçay et al., 2013; Searcy & Nowicki, 2005). Moreover, certain game theorists argue that the content or meaning of a signal derives specifically from contexts of collaborative common interest (Skyrms & Barrett, 2019), explicitly as honest signalling, even for humans. Thus, we might anticipate that the majority of signals are intended to be honest and transparent for adaptive fitness reasons, thus questioning Hockett's language design feature prevarication as a core feature of language, certainly without quantitative research to confirm this.

This prevarication feature becomes ever more questionable when we factor in the arguments for a distinctive cooperative quality that humans and their cultures possess that

could be tied up with language evolution. Von Heiseler (2022) argues for a unique two-level evolutionary system in which language and cooperation co-evolved in humans in East Africa, through the development of sensitivities to individual contributions to the group. This apparently translated to reproduction, and selection operating on the different concurrent equilibria. Heintz and Scott-Phillips (2023) argue that human communicative/linguistic productivity, or 'open-ended' expression, derives from interrelated cognitive capacities, which lead to the functions of expression and recognition of informative intentions. They argue that these capacities are based on pragmatic foundations, and the capacities serve to 'unleash' humans from narrowed communicative systems that are based on mutual benefit. This latter point rests on the assumption that for communication to be stable, it must be mutually beneficial, on average, to both signallers and signal perceivers. The authors argue that only humans have evolved beyond these biological and ecological constraints, to be able to discuss anything in the world or our imagination, alongside being able to engage in joint action, teaching, and producing art. These cognitive capacities have apparently come about because of humans choosing their own partners.

However, as already discussed throughout this work on the explorations of non-human pragmatics for instance, as well as the section on cooperative mutualisms, non-humans can (to some degree) share allegedly human features, and are certainly evidenced to be cooperative too. Moreover, again it does pay in some circumstances to be more cooperative than competitive, so it would be illogical and counter to the literature too to assume that only humans can be highly cooperative. If for no other reason, the number of wars in living memory that have threatened the existence of a large portion of the planet's population demonstrate how decidedly uncooperative humans can be. A flippant point, perhaps, given the advanced level of cooperation required to engage in organised warfare. However, the salient points here are that conflict occurs in nature as much as cooperation, if not more so, and that not only humans are capable of cooperation.

Furthermore, we need to be clear on the different types of cooperation that exist, and how that informs our view on all of these aspects. Only a small level of cooperation is needed to establish a convention, such as a signal for starting a war with someone, whereas high level and mutually beneficial cooperation might well be required to come to a truce with someone. Cram et al. (2022) have created an evolutionary conceptual framework for human-wildlife cooperation and competition that could be useful here to extrapolate to all intra/interspecies interactions generally. Their framework explains that *competition* is the state of parties being

opposed to each other's interests: in lay terms, one party will win and the other will lose, such as theft of resources that the authors term *kleptoparasitism*. *Commensalism* arises where one party benefits from a situation but with no net impact on the other party, such as scavenging by one party without any key food resource loss to other party. *Neutralism* occurs where parties interact with no effect on one another at all, such as hunting in the same area but without impacting on each other. There can be *mutualisms* where both parties benefit from passive cooperation. The authors give the example, prior to the emergence of human-honeyguide active cooperation (Spottiswoode, Begg, & Begg, 2016), that a honeyguide bird's presence around a bees' nest may have cued the human honey-hunters to that source of honey, and once the humans had removed the honey from the hive, the birds would be able to feast from the leftover wax. Such passive mutualisms can develop into actively *cooperative mutualisms*, in which parties like the honeyguides and humans actively coordinate their behaviour to collaborate for a mutually beneficial outcome. Therefore, whenever we discuss cooperation with respect to the development of linguistic conventions or the evolution of language more generally, we need to think more carefully about which type of cooperation might be needed.

For instance, one of the assumptions that Heintz and Scott-Phillips' (2023) work above rests on is that communication systems, especially that of non-humans, must be mutually beneficial to subsist. However, it is possible that there could be commensalism involved, which has no impact on the perceiver of the signal at all, neither negative nor positive. Meanwhile, Krebs and Dawkins (1984) have argued that the majority of signals are actually more likely to be given in a competitive context. So how 'leashed' non-human communication really is can be debated. Moreover, perhaps it should be subjected to the quantitative study methods proposed earlier in this chapter.

We also need to consider the impact different types of cooperation and competition will have on the signals/language being developed themselves. Krebs and Dawkins (1984) posit two types of evolution will lead to different types of signals, for instance. If signal perceivers benefit from the signal and respond in line with the signaller's interests, we could see heightened sensitivity to the signal leading to a reduction in amplitude (intensity) and conspicuousness of the signal, also reducing the signaller's costs. For instance, gossiping whispers might arise, though signals need to be detected to be successful at conveying information, manipulating behaviour, or creating social cohesion. Still, there could be a

comprise reached between economy and detectability that would not be expected where signals are produced for competitive functions, like guarding territory.

Therefore, signalling theory shows how many different viewpoints there are on the capacities of non-humans and the story of communication and language, to substantiate once more the need for the inductive framework presented throughout the earlier parts of Chapter 6. Signalling theory also impacts on this framework. The discussions provide additional potential features to weigh and plot into the framework, like the volume or, from a more modality general perspective, the intensity of a signal. We can also consider exploring honesty and dishonesty, signal expressivity, and economy, for their typicality across communication systems and languages. Even more impactful, signalling theory highlights that we need to add cooperation and competition as regions of the third spatial dimension when plotting features. This ensures that we consider Tinbergen's (1963) four questions for studying animal behaviour, especially the function (survival value), and evolutionary history. As Krebs and Dawkins (1984, p.391) put it, there are both phenomena to consider: an 'arms-race coevolution' and perhaps a less frequent but equally important 'coevolution arising from mutual cooperation'.

Such competition or cooperation can occur non-communicatively too of course. It is, therefore, necessary to reiterate the fact that we need to be exploring non-human cognition as much as communication for possible links to language. Therefore, as addressed earlier, we can consider 4E Cognition perspectives on the dynamic interaction of the brain, body, and environment (e.g. Newen, Gallagher, & De Bruin, 2018). We can also explore non-verbal continuities across species, such as aspects of body language, problem-solving techniques that demonstrate the structure of cognitive processes, or social interactions suggestive of comforting conspecifics for instance.

This brings us to the fact that we need to consider cultural as well as biological evolution, which has been the main sense whenever evolution has been raised in the dissertation so far. Cultural evolution is becoming more of a focus in research, and as such is a complex topic yet to be fully understood, but offers promising insights on the dynamic interchange between cultural and biological factors on language change (c.f. Nölle, Hartmann, & Tinits, 2020 for more detail on the state of the art). For one example, there is an argument, on the basis of computer simulations, that language use and development does not arise from natural selection and genetic encoding, but through cultural evolution (Christiansen, Chater, & Reali, 2009). This is because language changes far more rapidly than the process of

biological adaptation, though it is still subject to some biological constraints like cognitive limitations and contextual variations. This cultural evolution argument has been supported by more recent laboratory experiments, with the addition of arguing for language's adaptation for the purpose of balancing expressivity and learnability (Tamariz & Kirby, 2016). However, it is also important, when factoring in such approaches, to note that these researchers have themselves already taken an assumptive view of what they determine language to be or comprise of, such as these references focusing respectively on language structure and Universal Grammar; or productivity, combinatoriality, learnability, and expressivity. Both articles also take the explicit perspective that language is unique to humans, without any consideration of research that might challenge this view. Therefore, not only do we have an added dimension to the story of language, that of cultural impact, as touched on in Chapter 5, and expanded on here in the capacity of evolution. We have also witnessed in these articles the types of linguistic assumptions we need to be wary of, as addressed in Chapter 1, when applying the framework to non-humans.

This section has discussed the importance of examining human/non-human comparisons to ensure we establish fairness of treatment, alongside the importance of considering the various impacts of both biological and cultural evolution across species, and exploring both communication and cognition when applying the 4D graded language framework to non-humans. This also encourages us to seek out more than a list of features, and to follow the guidance of the Knowledge Approach from Chapter 2, to understand why language is associated with particular features and how those features might interact to yield language. This will give us a much clearer conceptualisation of language and how it co-exists with other species. However, alongside the inductive framework presented in this chapter, the next and final chapter makes explicit my thesis, integral for a PhD dissertation, which has emerged from this research – the concepts and evidence assessed. I hold that the inductive framework and procedure will show there are continuities across species with respect to language, but more in terms of (certain of) the features themselves, rather than necessarily in terms of an overall concept of language, or a species-only analysis. This means that it is equally possible, though perhaps not probable, that humans may not (always) exhibit the most prototypical features of whatever counts as language, while some instances of non-human communication or cognition might be very prototypical of language.

**Chapter 7 Conclusion**

**7.1    Dissertation Summary**

This dissertation has focused on the problem of the lack of an agreed upon conceptualisation (more commonly definition) of language and the associated issue of how to integrate what we know about non-human communication and cognition into a concept of language. The Introduction set out the main objective to approach these problems from a methodological perspective, in order to work out how we might resolve these problems. As a starting point, the chapter challenged the common sentiment that language is unique to humans, most obviously represented in the literature by the frequent collocations, *human language* and *animal communication*. The Introduction also challenged the two repeatedly proposed views to explain this relationship between language and non-human communication: that of a strict divide, or a linear continuum with humans at one end and non-humans at the other end. All these perspectives were challenged given the growing understanding of non-human capabilities, in terms of both how they communicate and their cognition, which are increasingly comparable to that of humans. The perspectives were additionally challenged by the need to explain the evolution of language without too much reliance on a sudden emergence of this complex phenomenon. As such, not only does treatment of non-humans require a more considered comparative framework, to allow for greater complexity than previously anticipated, and to allow for similarities as well as differences, but a focus on non-humans highlights the gaps in our understanding of the nature of language. If we do not know what language really is, that impacts on our study of it, hence Saussure's (1966) call for us to focus linguistics on the nature of language per se.

In answer to these issues raised, then, the dissertation focused on how we might approach these issues methodologically. Chapter 2 considered multiple ways in which we might be able to define or rather conceptualise language, by exploring categorisation options, from Classical Theory, and Prototype Theory, to the Knowledge Approach. Prototype Theory offered the most benefits, while also presenting the fewest problems in how we might conceptualise language. This theory also led to the reframing of the question from 'what is language' to 'what counts as language', to make the concept more accessible and easily conceptualised, as well as to encourage a more quantitative approach to language's description than before. The theory additionally offers a third option for accounting for the

possible relationship of language and non-human communication and cognition: a 'difference in type', if they do not actually all come under the same category of language. It was also determined that language sits in a taxonomical arrangement, or vertical dimension, at a lower and more specific level with respect to more superordinate general communication and cognition, as per Prototype Theory. This point also allows us to assess non-human communication and language on an equal footing, as they both derive from the same superordinate level concepts. Furthermore, we should be exploring non-human cognition as much as non-human communication for signs of language, given that both these general phenomena support language. Finally, Prototype Theory helped to frame this dissertation's structure in terms of the different dimensions involved.

Chapter 3, for instance, focused on the vertical dimension of the theory and how that highlights the necessity to establish the level of discussion at which language is being considered, so that its foundational aspects, like theory of mind and the influencing of behaviour or transfer of information, are not coalesced into a description of what counts as language so much as what it needs to function. Whereas a feature experienced in the world, like speech/signal volume modulation to increase one's sound in a noisy environment so perceivers can hear better (Lombard, 1911), or a speech act (Austin, 1975) to do something with our words like pronounce marriage, could well be features that might count as language per se. The chapter also highlighted the importance of studying both cognition and communication, given that a blend of these two phenomena might have led to the origin of language, though this view is subject to the outcomes of the feature plotting and what the eventual model reveals about the nature of language in the present day.

Chapter 4 then focuses on the horizontal dimension of Prototype Theory, to explore more of the basic level features as experienced in daily life, as more specific than general communication and cognition features, as well as those features that emerge in the interdisciplinary literature on what counts as language, including (centre embedded) recursion, symbolic signs, and repetition. The chapter also highlights some of the research areas that involve potential interpretation dangers, like formalist syntax or dialects, where other disciplines adopt and apply traditional linguistic perspectives without any delving into the nuances or different perspectives, making it important to streamline a linguistics approach across disciplines and species, as well as to show how linguistics variations may become more unified.

However, Prototype Theory and its two dimensions alone cannot account for all aspects of language. Therefore, Chapter 5 explores an expansion of the theory with two additional dimensions: the spatial and the dynamic, by analogy with the four dimensions experienced in the physical universe. The spatial dimension factors in context and culture that impact on language, spatial semantics that sign languages make use of, as well as a network of equivalent level, related, but separate concepts, like meaning. There is also the need to consider how language is dynamic and changes according to context, as well as diachronously, if we do not conceptualise language as more of a process, a verb, than an entity, which inherently involves change. Chapter 6 draws all these insights together to present a new 4D graded language framework, the basis for an ultimate model of language (if there are not actually multiple concepts using the same term). This will close the gap of a language conceptualisation, while fitting the facts of findings from philosophy, to linguistics, ethology, cognitive science, and anthropology. This includes a section on some key caveats for applying the framework to non-humans.

As a result, this dissertation presents a multidimensional framework of language, with graded boundaries between levels and equivalent related concepts, while the features of language are anticipated to have greater or lesser typicality based upon which language or non-human communication/cognition instance one studies. This approach conceptualises the relationship between language and non-human communication and cognition expressed in terms of an overlap with multiple feature continua, rather than a simple species difference. Just how great this overlap turns out to be will require further theoretical expansion and empirical investigations using this framework and the outline procedure presented in Chapter 6, while further investigations will also help to determine what the overall prototype of language will be, including its characteristics, and key exemplars, like Aymara and prairie dog communication for hypothetical example.

## 7.2    Dissertation Limitations

Given that interpretation often plays a crucial role in presenting – even shaping – fact (Tannen, 1998), and that any resulting theory '*depends* on the researcher's view; it does not and cannot stand outside of it' (Charmaz, 2014, p.239), it is critical to be as clear as possible not just about the project's overall intentions, methodology, but also its limitations.

A key limitation of this work is that it is theoretical, though it includes procedural guidelines for empirical research to follow, including quantifying the feature weightings across species, to accurately gauge how central or peripheral they might be to a prototype of language. The prototypical framework may also require improvements and embellishments following theoretical expansion and empirical application. As Bickerton notes (2016, p.2) 'the explorer is seldom the best cartographer'.

Moreover, it has simply not been possible to exhaustively and systematically review all the possible literature. Instead I have had to rely on well-cited literature as well as texts discovered through the search methods listed in the Introduction, key historical moments and theoretical breakthroughs, as well as prominent language and other conceptual models. This means that the literature, as a dataset, needs to be examined even further in the stages of research to follow this dissertation. However, the 4D graded language framework presented here is not meant to end the discussion of what counts as language and which species has it, but is conversely intended to re-energise this discussion that died off somewhat during the middle of the last century.

In terms of topics, artificial intelligence research has been discounted from this study in order to, on the one hand, limit the study, and, on the other hand, focus on natural language and communication as it has evolved and is currently used without manipulation. Similarly, the dissertation did not delve into the ontogenetic (lifetime) developmental aspect of language, since the dissertation focuses on accounting for the nature of language, not the nature of the development of this phenomenon. Again, this could be another avenue of research on the basis of the framework presented in the penultimate chapter, although even for other species the outcome could go either way, as there may be a critical period for passerine bird song adoption (Leppelsack, 1986) suggestive of innate language, but vocal learning as with mice (Arriaga, Zhou, & Jarvis, 2012) pointing to a tabula rasa approach.

From a theoretical perspective on this dissertation's limitations, one could consider, for instance, Ockham's razor, and state that the creation of a prototype of language with graded boundaries moves away from the simplicity and neatness of a classical definition, while invoking too much plurality: 'just moving the goalposts for what we call language' to quote a tutor mid-banter. However, Ockham's razor aims to guard against plurality or complication beyond necessity. As Krause (2012) states, defining simplicity can be difficult and so bring into question the value of Ockham's approach, giving an analogy of water running downhill in a meandering path instead of the straightest line from A to B because of

the reduced energy required to forge the path. This is not even to raise the questionable provenance of the theory. Yet the theory still holds weight and must be considered when assessing the value of the framework developed in this dissertation.

## 7.3    Dissertation Contributions and Thesis Statement

The theoretical 4D graded language framework developed here provides many benefits in different ways. The framework could offer assistance with unresolved issues in linguistics, from working towards an understanding of the adaptive purpose of language, its origins, and so on, once we have established what the nature of the phenomenon really is. It could help, for instance, with how we count the total number of recognised languages and dialects of the world (c.f. Tamburelli, 2021).

Could this framework help us to decode the world's currently inaccessible languages, like the undeciphered glyphs of Rongo Rongo of Easter Island, too? Currently, there is insufficient data to pattern find within the extant texts of Rongo Rongo, as led to the decoding of Linear B from ancient Greece, nor is there a Rosetta stone that would enable comparative translation, which are the two major methods of deciphering unknown languages (Robinson, 2002). Instead, if we had a clearer understanding of the types of features that language typically has, from repetition to morphology to a roughly equal amount of symbolic and iconic signs, for instance, we could apply these perspectives when attempting to decode languages that have remained a mystery until now. The framework also offers the opportunity to advance non-human communication and cognition in relation to its comparative study with language, by not only providing a comparative framework but providing justification for recognising the value of the non-human findings and their theoretical comparison with language.

This dissertation's coverage has necessarily been broad in scope in order to factor in the range of crossover findings and theories, and to build a unifying coherent framework that can be used across species as well as disciplines, so that these diverse findings become complementary rather than competitive. This framework also allows us to discern if any key gaps in the language scholarship remain, once the framework has been completed. As Wacewicz et al. (2020) note, one key benefit of a framework approach is the avoidance of setting down a particular theory as the correct explanation for and description of language to the detriment of other insights. Thus, this integrative framework avoids academic alienation,

as well as helps to encourage more inductive approaches by quantifying language features in terms of their typicality.

While a big picture approach was necessary to create the 4D graded language framework, it is important that the next stages of this research return to specialist areas with narrowed foci, to discern the appropriate features to be best plotted into the framework, including considering any features that have not yet been raised as potential linguistic features in either recognised languages or non-human communication. In this way, the framework facilitates greater interdisciplinary research, with a streamlined approach and potential terminology, and by providing research opportunities across disciplines, from feature identification to sampling and weighting, as well as creating the need for a computer program to store and analyse the data and present the model in graphic form.

Most notably, this dissertation innovatively re-approaches the question of the nature of language through the perspective of Prototype Theory, while providing graphic visualisations of the framework proposed for greater accessibility to the concepts discussed. The resultant cluster of typical features that language's prototype may have – which could be arrived at via methods beyond the ones presented here – will indicate clearly what counts as language, stepping away from the diffuse picture we have of the phenomenon currently. This 4D graded language framework also explains, for the first time, how we can integrate non-human communication and cognition into the discussion within linguistics, with an overlap of comparable features, as opposed to relying on species distinctions to attempt to describe the concept. Multiple simultaneous equivalent level feature continua are based on observable typicality and replace just one static and strict definition or criteria list, as found in Classical Theory, or a simple species apex. This enables more flexible comparison across recognised languages as well as species, while also reflecting psychologically real categorisations based on graded typicalities. Prototype Theory additionally allows flexibility to add new features as we come across them, without radically altering the conceptualisation of language as a whole.

Therefore, the approach based on Prototype Theory answers the challenges set by the 'difference in kind' and 'difference in degree' views of the relationship between language and non-human communication, by allowing for a difference between features, if not also species, but in (multiple) continuous terms that align with gradualistic evolution, given the theory's categorisation via family resemblances and graded boundaries. However, it must be reiterated that the actual details of the ultimate language prototype can only be ascertained after features have been explored carefully, and also more data across species has been collected and

incorporated into the framework. In this way, the proposed framework transforms a philosophical discussion into a quantitative operationalisable endeavour.

In terms of an anticipated answer to the research question of how language can be most effectively conceptualised in terms of its co-existence with non-human communication and cognition, or my explicit thesis statement, I suspect that, ultimately, there will be a strong overlap rather than a gap between the phenomena. However, it is not yet possible to say whether the phenomena end up coming under the scope of one concept of language, or whether some species will and others will not, or whether the two phenomena will only share some overlapping features and there will remain a species distinction. Still, it is expected that non-human communication and cognition, as well as language, will be closer than ever previously conceptualised, and will expand our perspective on what we think of as language.

This could have the added benefit of improving non-human ethics, given the high social status that comes with being linguistic, so that other animals may be respected and recognised more where their communication and cognition can more closely be compared with – if not included into – a concept of language. Furthermore, by applying Prototype Theory to the macro categorisation of language, this also aligns with whichever of the three major philosophical approaches is taken towards considering and respecting other animals in society (Calarco, 2015). This takes into account their various behaviours, needs, physiology and so forth. An 'identity' ethical approach engenders a sense of equality across species via focus on the similarity of other species to humans, and this comes from Prototype Theory's family resemblances, which highlight the similarities across category members and even across categories to a degree. The 'difference' ethical approach, in which respect for others is instead based upon the differences of other species to humans, is accounted for by how a prototypical framework allows for greater variation and flexibility between category members and their features than classical definitions. In other words, species can vary greatly but still be understood as part of one group more easily from a Prototype Theory perspective than via a strict criteria list, as in Classical Theory. Lastly, the 'indistinction' ethical approach to non-humans, which de-emphasises human uniqueness and emphasises continuities with other species, but starting from them and from nature, moving towards humans as the offshoot, is supported by the inductive nature of Prototype Theory. This encourages us to start from observed rather than predetermined language features and to assess their relative typicality across the communication and cognition instances of various species. Another ethical impact is that this new 4D graded language framework potentially encourages us to move away from

the species-specific term *animal communication*, or even *non-human signals*, and to adopt new more inclusive terminology, like *languoid*, if not *language*.

Further to the potential for greater ethical treatment of other species, following their inclusion into the scope of a concept of language in some way, there is an opportunity for increased collaboration with non-humans too. Already we have rooks (*Corvus frugilegus*) at the French Puy du Fou theme park collecting cigarette ends and other small rubbish in exchange for food dispensed by specially designed vending machines for the feathered workers (BBC, 2018), while dogs have been in service almost as long as they have been domesticated (Hare and Woods, 2020). There could even be chance for assisted weather prediction, given, for instance, how gray-cheeked mangabeys (*Lophocebus albigena johnstonii*) in Uganda take past weather conditions and related variables into account when searching for ripe figs, such as the average daily maximum temperature and solar radiation preceding their revisits only to trees that carried fruit at the previous visit (Janmaat, Byrne, & Zuberbühler, 2006). Could they assist us with improving our weather forecasts?

Therefore, this work serves to retrace our steps to tread a new path towards language and to our understanding of non-humans. Yet, as Polish semanticist Korzybski (Chapnick, 1989) eloquently notes: 'the map is not the territory'. Therefore, any change in belief is not necessarily a change in reality. In this instance, we simply need to archive our assumptive thinking about language and other species, given that a map that does not represent the actual landscape it purports to is of little use. In short, the 4D graded language framework presented in this dissertation points to there being a considerable feature overlap rather than gap between language and non-human communication and cognition. It might be time to start discussing non-human language features, however typical they turn out to be. As such, this work could put to rest some of the ongoing debates and frustrated polemics within linguistics, as well as those surrounding the status of non-human communication and cognition, while providing a more unified foundation for future interdisciplinary work to enable us to learn more about the nature of language and the place of language in nature.

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