Curious Parallels

An examination of terms and concepts shared between biology and linguistics,

and their relevance to the study of languages.

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Contents   **Page**

Declaration

Abstract

1.   Introduction

Wordcount: 27,793

Abstract

The linguistic world contains an array of terms and concepts which, in their literal sense at least, appear to belong primarily to the modern discipline of biology. We speak, for example, of the *evolution* of languages, of *living* languages, of *dead* or *extinct* languages, of *genetically related* languages and of the *ecology* of languages, to name but a few. *Vulnerable, critically endangered* and *extinct* are used by international bodies to classify the status of biological species and languages alike, and languages have in the past been described quite literally as living organisms. The aim of this dissertation is to examine where research currently stands on the parallels between biological species and languages, the processes which might link them, and the reasons why these comparisons have persisted over such a long period. Considerable attention will be paid in this regard to the role of *culture* as both a possible bridge and a potential barrier between language and life, given that the term is often used in binary opposition to nature on the one hand, and in a rather vague alliance with language in the term "language and culture" on the other. Defining precisely what culture is, and its relationship to biology and language alike, will therefore be a major objective. It is hoped that some gaps may subsequently be addressed.

1. Introduction

> The formation of different languages and of distinct species, and the proofs that both have been developed through a gradual process, are curiously parallel.

So said Charles Darwin in his 1871 book *The Descent of Man, and Selection in Relation to Sex,* (p. 89). The quote is paraphrased in the title of this dissertation, although, as will be seen, this is far from the first time that it has struck a chord. For example, it can clearly be seen that the parallels in question, as noted by the author, are those shared by different *languages* and distinct *species*. This suggests not only a specific analogy between these two particular categories as opposed to other potential candidates, but also that languages and species are identifiable as such. Were this not so, we could not possibly know whether a language or species had been formed or developed in the first place. The *gradual process* marks yet another parallel, and so a brief consideration of both languages and species is offered below.

1.1 Languages and species

Language is the primary means of communication of the human species. It is produced by combining arbitrary phonic or visual symbols into larger units for the purposes of communication. Any examination of it, however, would quickly find, not one, but a wide variety of different examples of this phenomenon. Estimates for the number of languages found across the world are usually in the range of between 6,000 and 7,000 (including at least 130 sign languages). The biocultural diversity questionnaire used later in this dissertation has used 6,500 as an approximation, based on UNESCO figures. It should also be noted that languages will here be treated as synonymous with "natural languages", understood to mean languages which have evolved through repetitive use and replication, either spoken or signed, and *without conscious planning*.

Written languages, on the other hand, are a form of technology used to convey a natural language in writing, "an optional accessory" as described by Pinker (1994, p. 16). There are no human communities without language, and individuals without it are so rare as to cause a sensation, with a possible upper percentage of less than 0.01% of the world's population (Downey, 2010). The equivalent figure for people without literacy skills, on the other hand, currently stands at roughly 1,000 times that number, at approximately 750 million people, or 10% of the world's population. These though, at least have the benefit of belonging to a speech community (UNESCO, 2017).

It is not known when humans first used speech, and estimates vary from about 50,000 to two million years ago, with 200,000 years an apparent compromise (List et al, 2016, p. 2). The languages of the world are divided into some 140 or so families based on supposed common ancestry. These families are themselves often divided into branches, which are in turn divided into groups in the manner of a family tree. Indo-European is the most widely studied family, and a simplified sketch of its branches can be seen in Figure 1:

Figure 1: A simplified tree of the Indo-European family of languages
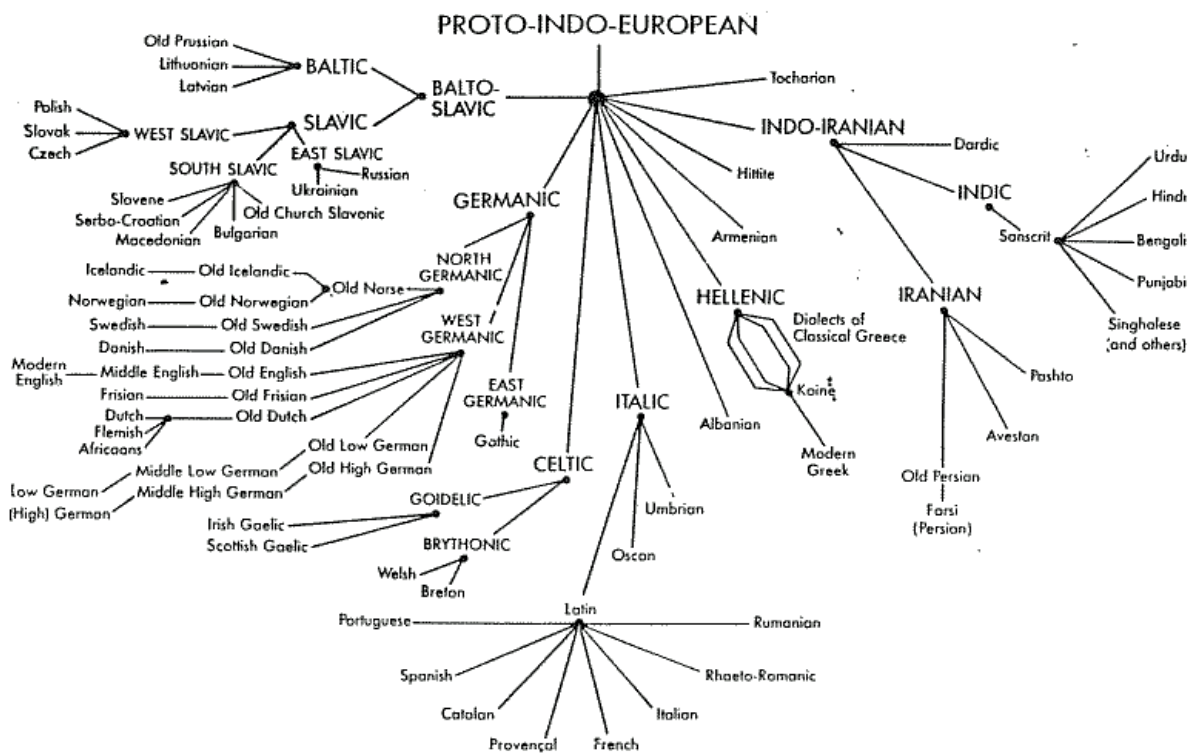
There are several ways in which languages can be considered independently of individual speakers. For example, if the number of speakers of every language across the world were totalled, the resulting figure would be considerably greater than the total number of people. This, of course, is because more than half of the world's population is at least bilingual. In addition, no speaker, not even a lexicographer, ever succeeds in using all the words of a particular language, and so the full corpus of a language may be considered to be the sum total of all the utterances of all its speakers, but far in excess of the reach of any one of them. Languages are bounded and can be identified, even if the ties that bind them may be a little loose. Dialect continua, for example, may blur the distinction between one language and another, but difficulties such as these are also present in biology when identifying subspecies from species.

When considering analogies between biological species and languages, it is worth noting at the outset that there are far more of the former than the latter, and also that they have existed over much greater timescales. However, as is the case with languages, no investigation into life on Earth would ever find a "thing" called life, but instead, an enormous variety of individual living organisms, from bacteria to fungi to plants and animals, which share the defining characteristics of life. These, just like languages, are taxonomically organised in hierarchical levels of classification which are believed to indicate shared common ancestry. The three-domain system of classifying biological organisms uses the *domains* of Archaea, Bacteria and Eukaryota as the highest levels of eight major taxonomic ranks. In the case of the first two, both of which are *prokaryotic* (i.e. organisms whose cells lack a nucleus and which are also overwhelmingly unicellular), it is notoriously difficult to estimate numbers, not only because of their (small) size and (large) number, but also because their methods of asexual reproduction make "species" identification difficult, if not inappropriate. Prokaryotes nevertheless have other useful analogies with languages which

will be examined later. The eight main taxonomic ranks (which do not include intermediate minor rankings such as superfamily or subspecies) can be seen in Figure 2:

Figure 2: Major taxonomic ranks of biological classification
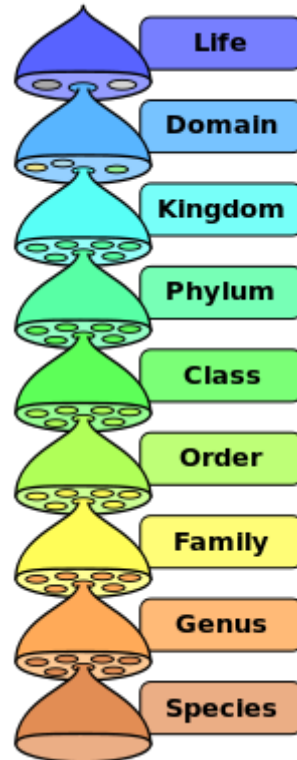
All forms of life will communicate in some way, including, for example, through chemical exchange, physical movement towards or away from another organism, olfactory messages, or complex auditory or visual symbols. Nevertheless, there can be little doubt that human language is utilised by one species alone, and therefore unique amongst communication systems. That said, it is not unique in being unique. There is no equivalent anywhere in the animal kingdom, for instance, to the honeybee waggle dance (Trask, 2004, p.10), the identification of which was sufficient to earn its discoverer a Nobel prize. This point is worthy of consideration as a counterbalance to claims of human uniqueness, given that many other species also have their own unique characteristics. Humans, for example, lack the echolocation and magnetic orientation abilities of various species, the ability to change colour to blend with their environment and so on.

Although Darwin specifically noted parallels at the most fundamental levels of languages and species, there are numerous other analogies between language and life in general which could be, and have been, made to illustrate the potential hierarchical and multileveled nature of both. Some of these are exemplified in the table below:

Table 1: Potential hierarchical analogies between language and life

Language	Life
Family	Family
Branch	Subfamily
Group	Genus
Languages	Species
Dialect	Subspecies
Idiolect	Organism
Morpheme	Cell
Phoneme	Gene

Not all of the main levels are shown here due to the much larger number of living things as opposed to languages, however the use of taxonomic levels with languages appears to be less precise than in biological taxonomy anyway. The *Routledge Language Family Series* of publications, for instance, contains volumes on not only the Turkic, Dravidian and Indo-European *families*, but also the Celtic, Romance, Germanic and Slavonic languages, all of which are themselves *branches* of Indo-European. Nevertheless, the principle of gradual descent from a common ancestor is evident in both the biological and linguistic cases. At the same time, in terms of processes, we can no doubt add the likes of variation, competition and inheritance, as well as the existence of species and language "barriers" to the list of analogies which so fascinated Darwin.

1.2 General themes and objectives

It should be remembered that languages and species do not require academic study by human beings in order to proceed. Indeed, they managed perfectly well without such activity for tens of thousands of years in the case of the former, and millions in the case of the latter. A sharp distinction therefore needs to be drawn between actual languages and living things on the one hand, and the academic disciplines of linguistics and biology on the other, which are based upon our *interpretations* of how best to categorise the subject matter of particular disciplines. Given that this thesis is concerned with such interpretations and categorisations, it contains within a number of themes and objectives. There are four themes, numbered for convenience, as follows:

Theme 1: The relationship between language and animal communication;

Theme 2: Parallels between historical linguistics and evolutionary biology;

Theme 3: Parallels between linguistic and biological ecology;

Theme 4: The relationship of culture to both language and biology.

These have been chosen as it is felt that each may have a part to play in the parallels shared between languages and species. Human language, for example, is ultimately a form of *animal communication*. To deny this would be to deny, in the face of overwhelming evidence to the contrary, the status of *homo sapiens* as an animal species. Consequently, its relationship to other animal communication systems is here considered a topic of relevance covered by Theme 1. As noted above, *evolutionary* parallels between languages and species were first recognised in the nineteenth century, and these are the subject of Theme 2. An additional parallel, which could not have been foreseen at that time, has since become apparent, namely the unprecedented loss of diversity in both the biological and linguistic spheres. This more recent analogy, then, allows for a wide range of comparisons within an *ecological* context, where languages, like species, have to compete for the limited resources available to them

within their respective environments in order for them to survive, and this forms the basis of Theme 3. This, in turn, has led to the growth of the concept of biocultural diversity, labelled as the sum total of the world's diversity in its biological, linguistic and cultural forms. We have therefore seen, in the present century, a shift towards looking at all aspects of diversity as elements of a larger whole, which is perhaps more in keeping with attitudes of the nineteenth. These stand in stark contrast to the twentieth century, where an increase in specialisation and a splitting of disciplines into the "two cultures" of natural sciences on the one hand, and humanities and social sciences on the other, has led to biology and linguistics landing on opposite sides of the academic fence. Consequently, via the two cultures and biocultural diversity, the relationship between *culture* and both language and biology repeatedly raises its head and subsequently demands attention as the fourth and final theme. Interwoven with these four themes stand eight objectives, as shown below:

Objective 1: To seek out the findings of research into comparisons between animal communication and human language, particularly with regard to the supposed uniqueness of language;

Objective 2: To examine why so many concepts and terms are shared between biology and linguistics in the first place;

Objective 3: To establish whether or not researchers from linguistic and biological fields collaborate in areas of possible overlap;

Objective 4: To investigate whether the existence of the "two cultures" is a manifestation of dualism and a hindrance to academic collaboration between the two fields;

Objective 5: To examine whether or not the concept of biocultural diversity has the potential to be a unifying force;

Objective 6: To see if public attitudes towards linguistic diversity are similar in principle to attitudes towards biodiversity;

Objective 7: To examine definitions and interpretations of "culture" and "cultural

evolution" alongside some other familiar terms such as "environment" and "technology";

Objective 8: To reach some conclusions on the relationship between language, culture

and biology.

Table 2: Map of themes and objectives (by reference to dissertation sections):

Themes: ► Objectives: ▼	1. Animal Communication	2. Historical Linguistics	3. Linguistic Ecology	4. Relationship of Culture
1. Comparison of animal communication and language	1.1; 1.3.1; 3.5; 3.8; 4.1; 4.5			4.4; 4.5
2. Shared terms and concepts between biology and linguistics	2.1; 3.1; 3.5; 3.8; 4.1; 4.5	1; 1.1; 1.3.2; 2.2; 3.2; 3.4; 3.5; 3.6.1; 3.6.2; 3.6.3; 4.2; 4.5	1.1; 1.3.3; 2.3; 2.4; 3.3; 3.4; 3.5; 3.7.1; 3.7.2; 3.7.3; 3.8; 4.3; 4.5	1; 1.1; 1.3.4; 2.2; 2.3;
3. Collaboration between biological and linguistic fields	1.3.1; 2.1; 3.1; 3.5; 4.1	2.2; 3.2; 3.4; 3.5; 3.6.1; 4.2; 4.5	2.3; 3.3; 3.4; 3.5; 3.7.1; 3.7.2; 3.7.3; 4.3; 4.5	4.5
4. The two cultures and dualism as a possible hindrance	3.1; 3.5; 4.1; 4.5	1.3.2; 2.2; 3.2; 3.4; 3.5; 3.6.1; 3.6.2; 3.6.3; 4.2	1.3.3; 2.3; 3.3; 3.4; 3.5; 3.7.1; 3.7.2, 3.7.3; 4.3	3.5
5. Biocultural diversity as a potential unifying force	3.8; 4.5	4.5	1.1; 1.3.3; 3.8; 4.3; 4.5	4.5
6. Attitudes towards linguistic versus biodiversity	2.4; 3.8		2.4; 3.7.1; 3.7.2; 3.7.3; 3.8	3.8
7. Definitions of culture and cultural evolution		3.6.2; 3.6.3	3.7.1; 3.7.2; 3.7.3	1.3.4; 4.4; 4.5
8. Conclusions on language, culture and biology	4.5	4.5	4.5	4.5

1.3 Literature review

Although the curious parallels reference comes from *The Descent of Man*, Charles Darwin is known to have reflected on the nature of language as early as 1837 following his return from the voyage on the *Beagle*, where he noted that "all speculations on the origins of language must presume it originates slowly" and that "we cannot doubt that language is an altering element" (Richards, 2002, p. 2). Any review of relevant literature must therefore also include his *On the Origin of Species,* first published in 1859. After all, were it not for this book, there would be no evolutionary theory with which to compare species and languages in the first place. It is also worth noting that he chooses relationships between *languages* as an illustration to show that "the natural system is genealogical in its arrangement" (Darwin, 1859, p. 422).

He was obviously influenced by the works of others. *The Geological Evidences of the Antiquity of Man* was written in 1863 by his friend Charles Lyell, who devotes all of chapter xxiii to a very relevant topic, namely the 'Origin and Development of Languages and Species Compared'. Lyell notes that "we may compare the persistency of languages, or the tendency of each generation to adopt without change the vocabulary of its predecessor, to the force of inheritance in the organic world" (p. 467). Living languages, like organic life, are derived from extinct ones (p. 461), they are part of a "struggle for existence" reminiscent of the struggle for life in the title of Darwin's *Origin*, and subject to "powerful causes of selection" (p. 463) which see one dialect triumph over another. All of this takes place without speakers being necessarily aware of it (ibid). Finally, languages are subject to a slow and gradual extinction, and, once extinct "can never be revived, since the same assemblage of conditions can never be restored" (pp. 466-467).

Lyell clearly believed that languages changed by some kind of natural force which was beyond the control of their speakers. Even one venerated by its users would be "incapable of permanently maintaining its ground" (p. 464). His respect for languages as natural phenomena, though, pales when compared to August Schleicher, a German linguist who took an interest in Darwin's theory. He is known to have produced family trees (*Stammbäume*) illustrating the relationship between different languages as early as 1853, prior to Darwin's *Origin*. Indeed, he is frequently acknowledged as "the first linguist to portray language development using the figure of a tree" (Richards, 2002, p. 23). In 1863 he wrote *Die Darwinsche Theorie und die Sprachwissenschaft*. His work was translated into English in 1869 under the title *Darwinism tested by the science of language*, and according to Richards (p. 37), "Schleicher's greatest and lasting contribution to evolutionary understanding may simply be his use of a *Stammbaum* to illustrate the descent of languages", which, it is worth remembering, preceded its equivalent use for biological species. His thesis however, showed a vision of languages themselves as living things, and claimed that:

- Languages are organisms of nature and have never been directed by the will of man;

- They rise and develop according to definite laws; they grow old, and die out;

- They are subject to phenomena which we embrace under the name of "life";

- The science of language is consequently a natural science;

- Its method is generally altogether the same as that of any other natural science.

  (Schleicher, 1863, pp. 20‑21)

There was therefore a period in the nineteenth century when evolutionary concepts were openly shared between what would now be called linguistics and biology. This state of affairs, however, was not destined to last. The *Société de Linguistique de Paris* famously went so far as to ban papers on the evolution of language in 1866 and, during the course of

the late nineteenth and early twentieth centuries, Ferdinand de Saussure shifted the emphasis in linguistics from the diachronic to the synchronic, thereby "killing the field that had borne him" (Aranoff, 2017, p. 450). Within the social sciences in general, evolution became discredited, accused of Social Darwinism, and largely shunned. Einar Haugen's 1971 paper *The Ecology of Language*, which stated that language ecology may be defined as the study of interactions between any given language and its environment, hails the beginning of a new ecological metaphor and another parallel between linguistics and biology. As will be seen, however, this metaphor has run into trouble.

A significant development of the latter decades of the twentieth century was the growth of the concept of cultural evolution, and it is worth noting that it was brought to prominence by those who specialised in evolution, rather than those who specialised in culture. In 1975, evolutionary biologist Edward. O. Wilson produced his *Sociobiology: The New Synthesis*, on social behaviour in animals. Much of its content was safely confined within ethology and animal communication. This was not always the case, though, as, on occasion, comparisons with humans were made, including the characteristics of both language and culture. All aspects of culture, according to Wilson, were separated from animal tradition by a matter of degree only, with one exception, namely language, "which is truly unique" (p. 87). Wilson received criticism from scholars within his own discipline as well as outside of it. Some of the anger directed at him, however, was no doubt down to his daring to invade the turf of other academic disciplines (and also pass judgement on them), by imagining a macroscopic examination of those academic subjects which study all of our planet's social animals, and arriving at a conclusion whereby "the humanities and social sciences shrink to specialized branches of biology" (p. 271). Seeing their disciplines shrunk in this way was always likely to irk some of those who had devoted their working lives to them.

There is no specific reference to linguistics in the above quote, but its practitioners were not to escape lightly either. On the question of the existence of a universal grammar, Wilson maintains that this is a difficult question to answer because "most attempts to generalize the rules of deep grammar have been based on the semantic content of one particular language" (p. 283). A fair cop, some might argue. However, even more annoying than using one language to try and establish universals was the unscientific attitude employed by them while so doing, and the production of oblique literature which frustrated natural scientists. He subsequently concludes that "this discipline, one of the most important in all of science, is ripe for the application of rigorous theory and properly meshed experimental investigation" (ibid). Rather than undermining the importance of the science of language, then, this quote seems to be expressing genuine frustration at a perceived lack of progress in it. *Sociobiology* was not primarily concerned with the study of language or even human culture more broadly, however, it did reawaken the so-called nature/nurture debate and let the Darwinian genie out of its bottle after an absence of almost a century which had seen blank slates and purely synchronic studies prevail. It is this which marks its significance. Darwinism had reached out to the social sciences rather than the reverse, and this process would continue.

The following year saw the publication of Richard Dawkins' *The Selfish Gene*. This book promoted the idea of a gene-centred view of evolution, as opposed to an emphasis on organisms or group behaviour. Largely concerned with evolutionary biology in general, its last chapter was, however, entitled *Memes: the new replicators*. Here he turns his attention towards man, noting that "most of what is unusual about man can be summed up in one word: 'culture'." (Dawkins, 1976, p. 189). The first examples of culture deal with language, but the author quickly explains that "language is only one example out of many" (p. 190). Further examples include "fashions in dress and diet, ceremonies and customs, art and architecture,

engineering and technology, all evolve in historical time in a way that looks like highly speeded up genetic evolution, but has really nothing to do with genetic evolution" (ibid).

Dawkins was certainly not the first to see the analogy between these (and admits so) but his book did provide a catalyst for propelling it into the mainstream. He then goes so far as to say that "we must begin by throwing out the gene as the sole basis for our ideas on evolution" (p. 191) and adds to it the concept of the *meme*, a cultural replicator of ideas analogous to the gene. We now see the basis for the birth of a new academic discipline called memetics, which in turn would develop into variations of the same theme known as gene-culture coevolution or dual-inheritance theory. Significantly, these theories are held to be in keeping with, and indeed part of, a Darwinian approach. It is, however, interesting to note that between Wilson and Dawkins we already have an example of the ambiguous relationship between language and culture. Language cannot be both "truly unique" and also "one example out of many".

In 1982, Dawkins wrote his sequel to *The Selfish Gene* entitled *The Extended Phenotype*, and in the preface lists "humanists interested in evolutionary science" as part of his target audience. Here, Dawkins expands upon his gene-centred theory to include aspects external to the organism itself, noting that "the phenotypic effects of a gene are the tools by which it levers itself into the next generation, and these tools may 'extend' far outside the body in which the gene sits". Examples include various kinds of niche construction such as birds' nests, beavers' dams, termite mounds and so on. This of course has implications for the study of human culture, particularly cultural artefacts of all kinds. Critically, Dawkins in this book defines a *replicator* as "anything in the universe of which copies are made" (p. 83) "…. purposely defined in a general way, so that it does not even have to refer to DNA" (p. 87). Dawkins adds that he is "indeed, quite sympathetic towards the idea that human culture provides a new milieu in which an entirely different kind of replicator selection can go on"

(ibid). The time was now ripe, so it seemed, for an innovative analysis of human culture within its own evolutionary framework.

The third book in the Dawkins trilogy is his 1986 publication, *The Blind Watchmaker*. The title is based upon a quote from William Paley's 1802 book *Natural Theology* where the author imagines himself happening upon a watch and concluding that "there must have existed, at some time, and at some place or other, an artificer or artificers, who formed the watch for the purpose which we find it actually to answer; who comprehended its construction, and designed its use". This is of course an analogy for the existence of a designer, a creator of complex things in the form of God. Dawkins' book aims to prove conclusively that a complicated design does not require a complicated designer, and that Darwinian natural selection is sufficient to explain the complexity of the living world without the need to invoke a creator. In keeping with his thesis in *The Extended Phenotype*, Dawkins treats "man-made artefacts like computers and cars…firmly…as biological objects" (Dawkins, 1986, p.1) because they are clearly the product of biological objects, and an indication of the presence of life. As far as the creation of artefacts is concerned, then, he is obviously in agreement with Paley. They part company, however when it comes, not to the artefact itself, but to the artefact's designer, as illustrated in the following:

> Natural selection, the blind, unconscious, automatic process which Darwin discovered, and which we now know is the explanation for the existence and apparently purposeful form of all life, has no purpose in mind. It has no mind and no mind's eye. It does not plan for the future. It has no vision, no foresight, no sight at all. If it can be said to play the role of watchmaker in nature, it is the blind watchmaker. (Dawkins, 1986, p. 5)

Where, though, do languages fit into all of this? Steven Pinker and Paul Bloom in their 1990 article "Natural language and natural selection" maintain that language evolved "by a conventional neo-Darwinian process" (p. 707) in line with natural selection. They make the point that languages show "no notable correlation with technological progress" (ibid) and

they present a list of facts which suggest that "the ability to use a natural language belongs more to the study of human biology than human culture; it is a topic like echolocation in bats or stereopsis in monkeys, not like writing or the wheel" (ibid). Contrary, then, to Dawkins' assumption that language is one of many elements of culture, Pinker and Bloom here make the case for language being rather different, and Pinker (1994) subsequently goes on to dispense with culture altogether, asserting that language is an "instinct". The essence of his thesis is worth quoting in full:

> Language is not a cultural artifact that we learn the way we learn to tell time or how the federal government works. Instead it is a distinct piece of the biological makeup of our brains. Language is a complex, specialized skill, which develops in the child spontaneously, without conscious effort or formal instruction, is deployed without awareness of its underlying logic, is qualitatively the same in every individual, and is distinct from the more general abilities to process information or behave intelligently. (p. 18)

There are some bold claims here, which, as we shall see, have not gone unchallenged. Pinker then goes on to compare the human language faculty with spiders' ability to spin webs, and asserts that "language is no more a cultural invention than is upright posture" nor is it "a manifestation of a general capacity to use symbols" (ibid).

In 1998, Edward O. Wilson returns with his *Consilience: The Unity of Knowledge*. Whilst pleading for convergence, he bemoans the lack of progress in the social sciences, and their attempts at proceeding "largely without linkage to the natural sciences" (p. 200). The chapter *From Genes to Culture* offers an account of dual-inheritance theory, giving a nod towards both Pinker's language instinct and Dawkins' meme along the way, in the search for the basic unit of culture which corresponds to the gene. Gene-culture coevolution, is, for Wilson, "the conceptual keystone of the bridge between science and the humanities" (p. 150). Regardless of individual differences which may have existed between them, therefore, the last quarter of the twentieth century saw a consolidated movement by self-confessed

advocates of Darwinism towards explanations of phenomena which had traditionally been considered to be solely in the cultural realm.

The new millennium saw evolutionary approaches to language continue full steam ahead. From the outset, new publications addressed issues such as language change from an evolutionary perspective. Advancements in animal communication gave a greater insight into intraspecies transmission and parallels with human language, while work on cultural evolution often used language to illustrate this phenomenon in action. Due to the increase in academic specialisation that had taken place by the end of the twentieth century, these different aspects are shown below in accordance with the four themes of this dissertation.

1.3.1   Language and animal communication

Given that language is the primary intraspecific communication system of humanity as an animal species, it follows that animal communication may be able to offer some comparisons. Many animal species use vocalisations to communicate, and recent studies have shown that a variety of these, including wolves, orcas, sperm whales and cod, have regional "accents" or "dialects". Vocalisation, however, is not the same thing as "vocal learning", defined as the ability to *acquire or modify* vocalisations as a result of auditory experience (Lattenkamp and Vernes, 2018, p. 209), which is an essential prerequisite for human language. Vocal learning ability has only been found in certain groups of mammals and birds, namely humans, cetaceans, pinnipeds, bats, elephants, goats, parrots, hummingbirds and songbirds (ibid). It can be seen that apes and monkeys are missing from this list. Rather surprisingly then, especially when considering the effort which has been put into assessing them, "there is sparse evidence that our closest relatives, nonhuman primates, have the capability to learn new vocalisations" (ibid). The groups which do have this capacity are not

particularly closely related to each other, and even within these, a distinction can be drawn between those species which can faithfully reproduce only the vocalisations of their own species, and those which can mimic other species, such as the proverbial "pretty Polly" parrot, and the appropriately-named mockingbird. There can be little doubt, in fact, that the closest parallels in the animal kingdom to human language are to be found, not in primate vocalisations, but in birdsong. Darwin said as much in *The Descent of Man*.

Recent work undertaken by Robert Lachlan and Stephen Nowicki has shed new light on this, and in their article 'Context-dependent categorical perception in a songbird' (Lachlan and Nowicki, 2015) they claim that their study "demonstrates that the phonology and perception of swamp sparrow songs share even more features with human phonology and speech perception than previously suspected" (p. 1896). This is because phoneme categorisations in the notes of swamp sparrow songs "suggest for the first time that this central characteristic of human phonology is also found in a nonhuman communication system" (p. 1892). Despite not being relevant to all aspects of human language such as syntax, the phonological parallels are nevertheless highly significant, as "although speakers and listeners are generally unaware of the fact, many phonemic categories in speech vary in their structure and in how they are perceived, depending on linguistic context" (ibid). Phonological changes of course also drive language change, and one of the authors' conclusions is that, the mechanisms underpinning complex phonology, due to their presence in both human speech and swamp sparrow song, may have evolved before syntax and semantics, which only exist in human speech, and therefore "may have their origins in the logic of assessment signals that govern much of animal communication" (p. 1896). The same authors, this time in conjunction with Oliver Ratmann, went on to produce the paper 'Cultural conformity generates extremely stable traditions in bird song' (Lachlan, Ratmann and Nowicki, 2018). This time, birdsong was extended into the field of cultural evolution.

17

The article deals primarily with conformist bias, and the authors assert that their "results demonstrate conformist bias in natural animal behaviour and show that this, along with moderately precise learning, may support traditions whose stability rivals those of humans" (p. 1). The subject matter was again phonological, with a simulated model based on recordings of 615 swamp swallow song repertoires being used to estimate the stability of syllable types. The paper notes that, according to the parameters of their model, "the average age of the oldest syllable type in each population was 1537 years, and 8.6% of syllable types (and 26.5% of all syllables) were older than 500 years" (p.5). These time frames are quite staggering, and can be compared in length to periods of human languages (for example Old, Middle and Modern English). Indeed, the authors' most striking claim is that their findings "suggest that the ability to transmit traditions with precision can no longer be considered a fundamental difference between how human and non-human cultures evolve" (p. 6).

1.3.2   Historical linguistics and evolutionary biology

The year 2000 saw the publication of William Croft's innovative *Explaining Language Change: An Evolutionary Approach.* The author's preface notes that the book "presents a framework for understanding language change as a fundamentally evolutionary phenomenon" (xiii) and that a speaker's knowledge of grammar cannot be disentangled "from the act of using language" (ibid). These factors form the backbone to the central thesis, namely that "the proper linguistic equivalent to the genome was not a speaker's grammar but the utterance" (xiv). Influenced by David Hull's generalised theory of selection for the evolution of concepts as well as organisms, Croft goes on the hunt for the unit of specifically linguistic selection to sit alongside physiological genes and cultural memes, and subsequently introduces us to the *lingueme*. As far as comparisons between languages and species are

concerned, he criticises the tendency towards zoo-centric thinking so often in evidence and asserts that "a language system is more like a plant than an animal" (p. 230). His was the first attempt at steering evolutionary thinking about languages away from the assumption that parallels mean parallels with animal evolution. It is a ground-breaking and influential work. Not everyone, however, has been convinced by this approach. For example, although praised as an alternative to Chomskyan views of "I-language" by emphasising the "E-language" of real-life language use, a review of the book by Andrew Carstairs-McCarthy (2003) left him "unconvinced" (p. 205) that Croft had succeeded in his central purpose of using evolutionary theory to explain language change. One "disquieting" (p. 204) difference between biological evolutionary theory and the linguistic evolutionary theory proposed by Croft was the way in which the term "population" had been defined. This issue is discussed further in 3.6.2 below.

In 2005, a paper by Quentin D. Atkinson and Russell D. Gray entitled 'Curious Parallels and Curious Connections—Phylogenetic Thinking in Biology and Historical Linguistics' was published in *Systematic Biology*. It reviews parallels between biological and linguistic evolution and the development of phylogenetic methods in both evolutionary biology and historical linguistics. A central feature of the article is that due to analogous processes between languages and living things, both linguists and biologists need to ask similar questions, and the authors find it likely that these two fields, "which have evolved along related paths throughout their history" (p. 514) will remain curiously and productively connected (p. 524). It lists twelve fundamental features of biological and linguistic evolution which are "demonstrably analogous" (see Table 3). The table provides a good summary of similarities between the two, but further examples can be seen within the article itself. *Inheritance* is common to both species and languages, with DNA sequences passed on in the case of the former, and phonemes and vocabulary in the latter. *Homologies* indicate shared descent, but imperfect *replication* can lead to *mutation* or *drift*. This results in *variation*

which initiates *selection* processes. Ultimately, this produces lineage splits, causing *cladogenesis* and *speciation*. Contact may then lead to *horizontal transfer* and *hybridisation*, with eventual *extinction* and subsequent *fossilisation*. One feature missing from this quite extensive list of analogies is *competition,* whereby both species and languages have to compete for a finite amount of resources from their respective environments in order to maintain their existence. Nevertheless, the parallels listed are numerous, fundamental and eerily similar in function, despite the objects of study being substantially different. That said, given Richard Dawkins' insistence (1.3 above) that man-made artefacts should be treated as biological objects because they are an indication of the presence of life, then there may be every reason to treat "fossils" carved on stone in a similar same way to fossils made of bone.

Table 3: "Demonstrably analogous" biological and linguistic evolutionary features (after Atkinson and Gray, 2005)

Biological evolution	Linguistic evolution
Discrete characters	Lexicon, syntax, and phonology
Homologies	Cognates
Mutation	Innovation
Drift	Drift
Natural selection	Social selection
Cladogenesis	Lineage splits
Horizontal gene transfer	Borrowing
Plant hybrids	Language Creoles
Correlated genotypes/phenotypes	Correlated cultural terms
Geographic clines	Dialects/dialect chains
Fossils	Ancient texts
Extinction	Language death

Eleven years later, the article 'Unity and disunity in evolutionary sciences: process-based analogies open common research avenues for biology and linguistics' by Johann-Mattis List et al was published in *Biology Direct* (2016, 11:39). This deals with much the same phenomena as Atkinson and Gray, and the abstract of the article refers to the "surprising similarities between the evolution of life forms and languages" (p. 1). Evolutionary biology and historical linguistics are noted as the academic disciplines which specialise in these two fields (p. 2). Nevertheless, the research objects of the two disciplines differ greatly, evolutionary biology examining substantial objects with a concrete physical manifestation, whereas historical linguistics deals with "intellectual objects" which, quoting Popper, are "products of the human mind" (ibid). This reflects a dualist, or indeed pluralist, position if Popper's "three worlds" are accepted. A critique of object-based analogies, such as comparing words to cells, languages to species and so on, leads to the "Unique Selling Point" of this article, namely that process-based rather than object-based analogies provide more beneficial results via a unifying explanatory framework of evolutionary processes, because "general evolution cannot be studied from within one discipline alone" (p. 10). Figure 3 below, taken from their article, consists of seventeen processes in three categories selected by the authors, viz, seven specifically linguistic, four specifically biological, and six analogous processes, as opposed to the twelve features proposed by Atkinson and Gray. One analogous process which is prominent in both List et al and Atkinson and Gray is the borrowing of words and horizontal (or lateral) gene transfer. In 2014, the lead author of the above article, Johann-Mattis List, produced another on that very topic entitled 'Networks of lexical borrowing and lateral gene transfer in language and genome evolution'. It rightly notes that "borrowing is a constitutive part of language history" (p. 143) which can lead to difficulties for historical linguists trying to reconstruct the correct relationships between language

branches on a linguistic family tree. There are still parallels with biological organisms though, as "language history bears a close resemblance to prokaryote evolution" (p. 144).

Figure 3: Linguistic and biological evolutionary processes (after List et al, 2016)
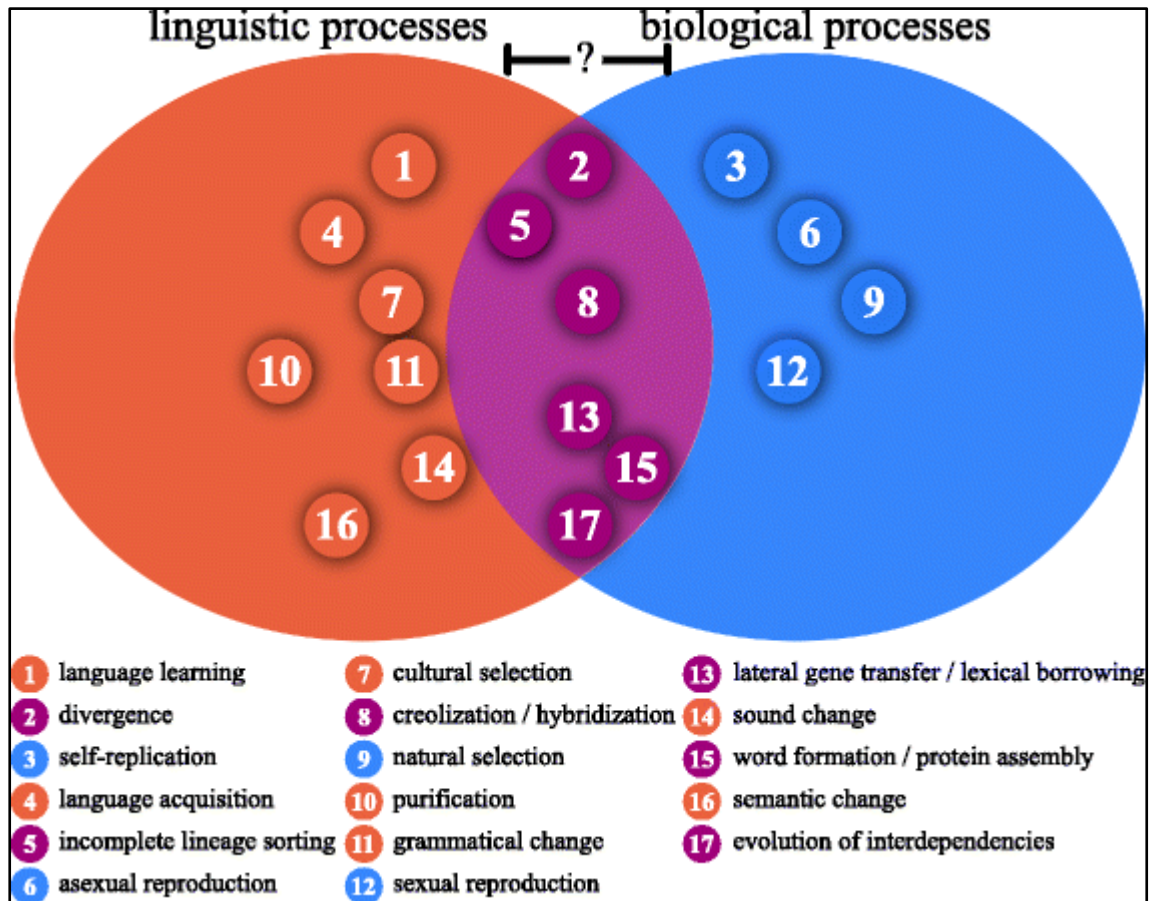
To the above efforts can be added the work of Nathalie Gontier and her Applied Evolutionary Epistemology (AEE) framework, first mooted in 2012. In 2017, she produced two papers on language evolution specifically. The first: 'What are the Units of Language Evolution?' (2017a) includes a definition of applied evolutionary epistemology as "the phenomena where *units evolve at levels of an ontological hierarchy by mechanisms*" (p. 235), and the task is to identify these mechanisms. Subsequently, Gontier produced a "sequel" to this paper entitled 'What are the levels and mechanisms/processes of language evolution?' (2017b). The article again offers its own definition within an AEE framework. Importantly, it

stresses that evolution is not synonymous with, or restricted to, that which evolves by natural selection. Evolution occurs when units change at levels of an ontological hierarchy by mechanisms (p. 14) and can be extended to include not only the cultural, but also the inorganic (p. 13). Put another way, there are different kinds of evolution (p. 18), and, according to Gontier, accepting an evolutionary worldview implies that "there cannot exist anything in this world that did not evolve" (p. 23), including inorganic matter. In conclusion, the author notes that "gene-culture coevolutionary theorists have long been engaged in finding mechanisms peculiar to cultural evolution, and it is highly likely that language evolution will prove to have some peculiar mechanisms too" (p. 40).

1.3.3   Linguistic ecology and biocultural diversity

Salikoko Mufwene's *The Ecology of Language Evolution* was published in 2001. Despite asserting that "by evolution, I mean nothing more than the long-term changes undergone by a language (variety) over a period of time" (loc. 304), the author nevertheless invites us to think of languages as analogous to species rather than organisms, makes constant references to speciation, and also submits that "a language is more of the parasitic symbiotic kind of species than of the animal kind" (loc. 2313). In this scenario, speakers are seen as "hosts", but it represents another, albeit different, attempt at emphasising that biological evolution does not apply to animals only, there are other forms of life which may provide more appropriate analogies for languages. The book makes the important point that language change can take place without contact with other languages (internal ecology) and that this "contact as an ecological factor is everywhere in our day-to-day interactions. It nurtures the invisible hand that executes change" (loc. 400). This invisibility serves to reinforce the point that evolution "has no purpose or defined goals. It should not be interpreted as progress" (loc. 2238).

This ecological approach has not gone without criticism. In response to a more recent paper by Mufwene, for example, Willans and Jukes (2017) ask 'How far can the language ecology metaphor take us?' and argue, from the particular perspective of Pacific languages, that the "ecology metaphor does not ultimately offer a compelling basis for an overarching theory of language vitality" (p. 263) and that drawing ecological parallels by comparing languages to species removes "the human experience" (p. 272) from the debate around such a theory. The extent to which linguists should become advocates for the preservation of linguistic diversity is another related issue. However, it is not apparent why the framework as proposed by Mufwene need influence any of these matters in one direction or the other, just as Darwin's theory of evolution neither prevents nor insists upon biologists being advocates for biodiversity.

In the midst of all these biological and linguistic analogies, a new term was coined, namely *biocultural diversity,* and a book edited by Luisa Maffi, entitled *On Biocultural Diversity: Linking Language, Knowledge, and the Environment* was released, also in 2001. It contains a series of articles highlighting various aspects of biological, cultural and linguistic diversity, along with perceived interconnections and threats to them all. Maffi, who co-founded the *Terralingua* organisation, has defined biocultural diversity as: "the diversity of life in all its manifestations: biological, cultural, and linguistic — which are interrelated (and possibly coevolved) within a complex socio-ecological adaptive system" (Pretty. J et al, p. 269). It is worth noting here that "cultural" and "linguistic" are noted separately. Indeed, the *Terralingua* publication *Biocultural Diversity Toolkit: An Introduction to Biocultural Diversity*, contains a section on the *three* manifestations of biocultural diversity. Biodiversity and linguistic diversity are represented by species and languages respectively, but cultural diversity is described as "the variety of worldviews, lifeways, knowledge and value systems, practices and forms of expression displayed by different human societies" (p. 8). This would

appear to be a reasonable enough approximation of a definition; however, the following point

is also made:

> How many different cultures there are in the world is difficult to quantify,
> because cultural boundaries are permeable, and many cultural traits overlap
> across multiple social groups. Due to these complexities, commonly the number
> of different languages is used as a proxy for the diversity of cultures (ibid).

This can immediately be seen as a contradiction. If languages are sufficiently close to

cultures to serve as a proxy, then there are only two manifestations of biocultural diversity.

Conversely, if they are not close enough for that purpose, then languages should not be used

as a proxy for cultures in the first place. The fundamental point behind biocultural diversity,

however, is that the "three realms" (p. 2) of the web of life are interwoven and

interdependent, as illustrated in the figure below:

Figure 4: Plant diversity versus language diversity
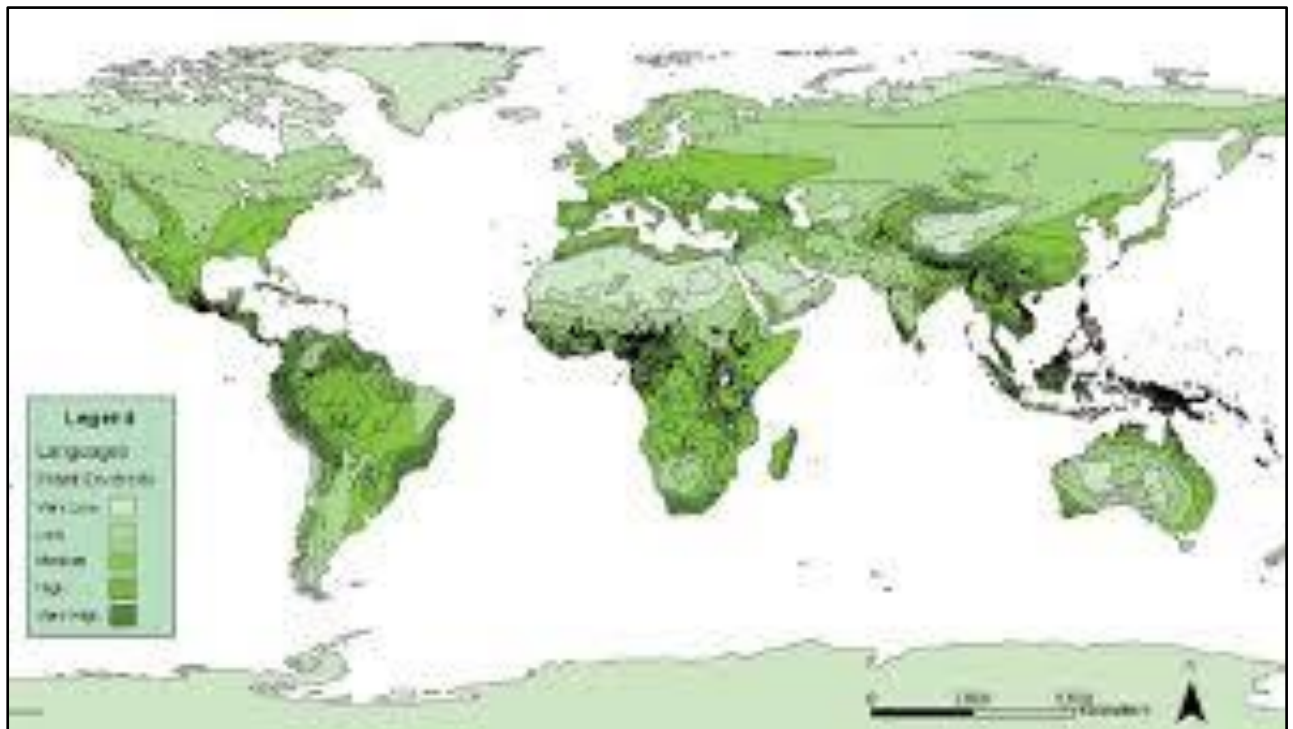
Figure 4 shows the *Terralingua* map of plant diversity (shades of green) and language
diversity (black dots). The darker the shade of green, the greater the diversity of plants, and
the more numerous the black dots, the greater the diversity of languages (*Biocultural
Diversity Toolkit: Vol 1: An Introduction to Biocultural Diversity*, *p.11. Source: Stepp et al
(2004) for Terralingua).*

This, then, offers another parallel between biological species and languages in an ecological context, often utilised by those on all sides. For instance, the International Union for Conservation of Nature (IUCN), the body which produces the Red List of Threatened Species, made this statement about biocultural diversity, where, once again, we see language being used as standard bearer for cultural diversity, as if the one represented the other:

> It is no coincidence that areas of linguistic and ethnic diversity are also areas rich in biodiversity. Most of the world's languages are spoken by indigenous and other tribal peoples in countries that harbour great biodiversity. When a language dies, we also stand to lose the local ecological knowledge and wisdom that reposes in that language (IUCN, 2018).

In 2015, linguist Stig Eliasson, presented a paper in *Language Sciences* entitled 'The birth of language ecology: interdisciplinary influence in Einar Haugen's 'The ecology of language'. In addition to Haugen's own definition of language ecology as "the study of interactions between any given language and its environment" (p. 78) he references some of the more fundamental elements of Haugen's concept such as that "the true environment of a language is the society that uses it" (p. 79) and that "language exists only in the minds of its users" (ibid). Eliasson, for his part, states his intention to "outline some of its conceptual and theoretical problems" (ibid). He notes that the term ecology (in any context) is not attested until the second half of the nineteenth century. In a specifically linguistic context, he distinguishes between, on the one hand, Haugen's linguistic or *language ecology*, and, on the other, a field which has labelled itself *ecolinguistics*. There are significant differences between these, with the former representing language interaction and contact, and the latter defining itself thus:

> Ecolinguistics explores the role of language in the life-sustaining interactions of humans, other species and the physical environment. The first aim is to develop linguistic theories which see humans not only as part of society, but also as part of the larger ecosystems that life depends on. The second aim is to show how linguistics can be used to address key ecological issues, from climate change and biodiversity loss to environmental justice (IEA, 2019).

Haugen is on record as stating in 1987 that "there were many parallels in the current concerns about plant and animal species to the linguists' concerns about the life and death of languages" (p. 83). Eliasson notes that in Haugen's (admittedly limited) ecological analogy, the three "central elements" (p. 86) of his framework are, organism, environment and interaction. According to him, "the difficulty that lies in the translation of biological and social conditions into linguistic ones, leads to a shifting focus in his definitions of language ecology, and its object of study is not well defined" (p. 90).

In similar fashion, A.V. Kravchenko's 2016 paper 'Two views on language ecology and ecolinguistics' criticises, not only Haugen's core concept, here described as including "contradictory or mutually excluding theoretical approaches" but also linguistics more generally. Its treatment of language as a "tool" and languages as "codes" is referred to as "the language myth" (p. 108). With frustration reminiscent of Edward O. Wilson some forty years earlier he claims that:

> Biologically, a human is a linguistic organism…. Failure to realize that language is a biological phenomenon is, probably, one of the reasons why the millennia-long study of language has not produced any remarkable effects on human life compared to the achievements in physics, chemistry, biology, or computer science (p. 102).

To add to the disciplinary confusion, unlike the distinction referred to above, Kravchenko treats language ecology and ecolinguistics as basically interchangeable. There are therefore numerous conceptual and definitional difficulties associated with this field.

1.3.4 Cultural evolution

In 2005, the book *Not by Genes Alone*: *How Culture Transformed Human Evolution* by Peter Richerson and Robert Boyd was published. This was the culmination of work started as far back as 1985 with their *Culture and the Evolutionary Process* and is a major work on

gene-culture coevolutionary theory. The authors themselves note the two main points that they wish to make in the book, namely that;

- culture is crucial for understanding human behaviour;

- culture is part of biology.

In keeping with several other authors mentioned above they bemoan the scant attention paid to evolutionary theory by many social scientists, believing that:

> the most fundamental questions of how humans came to be the kind of animal we are can *only* be answered by a theory in which culture has its proper role *and* in which it is intimately intertwined with other aspects of human biology (p. 4).

They then, on page 5, offer the following definition of culture:

"Culture is information capable of affecting individuals' behavior that they acquire from other members of their species through teaching, imitation and other forms of social transmission".

This book is a serious attempt at bridging the gap between the natural and social sciences, and is a worthwhile venture for that reason alone. However, some essential questions remain regarding the above definition, such as, for example, why information acquired from *other* species, or from independent *deduction* via the non-human environment should be excluded? Within the book, language is clearly included under the umbrella term "culture" and is used on occasion to support their hypothesis (e.g. pp. 90-92). Here, they note that cultures are *not* tightly structured wholes, a point which is at odds with a well-established definition of culture, still prevalent in anthropology today, as "that *complex whole* which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society" (Tylor, 1871, p. 1). They also note that language is not a good predictor of material culture, that studies in diverse parts of the world have shown that neighbouring villages with closely-linked languages are no more similar in terms of their

material culture than villages just as nearby which speak totally unrelated languages. To this they add that languages likewise do not correlate with other traditions in the form of hunting, farming, religion, dance and other rituals. Mixing people from different populations "may produce independent subcultures within a population, subcultures that can coexist within a single individual" (p. 93). Apart from confirming the fact that languages are not the same things as "cultures", it also implies that there are so many variables to what people learn that, ultimately, we all have a culture of our own. This stance will be expressed later in this essay, although possibly not in a manner which is in full agreement with the authors.

Another champion of cultural evolution is Alex Mesoudi, who, in 2011, published a book entitled *Cultural Evolution: How Darwinian Theory Can Explain Human Culture and Synthesize the Social Sciences* (Mesoudi, 2011). In it, Dawkins' memetics is described as one of a number of "recent fads" (loc. 611) and the author notes the importance of defining "exactly what is meant by a theory of cultural evolution" (loc. 612). Variation, competition and inheritance are seen as essential components, as without all three "evolution simply does not happen" (loc. 634). The point of the book is to show that culture contains all the necessary elements for evolution to take place. Variation in culture is plain for all to see through the different sets of skills and beliefs in evidence across the world. The "struggle for life" (loc. 721) by the words and grammatical forms of languages is used as an example of competition, with the gradual accumulation of knowledge and technological advancement proving the existence of inheritance. In summary, it proposes that human culture evolves in a Darwinian manner (but not a neo-Darwinian one as per Dawkins). The following quote, however, appears on the face of it to be something of a contradiction:

> We can also observe cultural adaptations that are exquisitely designed for a particular purpose or for use in a particular environment but that are the result of cultural rather than biological evolution. An example might be the bow and arrow, which features multiple working parts all interacting with one another in a precise manner. (loc. 805-808)

Exquisite designs for particular purposes are not the product of a "blind watchmaker", but rather of a designer. Those arguing the case for cultural evolution, however, seem to be unfazed by this point. Indeed, it is clearly made in the book: "cultural evolution appears to be guided by the intentional actions of people who possess at least some degree of foresight, potentially increasing the likelihood of adaptive cultural mutations" (loc. 1016-1018). Such intentional actions are known as "guided variation", which is one of two types of cultural mutation, the other being "copying error". Whereas copying error is *directly analogous* to genetic mutation, guided variation is a specifically cultural process that *does not have a close parallel* in biological evolution (Stubbersfield et al, 2018). This does not, of course, imply that guided variation is in any way false, but rather that there is no equivalent to it in the process after which cultural evolution has chosen to name itself. Its classification as an evolutionary feature should therefore be handled with care, as the fact that human beings advance technologically does not of itself make that process evolutionary by default.

Perhaps of more direct relevance, however, is the extent to which guided intentional actions reflect the ways in which languages change. In 2013, the chapter "Cultural Evolution of Language" was co-written by Dan Dediu and ten other eminent linguists. Contrary to the stance taken by Pinker, Chomsky and others, this piece argues against treating language as an "instinct" and is critical of "the misconception of language particularism" (p. 304), which treats language as if it were different from other kinds of human culture. Many of these misconceptions about language are soundly rebutted, although it is not apparent why any of the rebuttals in themselves mean that language should not be treated separately from other kinds of culture. Language itself is seen as a form of "coordinative technology" (p. 310) where speakers "agree" (ibid) on a joint code. "Agree" implies conscious consent, and is at odds with the authors' own conclusion that languages "offer us elaborate design without any designer, showing us the "blind watchmaker" of evolutionary processes hard at work." (p.

332). This last statement, perhaps unintentionally, conjures up an image of language evolution which contradicts Mesoudi's "intentional actions" and also the article's own criticism of "language particularism". The arguments made for cultural evolution as a whole can easily come across as attempts at trying to fit a square peg into a round hole, with proponents eager to find a mechanism which will synthesise the social sciences. Language taken separately, on the other hand, has no problem passing Mesoudi's three tests with flying colours. The example of competition has already been noted, and the very existence of 6,500 languages, and their gradual changing over time (e.g. Old, Middle and Modern Welsh) clearly prove variation and inheritance. This does not necessarily mean that there is a conflict between the two, however, as it may be that the different components of culture all evolve, but, as is the case with biological reproduction for example, do not do so in the same way. In his 2018 article, "What is cultural evolution like?", Daniel Nettle opines that "the real problem for the hope of a unified Darwinian "cultural evolutionary theory" is that different cultural cases are very different from one another, and hence approximate the genetic situation to different degrees" (p. 62). The examples illustrated above hopefully show that language and technology sit at two very different ends of this cultural evolutionary scale. Nettle goes on to question a vision of culture which largely sees people as passive recipients of it, stating that he, in the main, has "interests and biases that go beyond the mere desire for my behaviour to be the same as everyone else's" (p. 74), and argues for a unity of the social sciences which places "human action, or more generally human cognition, rather than cultural selection, at the heart of that enterprise" (p. 75).

2.   Methods

Following successful completion of the relevant institutional ethical approval procedures, research activity commenced. In keeping with the Themes of the project as noted in 1.2 above, relevant publications were sought, in the form of published books, articles in academic journals and web pages, which dealt with the following topics:

- The relationship between language and animal communication;

- Parallels between historical linguistics and evolutionary biology;

- Parallels between linguistic and biological ecology;

- The relationship of culture to both language and biology.

As far as animal communication, historical linguistics and linguistic ecology were concerned, it was decided at an early stage that research questions related to these would benefit from asking the experts in person. To that end, three distinct, but similarly themed questionnaires were produced, each containing a mixture of multiple-choice and open questions, some of which were common to all three. The option of producing one generic questionnaire for all disciplines was considered but ruled out, as some specific questions were deemed necessary in each case, and these may possibly have led to confusion amongst the other recipients. Subsequently, the questionnaire on animal communication contained 14 questions, while those on historical linguistics and linguistic ecology both contained 12.

Searches were carried out for authors who had been published in these three areas, and this aspect was considered more important than whether or not the author in question was acknowledged as an historical linguist, linguistic ecologist and so on. All views were welcome, provided they had gone through the quality assurance procedures required for publication, especially in academic journals. Consequently, some of those academics writing on, for example, language change, may have been considered, or considered themselves, to be, say, anthropologists, psychologists or philosophers. The topic of the published work was

the determining factor. As many of them were in any case leading academics in their given disciplines, it was envisaged that they would be extremely busy people who may well not be able to respond to a questionnaire from a research student. Consequently, a total of 60 emails, 20 in each of the three fields, were sent individually to each recipient in the hope that perhaps 20 responses overall would be returned. In line with expectations, just under one in three of the recipients completed the questionnaire, four from animal communication, six from historical linguistics and nine from linguistic ecology. Questionnaires were distributed via email, but all emails were sent using a university email address so that recipients were able to see that the message had been sent from an academic institution. An introductory letter was included, outlining the project, and the right of recipients to not participate at all or withdraw at any point. Personal information on participants was kept in password-protected files.

All recipients were asked in the initial questionnaires whether they would be willing to participate further in a semi-structured interview, and of the 19 respondents, six went on to undertake this second part of the process, three in historical linguistics and three in linguistic ecology. Unfortunately, no-one from the animal communication side proceeded to this stage. The one animal communication specialist who had initially agreed to an interview, which led to a series of detailed questions based on that individual's publications being prepared, suddenly decided to withdraw. No reason was given. However, by this point, it was too late to look for someone else. A summary of the final figures can be seen in the table below:

Table 4: Specialist questionnaires

Questionnaire type	Invitations	Responses	Interviews
Animal communication	20	4	0
Historical linguistics	20	6	3
Linguistic ecology	20	9	3
Totals	60	19	6

Responses to the first generic questionnaire were anonymous, and, for most contributors, their participation ended at this point. An outline of the questions is shown below in this section, with the actual questions and responses shown in Section 3. The semi-structured interviews, on the other hand, contained bespoke questions based on the individual respondents' replies to the first questionnaire, and also on their published work. Consequently, before moving from the first to the second stage, and given that identification of the individuals concerned would be virtually inevitable under these circumstances in any event, respondents were asked for permission to include their names. Despite the original intention to hold video-link or face-to-face interviews, this proved difficult in practice, and so the interviewees returned their completed answers in writing, in their own time.

The biocultural diversity questionnaire aimed at the general public, which forms, in essence a sub-section of Theme 3, was dealt with in a different manner. As this is a topic which regularly receives considerable media attention, at least in the case of biodiversity, a questionnaire was prepared which could be sent to members of the general public to assess not only their factual knowledge of different biocultural categories, but also their attitudes towards them. The original intention was for this to be split between recipients based in the largely monolingual UK and another nation-state with a high proportion of multilinguals, such as the Netherlands, in order to establish whether or not the ability to speak more than one language had any bearing on the answers. However, after initial enquiries, this route turned out to be prohibitively expensive. For practical reasons, the questionnaire was subsequently distributed to students and staff in one of the Faculties at the University of Wales Trinity Saint David, as there was no reason to assume that this group would be any more knowledgeable than any other non-specialist group. The aim was to receive 100 responses, and a total of 105 were completed, this time via an online survey platform rather than individual emails. A total of 16 questions were asked, and care was taken to spread the

questions on biodiversity, linguistic diversity and cultural diversity at random intervals. One reason for doing this was to assess whether knowledge of, or attitudes towards, biodiversity would be any stronger than the others.

With regard, then, to the fourth theme on the relationship of culture to both species and languages, it was deemed sufficient to rely solely on available materials in published academic works, and incorporate questions about the divide between the natural sciences on the one hand, and the humanities and social sciences on the other, into various questions in the different questionnaires. This theme was based upon the issue raised in 1959 by C.P. Snow for the annual Rede Lecture at the University of Cambridge entitled *The Two Cultures*. Snow was, in his own words, "by training…a scientist; by vocation…a writer" (p. 1) and therefore ideally placed to comment on this divide. Members of these two groups had, according to Snow, "almost ceased to communicate at all" (ibid) to such an extent that "the intellectual life of the whole of western society is increasingly being split into two polar groups" (p. 2) labelled by him as literary intellectuals and scientists. He bemoans a "fanatical belief in educational specialisation" (p. 9) particularly in the UK, and asserts that the gap between scientists and non-scientists "is much less bridgeable among the young than it was even thirty years ago" (ibid). Given that the biological and the linguistic landed on different sides of this gap, it was felt that this topic may be of some significance.

2.1 Animal communication questionnaire for published authors

The introductory paragraph of this questionnaire noted that its purpose was to gather information to help establish the extent to which academics studying aspects of animal communication use theories and methods from linguistics in their research, and where animal communication sits as a discipline. This is in accordance with the first theme outlined in the General Themes and Objectives section above. Individual emails were sent to academic staff

in Europe, North America and Asia who had published on the topic, and the four responses received were from the United States (2), France and the Netherlands. Questions 1 and 2 related to whether or not recipients considered animal communication to be a branch of some other discipline and how they saw themselves as individual academics. The underlying reason for these questions was to establish whether linguistics/linguist would feature amongst the responses, given that human language is itself a form of animal communication. Question 3 asked for information on personal research undertaken by the participants, while Questions 4 to 10 were all linked in some way to either the necessity, desirability or reality of collaboration between animal communication and linguistics. Question 11, related to the "two cultures" theme, asked whether the division of academic disciplines into natural and social sciences facilitated or inhibited collaboration across this divide. In keeping with the centrality of this theme, this question was asked in all three of the questionnaires. Questions 12 and 13 pertained specifically to differences and similarities in inter- and intraspecies communication, and offer an example of why separate questionnaires were provided for each target audience. The final question was a request for a semi-structured interview, which was also common to all three questionnaires.

2.2   Historical linguistics questionnaire for published authors

The introductory sentence of this questionnaire noted that its purpose was to gather information to help shed further light on the shared terms and concepts used in (evolutionary) biology and (historical) linguistics. This can therefore be seen to be in keeping with the second of this essay's four themes. Individual emails were sent to academic staff in Europe, North America and Australasia who had published on the topic, and the six responses received were (one each) from the United States, Portugal, Germany, the United Kingdom, France and Sweden. The rationale for this questionnaire was rather different to that of the

first, with the first four questions all concentrating on aspects of common terminology such as "vulnerable", "extinct" and "genetically related" and attitudes towards them. Questions 5 to 8, were all linked in some way to either the necessity, desirability or reality of collaboration between evolutionary biology and historical linguistics, with Question 9 being the same "two cultures" question as the one in the animal communication questionnaire. Questions 10 and 11 were subject-specific, focusing on the shared usage of "family trees" and definitions of the term "evolution" with regard to languages. This latter question was therefore linked not only to Theme 2, but also to the fourth theme of this dissertation on the relationship between language, culture and biology. The final question once again asked whether respondents would be available for a semi-structured interview.

2.3 Linguistic ecology questionnaire for published authors

This questionnaire noted that its purpose was to gather information to help shed further light on the shared terms and concepts used in linguistic and biological ecology. This can therefore be seen to be in keeping with Theme 3 of this essay's four themes. Individual emails were sent to academic staff in Europe, Asia, North America, South America and Australasia who had published on the topic, and the nine responses received were from the United States (3), Germany (2), Brazil, the United Kingdom, Italy, and Australia. This questionnaire followed a rather similar format to the second, but was based upon shared concepts in an ecological, as opposed to an evolutionary context. For example, recipients of this questionnaire were asked for their views on the use of the term "ecology" in a linguistic context rather than a question on "family trees". All the other questions were either identical or else "ecological" equivalents to the "evolutionary" ones in the historical linguistics questionnaire. In general, and to a greater extent than was the case with the other questionnaires, the responses were more inclined to include additional comments, sometimes

as well as, and sometimes instead of, choosing from the options provided. One noticeable feature was that there were considerably more opinions about fundamental issues such as the nature and scope of the field. These were often contradictory or critical in nature and gave the impression that this field is divided, if it is in fact one field in the first place.

2.4 Biocultural diversity questionnaire for the general public

The purpose behind this questionnaire was to examine the third theme of parallels between linguistic and biological ecology from a different angle, namely that of the general public as opposed to published academics. Its aim was to catch a glimpse of a lay audience's awareness of the scale of both biological and cultural diversity globally, the perceived threats to these, and consequent attitudes towards their preservation.

The 16 questions were placed into three sub-categories, namely:

- How many?
- What percentage?
- How important?

The first two are of course quantifiable, while the last measures attitudes. Questions on languages and cultural heritage were deliberately interspersed between those on biodiversity in an attempt to avoid any second guessing as to the direction of travel. Establishing whether or not there was any difference in knowledge or attitudes between the "bio" and "cultural" sides of biocultural diversity was also an objective. Within the biological categories, the classes Mammalia and Amphibia were intentionally chosen to see whether lumpy toads elicited the same response as fluffy bunnies. Conifers were similarly selected to look for any differences in attitude between animal and plant life.

3. **Results of questionnaires and interviews**

The results of the questionnaires have been divided below into those questions which are specific to individual questionnaires and those which are shared between two or more. The results of all questions can be seen in the following sections, with, where applicable, the options presented and the *number* of received responses indicated in each case. A selection of the most significant additional comments has also been included. When compiling the responses, it became apparent that the collation of information would have been improved had each questionnaire contained one section of common questions and another section of specific ones, thus making it easier to standardise the numbering of questions. This had not been done initially as the questionnaires were prepared individually and then distributed as soon as completed, however, this oversight would not be repeated in any future distribution. On this occasion, those questions which were included in more than one questionnaire have been placed in Sections 3.4 and 3.5 with their combined results shown in Tables 12 – 22. It should be noted that the letter "Q" at the *beginning* of a reference, e.g. QAC1, indicates a respondent's *questionnaire number*, whereas "Q" at the *end*, e.g. ACQ1, indicates a *question number* within a particular questionnaire.

3.1 **Results of questions specific to the animal communication questionnaire**

Unfortunately, only four responses were received in the field of animal communication. All will remain anonymous as none went on to complete a semi-structured interview. That said, every respondent was a leading expert in this line of work, regularly publishing the results of research in scientific journals. This alone has made their responses of great use. The first question (ACQ1) related to the status of animal communication and where it sits as an academic discipline. The responses can be seen below:

Table 5: Responses to ACQ1: "Do you consider the study of animal communication to be a branch of any of the following academic disciplines? (please highlight as many as you feel relevant)"

Option	Responses
a) Biology	4
b) Zoology	3
c) Ecology	1
d) Ethology	4
e) Behavioural science	2
f) Cognitive science	3
g) Psychology	1
h) Linguistics	1
i) Other (please specify)	0

The second question (ACQ2), based on the same choice of academic disciplines, was directed at the individual respondents themselves:

Table 6: Responses to ACQ2: "Do you consider yourself to be any of the following? (please highlight as many as you feel relevant)"

Option	Responses
a) Biologist	2
b) Zoologist	2
c) Ecologist	1
d) Ethologist	3
e) Behavioural scientist	2

f) Cognitive scientist	1
g) Psychologist	2
h) Linguist	0
i) Other (please specify)	0

It is significant, then, that of all the choices offered, linguist was the only option which received no responses at all. When combining the results of these first two questions, it can be seen that ethology/ethologist is at the top of the league with seven, and linguistics/ linguist at the bottom with zero. Ironically, the responses given to ACQ3 would grace many a linguistics department. The question asked was "Could you explain in simple terms which aspects of animal communication have primarily featured in any research you have undertaken". The responses included "the structure and function of signals, including the mechanisms by which they were produced" (QAC1), "perception and categorization of human speech prosody" (QAC2), "language evolution; bio-acoustics; eco-acoustics; articulation; semantics; syntax; socio-ecology" (QAC3) and "the social functions of more complex forms (enhanced repertoire size) of communication" (QAC4). The responses to ACQ4, namely "Does the study of animal communication in general have its own specific methods which are distinct from other disciplines?" suggests some difference of opinion ranging, on the one hand, from the bluntly put "no" (QAC3) and "I don't think so, studying animal communication is inherently multidisciplinary.…" (QAC1) to, on the other hand, "I think so, especially considering the different modalities of communication among the animal kingdom, and the specific constraints of every animal species" (QAC2) and "acoustic data collection and playback experiments are relatively unique to animal communication. These methods overlap somewhat with the study of human speech" (QAC4).

Regarding whether or not the study of animal communication should include human language (ACQ5), there would appear to be strong, albeit conditional, support for this idea amongst the respondents, as illustrated below.

Table 7: Responses to ACQ5: "In your opinion, should human language fall within the scope of animal communication?"

Option	Responses
a) Yes, in principle, but due to its ubiquity and complexity, human language would still require a specific discipline of its own	3
b) No, its inclusion would detract from the study of other animal species	0
c) Partially, the study of human language should be seen as a 'sister' but separate discipline	1
d) Other	0

No additional comments were added. Nevertheless, the fact that none of the participants selected Option b) would seem to justify the question being asked.

In response to the question "Does any aspect of your specific personal research involve collaboration with linguists?" (ACQ8), this was noted as being the case by all four, with comments including "not at present, but it has on occasion in the past and will likely require more such collaboration in the future" (QAC1), and "yes, establishing and development of speech rhythmic and intonational patterns for testing prosody perception" (QAC2), to a simple "yes" (QAC3) and "yes some of my work has been in collaborative with researchers from quantitative linguistics" (QAC4). With regard to similarities in communication systems across different animal species (ACQ12), all of the options offered might apply, depending on the species in question, as illustrated here:

Table 8: Responses to ACQ12: "to the best of your knowledge, does research in animal communication suggest that *similarities across different animal species* are primarily driven by: (please highlight as many as you feel relevant)"

Option	Responses
a) Shared evolutionary inheritance (taxonomic genus/class etc)	3
b) Shared environmental factors (e.g. 'social' structures and living patterns)	3
c) Geographical proximity	1
d) Other?	0

Additional comments noted that "for any pair of species, the reasons will be different" (QAC3) and that "there is evidence for all of these options" (QAC4).

In similar fashion, responses to ACQ13, on intraspecific dialect or accents, noted that all of the proposed options could apply in different circumstances:

Table 9: Responses to ACQ13: "To the best of your knowledge, does research in animal communication suggest that *different 'dialects' or 'accents' found within the same individual species* are primarily: (please highlight as many as you feel relevant)"

Option	Responses
a) Inherited through the genes	2
b) The result of learned behaviour	2
c) The result of geographical separation	0
d) Other?	1

It was emphasised that "both types of variation can be either innate or learned" (QAC3).

However, the additional comments added further weight to the relevance of birdsong as a

source of learned variation, given that "in some cases, such as birdsong, learning is clearly the primary source of dialect differences. In other cases, there may be a mix and in yet other cases, genetic differences are the most parsimonious explanation" (QAC1). Nevertheless, the assertion that "bird song dialect is often thought to be learned, whereas variation in primate vocalizations is typically thought to be innate" (QAC4) did come as something of a surprise.

3.2   Results of questions specific to the historical linguistics questionnaire

A total of six questionnaires were completed on the links between evolutionary biology and historical linguistics. Only one of the questions (BLQ10), was specific to this questionnaire, and the response to it can be seen in the table below.

Table 10: Responses to BLQ10: "In your opinion, is the 'family tree' model of indicating evolutionary relationships (please highlight as many as you feel relevant)"

Option	Responses
a) An adequate model for all biological species	2
b) An adequate model for all languages	2
c) An adequate model for some biological species, but not all	1
d) An adequate model for some languages, but not all	2
e) An inadequate model for biological species	4
f) An inadequate model for languages	3
g) Other?	0

As one of the staples of phylogenetic relationships, whether biological or linguistic, the family tree model, famously used by Darwin for his "tree of life" diagram and also used in philology to explain relationships between languages, clearly turned out to be a thorny issue. Additional comments noted that it was "an OK approximation most of the time" (QBLE2),

with two offering combinations of both adequate and inadequate, one stressing that it was "much more appropriate for biology" (QBLE6) and the other claiming that "in both biology and language, some patterns of diversification are tree-like but some aren't" (QBLE3).

3.3   Results of questions specific to the linguistic ecology questionnaire

A total of nine respondents completed the questionnaire on linguistic ecology. Again, only one of the questions (ELQ1) was specific to this questionnaire alone, and that question, along with responses to it, are shown here:

Table 11: Responses to ELQ1: "The term *'ecology'* is often used to describe interactions between not only biological organisms but also languages in their respective environments. Do you consider the application of the same term for these different phenomena to be:"

Option	Responses
a) Of no consequence, both concepts are easily understood and separated	1
b) Useful and of some significance, indicating the similar processes affecting both biodiversity and linguistic diversity	3
c) Unhelpful and misleading, giving the impression that languages are living organisms	3
d) Other?	1

The "other" response above added that this application of the same terms was "very useful" (QEL5) and so was closest to Option b). It can be seen that the number of responses above totals only eight. This is because one respondent chose to *expand* on the questions asked rather than select one of the multiple-choice options, stating that "the notion of "ecology" is used in reference to the environment that influences the evolution of (a) language" (QEL3).

This was one of many additional responses received to this question, with a diverse range of opinions in evidence. The quotes below offer some indication of these. One opinion expressed was that:

> the term "language ecology" is confusing to biologists, natural scientists in general and laymen informed about biology. I would have preferred a different, distinct term for the matters pursued (QEL9).

A similar objection, albeit from a different viewpoint, but with its own suggested alternative, stated that:

> it is anthropocentric to use the term "ecology" in a way that excludes animals, plants, forests, rivers and trees at a time in history that we most need to focus on them. So I would much prefer it if "language ecology" was instead referred to as "language interaction" (QEL2).

Yet another respondent, however, emphasised the point that not only the linguistic, but also the biological use of the term "ecology" is based upon a metaphor, and that:

> the question should not be whether biology and linguistics can be kept apart but whether researchers in biology and linguistics alike are aware of the metaphorical nature of the term and the consequences of using it (QEL6).

This could perhaps be considered a reminder to those who believe that "ecology" is solely a biological term. As if to reinforce this, a further respondent noted that:

> the term itself seems to be applied to mean two very different things: 1) the relationship between languages within a given social/ political context, and 2) the relationship between languages and the physical environment. There is basically disagreement about what constitutes the environment – is it social/political or physical/biological? (QEL4).

This comment highlights the divisions referred to previously. The killer blow, however, was the following:

> so far in my reading of Ecolinguistics I have yet to come across a convincing paper on the topic, so I have yet to understand what "ecology" applied to a language could mean (QEL1).

3.4 Results of questions common to the historical linguistics and linguistic ecology questionnaires

Five questions were common to both the historical linguistics and the linguistic ecology questionnaires. This combination means that the total number of respondents now increases to fifteen, although one respondent in particular (QEL3) chose to write in the additional comments boxes rather than selecting from the multiple-choice options. The responses to these five questions are shown in this section, with the first here:

Table 12: Responses to BLQ1/ELQ2: "The terms *'vulnerable', 'critically endangered'* and *'extinct'* are used to classify levels of endangerment not only of biological species (IUCN) but also of languages (UNESCO). Do you consider the application of the same terms for these different phenomena to be:"

Option	Responses
a) Of no consequence, both are easily understood and separated	2
b) Of use and of some significance, indicating the similar dangers facing both biodiversity and linguistic diversity	10
c) Unhelpful and misleading, giving the impression that languages are living organisms	2
d) Other?	0

It can be seen that Option b) was clearly the most popular choice, with Option a) receiving two responses on the historical linguistics questionnaire but none on the linguistic ecology one, and Option c) doing the reverse. The sharing of terms in fact seemed to face greater opposition within the linguistic ecology/ecolinguistics field than it did elsewhere. That said, the terms in Table 12 above received less objectional responses than did the term "language

ecology", with two respondents keen to make this point themselves in their additional comments.

One of these was as follows:

> I view the terms "vulnerable", "critically endangered" and "extinct" as more neutral than the term "language ecology". The former terms do not necessarily make you think of biological organisms (QEL9).

The other displayed much the same sentiment:

> These terms generally make sense and don't imply that languages behave like species in general (in the way that "language ecology" does) (QEL2).

Some responses, however, came with an added warning:

> It is of significance and also of (some) use. But there is a theory behind it, equalling some aspects of languages with some aspects of living beings. This theory makes sense from one point of view, but is terribly misleading from another (QEL6).

Also, from a rather different angle:

> I think these labels are misleading because endangerment isn't a property of a language. It's the product of a political context – we should be rating that. Labelling languages "endangered" etc verges on victim blaming (QEL4).

This last point, although valid, is nevertheless equally true for biological species.

Endangerment is not a property of theirs either, and political policy will also determine vital aspects of their conservation such as habitat loss or (in)action on climate change.

The next question was based on the same principle, but with a different choice of terms. Here is the question and the responses to it:

Table 13: Responses to BLQ2/ELQ3: "Terms such as *'living', 'dead'* and *'genetically related'* are frequently used to describe languages. Do you consider the application of such terms to languages to be":

Option	Responses
a) Of no consequence, their meaning is easily understood	2
b) Of use and of some significance, indicating similarities in the ways that both biological species and languages come into being, cease to exist and relate to each other	6
c) Unhelpful and misleading, given that languages are neither living organisms nor related to each other by genes	3
d) Other?	3

There were again some differences between the historical linguistics questionnaire responses and the linguistic ecology ones, with Option a) chosen only by the former, and Option d) solely by the latter. The use of "genetically related" in particular seemed to arouse strong feelings, as indicated here:

> "genetically related" may be misleading since it implies too strongly that languages behave in the same way as species, which might blind researchers to ways that they might be different (QEL2).

And even more strongly here:

> Especially the term "genetically related" is gravely misleading and should be replaced. The other two terms are, however, less innocuous and so well entrenched that they will have to be kept (QEL9).

Again, as far as the following question on biocultural diversity was concerned, as shown in Table 14 below, it is interesting to note that all three of the respondents who chose Option b) were recipients of the historical linguistics questionnaire. It was not chosen by any of the linguistic ecology respondents, who, it could be argued, should have a better understanding of biomes.

Table 14: Responses to BLQ3/ELQ4: "The term *'biocultural diversity'* has been defined as *"the diversity of life in all its manifestations: biological, cultural, and linguistic"*. All three types of diversity are often noted as facing similar threats. Do you consider these common threats to be":

Option	Responses
a) Clearly linked, there is a knock-on effect between all three	6
b) Environmentally determined. Biological, cultural and linguistic diversity are similar in certain areas simply because they share the same kind of biome (e.g. dense rainforest versus arctic tundra)	3
c) Entirely coincidental, they are not interrelated	0
d) Other?	6

In general, this question had a greater incidence of additional comments, ranging from "I am agnostic with respect to this question" (QBLE1) to the subtly put "I think these are consequences of complex phenomena that cannot be captured by the choices here provided" (QBLE4). It might simply be, therefore, that this question was too simplistic and not sufficiently thought through. One respondent felt that even if they were all linked that this was "of little practical value" (QEL4) and yet another that any links between them were primarily metaphorical (QEL6). The remaining comment, however, was straight and to the point:

> I think the notions "biological diversity" and "cultural and/or linguistic diversity" should be kept apart. For instance, "biological diversity" could in principle be maintained, while "linguistic diversity" totally disappears (QEL9).

Despite *some* support, the suggestion that binomial nomenclature could be applied to languages in a similar fashion to biological species was not well received, with the largest single response asserting that it would be of no practical purpose. The idea behind this was to

create a standard method of labelling languages by linguists which would be independent of political considerations. The responses are shown below.

Table 15: Responses to BLQ4/ELQ6: "Binomial nomenclature (e.g. *Canis lupus*) **is applied to biological species, often alongside a common name (e.g.** *wolf*). **In your opinion, would the application of binomial nomenclature to the world's languages in similar fashion be:"**

Option	Responses
a) Of no practical purpose	7
b) A useful means of distinguishing languages from each other, especially in the more linguistically diverse parts of the world	3
c) Another example of blurring the distinction between biological organisms and languages	1
d) Other?	3

Whether or not the evolution/ecology of languages was part of a wider cultural or biological process received a mixed response, as follows:

Table 16: Responses to BLQ11/ELQ5: "In your opinion, which of the following definitions best explains the term *'evolution' / 'ecology'* **as applied to** *languages***"**

Option	Responses
a) An exclusive process which applies to languages alone	1
b) Part of the wider process of cultural evolution/ecology which includes other aspects of culture but is separate from biological evolution/ecology	5
c) Part of the wider process of biological evolution/ecology as are other forms of animal communication/human culture	6
d) Other?	4

One respondent claimed that "the question seems ill-stated" (QBLE1) and a further two wrote additional comments in the "other" box, as expressed here:

> The ecology of a language is not limited to the other languages that it coexists and may compete with. It includes a host of socioeconomic and natural ecology pressures that affect the behaviors of speakers (QEL3).

And again here:

> Ecology is the interaction of humans with other humans, other species and the physical environment. Language use plays a role within ecology since it is one of the ways that humans interact with each other (QEL2).

These seem in principle to be quite close to Option c), and it is apparent that language operating in a "vacuum" is not a popular view overall.

3.5 Results of questions common to all three questionnaires

A further five questions were common to all three questionnaires. This combination means that the total number of respondents now increases to nineteen, although, as previously mentioned, one of these (QEL3) usually chose to write in the additional comments boxes rather than selecting from the multiple-choice options and so this may affect the totals shown. It should be added that the animal communication version of the question shown in Table 17 below was worded slightly differently to the other two, although it asked about the same issue in principle. Consequently, the respondents' replies to the animal communication question have been placed against one of the available options based upon the wording of their responses. They can, however, be seen to be broadly in line with the others in any event. This scenario, however, was not the case with the remaining four questions, all of which, apart from naming the individual disciplines differently (e.g. animal communication/historical linguistics/ linguistic ecology) were identically structured. The responses to these five questions are now discussed in this section.

Table 17: Responses to BLQ5/ELQ7/ACQ6: "To the best of your knowledge, do (animal communication/evolutionary/ecological) biologists in general make use of findings from the field of (general/historical/ecological) linguistics?"

Option	Responses
a) Regularly	0
b) Often	1
c) Sometimes	1
d) Rarely	6
e) Only in very specific cases	4
f) Never	3
g) Other	4

As can be seen, biologists making use of findings from linguistics was deemed to be an event which happened rarely, if at all. This appeared to be the opinion across all three disciplines as no discernible differences were evident between the various sets of responses. The animal communications respondents ranged from uncertainty in the one case (QAC2) to the more typical "only occasionally" (QAC4), "no, not usually" (QAC3) and "not as it is practiced by most researchers today" (QAC1). The historical linguistics stance was perhaps best summed up by the following additional comment: "I am not aware of much if any influence in the direction from historical linguistics to evolutionary biology" (QBLE3). Meanwhile, many of the linguistic ecology responses once again displayed bemusement at the use of the term itself and doubted that biologists would make use of works specifically labelled "linguistic ecology" (QEL2) or even know anything about the "ecology of language" (QEL3). One claimed that "biologists are usually quite puzzled" by the term (QAC9). This type of response, though, was felt by one respondent to be representative of the tendency of

many academics to "stay in their tiny epistemological box throughout their entire career" (QEL8). Another response to the linguistic ecology questionnaire, however, reminded us that "the form of illustrating genealogical trees in biology was adopted from illustrations from linguistics" (QEL6). This may serve as a timely reminder to those who hold serious objections to the application of the term "genetically related" in the linguistic field (see Table 13 above). The reverse scenario, where linguists made use of findings from biology, appeared to be more evenly split, as can be seen here:

Table 18: Responses to BLQ8/ELQ10/ACQ9: "To the best of your knowledge, do (historical/ecological) linguists in general make use of findings from the field of (animal communication/evolutionary/ecological) biology?"

Option	Responses
a) Regularly	0
b) Often	1
c) Sometimes	7
d) Rarely	6
e) Only in very specific cases	3
f) Never	0
g) Other	1

Five of the seven "sometimes" responses, however, came from the historical linguistics questionnaire, suggesting that this field makes greater use of biological methods than the others. Linguists using findings from animal communication specifically was not thought to be a regular occurrence, with one respondent making an additional comment which deserves to be quoted in its entirety:

I think biologists interested in animal communication are more likely to make use of findings from linguistics than are linguists interested in human language likely to make use of findings from those studying animal communication. Further (and perhaps unfortunately), I think linguists who do draw on findings from studies of animal communication sometimes "cherry pick" ideas and results and therefore draw on those studies in a shallow fashion (QAC1).

One striking aspect of the linguistic ecology questionnaire was the additional comments, many of which were critical in some way. Two respondents, for example, again expressed uncertainty regarding the definition of a linguistic ecologist, and who might count as one. A range of different and conflicting attitudes towards "ecological linguistics" were then evident in several of the added comments:

From dismissiveness:

I think that they may borrow terminology from biological ecology (e.g., semantic niche) and then (in an often forced way) try to apply it to language (QEL2).

To dislike:

I think most "ecolinguists" as they call themselves (and I hate the term *ecolinguistics*!) are much influenced by environmentalists but have expressed little interest in macroecology. So their discourse is more moralizing than it can explain what is happening from an evolutionary perspective (QEL3).

To disappointment:

I have a degree in ecology and am surprised by how little use is actually made of ecological theory in ecological linguistics. There are so many concepts that could be deployed productively (QEL4).

Despite the perceptions about the state of cross-fertilisation between biology and linguistics in general, the interdisciplinarity undertaken by respondents to the questionnaires appeared to be much higher than the presumed norm, as illustrated in the results below.

Table 19: Responses to BLQ7/ELQ9/ACQ10: "Do you use methods from both (biological discipline) and (linguistic discipline) in your personal research?"

Option	Responses
a) Regularly	6
b) Often	3
c) Sometimes	3
d) Rarely	2
e) Only in very specific cases	3
f) Never	2
g) Other	0

One respondent even noted that:

> Linguists complain that I am too biologically oriented, while some biologists like what I do. But I really don't know whether I should say I use "methods from biological … ecology." (QEL3).

As far as the *desirability* of collaborative research was concerned, it received replies which appear on the face of it to tell a different story to the reality on the ground. There is no discernible difference between the responses given across the three questionnaires, which is rather surprising given the differences in attitude seen in some of the previous responses. That said, the sole "unnecessary" response came from the linguistic ecology questionnaire.

Table 20: Responses BLQ6/ELQ8/ACQ7: "In your opinion, is collaborative research between (biological discipline) and (linguistic discipline)"

Option	Responses
a) Unnecessary	1
b) Desirable	8
c) Essential	8
d) Other?	3

Some responses contained quite detailed additional comments which have been included here for information. The one below was added by one of the historical linguistics respondents, who had also highlighted both the "desirable" and "essential" options:

> What is most essential, in my opinion, is recognizing that there is an abstract theory of evolutionary change (change by replication) that subsumes biological evolution, cultural evolution and language change. There are differences in how it is instantiated in these domains, and these differences can cause (and have caused) misinterpretations and mis-adaptations of ideas. There has to be some recognition of these facts on the part of both the biologists and the linguists who are collaborating, for it to be productive (QBLE3).

The respondent who felt that any such collaboration was *unnecessary* added the following:

> If a "linguistic ecologist" only considers relationships of languages with other languages without considering the biological and physical world then it would be useless – the linguist could offer nothing to the ecologist. It would be much better for ecologists to meet ecolinguists (QEL2)

This again appears to suggest a divide between one field (often, but not always, termed language ecology or linguistic ecology), which studies relationships between languages, such as, for example, language shift , and another (often, but not always, termed ecolinguistics), which studies languages from within a wider ecological framework, such as its role in sustaining human communities within their physical environment.

One of the "other" respondents adding the following warning:

if this theory sees a clear link between entity-like languages and biological entities, as it has been done so often since the 19th century, it is, I think, of no use, because there is, in my opinion, so much convincing evidence that the social and the biological do not work along the same lines (QEL6).

There is an implication here that the "social" is therefore not "biological" and this distinction will be considered later. It in fact has some bearing on the next question regarding the division of academic subjects:

Table 21: Responses to BLQ9/ELQ9/ACQ11: "In your opinion, does the division of academic disciplines into natural sciences on the one hand and social sciences/humanities on the other":

Option	Responses
a) Facilitate collaboration between biological and linguistic disciplines	0
b) Inhibit collaboration between biological and linguistic disciplines	10
c) Neither facilitate nor inhibit collaboration between biological and linguistic disciplines	6
d) Other?	3

It can be seen that no-one was of the opinion that such a division facilitated collaboration between the two sides. This should occasion no surprise as division is not often a fruitful source for cooperation. Some additional comments were noted under the "other" option. One of these thought that merging natural and social sciences would cause problems of its own and that "changing the academic reward system to genuinely encourage interdisciplinary collaboration would be more helpful" (QBLE3). Another added that this academic division was "making collaboration more difficult, as biologists rarely feel obliged to learn about

linguistics, while linguists often learn at least something about biology" (QBLE1). This should perhaps be compared to the comment made above by a biologist in response to the animal communication questionnaire (QAC1, Table 18) which says more or less the exact opposite. One respondent to the linguistic ecology questionnaire felt very strongly about this issue as can be seen by the following comment:

> This is one of the most pervasive problems within the academic institution. I have spent much of my career acting as if this division does not exist at all. This is a form of reductionistic thinking that reduces knowledge to a little box (QEL8).

The final question on each questionnaire was a request for an interview, which ultimately led to six being held. The number of responses to the different options are shown below:

Table 22: Responses to BLQ12/ELQ12/ACQ14: "Would you be interested in participating in a brief semi-structured interview to expand on the subject matter raised in this questionnaire? (this would require permission to include your name)"

Option	Responses
a) Yes, of course	4
b) No, unfortunately not	5
c) Possibly, if a convenient time can be arranged	10

3.6 Semi-structured Interviews from the Historical Linguistics Questionnaire

Respondents were chosen for interview from those who had very kindly noted that they were definitely or possibly available. This required the tailoring of further bespoke questions based upon the answers to the initial questionnaire, as well as articles written by each individual contributor. The three interviews which resulted from the historical linguistics questionnaire are shown in this section.

3.6.1 Semi-structured Interview with Johann-Mattis List

At the time of interview, Johann-Mattis List was Senior Scientist in the Department of Linguistic and Cultural Evolution at the Max Planck Institute for the Science of Human History in Jena, having previously worked as Research Fellow at the Centre de Recherches Linguistiques sur l'Asie Orientale in Paris, France, and as Post-Doctoral Researcher at Philipps University in Marburg, Germany. Doctor List has written extensively, either alone or in conjunction with other scholars, on the parallels between evolutionary biology and historical linguistics, and his main relevant works are referred to either in the following interview or in the bibliography. He was lead author of 'Unity and disunity in evolutionary sciences: process-based analogies open common research avenues for biology and linguistics' which was considered an essential article for this dissertation's literature review. This interview is a continuation of responses given to the questionnaire QBLE1.

When asked to elaborate on any collaborative work which has led to interdisciplinary progress between historical linguistics and evolutionary biology (SSIQ1JL), Doctor List referred to the upcoming article which he co-authored with Guillaume Jacques entitled 'Save the trees. Why we need tree models in historical linguistics (and when we should apply them)' (Jacques and List, 2019) which subsequently appeared in the *Journal of Historical Linguistics* 9.1, a special edition devoted to 'Understanding language genealogy: Alternatives to the tree model'. Jacques and List's article basically defends the use of tree models to establish relationships between languages in historical linguistics, but notes in the conclusion that "no linguist would deny that not all aspects of language history are tree-like" (p. 158). This article, and, incidentally, this article alone, elicited a response in the same volume from the editors Kalyan and Francois (2019) entitled 'When the waves meet the trees: A response to Jacques and List' (pp. 168-176). These authors are proponents of Historical Glottometry (HG), and argue that their stance is not an outright defence of the traditional 'wave model'

usually offered as an alternative to family trees, but, as suggested by the title, a modified version compatible with Jacques and List. Their conclusion therefore suggests innovations to traditional practices on both sides. This has parallels with the biological literature, which is likewise finding flaws in Darwin's tree of life, and arguing that it cannot account for all species, prokaryotes in particular, as argued, for example, by Bapteste, E. et al. (2009) in the article 'Prokaryotic evolution and the tree of life are two different things'. This same point is again in evidence in question SSIQ4JL, where Doctor List's questionnaire response to a question on the tree model appears to contradict his stance in earlier papers authored by him. He confirms that the recent 'Save the Trees' article represents his current thinking on the matter, namely that the tree model is important, but in part insufficient. However, the "prokaryotic issue" again raises its head in SSIQ5JL via the matter of Lateral Gene Transfer (LGT), an oft-used parallel for "borrowing" in languages. Here, Doctor List asserts that the biological aspects of LGT and the linguistic aspects are far too different to allow for a direct comparison, going so far as to suggest that "the current approaches in biology suffer heavily from the fact that scholars just don't know what is transferred and what is inherited". This is clearly not a promising foundation on which to build. Despite this, Doctor List is still of the opinion that evolutionary biology and historical linguistics share many striking parallels (SSIQ6JL).

In response to question SSIQ2JL, Doctor List acknowledged that the process-based analogies first promoted in his 2016 'Unity and Disunity' paper had not borne fruit as initially hoped, and that it was still at times difficult to take inspiration from evolutionary biology. As to whether "biology is of more use to linguistics than linguistics is to biology" (SSIQ3JL) in the context of collaboration between the two disciplines, he notes that currently "linguists make a lot of use of algorithms proposed first for biology" but, with the exception of neurolinguistic programming, there is no precedent "where methods developed for

studying languages would have been useful for biology". The admission that "biology guarantees practically our funding by now" is perhaps a little worrying in terms of the supposed worth of purely linguistic research.

Based on Doctor List's claim that general evolution cannot be studied from within one discipline alone, Question SSIQ8JL asked whether we have now reached a stage where a full picture of evolution does, or soon will, exist. His response indicated some scepticism for two reasons, both of which are of great importance to Themes 2 and 4. Firstly, the belief that cultural evolutionists "ignore the specifics of evolution in the different fields, specifically linguistic phenomena like regular sound change" and secondly, that they "have a hard time to actually find parallels in other evolving systems than language". He concluded by adding that "the wish to unify everything is at times leading to annoyingly simplifying accounts". No specific examples were noted here, however the belief that there is a *wish* to unify everything in the first place is cause for some concern. When asked (SSIQ9JL) why we are unable to quantify how many cultures there are in the world. Doctor List replied that he honestly did not know and had never asked himself the question. Finally, when asked if he agreed with the assertion that culture is part of biology (SSIQ10L), Doctor List stated that it depends on the perspective but that he preferred to keep things distinct, and any unifying process would mean that not all evolution is biological, but overarching both the biological and linguistic.

3.6.2 Semi-structured Interview with William Croft

At the time of interview, William Croft was Professor in the Department of Linguistics at the University of New Mexico, Albuquerque, a position he has held since 2006. Prior to this, he worked as Professor and Assistant Professor at the Universities of Manchester and Michigan respectively. Professor Croft has been a prolific author for some forty years, however, it is his framework for language evolution in *Explaining language*

change: an evolutionary approach which, as noted in the above literature review, is of particular relevance here. Consequently, the first half of this interview concerns itself with the responses to the questionnaire QBLE3, while the second deals almost exclusively with questions based on Professor Croft's 2013 updated version of Chapter 2 of this book.

When responding to SSIQ1WC, concerning possible contradictions in his answers on parallels between the biological and the linguistic worlds in the original questionnaire, Professor Croft confirmed his belief that "there is a common evolutionary model behind both biological and linguistic entities, but one must be careful as to the parallel instantiations of the elements of the common evolutionary model". Therefore, Question 2 of QBLE3 had, in his view, proposed a wrong parallelism. This, then, was an example of the potential to draw false analogies, in this case, between terms such as "living", "dead" and "genetically related".

In response to SSIQ2WC, when asked whether he was of the opinion that language change has its own specific characteristics which distinguish it from cultural evolution more generally, Professor Croft noted that he considered "language change to be a type of cultural transmission. This does not preclude the possibility that there are aspects of language that make linguistic transmission different from transmission of other cultural traits", another point of great importance to Theme 4 which will be returned to in the later discussion section.

As was the case with Doctor List above, Professor Croft was asked (SSIQ3WC) why we are unable to quantify how many cultures exist in the world. He replied that "the population that defines the divergence of one cultural trait (say, language) is different from the population that defines the divergence of another cultural trait (say, religion)". Indeed, this was in many ways the point of the question, as, if Tylor's (1871) "complex whole" definition of culture is correct, we should expect the boundaries of cultural traits within these populations to largely coincide. Professor Croft's response then continues to make several of the points made elsewhere in this essay, such as that "culture" is quite a bit vaguer than

"language", and that some of the difficulty in quantifying "cultures" is due to the difficulty of defining the set of traits that constitutes a culture. Even so, the Murdock classification is put forward as an example of cultures being quantified.

Moving on to differences and similarities between the natural and social sciences (SSIQ4WC), Professor Croft emphasises that "the usual distinguishing feature between natural sciences and social sciences and humanities is that the latter has as its domain of inquiry human social interaction and its products (language, music, political institutions, etc.), and the former does not". This is indeed the case. However, one of the central tenets of this dissertation is that this division is a manifestation of dualism (i.e. the remit of the humanities and social sciences is to study the "mental" world, while the natural sciences look after the "physical" one) and, by its very existence, not only implies that such a division is correct, but also institutionally promotes its continuation. Professor Croft, of course, has already noted that "natural sciences and social sciences/humanities are different, although they are not as different as some think" (QBLE3), offering us some hope of crossing this divide, although he sees no special affinity between biological and linguistic evolution in particular, claiming rather that "pretty much all of the social sciences/humanities share as many "curious parallels" with biological evolution" as does the study of language change (SSIQ5WC). All involve the replication of social practices via human interaction.

The interview now turns to questions based on the revised Chapter 2 of Professor Croft's *Explaining language change: an evolutionary approach* which has been put on his website. One quote from this chapter notes that "linguistic diversity is so great that it is impossible to establish any but the most general exceptionless, unrestricted universals of language" (SSIQ6WC). This is an attractive statement which instantly strikes a chord. Nevertheless, given the even greater numbers of biological species, Professor Croft was asked whether this was not also the case (if not even more so) with biodiversity. He replied in

the affirmative, adding that, as with species, our knowledge of languages is confined to a relatively small sample.

In SSIQ7WC, based on a quote from his revised chapter which notes that evolutionary theory when applied to language "provides a model of change that is not the result of the intentional behaviour of individual persons", Professor Croft was asked whether lack of intent was a prerequisite for evolution. He replied that "intentions related to communicative success in interpersonal interaction are OK; intentions based on making the linguistic system "simpler" or more "elegant" are not". Although the precise meaning of this distinction was not fully apparent, it has been taken to mean distinguishing between trying to make oneself more easily understood in a "natural" situation, as opposed to what might be described as "linguistic engineering".

SSIQ8WC concerned Professor Croft's assertion that "only actual interbreeding ultimately matters for the definition of a species/language" (*intelligible communication* being the "interbreeding" required in the case of language). If so, then how should we define individuals with the *potential* to interbreed, who, for whatever reason, would be extremely unlikely to do so? The example given in the question was that of a male puma from British Columbia and a female from Patagonia. These would never interbreed in the wild but would nonetheless have the *potential* to do so, for example, under forced circumstances such as being captured and kept in the same zoo. Linguistic equivalents would include individuals who spoke the same language but who were unlikely to ever communicate with each other despite having the potential to do so. Professor Croft replied that drawing the line between populations in both biology and linguistics presents difficulties, but "what matters is presence of interbreeding vs. absence of interbreeding". Whilst accepting that a lack of "interbreeding" between populations is a major factor in the ultimate creation of new species, this stance was not felt to be particularly convincing, given those individuals who are perfectly *capable* of

interbreeding but do not necessarily do so. It could be argued that the limits of populations are already reflected by existing language and species barriers.

As far as a general framework for linguistic, cultural and biological change is concerned, (SSIQ11WC) Professor Croft noted that he was of the belief that "such a framework exists" even if scholars did not necessarily agree on its structure. On the face of it, this appears to be a more optimistic stance on the issue than the one taken above by Doctor List (SSIQ8JL).

3.6.3   Semi-structured Interview with Nathalie Gontier

At the time of interview, Nathalie Gontier was Director of the Applied Evolutionary Epistemology Lab in the Centre for Philosophy of Science at the Faculty of Science of the University of Lisbon. She is also founder and editor-in-chief of the Springer book series on Interdisciplinary Evolution Research. Of particular interest to this dissertation is her work on the Applied Evolutionary Epistemology methodology. The following interview is a continuation of questionnaire QBLE4.

When asked if dichotomies such as biological/cultural and animal/human played a part in the division of the academic world into natural sciences and social sciences/ humanities (SSIQ1NG), Professor Gontier affirmed that they did. As has already been noted in the above literature review, she confirmed that nineteenth century natural historians saw continuity between biological and cultural or linguistic evolution. Interestingly, she asserts that the cause was a synchronic/diachronic split within subjects like linguistics, anthropology and sociology which cut them off from their "evolutionary" counterparts. This point was also noted in the literature review by Aranoff (2017, p. 450), and it would indeed be highly ironic if evolution turned out to be the "dividing theory" of the social sciences, given that it is often referred to as the "unifying theory" of biology.

With regard to whether networks offered a more efficient method of indicating shared relationships than the family tree model, Professor Gontier asserted that the latter model was very good at indicating vertical transfer, but not horizontal transfer, which was better represented by the former. "Both demonstrate different aspects of evolution and it is best to try and use both models when interpreting data" (SSIQ3NG). This is in at least partial agreement with Doctor List's response in SSIQ4JL that the tree model is important, but in part insufficient.

Turning to Professor Gontier's Applied Evolutionary Epistemology framework (SSIQ5NG), she was asked whether complex items of technology which have clearly been intentionally produced for a specific purpose are examples of evolution or creation. She asserted in reply that "everything is the result of evolution, including our capacity to create technologies" and her response to the next question (SSIQ6NG) confirmed in unambiguous terms that, in her view, "everything" meant precisely that. Everything, including inorganic matter, evolves, and "today, being alive is not necessary to be recognized to be the subject of evolution". Examples given by her of "dead" structures which evolve included DNA, languages, cultures and technologies. From the point of view of a neutral observer, it is difficult to disagree with the assertion that these items are not of themselves independently alive. Nevertheless, they all, in some way or other, interact with or are dependent upon living organisms for evolution, and do not, on their own, display what are, according to Alex Mesoudi, the three essential features of evolution, namely variation, competition and inheritance. Therefore, if inorganic matter is to be considered part of the subject matter of evolution, then a definition of some kind is required to determine what exactly distinguishes "evolution" from the much simpler concept of "change". The course of a river may be said to "change" over a period of time due to sedimentation and various other factors, but it cannot

be said to have "evolved". There is clearly "modification" going on but very little of what could be described as variation, competition or inheritance.

As was the case with the previous respondents, Professor Gontier was asked why we are unable to quantify how many cultures exist in the world (SSIQ8NG). Her response was of particular value and relevance, noting that people "do not agree upon how to define culture on the one hand, and on the other, because there are numerous variations". Without going as far as the definition offered later in this essay, she nevertheless went on to add that "basically, every kind of hobby practised with more than two people can be understood as a culture". In addition, "age, gender, location, ethnic background, social stratification, jobs, hobbies, educational background can all function as a means to differentiate cultures. Yet, these distinctions can occur in a group where everyone speaks English". This, in short, is an extremely convenient summary of why this work has deemed it unacceptable to use languages as a means of counting cultures. They simply do not correlate; not every culture has its own language and every language does not of itself possess a culture.

This theme led to the essence of question SSIQ9NG, namely, "in your opinion, should language evolution and cultural evolution be treated as distinct?". Here, however, we see a casualty of the distinction between *language* and *languages*. The question was meant to refer to language change but Professor Gontier's response clearly indicates that it was taken to mean the evolution of the generic human language faculty, and so this question in hindsight should have been worded better. In the final question (SSIQ10NG), Professor Gontier stated that cultural evolution and technological evolution shared as many parallels with biological evolution as did historical linguistics.

3.7   Semi-structured Interviews from the Linguistic Ecology Questionnaire

Respondents were again chosen for interview from those who had kindly noted that they were definitely or possibly available. This required the tailoring of further bespoke questions based upon the answers to the initial questionnaire, as well as articles written by each individual contributor. The three interviews which resulted from the linguistic ecology questionnaire are shown in this section.

3.7.1   Semi-structured Interview with Salikoko Mufwene

At the time of interview, Salikoko Mufwene was Frank J. McLoraine Distinguished Service Professor in the Department of Linguistics at the University of Chicago. Professor Mufwene has, either individually or collaboratively, authored and edited academic publications for over forty years, and specialises particularly in the development of creoles and language evolution. It is this aspect which is of the greatest relevance to this essay, especially as raised in his seminal 2001 work *The Ecology of Language Evolution,* a book considered essential to the literature review, and referred to again in the following interview, which is a continuation of questionnaire QEL3.

In response to SSIQ1SM, Professor Mufwene acknowledged that although he had at one point believed he had been the first to analogize languages with species (as opposed to Schleicher's organisms for instance), he later discovered that this had been done in the nineteenth century by Herman Paul. Indeed, Darwin's "curious parallels" could be considered another example. This perhaps serves as confirmation of the point made in the earlier interview with Professor Gontier that nineteenth century naturalists saw continuity between biological and cultural or linguistic evolution (SSIQ1NG).

When asked whether, despite his belief that language falls under the overall category of culture, it could nevertheless be possible for language to be a discrete component of it with

its own distinct characteristics (SSIQ2SM), Professor Mufwene replied that it could, although "language also shares some characteristics with other cultural domains, for instance, with music in being compositional and being learnable." His response to the next question, however, (SSIQ3SM) was not in agreement with the proposition that design and evolution are mutually exclusive, given that, in cultural fields, "practitioners innovate constantly and introduce changes". He was clearly of the opinion that evolution could include planning.

As was the case with the other interviews, Professor Mufwene was asked why it is so difficult to quantify how many cultures exist in the world (SSIQ4SM). He responded by saying that "what should be quantified is not how many cultures there are but rather how many music styles there are, how many cooking/food processing styles there are, how many legal systems there are, how many religions or belief systems there are, etc". This again is in keeping with the major theme mentioned above that cultures should not be envisaged as "complex wholes" but rather as collections of variable traits which do not necessarily overlap or correspond to each other. He went on to add that "two populations practicing different languages may share the same non-linguistic culture (more or less) and two populations practicing the same language may practice different non-linguistic cultures", a point made not for the first time in these interviews, and rather similar to the equivalent one made by Professor Gontier.

In SSIQ6SM, Professor Mufwene was asked why he disliked the term *ecolinguistics* and its perceived use, in his view, as an "advocacy movement". He replied that he had found ecolinguistics "lacking in explanations while very strong in moralizing people about saving languages from endangerment and loss". The assertion that advocacy does not explain how things happen or evolve suggests perhaps that academic scholarship should be kept apart from the promotion of causes, no matter how worthy.

Professor Mufwene has done much work on creolisation, and was asked whether the development of creoles was living evidence of language evolution in action (SSIQ7SM). He replied that it was, "definitely", to such an extent that "creoles are prompting us loud and clear to reopen the books about language evolution". Contact is central to the process of language change and speciation. On the related issue of loss due to language shift, Professor Mufwene had noted in *The Ecology of Language Evolution* that one of the reasons why languages die is because their speakers choose to speak other languages. He was asked whether "choose" was in fact an appropriate term given that, as far as acquiring our mother tongues is concerned at least, we do not choose them, but have them chosen for us (SSIQ8SM). His response conceded that "choose" was not necessarily the best term, and that speakers may find themselves "in situations where they have fewer and fewer opportunities to speak the relevant languages" even if they would like to. This was felt to be a point worth raising, as literature on language use often refers to speakers "choosing" their languages when they do no such thing, and also "agreeing" to the code in question when they may merely, not unlike songbirds, be largely displaying "conformist bias".

On reconciling the "physical" aspects of speech with the "mental" (SSIQ9SM), Professor Mufwene felt that there was an issue regarding "which had precedence over which", but concluded that "an organized internalization of communicative practices" was probably more accurate than the outward execution of an internal system. As for Richerson and Boyd's claim that "culture is part of biology", Professor Mufwene did not agree with this statement (SSIQ10SM) preferring instead to think of it as a "consequence of biological evolution".

3.7.2 Semi-structured Interview with Cynthia Rosenfeld

At the time of interview, Cynthia (Cindy) Rosenfeld was a doctoral student at North Carolina State University. This was immediately seen as a refreshing opportunity to incorporate a different perspective into the interviews. She has published several articles in academic journals, including recently contributing two relevant articles on language and ecology which led to the initial contact in this case. The following interview refers to these, alongside other aspects of her research, and carries on from questionnaire QEL7.

The interview with Ms Rosenfeld began by requesting more details of her background and experience. This was followed by a question based on one of her responses to the initial questionnaire where she claimed that "language may not be living the way a biological organism is, but language is of a biological organism". This same question (SSIQ2CJ) subsequently asked whether she saw the *products* of living organisms as extensions of them, in similar vein to Richard Dawkins in *The Extended Phenotype*. She confirmed that this was the case and added that in her view "language is as natural and as evolving a process for humans as building bowers are for Vogelkops".

Moving on to issues regarding her work on the Endangered Languages Project in North Carolina, Ms Rosenfeld was asked (SSIQ3CJ) whether biodiversity was similarly endangered in the same geographical areas. She replied that she was "not sure how often the cases of linguistic endangerment/extinction and species endangerment/extinction coincide" but imagined that "a neoliberal value of progress often enters an area and affects both". However, one aspect raised regarding the linguistic side of things was that "the pressure to speak English to be able to participate in English-bound institutions and practices is high". This is worth bearing in mind as a factor related to the element of choice mentioned in the previous interview with Professor Mufwene. "Choosing" to speak a language and "being pressurised" into doing so draw two rather different pictures.

On the division of academic subjects into sciences and humanities (SSIQ5CR) Ms Rosenfeld noted that as a humanities major, she fell in love with science through communication, and is "still desperately trying to catch-up". She added that "we have been specialized and siloed, and it can be hard to break out". Ms Rosenfeld was then asked, in similar fashion to Professor Gontier, if dichotomies such as human/animal and culture/nature played a part in the division of the academic world into humanities and natural sciences in the first place (SSIQ6CR). She replied that they did, and went on to give an example of "how humanities came to fear nature", and were themselves the result of "human exceptionalism".

As for whether the use of "Earth-centered language" – a term used in one of her published articles - would ultimately benefit linguistic as well as biological diversity, (SSIQ8CR) Ms Rosenfeld replied that earth-centered language was "absolutely an invitation to explore the rich lingual diversity on this planet and learn how different words can lead to new understandings". In SSIQ9CR, the use of the word "dirt" to mean both "soil" and "filth" was given as an example of the diverse meanings that a single word could convey. When presented with the possible different interpretations of the terms "ecolinguistics" and "language ecology" (SSIQ10CR) Ms Rosenfeld noted that she preferred "reserving "ecolinguisitics" for work done that focuses on how language represents ecology and ecological philosophy. I use "language ecology" to refer to how language is impacted by the environment."

3.7.3 Semi-structured Interview with Keith Moser

At the time of interview, Keith Moser was Professor in Classical and Modern Languages and Literature at Mississippi State University, where he has held various roles since 2007. During this time, he has written prolifically, authoring five full-length books and some sixty refereed periodical articles. His wide interests include French literature, the

interdisciplinary intersection between literature and science, and ecolinguistics, the last two of which, in particular, are relevant to Themes 3 and 4. The following interview refers to Professor Moser's work and is a continuation of questionnaire QEL8.

Due to a commitment in his article 'An Ecolinguistic, Scientific, and Serresian Interpretation of Communication: The Importance of (Re)-Conceptualizing Language From a More Ecocentric Perspective' to "unapologetically transcend traditional disciplinary boundaries" (SSIQ2KM), Professor Moser was asked if he saw any link between the concept of "academic boundaries" in established disciplines on the one hand, and "political boundaries" between nation-states on the other. His response confirmed that he did, noting that it was sometimes difficult to create legitimate classes that correspond to his research and teaching interests, "because some colleagues defend what they consider to be their sacred, sovereign territory tooth and nail".

On the issue of social complexity hypothesis in communication (SSIQ3KM) Professor Moser noted "that there does appear to be a correlation between social complexity and cognitive ability". The complexity of human societies of course implies that this will have implications as far as the evolution of human language is concerned. In the same article, Professor Moser refers to what he calls "the primordial sounds of the earth". Given the view expressed in Professor Gontier's interview above that "everything evolves", Professor Moser was asked (SSIQ4KM) whether these primordial sounds extended to inorganic matter. He explained that what he had in mind was "the importance of becoming attuned or reconnecting ourselves to the most essential sounds of the planet that we often dismiss as insignificant background noise", but that the question of inorganic matter was one he felt he needed to develop more fully in future studies.

On record as stating that "the disappearance of any non-human language is a potentially lethal catastrophe" (p. 20), Professor Moser was asked (SSIQ5KM) if he felt that non-human languages should fall within the remit of ecolinguistics. He replied that he did, and felt that ecolinguistics had a major role to play in "the deconstruction of the last form of human exceptionalism in the shape of language that has created a myopic and deadly sharp ontological gap between *Homo sapiens* and other species". This is significant, given that Edward O. Wilson sees all human culture as being separated from animal behaviour by a matter of degree only, with the *exception* of language "which is truly unique". Also, the responses to the earlier animal communication questionnaire showed that none of the respondents considered themselves to be linguists.

Another of Professor Moser's articles is entitled 'Is Preserving Indigenous Languages and Cultures the Key to Avoiding the Impending Eco-Apocalypse?: An Ecolinguistic Reading of Le Clézio's *Le Rêve Mexicain'*. In it, he mentions "non-anthropocentric thought systems", and in SSIQ6KM he was asked if these were largely the product of indigenous peoples outside of "the West". He responded by saying that in his experience "autochthonous civilizations whose existence still revolves around a direct, sensorial connection to the earth tend to view the world and their small place in it from a biocentric lens". Later in the same article Professor Moser added that "the budding and promising discipline of ecolinguistics is extremely diverse comprised of numerous subfields". Given the divisiveness shown in some of the responses to the linguistic ecology questionnaire, he was asked in SSIQ7KM to define the scope of ecolinguistics as he sees it, particularly its relationship with "language ecology". In response, he noted that he felt it was essential for ecolinguists to engage with non-human "languages" and try not to define the parameters of ecolinguistics in a narrow way. Although there is much to commend in this stance, care also needs to be taken to avoid an "anything goes" attitude, which leaves little point in providing disciplines with names at all.

Further on in the same article, Professor Moser contrasts the "narcissism, and extreme opulence" of dominant world languages with the "humility and importance of stewardship" on display in the languages of minority civilisations. He was asked (SSIQ8KM) whether indigenous peoples' attitudes changed if they shifted language, or whether their traditional values were maintained but expressed through a different medium. Professor Moser speculated in response "that the language we speak on a regular basis without a passing thought influences how we think and act in the world".

On a similar theme, the Professor expressed a desire (SSIQ9KM) to see an embedding of "the more beneficial and sustainable environmental discourses of Amerindian civilizations into dominant Western languages". This would of course require these worldviews to be expressed through the medium of those same Western languages. Given this, Professor Moser was asked if he nevertheless felt that preservation of linguistic diversity was a worthwhile end in itself for its own sake (SSIQ9KM). His response was an emphatic "yes", as "when a language vanishes entirely, an invaluable vantage point for perceiving the world and our place in it is forever lost as well".

As with the other interviews, Professor Moser was asked for his opinion on dichotomies such as human/animal, mind/body and culture/nature (SSIQ10KM). In particular, he was asked whether these had led to a corresponding dichotomy between the sciences and the humanities in the academic world. He replied in the affirmative, going so far as to suggest that "our obsolete thought systems have yet to evolve to reflect the discoveries of modern science. Owing to the schism between the hard sciences and the humanities, it is only recently that humanists have started to reengage with scientific erudition". Insularity was held to be at the root of this problem, because "when placed in the light of modern science, the faulty logic undergirding these dichotomies collapses entirely".

3.8   Results of Biocultural Diversity Questionnaire

The first question in this questionnaire, on the number of United Nations member states, was asked purely to establish the extent to which the perception, prevalent in Europe, that "every country has its own language" would feed back into the responses. That is, would the figures for the number of countries in the world and the number of languages in the world be similar? Bar for this, there would only have been 3 x 5 questions. As it turned out, of the quantifiable responses, Question 1: "Approximately how many member states of the United Nations are there in total?" received far more correct answers than any of the others, with 66 participants out of 105 correctly noting that the United Nations has approximately 200 members. This was in fact the only quantifiable question which received more correct than incorrect responses. In addition, very few participants selected the higher-end numbers, with 101 of them choosing a figure in the hundreds as opposed to the thousands. This suggests that there was a broad awareness of the number of United Nations members.

The second question, regarding the number of UNESCO world heritage sites, received 33 correct responses. There are approximately 1,000 such sites in total. One respondent left this question unanswered and so the total number of responses on this occasion was 104. Answers were spread more evenly over all the choices on offer, albeit with a tendency to gravitate towards the centre.

Just under half of respondents correctly noted that there are approximately 6,500 extant species of mammal (Q. 3) with very few this time selecting the numbers towards the lower end of the spectrum. As with the United Nations question, then, albeit at the other end of the scale, there seemed to be a common-sense realisation that the correct answer in this case would be in the thousands rather than the hundreds.

In each of the remaining "how many?" questions, on conifers, languages and amphibians respectively (Q 4, 5 and 6), between 30 and 36 respondents chose the correct option. It is also worth noting that even though the majority of respondents selected an incorrect answer to all questions except the first one, the correct answer nevertheless received more responses than any of the other individual answers on each occasion.

Table 23: Approximate numbers within different categories of biocultural diversity

Category	Actual Number	Underestimate	Correct Answer	Overestimate
UN Members	200	12	66	27
Heritage Sites *	1,000	48	33	23
Mammals	6,500	54	51	**0
Conifers	650	43	30	32
Languages*	6,500	69	35	**0
Amphibians	6,500	69	36	**0

*(These categories received 104 rather than 105 responses)

** (These categories could not be overestimated as the correct answer was the highest one on offer)

These stand in stark contrast, to the "what percentage?" questions (Q. 7 – 11), where the correct answer was not the highest scoring one on any occasion. The majority of respondents overestimated the threats to World Heritage Sites and mammals, but underestimated the threats to conifers, languages and amphibians. The levels of discrepancy are shown in the table below:

Table 24: Perceived threats to different categories of biocultural diversity*

Category	Actual Threat	Underestimate	Correct Answer	Overestimate
Heritage Sites	5%	0	4	101
Mammals	25%	23	19	63
Conifers	33%	56	18	31
Languages	40%	63	16	26
Amphibians	40%	64	23	18

*(all based on 105 responses)

The Heritage Sites overestimate can largely be based on the fact that a relatively small proportion of 5% are classified as in danger in the first place. This is considerably lower than all the others. The threat to the diversity of the world's mammals was, much as expected, overestimated by the majority, while conifers, languages and amphibians were, by contrast, considerably underestimated.

Questions 12 – 16 asked how important it was for these different categories to be preserved. The choices on offer were: "extremely important", "fairly important", "not particularly important" and "not important at all". These questions did not require any competition between categories, such as, for instance, asking respondents to list them in order of importance. It was therefore possible to choose "extremely important" in every case, and this is indeed what the majority did. It was nevertheless interesting to examine the number of respondents who did not take this option. The table below shows the responses for all categories.

Table 25: Importance of preserving different categories of biocultural diversity*

Category	Extremely	Fairly	Not particularly	Not at all
Heritage Sites*	86	16	2	0
Mammals	93	11	1	0
Conifers	73	27	4	1
Languages	84	14	7	0
Amphibians	80	23	2	0

*(this question received 104 responses as opposed to the 105 in every other case)

Here again, mammals would seem to be the clear winners, followed by heritage sites. There did not seem to be a pattern of choosing the biological over the cultural per se or vice versa. Instead, different priorities appeared within the two, with mammals winning over conifers and amphibians, and heritage sites winning over languages. The relative lack of importance displayed towards conifers in particular is rather ironic, given that, as "the lungs of the world" it could be argued that all of the others, either directly or indirectly, depend upon these in order to survive. The biocultural diversity questionnaire suggested no obvious prioritisation of the biological over the cultural, with attitudes more inclined to vary within these divisions than across them. It must be admitted that this came as something of a surprise. As far as factual knowledge is concerned, however, there are clearly gaps which, no doubt, reflect the media attention afforded to different components of the biocultural package.

4.   Discussions and Conclusion

Having examined literature related to the subject matter under discussion, and having conducted original research, this final part will attempt to provide an overall summary and conclusion based on the four themes of this dissertation. In so doing, it will offer some new definitions of old terms, and reconsider some of the relationships between the academic disciplines which study them.

4.1   Discussion on Language and Animal Communication

Theme 1 briefly considered animal communication and its relationship to human language. We humans can be a very "centric" species, more than willing to place ourselves at the centre of everything. We have at various times been geocentric, thinking our earth was at the centre of the universe; anthropocentric, believing ourselves to be the only species made in the image of God; and ethnocentric, holding our own cultural attributes to be superior to those of all others. Lest we get too carried away, therefore, Jasanoff (2018) reminds us that "animals have had brains or brain-like structures for nearly five hundred million years; over 80 percent of that time, the ancestors of sheep were also our ancestors, and their brains were one and the same" (p. 12).

It was undoubtedly not that shared 80 percent of time, however, that saw the development of human language, a characteristic of ours where we have a particular tendency to emphasise our uniqueness. Keith Moser (SSIQ5KM) dislikes this tendency, considering it the last bastion of human exceptionalism. However even this bastion is coming under attack. Hauser, Chomsky and Fitch (2002) have cautioned against an overzealous inclination to claim a trait as uniquely human without first confirming that this is so by examining the comparative data (p. 1572). Critical of a narrow focus on primates, they distinguish between what they label the faculty of language in the broad sense (FLB) and the narrow sense (FLN),

and postulate that although the latter may be shown to be uniquely human, "most if not all of FLB is shared with other species" (p. 1578). In order to obtain a fuller understanding of the language faculty, interdisciplinary collaboration is required "to promote a stronger connection between biology and linguistics" (p. 1570).

This sentiment would appear to be echoed by many. The responses to the questionnaire on animal communication indicate that the participants do not see themselves as linguists. Nevertheless, all of them have collaborated with linguists in the past, and are also largely of the opinion that human language should fall under the scope of animal communication (albeit with the proviso that language would still require its own specific discipline). Their research indicates that similarities in communication systems do not correlate to genetic distance between species, serving as confirmation that the nearest parallels to human language may not necessarily be found in our closest living relatives. This does not of course mean that primates' cognitive processes in general are more distant, only the specific business of combining sounds or gestures for the purposes of communication. Regardless of this, there is increasing evidence that we have much to learn about human language from studying animal communication and vice versa.

4.2.   Discussion on Language and Evolution

None of the elements present within living things are exclusive to them, as they are also found in the non-living world. All life on Earth, for example, is carbon-based, but carbon is also found in "dead" things such as diamonds and graphite. Nathalie Gontier does not distinguish between natural history and evolution (SSIQ5NG) nor believe that evolution is restricted to organic matter (SSIQ6NG). It may ultimately be shown, then, that the evolution of living things is just one of many kinds, also extendable to include inorganic matter. However, even if this were proven to be the case, this would not mean that the distinction

between the biotic and the abiotic is somehow false, or that the organic and inorganic evolve in the same way. This same principle extends to within the biotic world itself. There is a reason why "life" is subdivided into domains, kingdoms, phyla and so on. There are differences between them, which may require them to be treated separately.

Evolution leading to speciation and extinction is common to both languages and biological species, and therefore often able to be represented by a family tree diagram. Family tree models, however, may not be appropriate in every evolutionary scenario, as testified by several of the contributors to the above interviews. Johann-Mattis List (SSIQ4JL). William Croft (QBLE3 – Q. 10) and Nathalie Gontier (SSIQ3NG) all acknowledge that, to varying degrees, the tree model is simultaneously both important and also insufficient. This is particularly so in cases where horizontal/lateral gene transfer is common, and difficulties arise in establishing what has been transferred vertically as opposed to laterally (SSIQ5JL). It may be, for example, that speciation of the family tree kind may be appropriate for eukaryotic organisms but not prokaryotes. Bapteste et al (2009, p. 1) make the rather stark claim that "prokaryotic evolution and the tree of life are two different things, and we need to treat them as such". Prokaryotic life is no less life because it is unicellular and less complex, but horizontal/lateral gene transfer is commonplace here. Nevertheless, the possibility that Darwin's tree of life does not extend to all life forms does not mean that he was wrong in those areas where he was right!

As far as overarching links between biology and language are concerned, we once again see some similarities in the messages emanating from different scholars. William Croft advocates a common model (QBLE3) which "subsumes" the biological, the cultural and the linguistic, but also advises caution when applying this model to these different domains (SSIQ1WC). In similar fashion, Salikoko Mufwene favours treating the biological and the linguistic in the same way when they are the same, and differently when they are different

(SSIQ10SM). This seems like very sound advice, otherwise, as noted by Johann-Mattis List, the specifics of the different fields will be ignored (SSIQ8JL). It will later be suggested that this is every bit as true within culture as it is within biology, as well as between the two.

4.3   Discussion on Language and Ecology

The relationship between language and the environment formed the basis of Theme 3. For the purposes of the present project, "environment" will be here defined as *everything external to the unit in question*. That unit may often, but not always, be an organism. It could equally be a cell, an organ, a language, or, indeed, an inanimate object. As far as any such unit is concerned, it should be emphasised that everything external to it forms part of its environment (so that an "internal environment" would be a contradiction in terms) and there is *no point* at which a given unit does not interact with its environment, whether such interaction involves sleeping in a chair, fleeing from a predator, receiving signals, or being blown about by the wind.

Turning to the responses to the linguistic ecology questionnaire, some of the criticisms made seem rather harsh, if not unfair, especially those concerning the use of the term "language ecology" to refer to solely linguistic interaction. If "birdsong ecology" can be considered a valid aspect of ecology overall (Strauss, 2019), then "language ecology" must clearly also be so considered. Although the wider environmental context of languages must be remembered, there is no reason why language interaction cannot also be studied for its own sake, whilst acknowledging that such interaction is itself part of a wider environment. No animal species, for example, lives in isolation, all of them interact with other species and the inorganic environment, but that is no justification for objecting to the study of, for instance, intraspecific competition in population ecology.

Some comments also seem to imply that certain terms are "owned" by biological sciences and should not be interfered with by other disciplines. However, their use in these fields may well have been taken (and taken metaphorically to boot) from a more general context. According to the *Online Etymology Dictionary,* for example, the word "genetic" was first recorded in 1831, with the meaning "pertaining to origins" and it is hard to envisage ecologists objecting to the suggestion that languages have origins. Seen in this way, language ecology is no more or no less than a particular aspect of human ecology, which is in turn a particular aspect of ecology as a whole. Lack of a precise definition of the exact nature of "language ecology" versus "ecolinguistics" is no doubt causing problems, nevertheless, the "linguistic" versus "biological" differences seen in some responses make this field a likely candidate for one of the many casualties of dualism, with most of the negativity, in this instance, being shown by the biological sciences towards the social.

4.4.   Discussion on Language and Culture

The relationship between language and culture formed the basis of Theme 4, and was raised on numerous occasions in the questionnaires and interviews. The definition of culture, however, has also been the topic of vigorous academic debate. In 2012, Helen Spencer-Oatey of the University of Warwick compiled a collection of quotations in her publication *What is culture?* It begins by acknowledging that "culture is a notoriously difficult term to define" (p. 1) with 164 different definitions recorded in the 1950s. A century of successive attempts by anthropologists had failed to reach agreement. One of the definitions on offer is her own, shown here:

> Culture is a fuzzy set of basic assumptions and values, orientations to life, beliefs, policies, procedures and behavioural conventions that are shared by a group of people, and that influence (but do not determine) each member's behaviour and his/her interpretations of the 'meaning' of other people's behaviour (Spencer-Oatey, 2012, p.2).

Spencer-Oatey quotes Edward Tylor's famous "complex whole" (1871) definition, noting it as his greatest legacy. According to this view, "cultures should be thought of as integrated wholes – that is, cultures are coherent and logical systems, the parts of which to a degree are interrelated… its components are more than a random assortment of customs" (Spencer-Oatey, 2012, pp. 14-15), therefore, "it follows logically that a change in one part of the system is likely to produce concomitant changes in other parts of the system" (p. 15).

The "complex whole" definition of culture as originally championed by Tylor (1871) is here rejected as fundamentally flawed and demonstrably false, and some of the comments made by contributors to this work regarding how cultures should be quantified may help to illustrate why (without implying that they necessarily agree with this stance). Nathalie Gontier, for example, makes the succinct remark that any pastime practised by more than two people can be understood as a culture (SSIQ8NG), while William Croft notes the difficulties involved in trying to establish the set of traits that constitutes a culture (SSIQ3WC). Salikoko Mufwene lists individual characteristics such as music, cooking styles, legal and religious systems, and notes that these, rather than "cultures" are what should be quantified (SSIQ4SM). He also adds that language and culture shifts do not go hand in hand (SSIQ2SM). These comments, in addition to such traditional academic ventures as spending over a century inconclusively trying to find the "homeland" of the Indo-Europeans based on the belief that speakers of a given language can be traced via their non-linguistic material culture, should be sufficient to support the view that different cultural practices disseminate separately, and are not interconnected components of a "complex whole".

It was noted above that 164 proposed definitions of the word culture had been counted in one particular study. On this basis, it has been assumed that proposing a 165th could not do much harm, and so the definition of culture suggested here is *that which is learned via interaction with the environment.* There is no necessity for what has been learned to be acted

upon, and so "culture" is not the same thing as "learned behaviour". This definition allows for the possibility of culture being reduceable to the individual, and acquirable by any organism with the capacity to learn, from any environmental source, including directly from the abiotic environment or from other species. Creanza, Kolodny and Feldman, (2017) note that "numerous nonhuman species also exhibit cultural transmission" (p. 7782) and that in many social scenarios "new information enters a population via trial-and-error learning or individual interactions with the environment" (p. 7783). Current definitions demand that transmission take place for said information to count as culture. However, the stance taken here is that *variation* in non-innate solutions to the challenges of life is what makes for cultural traits, which are born when they become habitual, even if only by one individual. The highly social nature of human life then makes the transmission of useful innovations virtually inevitable, but this is a consequence, not a cause. If *Hermit A* hunts with a bow and arrow, makes his bed from animal skins, creates fire by rubbing sticks together and prays to the Sun God, while *Hermit B* hunts with spears, makes his bed from leaves, creates fire with flint stones and prays to the Rain God, then they have two different cultures, transmission or not.

Language, of course, being a system of communication, inevitably *does* depend on transmission. What then, is the relationship between languages and (other elements of) culture? Although the generic capacity for human language is clearly an inherited part of our physiology, it is equally clear that the individual languages we speak are learned. William Croft (SSIQ2WC) considers language to be a type of cultural transmission, but adds that "this does not preclude the possibility that there are aspects of language that make linguistic transmission different from transmission of other cultural traits." In similar fashion, Nathalie Gontier suggests that language and culture are "sufficiently distinct to look into their evolution separately" (SSIQ9NG). If this is indeed the case, then there must be a need, at least some of the time, to treat language as separate from (other aspects of) culture.

4.5   Conclusion

So is language part of culture, and culture part of biology? And why stop at biology? As noted above, living things are made of the same "stuff" as non-living things, and subject to the same generic "laws of nature". It could, then, be argued that there is no need for an academic discipline of biology. In principle, to paraphrase Edward O. Wilson (albeit in a very different context) it could be "shrunk to a specialized branch of physics". The reason why this is not done, of course, is because although the study of life is *a part of* natural science, it also has sufficient specific features to make it stand *apart from* all other such sciences. There is no danger in acknowledging both of these positions, but difficulties arise when one is accepted and the other rejected. For example, living things possess many characteristics which apply to them and them alone, however, no biologist would argue that they are subsequently not subject to the more general "laws" of, say, gravity or thermodynamics.

This continuum, however, appears to break down when the biological meets the cultural. For example, the traditional "four-field" discipline of anthropology consists of biological, cultural, archaeological and linguistic anthropology. The first two of these, in particular, have been "at war" with each other (Fearn, 2008) over whether or not "Darwinian evolutionary theory guides research into human behaviour" (ibid) and, indeed, over whether anthropology is a science or not (Dreger, 2010). Some practitioners of cultural anthropology are of the opinion that human culture is not a part of human biology, but instead stands apart from it. The "laws" of biology do not apply to them. The stance taken in this work, however, is that just as biology is part of nature, so culture is a part of biology, a stance broadly in agreement with Richerson and Boyd (2005). However, the very label "dual-inheritance" has about it a suggestion of dualism, i.e. there is one thing called biology which evolves one way, and another called culture which evolves independently of it. The temptation to see things in

such a manner should be avoided, as, if, in accordance with Richerson and Boyd "culture is a part of biology" then logic also dictates that *cultural evolution is part of biological evolution*.

Nevertheless, just as "life" can be subdivided into three or more domains which are all living things but may evolve in different ways, the suggestion here is that the all-encompassing term "culture" can similarly be subdivided into (at least) three domains of its own, each of which is internally autonomous, that is, changes to one do not cause changes to the others. "Language" is here treated as one of these domains, being sufficiently discrete to warrant its separate treatment from (other aspects of) culture, with culture sufficiently discrete to warrant its separate treatment from (other aspects of) biology, and organic matter in turn sufficiently discrete to warrant its separate treatment from inorganic matter. Figure 5 shows a proposed outline of some of these "cultural domains".

Figure 5: Proposed "domains" of culture
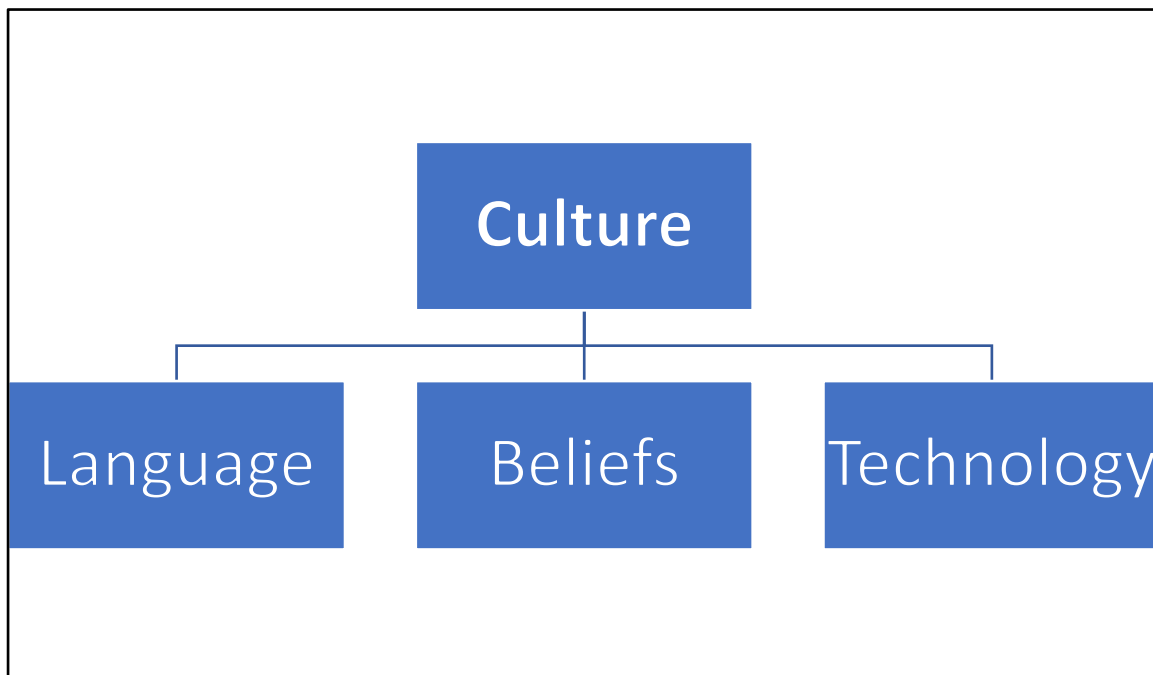
"Beliefs" here incorporate legal, political, religious, economic and other social systems, which are based upon assumptions of "right and wrong". Some of these may change independently, or alternatively have a knock-on effect on each other. Many countries, for example, have laws against the taking of another person's life or possessions, which are in

keeping with their political or religious beliefs. Similarly, there may be financial and legal incentives for couples to marry rather than live together which likewise reflect social values.

"Technology" is the third domain, defined here as *the use of materials from the environment as tools*. Items of aesthetic value will be treated as "tools" as they too have their uses and have been produced by the use of technology. Numerous academics, including contributors to this work, have referred to language itself as a technology. Dediu et al (2013 p. 310), for example, describe it as a form of "coordinative technology", Salikoko Mufwene calls languages "technologies for communication" (SSIQ2SM) and Cynthia Rosenfeld (SSIQ7CR) expresses the opinion that "language is a human technology" with technology conceptualised as "arts and tools one uses for living". With all due respect to these scholars (and in full agreement with Cynthia Rosenfeld's conceptualisation), language is not here treated as technology, on the basis that only that which is taken from the environment should be so considered. Although also eventually becoming part of the environment, language originates within our bodies (as production must precede reception) and is therefore considered part of our physiological inheritance instead. This same distinction would apply to "tools" inherent in other animals such as echolocation, web spinning, or teeth and claws.

The essential point, however, is that languages, beliefs and technologies are not interconnected in a complex whole and can change independently. In particular, technology and language are "value-free". A precision knife may be used by a robber to take a life, or by a surgeon to save one, and the words "I fully oppose capital punishment" do not represent any *linguistic* progression from "I fully support capital punishment" although, in Europe, at least, this is meant to signify social progression (Belarus is the only European country not allowed to join the Council of Europe due to its retention of the death penalty). Similarly, the sentence "my smartphone is out of battery" is no more *linguistically* complex than "my pen is out of ink" or "my quill is out of feathers".

The domains shown are not meant to be exhaustive, but rather an example of a principle which argues that culture needs its own established taxonomy to avoid the misinterpretations and simplifications referred to by William Croft and Johann-Mattis List. There are other cultural features, in particular "rituals and traditions" such as dance forms and cooking styles, which do not fit easily into any of the domains above, and suggest the need for additional ones. However, the task of fully allocating different domains to all cultural traits is beyond the scope of this project.

All of the above "domains" will change by descent with modification, and different mechanisms such as mutation, migration and drift will apply. Nevertheless, the mechanism which perhaps distinguishes them most of all, and which no doubt was behind Darwin's "curious parallels" remark, is the extent of the process of *selection* which operates on them. Of the three cultural domains shown in Figure 5, it is here suggested that:

- languages change in the manner most like natural selection, via subconscious manipulation by their speakers in a competitive environment;

- social beliefs change in a more "artificially" selected manner, including attempts at changing the unchangeable (e.g. murder is both illegal, and committed, universally);

- technology changes in the manner least like (indeed, very unlike) natural selection, as a result of its significant element of guided variation.

Indeed, some technologies in particular are more akin to acts of creation than evolution. Humans can not of course "create" in the true sense of the word, only modify an existing environment, however, we cannot say that human technology "has no purpose in mind" (Dawkins, 1986, p. 5) "does not plan for the future" (ibid) and "has no vision" (ibid). We cannot say that technology "should not be interpreted as progress" (Mufwene, 2001, loc. 2238) when it can be interpreted as precisely that. It is more than feasible, however, to claim that all these points are true of language.

Many discussions on language change concentrate on phonology or lexis, however some of the most "evolution-like" aspects of language involve how words, or parts of words, are put together in combination in grammatical structures, both syntactic and morphological. According to Dediu et al (2013) "grammatical structure is largely "under the radar" as far as conscious manipulation by speakers is concerned" (p. 311). However, its being under the radar is exactly what gives it the features of evolution. William Croft (SSIQ7WC) states that an evolutionary model of language "provides a model of change that is not the result of the intentional behaviour of individual persons" and this unintentionality should in itself be significant enough to treat language separately. Some of Pinker's "language instinct" claims go too far in the "innate" direction, especially his claim that language is "qualitatively the same in every individual" (1994, p. 18). This, however, should not be counterbalanced by going just as far in the opposite direction and sacrificing language particularism on the altar of a unified cultural evolution theory. Biology, culture and language each have their "square pegs" which do not fit easily into the wider accepted narrative. Prokaryotes do not sit neatly on the branches of the tree of life, cultural evolution does not comfortably mirror biological evolution, and language change is not equivalent to cultural change. This does not mean that prokaryotes are not living things, or that culture is not part of biology, or that language is not part of culture. However, what it does mean is that we may have to modify our understanding of the *taxonomic relationship* between prokaryotes and other living things, as well as between culture and physiology, and between language and culture. Each of these may indeed have to be treated separately to the other categories with which they share a wider taxonomy. In the specific case of language and culture, to paraphrase Salikoko Mufwene (SSIQ10SM), we should treat the cultural and the linguistic in the same way when they are the same, and differently when they are different.

In his book *The Unfolding of Language*, Guy Deutscher makes the following observation about the case system in Latin:

> There was one question I could not get out of my mind: who could have dreamt up all these endings in the first place? And if they weren't invented, how else could such an elaborate system of conventions ever have arisen? I had childish visions of the elders of ancient Rome, sitting in assembly one hot summer day and debating what the case endings should be (Deutscher, 2005, loc. 96-98).

And this is precisely the point, the elders of ancient Rome did not sit in assembly debating what the case endings should be, but they no doubt *did* sit in assembly debating which laws should be enacted, which religious beliefs would or would not be sanctioned, appropriate codes of dress, the state of the economy and so on, and did so in a language not planned by any of them. Who decides whether a language should be SVO, VSO, VOS or OVS? What makes *accessible information* English but *information accessible* French?

Beckner et al (2009) note that as far as language is concerned, "despite its lack of overt government, instead of anarchy and chaos, there are patterns everywhere. Linguistic patterns are not preordained by God, genes, school curriculum, or other human policy" (p. 18). This is indeed so. However, apart from the fact that with a couple of tweaks this quote could quite easily have been made about the natural world, those linguistic patterns must be determined by *something*, otherwise there would be no patterns. Therefore, on the assumption that these languages are not *primarily* being consciously manipulated by their speakers, then, apart from copying errors, *some form of selection* must be responsible for the changes which happen to languages over time. The term "linguistic selection" has been used by William Croft (1996) and this seems ideal. However, given that the business of communicating in social life is part and parcel of "natural" life for many animals, and humans in particular, then there seems to be no reason in principle why linguistic selection should be incompatible with natural selection, if not indeed a specific element of it. Given the importance of language in human society, then skilful manipulation of it is likely to be a beneficial fitness trait.

Nathalie Gontier (SSIQ1NG) has already referred to the holistic approach of nineteenth century scholars. This was then subsequently interrupted by a century of ever-increasing academic specialisation and fragmentation. In particular, a solid division was formed between "natural" sciences and "social" sciences (one which implies that human society is in some way "unnatural"). Recent decades have seen some crossover between the two, but the chasm remains wide. As Kravchenko (2016) notes:

> The ousting of the ideology of holism from scientific research, and the persisting reliance on analytical methods have led to an extreme fragmentation of our knowledge of the world and language as a specific domain of human existence in this world which sets humans radically apart from all other known biological species (p. 103).

He adds that there is a "methodological dead-end in the humanities in general, and in linguistics in particular" (p. 104) which can only be escaped from by acknowledging that "language as a phenomenon is grounded in human biology" (ibid). There is little chance of such an escape if human exceptionalism continues, and, as Keith Moser has already pointed out (SSIQ10KM), it is rife in our existing academic structures, which offer one field of study for human beings, and another for "everything else", as illustrated in Table 26:

Table 26: Biological Sciences and their Social Science "equivalents":

Biological Sciences	Social Sciences
Animal Communication	Linguistics
Ethology	Psychology
Zoology	Anthropology
Ecology	Geography

If we cannot knock down the twin pillars of the sciences and the humanities, we should at least attempt to build a bridge between them in the form of "biosocial sciences", which would include those disciplines which have both a biological and social element to them. The comprehensive study of language should of course be among them. Nor should we exclude the possibility that linguistic evolution shares many parallels with biological evolution because it *is* biological evolution. There can be little doubt that the communication system of any other animal species which changed by descent with modification would be viewed in this way. Languages, like species, are complex adaptive systems (Beckner et al. p. 1), they influence and are influenced by their environment, they change gradually over time, and split into new forms by methods which were, and still are, curiously parallel. So, let this work end as it started, from the horse's mouth, so to speak, with a quote from the same author and the same book: "the survival or preservation of certain favoured words in the struggle for existence is natural selection." (Darwin, 1871, p. 61)

Bibliography

Aronoff, M. (2017) 'Darwinism tested by the science of language' in Bowern, C, Horn, L and Zanuttini, R. (eds.) *On looking into words (and beyond)*. Berlin: Language Science Press.

Atkinson, Q.D. and Gray, R.D. (2005) 'Curious Parallels and Curious Connections—Phylogenetic Thinking in Biology and Historical Linguistics', *Systematic Biology*, 54 (4), pp 513–526.

Bapteste, E. et al. (2009) 'Prokaryotic evolution and the tree of life are two different things', *Biology Direct* 4, pp. 1-20.

Beckner, C. et al. (2009) 'Language Is a Complex Adaptive System: Position Paper', *Language Learning* 59, pp. 1–26.

Boyd, R. and Richerson, P. (1985) *Culture and the Evolutionary Process*, Chicago: University of Chicago Press.

Carstairs-McCarthy, A. (2003) 'Review of "Explaining Language Change: An evolutionary approach" by William Croft', *Diachronica* 20 (1), pp. 203-206.

Creanza, N, Kolodny, O and Feldman, M.W. (2017), 'Cultural evolutionary theory: How culture evolves and why it matters' *PNAS* 114 (30), pp. 7782-7789

Croft, W. (1996) 'Linguistic Selection: An Utterance-based Evolutionary Theory of Language Change' *Nordic Journal of Linguistics* 19 (2), pp. 99-139.

Croft, W. (2000) *Explaining Language Change: An Evolutionary Approach*. Harlow: Pearson Education.

Darwin, C. (1859) *On the Origin of Species by means of Natural Selection*. London: John Murray.

Darwin, C. (1871) *The Descent of Man, and Selection in Relation to Sex*. London: John Murray.

Dawkins, R. (1976) *The Selfish Gene*. Oxford: Oxford University Press.

Dawkins, R. (1982) *The Extended Phenotype*. Oxford: Oxford University Press.

Dawkins, R (1986) *The Blind Watchmaker*. New York: Norton.

Dediu, D et al. (2013) 'Cultural Evolution of Language' in Richerson, P.J. and Christiansen, M.H. (eds.) *Cultural Evolution: Society, Technology, Language, and Religion*, vol. 12, Cambridge, MA: MIT Press.

Deutscher, G. (2005) *The Unfolding of Language*, London: Heinemann.

Downey, G. (2010) 'Life without language' https://neuroanthropology.net/2010/07/21/life-without-language/ (accessed 18/10/2019).

Dreger, A. (2010) 'No Science Please, We're Anthropologists' https://www.psychologytoday.com/us/blog/fetishes-i-dont-get/201011/no-science-please-were-anthropologists (accessed 21/12/2018).

Eliasson, S. (2015) 'The birth of language ecology: interdisciplinary influences in Einar Haugen's 'The ecology of language'' *Language Sciences* 50, pp. 78–92.

Fearn, H. (2008) 'The Great Divide' https://www.timeshighereducation.com/features/the-great-divide/404341.article (accessed 21/12/2018).

Geisler, H. and List, J.M. (2013) 'Do languages grow on trees? The tree metaphor in the history of linguistics' in Fangerau, H. Geisler, H. Halling, T and Martin, W. (eds). *A Companion to the History of Science*. Stuttgart: Franz Steiner.

Gontier, N. (2011) 'Depicting the Tree of Life: The Philosophical and Historical Roots of Evolutionary Tree Diagrams' *Evolution: Education and Outreach* 4, pp. 515–538.

Gontier, N. (2012) 'Applied Evolutionary Epistemology: A new methodology to enhance interdisciplinary research between the life and human sciences' *Kairos: Revista de Filosofia & Ciência* 4, pp. 7-49.

Gontier, N. (2016) 'Converging Evolutionary Patterns in Life and Culture' *Evolutionary Biology* 43, pp. 427–445.

Gontier, N. (2017a) 'What are the Units of Language Evolution?' first published online in April 2017 and then in *Topoi* 37, 2018, pp. 235-253.

Gontier, N. (2017b) 'What are the levels and mechanisms/processes of language evolution?' *Language Sciences* 63, pp. 12–43.

Haugen, E. (1971) *The Ecology of Language; Language science and national development*, Stanford: Stanford University Press.

Hauser, M. D. Chomsky, N. and Fitch, W. T. (2002). 'The Faculty of Language: What Is It, Who Has It, and How Did It Evolve?' *Science* 298, pp. 1569–1579.

IEA. (2019) 'The International Ecolinguistics Association' http://ecolinguistics-association.org/ (accessed 29/08/2019).

IUCN. (2018) 'Biocultural Diversity' https://www.iucn.org/theme/governance-and-rights/our-work/bio-cultural-diversity (accessed 27/12/2018).

Jacques, G. and List, J-M. (2019): 'Save the trees. Why we need tree models in historical linguistics (and when we should apply them)' *Journal of Historical Linguistics* 9.1, pp. 128-166.

Jasanoff, A. (2018) *The Biological Mind: How Brain, Body, and Environment Collaborate to Make Us Who We Are*. New York: Basic Books.

Kalyan, S. and Francois, A. (2019) 'When the waves meet the trees: A response to Jacques and List' Journal of Historical Linguistics 9.1, pp. 168-176.

Kravchenko, A.V. (2016) 'Two views on language ecology and ecolinguistics' *Language Sciences* 54, pp. 102–113.

Lachlan, R.F. and Nowicki, S. (2015) 'Context-dependent categorical perception in a songbird' *Proceedings of the National Academy of Sciences of the United States of America* 112 (6) pp. 1892-1897.

Lachlan, R.F. Ratmann, O and Nowicki, S. (2018) 'Cultural conformity generates extremely stable traditions in bird song' *Nature Communications* 9, pp. 1-9.

Lattenkamp, E.Z. and Vernes, S.J. (2018) 'Vocal learning: a language-relevant trait in need of a broad cross-species approach' *Science Direct* 21, pp. 209-215.

List, J-M. (2016) 'Beyond cognacy: historical relations between words and their implication for phylogenetic reconstruction' *Journal of Language Evolution*, pp. 119–136.

List, J-M. et al. (2014) 'Networks of lexical borrowing and lateral gene transfer in language and genome evolution', *Bioessays* 36 (2), pp. 141–150.

List, J-M. et al. (2016) 'Unity and disunity in evolutionary sciences: process-based analogies open common research avenues for biology and linguistics' *Biology Direct* 11:39, pp. 1-17.

Lyell, C. (1863) *The Geological Evidences of the Antiquity of Man*. London: Murray.

Maffi, L. (ed.) (2001) *On Biocultural Diversity: Linking Language, Knowledge and the Environment.* Washington, D.C.: Smithsonian Institution Press.

Mesoudi, A. (2011) *Cultural Evolution: How Darwinian Theory Can Explain Human Culture and Synthesize the Social Sciences.* Chicago, University of Chicago Press. Kindle Edition.

Moser, K. (2015a) 'An ecolinguistic, scientific, and Serresian interpretation of communication: the importance of (re)-conceptualizing language from a more ecocentric perspective' *Language and Ecology* 2015, pp. 1-28.

Moser, K. (2015b) 'Is Preserving Minority Languages and Cultures the Key to Avoiding the Impending Eco-Apocalypse?: An Ecolinguistic Reading of Le Clézio's Le Rêve Mexicain' *The Journal of Ecocriticism* 7 (1), pp. 1-11.

Mufwene, S. (2001) *The Ecology of Language Evolution*. Cambridge: Cambridge University Press. Kindle Edition.

Mufwene, S. (2005) 'Language Evolution: The Population Genetics Way' in Hauska, G. (ed.) *Gene, Sprachen, und ihre Evolution*. Regensburg: Universitaetsverlag Regensburg.

Mufwene, S. (2017) 'Language vitality: the weak theoretical underpinnings of what can be an exciting research area' in *Language* 93 (4), pp. 202-223.

Nettle, D. (2018) 'What is cultural evolution like?' in *Hanging on to the Edges. Essays on Science, Society, and the Academic Life*. Cambridge: Open Book Publishers.

Pinker, S. and Bloom, P. (1990) 'Natural language and natural selection' *Behavioral and Brain Sciences* 13, pp. 707-784.

Pinker, S. (1994) *The Language Instinct*. London: Penguin.

Pretty, J. et al. (2007) *The Sage Handbook of Environment and Society.* London: Sage Publications.

Richards, R.J. (2002) *The Linguistic Creation of Man: Charles Darwin, August Schleicher, Ernst Haeckel, and the Missing Link in Nineteenth-Century Evolutionary Theory*. Chicago: University of Chicago Press.

Richerson, P. and Boyd, R. (2005) *Not by Genes Alone*: *How Culture Transformed Human Evolution.* Chicago: University of Chicago Press.

Rosenfeld, C. (2018) 'The Great Divide: What Dr. Moreau Tells Us About Posthumanism and the Anthropocene' *Kaleidoscope: A Graduate Journal of Qualitative Communication Research* 17, pp. 37-52.

Rosenfeld, C. (2019) 'From Prometheus to Gaea: A Case for Earth-Centered Language', *Language and Ecology 2019,* pp. 1-16.

Schleicher, A. (1863) *Die Darwinsche Theorie und die Sprachwissenschaft – offenes Sendschreiben an Herrn Dr. Ernst Haeckel*. Weimar: H. Boehlau.

Schleicher, A. (1869) *Darwinism Tested by the Science of Language*. (Translated by Alexander V. W. Bikkers), London: J.C. Hotten.

Snow, C.P. (1959) *The Two Cultures*. Cambridge: Cambridge University Press.

Spencer-Oatey, H. (2012) *What is culture? A compilation of quotations*. GlobalPAD Core Concepts.

Strauss, A. (2019) 'Nature's Headbangers, How the surprisingly intricate drumming of woodpeckers evolved' https://blogs.scientificamerican.com/observations/natures-headbangers/ (accessed 12/01/20).

Stubbersfield, J, et al. (2018) 'Faking the News: Intentional Guided Variation Reflects Cognitive Biases in Transmission Chains Without Recall'. *Cultural Science Journal*, 10 (1), pp. 54–65.

Terralingua (2014) *Biocultural Diversity Toolkit: Vol 1: An Introduction to Biocultural Diversity,* Salt Spring Island, BC: Terralingua.

Trask, R.L. (2004) *Language: The Basics*. 3rd Ed. Abingdon: Routledge.

Tylor, E. (1871) *Primitive Culture: Research into the Development of Mythology, Philosophy, Religion, Art, and Custom*. London: John Murray.

UNESCO, (2017) *Reading the past, writing the future: fifty years of promoting literacy,* Paris: UNESCO.

Willans, F and Jukes, A. (2017) 'How far can the language ecology metaphor take us?: A Pacific perspective on language vitality (Response to Mufwene)', *Language,* 93 (4), pp. 263-274.

UNESCO (2018) 'What is intangible cultural heritage?' https://ich.unesco.org/en/what-is-intangible-heritage-00003 (accessed 27/12/2018).

Wedgwood, H. (1866) *On the Origin of Language.* London: Trübner.

Wilson, E.O. (1975) *Sociobiology: The New Synthesis*. Harvard: Harvard University Press. Abridged Edition.

Wilson, E.O. (1998) *Consilience: The Unity of Knowledge*. Abacus: London.