Exaptation in Linguistics

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Preface

My interest in the paradigm of Linguistics was peeked by being introduced to the concept of Universal Grammar and the interest of Linguistics to dissect language to better understand its components and inner workings. When the time came to pick a thesis topic, it seemed logical to focus on the linguistic paradigm itself and after some searching I landed on the introduction of the concept exaptation into this paradigm as a suitable focus for this text. This had the added advantage of having to study another field of interest: evolutionary biology. It has been a rewarding enterprise to compare these two fields and to better understand the various distinctions and parallels between them.

This endeavour has taken more time than it should, but it is here and that is the most important consideration.

I am grateful to a number of people for helping me write this thesis. I am extremely grateful to Professor Arie Verhagen for helping me find this topic, and help setting up the structure for this thesis and providing valuable insight in crafting my arguments. I indebted to Dr. Ronny Boogaarts for coaching me to this final product and pointing out ways to better improve and support my reasoning. I am thankful for Prof. Dr. Gijsbert Rutten for providing the finishing touches to this text.

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Many thanks to my parents for providing mental support, and last but not least I wish to express my gratitude and love to Khodeza Koppenol for persuading me to complete this journey and giving me the love and support to carry it out. A final thanks to my cat Daisy, simply because she is nice and cute.

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Exaptation in Linguistics

1. Introduction

What follows will focus on the history of the introduction of the concept exaptation into two research fields: evolutionary theory and linguistics. It will provide the motivations behind its conception, and the shaping of the concept and the (potential) advantages of its introduction into both fields, but specifically focused on the study of linguistic change.

In both cases, the introduction of the term is the result of displeasure with the direction taken in each field of research. These attempts are meant to expand the horizon of their respective fields. It will become clear in both cases that this specific concept is not easily shoehorned into existing paradigms.

This text creates an overview of the steps, complexities and pitfalls involved in introducing a novel concept from a different research field into an existing paradigm. Additionally, within each field the introduced concept dissected into characteristics by which future examples can be recognized and measured. The conclusion focuses on the comprehensiveness and productiveness of this concept, which presents a critical analysis of the various considerations taken in these attempts and, by doing so, may create a useful frame of reference for any future attempts to borrow concepts from other research fields.

The text will be divided into two chapters and a conclusion:

Exaptation and Evolutionary Theory

Before focussing on linguistics, it is important to comprehend the assumed necessity of the introduction of the concept exaptation and to understand its affinity and contrast with the term adaptation. The lack of interest into the context in which evolutionary

change occurs led Stephen J. Gould and others to introduce the concepts: the spandrel and exaptation. The most prominent one is Exaptation: the first occurrence of a novel function of some biological feature, distinct from existing functions. This concept fills a gap, which was previously overlooked in evolutionary theory, but its study turns out to be complex and elusive.

Exaptation and Linguistics

This chapter explores the various usages of the term exaptation in relation to language but concentrates mainly on its introduction and development in regards to language change.

Certain similarities between both research fields make them an ideal source of inspiration. There are certain advantages to borrowing a concept. It is likely already understood, accepted and popular in another scientific field. This could help with its acceptance in the target field of introduction, but this is not guaranteed. The introduction by Lass(1990) is the result of an analogous objection to the existing paradigm of Linguistics. The study of exaptation in Linguistics appears to be somewhat counter intuitive. Most studies focus on a peculiar or particular phenomenon and find an explanation or an adequate description of the reason why this phenomenon occurs. The study of exaptation requires the opposite approach of finding types of linguistic change, which adhere to the definition given to exaptation. Lass' transfer of the concept into historical linguistics brought forth a critical response, but also further interest in expanding the concept in new ways.

To accurately assess the value of the transfer of the concept exaptation, it is crucial to have a detailed understanding of the resemblances and distinctions between the biological and the linguistic concepts. This scrutiny enables a better understanding

of the applicability and practicality of several definitions used to describe exaptation in relation to linguistic change. This provides a basis for answering the question whether the introduction of exaptation into linguistics is necessary and which factors are crucial when trying to expand an existing a paradigm.

This study estimates the possible uses and usefulness of the term. It also looks into the practice of introducing terms from other fields. It also suggests some methods which can aid future research into exaptation and related concepts dealing with linguistic change.

2 Exaptation and Evolutionary Theory

The introduction of exaptation was the result of Stephen J. Gould's long disillusionment with the direction the field of micro-evolution had taken. The fields of micro- and macro-evolution were initially complementary to each other. The new micro-evolutionary research into genetic processes, tended to exclude interest into external influences. In his Magnum Opus "The Structure of Evolutionary Theory" Gould succinctly stated his dissatisfaction with the divide which had arisen between micro-evolution and his own field of research; macro-evolution or palaeontology to be precise.

> Darwinians … have always recognized that their theory necessarily underpredicts the actual pathways of life's history – and that explanations for the byways of individual lineages (and major aspects of the highways as well) can only be located in the factual record of particulars. This concept potentiated the tacit truce that, until recent years, held between paleontologists and Darwinian theorists under the Modern Synthesis. Under accepted terms, the theorists said to the paleontologists: "give up your old claims about special macroevolutionary mechanisms, and admit our contention that microevolutionary population genetics and natural selection hold full theoretical sufficiency. We will then grant you control over the actual pageant of life's history by allowing that no nomothetic theory (and ours is 'as good as it gets') can specify actual pathways without factoring in the historical particulars that only your record preserves."(I have scarcely hid my conviction, either in this book or elsewhere, that this truce always operated as a "lousy deal" for the science of paleontology.) (Gould 2002, p. 1224)

During his lifetime, Gould introduced numerous critiques and novel concepts to the theory of evolution to make both fields complement each other again, instead of simply coexisting.

To better understand how this divergence between related fields occurred and why Gould searched for arguments and concepts like the spandrel and exaptation to bring them closer together again, it is important to be familiar with a number of milestones of evolution's history.

2.1 A brief history of the theory of evolution

2.1.1 Darwin's Theory

Darwin introduced his theory in 1859 through his seminal work, *On the Origin of Species*. His publication caused a storm of critique at the time. Besides the many detractors on religious grounds there were others who criticized the conclusions drawn from Darwin's theory on more empirical grounds. One prominent argument was against the posited plasticity of life. Traits could be favoured and combined through natural selection, but how could a favourable trait be improved upon when the trait was combined with a less perfect example coming from its partner. Since it is impossible to create a more pristine colour white by adding imperfect tints of white, how can nature be improving instead of, in present day terms, diluting its gene pool? Darwin's proposed blending of biological traits, at first glance, appeared to impede evolution and seemed to favour homogeneity. Darwin himself struggled with this incongruity and addressed it in his work.

> As according to the theory of natural selection an interminable number of intermediate forms must have existed, linking together all the species in each group by gradations as fine as our existing varieties, it may be asked, Why do we not see these linking forms all around us? Why are not all organic beings blended together in an inextricable chaos? (Darwin 1866, p. 547)

2.1.2 The Modern Synthesis

Darwin was no longer alive when the first hints of a solution surfaced. Around 1900 three scientists separately came into contact with the disregarded work of Gregor Johann Mendel. Mendel had studied and cultivated peas (Mendel 1865). During his study he found that there was regularity in the offspring of the plants he grew. Certain traits were recurring in offspring with an apparent mathematical consistency. When he crossed white flower and purple flower pea plants, the result was pea plants with purple flowers. When this new generation was crossed with each other, the result was a 3 to 1

ratio of purple vs. white flowers. There was no indication that these factors caused a blending of traits. He called the most prevalent characteristic the dominant trait. His discovery indicated that the life exhibited less plasticity than initially assumed. The rediscovery of his work was, at first, used as an argument against Darwin's theory of evolution by means of natural selection, since it was at odds with his understanding of life's plasticity. Darwin's measure of life's plasticity was incorrect, but his belief in natural selection survived this critique. It took three more decades for this presumed discrepancy to be agreeably reconciled. Through the works of Fisher, Haldane and Wright the two schools of thought were combined into what is now referred to as the Modern Synthesis. The consecutive discovery and understanding of DNA supported Darwin's theory and the modern synthesis. Despite continued sporadic critiques, the modern synthesis has endured, and the foundation presented in Darwin's theory has become undisputed within the academic community.

2.1.3 A new direction for micro-evolution

The discovery of DNA opened up a new manner of research into evolutionary processes by studying the changes in DNA sequences. The development of new methods of deciphering DNA strains opened a whole new world for researchers to explore. It also introduced a new perspective on what can be studied to understand the changes in species and the evolutionary process. Biological change could be linked to related changes in the DNA, since such changes can only be passed on if a change in DNA sequences occurs. This resulted in the Gene's Eye view expounded by the ethologist Richard Dawkins, wherein every gene is trying to reproduce itself by increasing the fitness of the vehicle in which it resided (Dawkins 1976).

The study of DNA changes can provide answers to the questions: What has changed, how has it changed and can lead to deducing possible consequences of this change. There are several advantages to this new form of research.

The availability of studying DNA sequences and the increased understanding of how it operates allows for an easier method to test certain hypotheses and find genetic origins of biological changes. If a DNA sequence is related to a particular trait, this will quickly reveal itself by comparing a sufficient number of conspecifics with and without this particular trait. Different generations can be compared and the effects this DNA change incurs can be tested and measured. An enormous amount of information can be

gained from this line of research, but not one directly useful to Gould and his fellow palaeontologists.

2.2. Gould's quest to realign micro- and macro-evolution.

The focus shift of micro-evolution was to the detriment of Gould's field of palaeontology. There is one thing that most fossils lack and that is DNA strains. DNA can survive a long time from a human perspective. The current oldest DNA strains found are 2 million years old (Kjær 2022), but when compared to the 4 billion years history of life on earth, this is simply a fraction. There is the added problem of decay. The oldest DNA strains will have undergone great amount of deterioration, which decreases the chances of producing conclusive research from the material that is available.

Genetic research does not provide answers to *why* something has changed. Answering why something has changed is a much more complicated process. The abundance of contextual factors which can influence evolutionary change increases the potential for incorrect assumptions and the likelihood of crucial factors being overlooked. Furthermore, there can be disagreements on the degree to which certain factors are of significance to a change. These disagreements are complicated to resolve, because the amount of influence exerted from contextual factors are difficult to test after the fact.

Nevertheless, for the field of palaeontology determining the environment in which the fossilized species lived is crucial for understanding the changes that have occurred. The shift in micro-evolutionary focus removes a frame of reference and comparison for the field of macro-evolution. This caused Gould and others to search for flaws and gaps in the current micro-evolutionary understanding of the evolutionary process. If successful, this should necessitate the reintroduction of contextual factors.

2.2.1 Expected Gaps

The idea of gaps within evolutionary theory is not a novel one. In fact, Darwin himself expected the process to be more complex than covered in his seminal work.

> Furthermore, I am convinced that natural selection has been the most important, but not the exclusive, means of modification. (Darwin 1866, p.6)

Even though this increased complexity is assumed, there have been few attempts to expand upon it. Gould explored the restricting nature of studying natural selection and noticed the homogeneity of its conclusions.

> The emphasis on natural selection as the only directing force of any importance in evolution led inevitably to an analysis of all attributes of organisms as adaptations. (Gould 1980)

> we use "adaptation" as our favored, descriptive term for designating any recognizable bit of changed morphology in evolution. (Gould 1980)

He was not the first to find the ubiquity of adaptations problematic. The frequent characterization of change as an adaptation spread into realms unrelated to biology and within the field of biology it was often used to explain almost everything. It was this carefree integration of evolutionary explanations for any natural phenomena which prompted George C. Williams to write *Adaptation and Natural selection,* where he suggested many advantageous traits were the result of fortuitous effects and not necessarily adaptation.

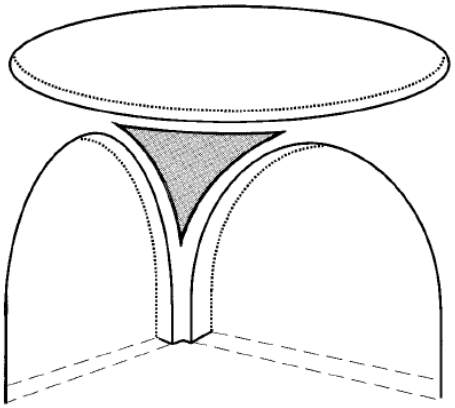
> adaptation is a special and onerous concept that should be used only where it is really necessary. (Williams 1966, p. 3)

This did not lead Williams to suggest how fortuitous effects could be incorporated into evolutionary theory or how they could be recognized and studied. This is not entirely surprising; while adaptation is an onerous concept that should be avoided, fortuitous effects are even harder to explain and incorporate into the existing theory. Therefore attempting to explain biological change through the adaptation process, before researching the possibility of it being caused by fortuitous effects is understandable.

Some forms of fortuitous effects have been proposed like Wright's genetic drift (Wright 1932) and pleiotropic effects[1] (Plate 1910 in Stearns 2010). However these were often deemed too insignificant and infrequent to warrant expansive study. The lack of new insights from these forays stifled further research into evolutionary processes beyond natural selection. Despite Williams' cautions against overusing adaptation as an explanation for beneficial traits, his work did not diminish the fervent belief in natural selection as the primary force behind evolution.

However, Gould and his colleagues were not perturbed by this state of affairs and they posited new forms of fortuitous effects. The first presented was the Spandrel (Gould & Lewontin 1979).

2.2.2 The Spandrel



The foundation for the concept of spandrel was the notion that pleiotropic effects can easily form the basis for new functions and processes. Adaptation causes the trait used for a specific function to change, but like a spiderweb when encountering an external force, it forces the surrounding tissue to change with it.For their concept they turned to architecture and used a side-effect of ecclesiastical design; the Spandrel. Many Christians desired to have a dome grace their churches. In order to fit a round structure on a rectangular foundation architects had to construct an intersection to connect the two designs. The resulting triangular shape, called 'spandrel', was unavoidable in order to support the structure. Later the surface of the spandrel was used to display ecclesiastical imagery, it thereby acquired a function for which it was not designed. The feature of being a by-product of a particular church architecture formed the basis for its biological equivalent. Gould and Lewontin borrowed the "Bauplan" concept advocated by Schindenwolf, Remane and Grassé, and used it to emphasize the holistic nature of organisms. It is possible for life to adapt but if a trait is accentuated through natural selection, this will automatically invoke consequences for the structure of the rest of the organism. If the bauplan of a species is highly interconnected, then there must be an extensive pool of properties of an organism

[1] By-products of natural selection

that are unintentional consequences of adaptation. These unintended characteristics can form the basis for performing a new function.

The concept received the following three types of criticisms:

- Architectural spandrels do have functions (Mark 1996, Houston 1997)
- The architectural characteristic described is not a spandrel (Mark 1996)
- A spandrel is a concept which is unlikely to lead to productive scientific research (Tooby & Cosmides 1992)

The first two are less relevant, since they dismiss the analogy or the term rather than the concept. Even if these criticisms are correct, the term can be used if the related concept is not confused with its architectural counterpart.

The last is more problematic. If no spandrels could be found this would make the term unusable. However, the non-existence of spandrels appears unlikely. This would mean that each and every physical change resulting from adaptation must automatically have a function. What is true, though, is that the prevalence of spandrels is hard to determine. For one thing, this depends on the amount of structural change caused by adaptation. This is likely very difficult to decipher, especially since it is near impossible to ascertain that an altered characteristic does not have a function.
From a logical standpoint the existence of spandrels is tenable, but from a practical standpoint it is not a very useful concept. Even if all possible functions of a characteristic have been eliminated, you have only succeeded in verifying a characteristic's insignificance. But although the spandrel did not appear to be immediately practically relevant for further research, a new concept could be deduced from its existence. This was coined: exaptation (Gould & Vrba 1982).

2.2.3 Exaptation

If spandrels can form the basis for a new function, than functionless characteristics can become functional. A kind of event which is not covered by the concepts 'natural selection' and 'adaptation'.

> What is to be done with useful structures not built by natural selection for their current role? (Gould & Vrba 1982)

There was no concept for the coming into existence of a new function.

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> Darwinians have always understood that their theory's most quirky, most original, and most brilliant intellectual "move" explains how a process that creates nothing directly can, nonetheless, operate on raw material of different origin to become a "creative" force in the construction of novel and useful features. (Gould 2002, p. 1275)

Natural selection and adaptation describe the process through which certain traits become more prevalent in a species and how traits can improve or transform through time, but not how they came to be.

The term 'Pre-adaptation' had already been coined (Bock 1959). This assumed the formation of useful material for a future function, but this concept is somewhat hampered by its nomenclature. Natural selection can only operate directly, since the resulting increases of fitness should work immediately. It cannot incur fitness increases in future situations, since this would indicate a form of teleological determination was involved.

Macro-evolutionists perceive instances which cannot be directly explained through natural selection. As a consequence they have adapted a hierarchical or multilevel perspective on life. Several selection levels are proposed: genes, cells, organs, organic systems, organisms, demes, and species. It has been very difficult to prove fitness benefits above the organism level. The gene's eye view assumes that any benefit above the organism level is beneficial at organism level as well and therefore is the result of immediate benefits from natural selection. In cases where the immediate benefits are not immediately apparent, there must be a misunderstanding on the part of the observer concerning the function under observation.

Although a new function cannot be based on material predestined for that purpose, it still requires physical characteristics to exist. The gene's eye view's focus on natural selection and adaptation ensured it was less interested in the formation and context in which a trait was formed and co-opted for a new function. A positive change is relatively easy to perceive but to map a historical path for this role is more exacting. Sometimes, this is not even possible because of a lack of evidence; however without historic insight any explanation is likely to remain speculation. The absence of a historic perspective will make evolutionary changes enigmatic.

Through creating a timeline containing historical context, these changes may be more easily understood. A trait might have multiple functions or the function may have altered through consecutive dissimilar ecological pressures. Having a benefit or function does not mean its origin is directly linked to that function. When a trait has multiple functions it is insightful to know which function came first. This can explain the ecological pressures or behaviour involved in the formation of their occurrence. For example the swim bladder has often been used as an example for an organ which gained an additional function respiration. However, recent research has found the opposite; it turns out the lung was there first, the buoyancy effect was a later function (Liem 1988). The unearthing of such histories provides insightful explanations of how organisms are formed and which pressures cause changes to spread. To understand why a new function exists, a contextual and historical perspective is needed. Although the introduction of new functions has always been a given in evolutionary theory, it had so far not received a term of its own.

> We suggest that such characters, evolved for other usages (or for no function at all), and later "coopted" for their current role, be called exaptations. … They are fit for their current role, hence aptus, but they were not designed for it, and are therefore no ad aptus, or pushed toward fitness. They owe their fitness to features present for other reasons, and are therefore fit (aptus) by reason of (ex) their form, or ex aptus. (Gould & Vrba 1982)

This formulation comes with some problematic associations. The similarities between the terms adaptation and exaptation and the presentation by Gould and Vrba might create the inference they are opposites somehow, but their relationship to each other is not a dichotomy. It is important to represent the differences between these terms explicitly. Gould and Vrba presented the following distinctions:

TABLE 1. A taxonomy of fitness.

Process	Character		Usage
Natural selection shapes the character for a current use—adaptation	adaptation	aptation	function
A character, previously shaped by natural selection for a particular function (an adaptation), is coopted for a new use—cooptation	exaptation		effect
A character whose origin cannot be ascribed to the direct action of natural selection (a nonaptation), is coopted for a current use—cooptation			

This overview does not create an accurate picture. A distinction is made between new functions arising from characteristics which previously had no function or those arising from the traits of an already existing function. However, to define adaptation and exaptation both as processes is misleading. The spreading of a trait through natural selection will take up a much longer time-frame than the occurrence of a new function, which is almost instantaneous. Exaptation is simply a necessary precursor to natural selection and adaptation. A more accurate overview of evolutionary change is listed below.

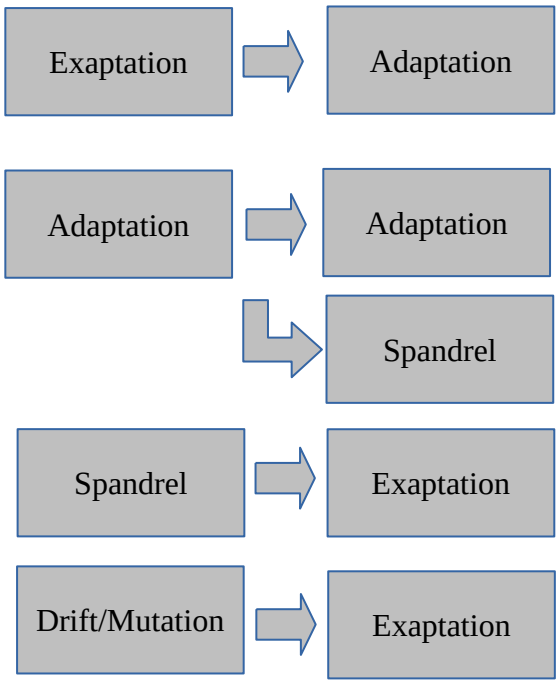
Table 1 *List of evolutionary changes*

Term	Origin of change	Cause	Change	Time period	Effect
Drift/ Mutation	Any characteristic	mutation	Physical change or no physical change	Event which is sustained by internal genetic duplication process and passed on to the next generation	New characteristic*/ No change
Spandrel	Non-functional periphery of adaptation	Adaptation	Physical change	Dependent on the adaptation process	New characteristic
Exaptation	Any characteristic	Ecological pressure or inventiveness	No physical change	Event/almost instantaneous	New function/ new behaviour
Adaptation	Exaptation or adaptation	Natural selection	Physical change	Process constrained by the structural	Specialization of a function

				make-up of an organism and the ecological pressures	

*: It is important to note the distinctions between a characteristic and a trait. A characteristic is a physical (or behavioural) attribute which is not related to a function. A trait is a physical (or behavioural) attribute which is related to a function.

The list indicates many distinctions between the terms and some similarities. There are no clear dichotomies. It, however, lacks a clear indication of the possible order in which these changes can occur. All the following sequences are possible.



Although this overview presents the possible sequences that can exist, it does not give a coherent time-frame for each of these occurrences. Except for exaptation, which is an almost instantaneous event, the other processes can be of various lengths. This is important, since the instantaneous and non-transformative aspect of exaptation makes it problematic to find.

Even more than the spandrel, the existence of exaptation is hard to refute, but to study it effectively one will encounter a number of hindrances.

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1. How novel is a new function?

In certain instances, the novelty of a function is readily accepted. The lung producing energy for the rest of the body is clearly distinct from also using the intake of air as a flotation device. However, in some instances this is not as clear, the eye can be used to perceive light and dark, movement, and colour. All of these deal with vizu perception and can be categorized as different adaptations sprouting from the same function, but there are grey areas. All functions within an organism exist in a sort of continuum. They are to a higher or lesser degree related to each other. All changes exist on a scale of relatedness. It is complicated and probably arbitrary to define a clear *point* on this scale where relatedness ends and unrelatedness.

2. How to find an instantaneous non-physical event in the past?

The fossil record is scarce and while it is possible to perceive changes in physical attributes, one cannot pinpoint an event from fossils. One can only conclude natural selection and adaptation has occurred through perceiving certain changes in the fossil record, but it cannot find exaptive events, since they do not involve physical change. It is only through an understanding of ecological pressures of a specific past that one can deduce the necessity of postulating a new function. If several descendant species of these archaeozoological finds are still alive today, it may be possible to deduce the occurrence of a new function through examining the maturation process of each of these species and pinpoint where different evolutionary paths were taken. However, if a species has gone extinct all that is left is conjecture based on the various facts that are known of a particular era.

3. What can be learned from an event?

When the context in which exaptation occurred, it is difficult to explain its occurrence, except by pointing out its usefulness. Even if a moment in time can be pinpointed for when an exaptation occurred, this does not guarantee a complete understanding of which factors were involved for its occurrence. When the factors are generally understood, it becomes the question of whether there can be found enough examples to perceive patterns. Through a better understanding of the past, the amount of speculation can be reduced, but it will always involve conjecture. Unless, there are no general

patterns in exaptation events. The event can be spontaneous and ad hoc, with no clear minimal requirements for its occurrence.

4. How to find an exaptation which is not easily perceivable?

As a last end lesser point, it is possible that a new function might occur without a clearly visible physical change and/or without later adaptation. If a new function is difficult to perceive, it is hard to determine when it first occurred or what circumstances caused it to occur.

Although the existence of exaptation is undeniable, its study is hard to realize. Their occurrence is erratic, illusive, and hard to pinpoint.

2.4 Conclusion

Even though Gould and others successfully found blind-spots within the evolutionary theory, the new concepts they introduced did not bring about the reconciliation he hoped for. Few researchers have disputed the existence of exaptation, but equally few have found this new concept a useful focus for further research.

> according to orthodox Darwinism, every adaptation is one sort of exaptation or the other – this is trivial, since no function is eternal; if you go back far enough, you will find that every adaptation has developed out of predecessor structures each of which either had some other use or no use at all. (Dennett 1995, p. 281)

Proving the existence of exaptation appears to be the smallest hurdle. The hardest part is finding examples which can be studied, since its occurrence is almost instantaneous, hard to pin-point and probably originated in the inaccessible past, it may not be practical for productive research. Even if all these assertions are true and the study of exaptive events is a strenuous and complex endeavour, to ignore it would be wrong. The occurrence of a new function is of momentous importance to any species. Some of them may exist only for a short while but those that survive the evolutionary rat race are important enough to merit consideration of their history and the circumstances of their origin. The perceived inevitability of exaptation may have been what drew linguists to posit its existence within language.

3. Introduction of exaptation in Linguistics

Exaptation has been of interest to a varied array of Linguistic researchers. This chapter will briefly touch on the various ways exaptation may be influential to various levels of language evolution but will focus specifically on the introduction by Lass as a phenomena of linguistic change. It then delineates the academic back and forth on the correctness of the examples, introducing new examples and the redefining of the exaptation concept to better fit current linguistic understanding.

3.1 The various suggested exaptive influences on language

Chomsky has suggested that the formation of language is a biological manifestation resulting from exaptation.

> Noam Chomsky, on the other hand, has long advocated a position corresponding to the claim that language is an exaptation of brain structure. (Chomsky, who has rarely written anything about evolution, has not so framed his theory, but he does accept my argument as a proper translation of his views into the language of my field – Chomsky, personal communication.)
> (Gould 1991, p.61)

This is an interesting assumption; however, there appears to be no clear method to test it.

> Chomsky has puzzled many readers with his scepticism about whether Darwinian natural selection (as opposed to other evolutionary processes) can explain the origins of the language organ that he argues for (Pinker 2003, p. 11)

The introduction of language was likely a gradual process. It required increased social behaviour and a brain with sufficient plasticity to construct the processes to support the increasing complexity of language. The option that language occurred fully formed in the human brain is an unlikely occurrence, since its production is not solely dependent on neurological processes, but also the result of certain non-neurological adaptations

(ears, trachea and larynx), which are only likely to occur after an increase in language usage.

If the formation of a linguistic brain does not create a different structure than a non-linguistic brain, there also appears to be no method to verify that exaptation has occurred, unless neurological adaptations followed. There is the problem that brain tissue does not fossilize which does not allow for a comparison between a pre-linguistic brain and a linguistic brain.

An added problem is the absence of specific neurological structures for language. Certain regions are generally associated with language processes (Broca and Wernicke), but other regions can manifest these functions as well, although this is often the result of brain damage in the two areas mentioned (Liebermann 2009). The brain is a highly flexible organ, which could in fact be hindered by a standard formation of linguistic structures.

All these factors make Chomsky's hypothesis currently unverifiable and this will therefore not fall within the scope of this study.

On a more linguistic level Fitch has suggested that certain linguistic characteristics may be spandrels.

> For something as recently evolved as language, and given the abstractness of many characteristics of language that interest linguists (such as recursion or subjacency), it would be surprising indeed if none of them were spandrels, in the sense of remaining unchanged from an initial exapted state. (Fitch 2004, p216)

It is important to note that Fitch here uses spandrels differently from Gould.

> Following (Gould and Lewontin 1979), an important subset of such traits are often termed 'spandrels'. A spandrel is an unselected by-product of some other selected trait, which is put to a novel use. (Fitch 2004, p.216)

Fitch's explanation directly attaches a new function to the by-product of a selected trait. One could conclude that the new function is introduced immediately. It is not certain whether this was intended. This would require that spandrels are the result of adaptation

and cause exaptation at the same time. This combination is not a requirement. Fitch names them spandrels, because he suspects no further adaptation has taken place after its first appearance. A spandrel need not be invoked in this instance when exaptation is sufficient for the occurrence of a new linguistic form. If you posit a spandrel you must account for a new characteristic being introduced as well as a novel function. The formation of a new characteristic is not relevant to Fitch's hypothesis. In his later work he has started to use the term as presented by Gould (Fitch 2010). Although he still expects spandrels are necessary for novel uses.

> It seems quite plausible that at least some details of the human language capacity reflect spandrels, given the number of different components that have been put to new use ("exapted") in this system over a relatively short time period. (Fitch 2010, p.66)

The alternative usage of spandrel aside, this assertion bypasses Chomsky's premise for the existence of a neurological structure exapted for language. Fitch points out exaptation has occurred for the audible production and perception of language (Fitch 2010). It seems reasonable to assume that auditory senses where initially formed for greater awareness of one's surrounding and the mouth, being initially used for consumption and later as a passage for oxygen intake. Using them for communication is an acceptable leap-like exaptive occurrence. The further specialization of these senses for communication are likely the results of adaptation.

The notion that recursiveness or other characteristics of languages are the result of exaptation raises questions:

Question 1: Is Language or components of language an exaptation based on a biological trait?

If it is based on a biological trait, it can be adapted and this would enable a study of its maturation. If instead, it is based on a neurological formation this would complicate the situation. Unless a novel neurological structure has evolved for Language, it becomes difficult to study. However, even if the biological trait was not adapted later, it could be noticeable since it must be maintained in the genetic code in order for the function to be

maintained. If based on a biological trait, this could result in an incorrect formation or maturation of the trait, which would result in some human individuals who are either hindered or incapable of using Language. Until evidence surfaces which proves a biological trait specific for language usage works incorrectly or not at all, it is not possible to verify a biological origin for Linguistic components. Therefore, this potential biological origin for language will not be covered in this text.

Question 2: Is the evolving language structure the result of several exaptation events?

Evolving complexity of language could be seen as a chain of exaptive and adaptive events. If they happened within the period of written texts, these exaptive events could be deduced from these historic records and be studied and analysed.
In this case the exaptation(s) can be placed in a specific context and the circumstances of its occurrence can be analysed and compared to different languages who already possess this exaptation or acquired it at a later time.

If the linguistic evolutionary components mentioned by Fitch (Fitch 2010, p.117) were introduced into languages this likely happened at a period before written texts, which would make a study of its occurrence only possible through deduction. Since there are currently no examples of language being founded on biological trait(s) or linguistic exaptive or spandrel-like components occurring within written history, these types of linguistic exaptations will not be covered in the following analysis. In this analysis biology will only be used as a reference to compare the biological evolution process and the terms posited by Gould & others to linguistic evolution and linguistic change.

3.2 Why did Lass introduce exaptation into Linguistics?

Many linguists have tried to find clear universal patterns in the way languages are produced and change. If such patterns can be discovered and codified these would result in a clearer understanding of language structure and of language change. Through this framework it would become possible to make reliable predictions and set helpful demarcations for further research.

Roger Lass has been focused on this pursuit to find a better framework for studying language. In his 1980 work; "On explaining language change" he expressed his

dissatisfaction concerning the type of explanations he encountered in contemporary linguistics.

> There are no probabilistic explanations, because these are not explanations in any reasonable sense. They are merely post hoc recognitions of sets of conditions that fit certain generalizations, but fail to account in any principled way for the cases that don't fit; they have no 'empirical' status in the strict sense of the term. (Lass 1980, p.90)

Although he finds the deductive generalizations in linguistics unreliable, he does not immediately offer a clear alternative.

> It is a commonly held, and erroneous and counter-productive belief, that in order to be justified in criticizing something, you have to have something better to substitute for it. (Lass 1980, p.4)

He does mention the requisite standard explanations should meet, but also hints that this may not always be attainable.

> the goodness of an explanation is to be judged only in absolute terms, divorced from any consideration of explaining as a speech-act with (happy or unhappy) perlocutionary effects; and that the highest (or even only) goal of intellectual endeavour is D-N explanation and/or falsification of hypotheses, with its corollary that reduction to ' law' is the only source of respectable knowledge. (Lass 1980, p.145)

> What I am advocating is the conduct of a rational 'metaphysical research programme' (Popper 1976, p.37), in which non-empirical positions are argued, as far as possible, according to the canons of reason, and criticized, and the worst idiocies pared away. (Lass 1980, p.171)

Exaptation in Linguistics

> I have already suggested at a number of points that a mature and viable linguistic theory has to be pluralist, in the sense of subsuming complementary aspects of its subject matter. (Lass 1980, p.145)

A number of his colleagues have criticized his quest for a completely empirical foundation for linguistic arguments, since linguistic change has not occurred in an overall predictable manner. He later admitted that his initial goal cannot be attained.

> That book in retrospect was a bigoted, coarsely positivist assault on all forms of explanation other than those fitting the D-N or covering law model. Having shown (to my satisfaction at least) that such ideal schemata are inappropriate for the explanation of language change, since there are no 'laws' of the requisite kind, I concluded that linguistic change is (in principle?) inexplicable in any epistemically satisfying sense. (Lass 1997, p.332)

The acceptance of this incongruence has not prevented him from searching for alternatives to the common forms of explanation used in linguistics. This search eventually lead him to evolution and exaptation. This concept appeared as a possible candidate for a different perspective on linguistic change.
He suggested to incorporate the term into linguistics in his 1990 article.

> Exaptation then is the opportunistic co-optation of a feature whose origin is unrelated or only marginally related to its later use. In other words (loosely) a 'conceptual novelty' or 'invention'. (Lass 1990, p.80)

Within the article he indicates his awareness that borrowing terms can lead to "*sloppy metaphors*".
On the one hand, it must remain faithful to justify the use of the term. On the other hand, the translation must result in a meaningful and useful term in the field in which it is introduced. Such a translation of a concept can result in a number of possible alterations as listed in Table 2.

Table 2

Translation options	Reasons for adopting:
1. Translating elements	Which elements are essential to remain faithful to the original concept and also crucial to the new context?
2. Not translating elements	Which elements are not applicable to the new context and have to be discarded?
3. Altering translated elements	Which characteristics cannot be faithfully translated, since they do not (fully) apply to the new context?
4. Adding elements	Which elements must be added to concept in order to fit the new context?

The linguistic concept of "Exaptation" has undergone a number of changes after its introduction. In the 1990 article not all characteristics of linguistic exaptation where directly addressed, but through the examples presented by Lass most of them can be deduced. These characteristics are listed in Table 3.

Table 3 Characteristics of Exaptation according to Lass 1990

Characteristic	Significance
1. Semantic change	Does the change involve a change in meaning or alternative syntactic association (e.g. an alternative form of syntactic agreement: tense marker → gender marker)? - If the semantics of a form changes and the novel meaning is distinctly different, it can be considered leap-like and therefore an exaptation.
2. Usage change	Is the new usage form different from the original usage form from which it originated? - If the altered usage form is novel to a language, it must be an exaptation.
3. Junk	Has the old pattern lost its semantic function? - if the old form no longer has a function, the introduction of a new usage form must be an exaptation.

4. Irregular	Has the production of junk linguistic material become irregular? - if a form has lost its semantic function, its production can maintain the previous usage form or its usage form can become unclear to the speakers of the language. An irregular form is a clear indication, that besides losing its meaning its original usage pattern is also no longer maintained.
5. Unrelated origin	Is the linguistic change distinctly different from the old usage? - A change can only be an exaptation if the new function is distinctly different from the old usage.
6. Expansion	Is the change the result of a productive pattern altering junk material? - If an already productive pattern changes the usage of junk material, this is a form of adaptation and not exaptation. The alteration of the junk material can be distinctly different from its old usage, but the transformation cannot be claimed to be unexpected or leap-like, since it is an extension of a productive pattern.

All the examples of exaptation presented by linguists will be judged with respect to these six characteristics to more easily determine whether it can truly be considered an exaptation. The determination per example may change, when a new definition of exaptation is posited. From Lass' first article on exaptation when the following characteristics are met the example is considered an exaptation.

Definition 1 (Lass 1990)

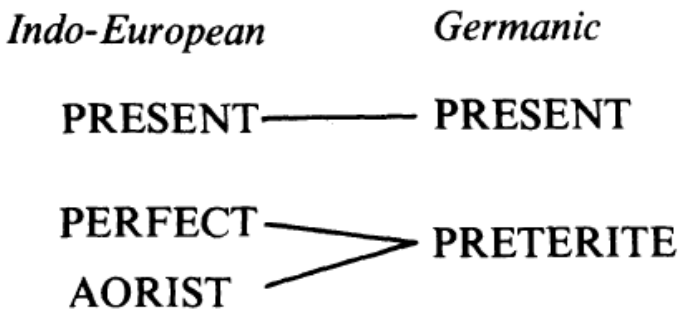
Definitions	Semantic Change	Usage Change	Junk	Irregular	Unrelated origin	Expansion
Lass 1990	Y/N*	Y/N	Y	Y/N	Y	N

* the definition only states the need for conceptual novelty but certain examples do not appear to involve a semantic change.

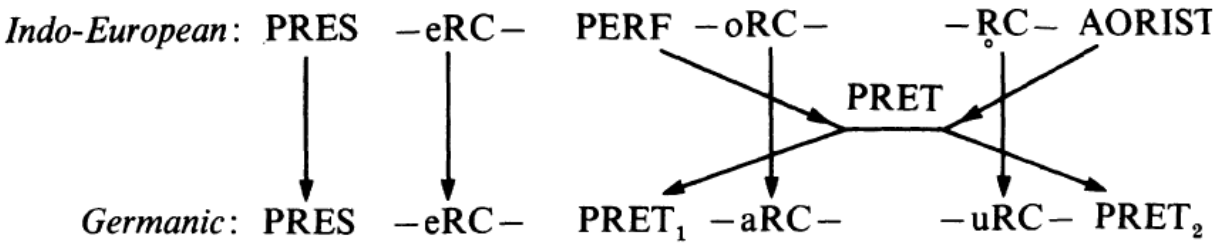
Exaptation in Linguistics

The first example describes two Indo-European past tense forms which lose their distinction from each other. These forms then merge their characteristics to become a singular/plural distinction in Germanic, something which was purportedly previously indicated through suffixes.

> One of the great innovations characterizing Germanic is the destruction of the Indo-European aspect system. This was replaced by a tense-system, with no grammaticalized aspects. In rough outline, the IE present continues as the Germanic present, while the two 'past' categories, perfect and aorist, merge to form a new, conflated preterite:



> … strong verbs however were more conservative, and retained- if in a drastically altered capacity - much of the original contrastive morphology.



> … The scenario encapsulated here would appear to be:
> (i) loss of the (semantic) opposition perfect/aorist;
> (ii) retention of the diluted semantic content 'past' shared by both (in other words, loss of aspect but retention of distal time-deixis);
> (iii) retention of the morpho(phono)logical exponents of the old categories perfect and aorist, but divested of their oppositional meaning;
> (iv) redeployment of the now semantically evacuated exponents as markers of a secondary (concordial) category; in effect re-use of the now 'meaningless' old material to bolster an already existing concordial system,

but in quite a new way. Lass (1990, p83-87)

Example 1: IE syntactic distinction becomes plural distinction in Old German (Lass 1990)

Language	Old vs. New usage	Semantic Change	Usage Change	Junk	Irregular	Unrelated Origin	Expanded Pattern
IE →OG	perfect/aorist → Pret1/Pret2	Y	N	Y	N*	Y	N

*There are no examples but it seems plausible if the perfect/aorist distinction is lost the corresponding forms are no longer used in a consistent manner.

The second example is the adjective inflection ‘e’ in Afrikaans indicating the gender of the following noun. This gender indication was lost and the new pattern was based on the morphological structure of the adjective itself.

> My second case is not so much one of massive exaptation of an old system as a new and conceptually innovative form of inflection, with no concordial (and virtually no semantic) function. But it is still exaptive, in that the surface exponents of an old contrast - if in rather degraded form - are retained, and pressed into a quite new service. …
> Aside from survivals of the old genitive and dative inflections in certain instances, the adjective was essentially either endingless or in -e. …
> Now it would seem likely that once the basic trigger of gender was lost, the Distribution of -e would for a time be close to random; each adjective' had' a form in zero and one in -e, and the absence of gender-specifications should allow reasonably for either one surfacing in a given context. …
> And indeed, in the 'transition' period between the Dutch and Afrikaans systems, this is precisely what we do find ('deviant' forms cited from Scholtz, I98I: 129, which gives an excellent historical overview). This is the crucial 'junk' stage.

(12) *Junk-deployment in Afrikaans: idealized scenario*

I. Gender marked morphologically:

II. Loss of gender

III. *-e* is now junk: een kleyn ~ kleyn-e {harpoen / stuk}

IV. Adapt or die: *−e* saved by redeployment (exaptation)

V. Result: any adjective is inflected or not as a categorial property, regardless of the head noun it modifies, or any NP features.

Lass (1990, p.88-91)

Example 2: Afrikaans adjectival -e (Lass 1990)

Language	Old vs. New usage	Semantic Change	Usage Change	Junk	Irregular	Unrelated Origin	Expansion
Afrikaans	marker of gender → marker of morphological structure composition	N	Y	Y	Y	Y	N

His article and these examples did not go unnoticed.

3.3 Criticism on Lass' Exaptation

Several critiques were presented against the introduction of exaptation.

3.3.1 An impossible phenomenon

Some linguists dismissed exaptation out of hand (Vincent 1995). One of the reasons given was that exaptation is impossible within language, because any linguistic change must have been envisioned by the mind of a single speaker.

> exaptation cannot be a valid process of change since it labels a correspondence between two stages of a language's development and is not therefore a

> phenomenon that could be encompassed in the mind of a single speaker, which is the only proper locus of linguistic change (Andersen 1973). (quoted from Vincent 1995, p.436)

This argument is not directly persuasive. It is premature to exclude a potential form of linguistic change, because it is does not adhere to a maxim that any linguistic change must originate from the mind of a single speaker. It is not clear how this requirement could be demonstrated. To discard exaptation out of hand would be premature, especially, since there is no clear justification for the stated proviso.

3.3.2 Junk and unrelated origin

Lass also suggested the existence of junk material in language. This concept was also considered an impossible occurrence.

> the notion of linguistic junk is not coherent because languages are sign systems and no part of a sign system is without function, even if we as analysts have not yet worked out what the function in question is. (Vincent 1995, p.435)

This stated proviso also must be demonstrated to be a linguistic requirement. It is problematic to assert that language is a sign system and therefore everything in it must be a sign with a function, regardless whether the function is understood. If this were true than junk is indeed simply impossible. However, having a sign system does not automatically lead to the inference that everything contained in it must have a function. If one takes the evolutionary analogy, there exists junk DNA which does not hinder evolution. If languages also incorporate junk material this does not immediately make the sign system inoperable. However, linguistic evolution and its counterpart are inherently different. In biology, junk DNA does not appear to hinder the maturation and maintenance process of a single organism. These processes occur unconsciously. In the case of linguistic production, junk can more directly interfere in language, since its inclusion in utterances can increase confusion for its speakers. The introduction of a large amount of linguistic forms without meaning is likely to interfere with the fitness of a language, since the production of utterances will incur a greater conscious effort. This does not make junk impossible. The inconvenience or hindrance of junk in a sign

system is not an affirmation for its non-existence. Evolution requires variation to work and junk DNA provides a greater potential for variation. This could be an aspect of linguistic evolution as well.

The other assertion that everything in a language must have a function is also hard to maintain, especially when creating a clear definition for a function is not as easy as it may seem. To maintain that everything has a function, the definition of function must as a result be very broad. This presumption raises the question: Can a linguistic element only be functionless at the moment it has been discarded? Does a linguistic element before it is discarded still have a function and is it therefore considered productive? If it still has a function and is therefore productive, what justification can be given for its disappearance? This creates a more puzzling problem than the old chicken and the egg question. The claim that everything has a function requires a new explanation for the loss of linguistic elements. Degeneration resulting in junk material can be an explanation of this occurrence, but only if junk material is considered a possible outcome within a sign system.

A more cogent critique against Lass' introduction of exaptation is posited against the first IE-Germanic example presented in the 1990 article, where the perfect/aorist distinction was lost and later turned into a singular/plural distinction. Ramat stated this change does not involve actual junk. The usage form was still functional and productive in some way. Lass describes this example as two past tense syntactic forms defining action. Afterwards the action distinction is lost and the distinction is exapted in Old German as a singular/plural distinction, which was previously covered by an affix. However, Ramat (1998) indicates the singular/plural distinction was already part of the old IE perfect/aorist contrast and therefore does not involve actual novelty. It comes down to a different interpretation of the change studied, see Example 1b for the comparison.

Example 1b:

IE syntactic distinction gets lost in Old German (Ramat 1998)

Language	Old vs. New usage	Semantic Change	Usage Change	Junk	Irregular	Unrelated Origin	Expansion
IE →OG (Lass 1990)	perfect/aorist → Pret1/Pret2	Y	N	Y	N	Y	N

IE →OG (Ramat 1998)	perfect/aorist → loss of distinction	N	N	N	N	X*	N

*: If there already was a singular/plural distinction before then there did not occur any leap-like change which made it distinct from the previous usage form.

Therefore no new form or function was introduced. This then becomes an example of a form losing a grammatical element. This would be a case of degeneration and not exaptation.

Another critique can be presented against example 1, since it is difficult to establish leap-like change. The path travelled from its IE source material to its new form is not completely documented. It is based on deduction of comparing different languages. The etymological changes may have happened gradually and could be more adaptive than exaptive. Only through finding the etymological roads travelled can it become clear whether the original meaning has become removed from its original form.

Example 3 (Svennson & Hering 2010)

Word:	OE: Tun	Modern English: Town
Meaning:	Fence	City

Example 4 (Hayes 2012)

Word:	Middle English: Nice	Modern English: Nice
Meaning:	Foolish/stupid	Agreeable/Pleasant

The great distinction between these former and modern meanings may appear leap-like, but only if you do not take the path they have travelled into account. This is very much like the first appendages of reptiles: they are nothing like the wings of present day birds, but they are nonetheless related and the result of adaptive changes. Only flight as a novel function for an alternative manner of locomotion is exaptive. It is possible, Ramat's assertion is correct and this example can be discounted as an exaptation.

If many of the examples put forward can be successfully countered in this manner it would create another problem for the viability of exaptation in Linguistics.

The reliability and quantity of examples is important in order for the term to be accepted in the linguistic field. Does exaptation occur with a certain frequency and probability? Since Lass only presented two examples in his initial article, a lack of examples is a significant hindrance for his theory. Studying a rare phenomenon can be an unsuccessful enterprise. However, various linguists have continued to posit alternative examples of exaptation which has continued a level of interest into the concept.

3.3.3 Conceptual novelty & usage change

Another area of critique is the characteristic of 'conceptual novelty'. At first glance, conceptual novelty appears clear enough but as many researchers have indicated, it can be defined and interpreted in various ways:

> *Returning then to the relation between grammaticalization and exaptation, we may provisionally schematize it thus:*

	Form	*Content or function*
grammaticalization	*NEW*	*NEW*
exaptation	*OLD*	*NEW*

Vincent (1995, p.437)

Later Ramat (1998) added a third option;

Table 1. Form/function relations in linguistic units

	function	*form*	*type of grammaticalization*
I	*OLD*	*NEW*	*formal renewal (e.g. negation)*
II	*NEW*	*NEW*	*creation of new categories (e.g. Romance auxiliaries)*
III	*NEW*	*OLD*	*exaptation (Lass 1990) (?)*

Ramat (1998, p.108)

To this she added an addendum:

> The fourth logically possible case, which corresponds to the combination of old function with old form is of no interest here, since it concerns cases of preservation of the state of affairs. (Ramat 1998, p.108)

It is possible to alter the definition of the fourth possible case. Linguistic forms and functions which are maintained within a language, will not be of interest to researchers, but the fourth option may actually involve change. An old form may get an already existing function which differs from its previous function. This may be an uncommon occurrence, especially when compared to preserving an already existing form, but nonetheless possible. This fourth option, however, depends on how a novel function is defined. If an old form gains a function which already exists within a language should this be considered a new function. If Lass' assertion that IE-OG example introduces plurality to the Germanic usage form is correct, then it is a question if this plurality is truly novel, since plurality already existed in IE. This would be an expansion of an existing function, which is not the same as the expansion characteristic of exaptation, since this is an occurrence of a productive form which attaches itself to available "junk" material. In order for exaptation to be productive within linguistics, this interpretation of the novel function concept must be acceptable. If all new forms of plurality or another function need to be dismissed out of hand, because it already exists somewhere within a language, than very few examples of truly novel functions are likely to be found. This would make researching exaptation an almost futile exercise. Therefore the fourth option can be posited alongside the others, see Table 4.

Table 4

Type	Function	Form	
1	Old	New	Formal renewal
2	New	New	Creation of new categories
3	New	Old	Exaptation (Example 2)
4	Old	Old	Exaptation (Example 1*)

*: If Ramat is correct and there was no junk period in the IE-OG transition, then the example is not suitable, but examples may be found that transpired in a similar fashion as Lass suggested.

Accepting this definition of a novel function requires a closer inspection of the possible form and function pairings. It is important to understand the definition of form used by Vincent and probably by Ramat:

> the phonetic material which makes up the form side of the grammaticalizing item is inherited, therefore in one sense 'old'. However, it is new RELATIVE TO THE GRAMMATICAL SYSTEM (Vincent 1995, p. 437)

If the phonetic material is unchanged, but exaptation has occurred the following two options are possible.

Option 1	Option 2
Grammatical form (novel) Phonetic form (same) Usage context (novel)	Grammatical form (novel) Phonetic form (same) Usage context (same)

Option 1 one is the only viable form to denote an exaptation. The problem with the second option is that if no new phonetic form or usage context is introduced, how can a listener ever infer that a different grammatical form, possibly with a novel semantic meaning, is intended by the speaker. An aspect has to change to be understood as an indicator something linguistically novel is intended or conveyed. If an utterance contains no new phonetic elements and is not distinguished by using a different structure or context, how can a listener infer a novel usage? The utterance has been productive and meaningful before, therefore the listener has received no clue to interpret it in a novel manner. It is possible to explain the novel meaning, but why would one choose an already existing and productive utterance to have two different meanings.

The three types of change discussed above presented in Table 5.

Table 5

Term	Definition
New grammatical function	An extra-grammatical usage form introduced into a language

New grammatical form	A different manner of producing an already existing grammatical function.
New phonetic form	A modification in the phonetic material used to produce a grammatical form

The third option of introducing new phonetic forms is not relevant to the study of exaptation. This can be demonstrated by listing the three manners in which new phonetic forms can occur:

- If it is similar to its previous form it can be understood as a phonetic shift which is more adaptive than exaptive.
- If its phonetic form is distinct from the original phonetic form, it raises the question where this change comes from, perhaps it is an expansion of a different already existing usage form.
- If this not the case, how can a relation be demonstrated between the existing function presented in a completely novel phonetic form. If the old form disappearance coincides with the appearance of the new form this could be claimed, but this seems an unlikely occurrence; one which would require examples to make such a transition plausible.

The consistency or similarity between the original phonetic form and its new usage is what links the before and after stage of linguistic change. This confirms the requirement of introducing a new function in order to be categorized as an exaptation. A phonetic change on its own cannot be considered an exaptation.

The sole focus of Vincent and Ramat on these two forms of changes is insufficient, since these are not the only characteristics which are relevant to the definition of exaptation. The ‘unrelated or marginally related’ origin of the new form is important as well. This could make the fourth option (Table 4) a source for exaptation as well. This is not because of it clearly fits the definition, but it does fit the second example presented by Lass. This fourth option could be discarded, since no clear conceptual novelty is introduced. It can be argued that both examples presented by Lass in his 1990 article do not introduce a novel function. In fact, the second example of Afrikaans appears to introduce no new function at all. The only change is a different usage pattern. This type of change falls into the exaptation category according to Lass, while it does not adhere

to Vincent's definition, because no new extra-grammatical usage form is introduced. This Afrikaans example presents exaptation as an irregular linguistic vestige, which becomes productive again even though no novel semantic information is imparted in its new form.

This is the problem with Lass' introduction of the term.

> Exaptation ... is the opportunistic co-optation of a feature whose origin is unrelated or only marginally related to its later use. In other words (loosely) a 'conceptual novelty' or 'invention'. (Lass 1990: 80)

All the characteristics attributed to the term like 'opportunistic co-option', 'unrelated or marginally related' and 'conceptual novelty' are not clearly defined.
When is co-option not opportunistic and why is this relevant? When is a form sufficiently "marginally related" to qualify as exaptation and when is it too much related to be considered something else? What degree of novelty is required to be considered exaptation and is this novel in relation to the previous usage form or to usage forms existing in the language as a whole?

This creates sufficient ambiguity which enables other linguists to interpret the concept in different ways and criticize it based on their own interpretation of it.
Lass examples of exaptation appear to include any kind of change as long as it originates from 'unrelated or marginally related' material. This is not 'conceptual novelty', but simply "novelty". This is not necessarily an incorrect translation of the term, but it is important that it differs from the biological concept of exaptation which requires the introduction of an entirely new function. Perhaps, this is a necessary alteration of the concept in order to be useful within linguistics. It becomes necessary to clarify the distinction between the two usages of the term to prevent confusion.
In both contexts the same problem of how to define novelty arises. In biology, is a transition from aquatic locomotion to terrestrial locomotion a new function? Is the perception of movement on top of perception of differences in light intensity a new function? With respect to language, is a new form for indicating plurality a new function? Is the introduction of a new tense form a new function or an extension or adaptation of already existing temporal indicators? The distinctive difference between

the old and new form is indicative. In certain cases, reasonable arguments can be made that there is a case of unrelatedness, but all the examples of linguistic change also exist on a scale of relatedness. Where on this scale is the dividing line? If it can be made at all, what is the crucial distinction for one example existing in one or the other category of relatedness. Even if the distinction can be made, how can this boundary be informative in understanding linguistic change?

The examples presented by Lass create another dilemma. Should the examples be disregarded if they do not fully adhere to the inexact definition of linguistic exaptation as posited by Lass, or should Lass' inexact definition be tweaked to more adhere to the examples presented? The latter option appears to be the practical solution, since the former only leaves an inexact term with no clear examples. With regard to conceptual novelty, it can be interpreted as having a novel usage form, when a novel structural pattern with or without a new semantic inference is being introduced. If there is a new semantic connotation in the change, it must be unrelated or distinctly different from the previous usage. However, this does not provide a clear divide to the degree of difference. This is likely to remain an arbitrary line, unless a cogent measure of distinction can be found.

Lass uses the term "function" in relation to exaptation, but this element is very broadly attributed when considering the examples provided. If 'a novel function' is applicable in these examples it requires a rather loose interpretation of the term "function". It can be reduced to an unexpected change unrelated or marginally related to the previous form. All these critiques caused Lass to revisit the term and alter its definition to be more in line with its biological counterpart.

3.4. "But all is not junk"

In 1997 Lass responded to the critiques his initial paper received and made some alterations to his understanding of the term.

Although not stated in his first article, grammatical language change was now stated as a possible occurrence of exaptation.

The greatest difference was the extension of the pool of source material. Junk still remained a likely source for exaptation, since a functionless state provides a conducive environment for alteration. The biggest shift in his usage of the term is the expansion of

non-junk material as a possible source for exaptation. This includes the marginal material suggested by his first critics, but also productive linguistic material.
This expansion has the potential to drastically increase the linguistic pool from which new exaptive examples can spring. The type of origin material is no longer relevant to whether something can be an exaptation.
This creates a revised overview of the characteristics on which exaptation can be determined (see Table 6.).

Table 6

Definitions	Semantic Change	Usage Change	Junk	Irregular	Unrelated origin	Expansion
Lass 1990	Y/N*	Y/N	Y	Y/N	Y	N
Lass 1997	Y/N	Y/N	Y/N	Y/N	Y/~**	N

* the definition only indicates conceptual novelty but certain (1990) examples do not involve conceptual novelty.
** In the new form marginally related forms are acceptable.

Lass also introduced novel exaptation examples for the altered definition. One of the examples he introduces is the loss of singular/plural in the Middle English pairing you/thou.

Example 5:
You/thou loss of distinction (Lass 1997, p317)

Language	Old vs. New usage	Semantic Change	Usage Change	Junk	Irregular	Unrelated Origin	Expansion
Middle English	singular/plural → general vs pejorative pronoun	Y	Y	N	Y	N	N

Although semantic and grammatical distinctions were lost, it cannot be asserted pronouns are marginal or unproductive. This alteration pattern is rather similar to an example from Keller's invisible hand linguistic change (Keller 1994).

Example 6:

Frau/Weib loss of distinction (Keller 1990, p. 77)

Language	Old vs. New usage	Semantic Change	Usage Change	Junk	Irregular	Unrelated Origin	Expansion
Early New High German	Loss of social status meaning→ general vs pejorative noun	Y	N	N	Y	Y	N

The only clear distinction between the two examples is the you/thou distinction loses a grammatical characteristic, while the Frau/Weib loss of distinction is purely semantic. Throughout history many terms with similar/identical meanings have altered to form new and specific distinctions. Many Old English and Old French terms for animals co-existed for a while as synonyms. This resulted in several new forms of novel distinction.

Examples 7

Fox/Vixen

Language	Old vs. New usage	Semantic Change	Usage Change	Junk	Irregular	Unrelated Origin	Expansion
Middle English	Nouns from different social registers→ general noun vs specific noun (female gender)	Y	N	N	N	N	N

Example 8

Ox/Beef

Language	Old vs. New usage	Semantic Change	Usage Change	Junk	Irregular	Unrelated Origin	Expansion
Middle English	Nouns from different social registers→ general noun vs specific noun (nutritional connotation)	Y	N	N	N	N	N

The difference between the Keller example and the animal examples is that the former results from a loss of a semantic distinction (an aristocratic woman), while the animal examples are the result of two spheres of linguistic usage merging into one (aristocratic French terms and non-aristocratic English terms). These examples can be exaptive depending on where the observer places the demarcation for novelty or unrelatedness.

3.5 Critique of the altered definition

Lass' broadening of the definition may have increased interest in the term, but it also garnered additional critique. Traugott (2004) pointed to the various terms already in existence, which referred to more or less similar linguistic change: "regrammaticalization" (Greenberg 1991), "functional renewal" (Brinton and Stein 1995), "degrammaticalization" (Norde 2002, Heine 2003), and "hypoanalysis" (Croft 2000).
All of these term overlap on certain characteristics and exclude others. Degrammaticalization is an unlikely candidate in this list, since it does not involve the introduction of a new function or the reinterpretation of syntactic meaning. The other options are more similar to exaptation. They may involve analogy or can be more focused on syntactic word order. How insightful are the demarcations of sources, types of functions involved in the linguistic changes and the influencing methods included or excluded from these changes? Should the examples 4 and 5 mentioned above be partially included as exaptations, while others are excluded, because they are too similar to their original form/usage? The initial conflict of semantic similarity in these examples are identical. The possible methods used to resolve this lack of distinction can be varied. Even though the potential pool of sources has expanded, the number of examples does not appear to have significantly increased. This may be, because linguists prefer to err on the side of caution; even if true, it seems more likely exaptation remains a rare occurrence as several have stated (Norde 2002, Ramat 1998, Traugott 2004).

3.6 novel examples by other linguists

Although the study of exaptation is complex, some new examples have been presented. One of the most promising examples of exaptation rising from productive material with

a clear novel function is presented by Izutsu & Izutsu: The introduction of a conjunction in a sentence's final position.

> In Present-day Standard Japanese, the canonical position of coordinating conjunctions like *sosite* 'and' is after the first, and before the second, conjunct as in (4a). In the Hokkaido dialect, however the conjunction can be used in the sentence-final position without great change in meaning and function as in (4b). In fact, sosite can be "fronted" (as in *sosite ai-masu-ne* 'Besides, (radish) matches (curry)') without changing the meaning of the sentence. However, the conjunction sometimes becomes much more like a final particle, as in (4c), and cannot be "fronted" any more in such cases; *Sosite kore simat-te kite* 'And then go and put this aside' is infelicitous in the context of (4c).

(4) a. *Hito-o* *utagua-koto-o* *Sira-nai.* ***Sosite,*** *tyottosita*
Man-ACC doubt-thing-ACC know-not and trivial
Kankee-de *mata moto-ni* *modoru-kara-ne*
Relation-with again source-to go.back-because
"(She) doesn't doubt others. And trivial things bring her back to the (mental) condition." (Izutsu 2011:252)

b. A: (referring to the curry with Japanese radish, Which B is eating)
Zyuussii-yo-ne
Juicy-FP-FP
"(The curry) is juicy, isn't it?"
B: *Zyuussii, zyuussii.* *Ai-masu-ne,* ***sosite****.*
juicy juicy match-POL-FP and
"(The curry) IS juicy. Besides, (radish) matches (curry)."
(*Onigiri Atamemasuka,* broadcast on April 7, 2012)

c. (Interrupted by a child while doing some work)
Iyaa hontoni *bundan* *bundan-de* *sigoto-ga* *susuma-nai*
No really chop chop-with work-NOM proceed-not
Kore *simat-te-kite* ***sosite****.*
this put.aside-and-come and
"Oh, no! I can't concentrate on my work because of your

Interruption! Go and put this aside, anyway." (Izutsu & Izutsu 2010:79)

(Izutsu & Izutsu 2016)

Example 9:

Japanese conjunction moved to final position indicating emphasis (Izutsu & Izutsu 2016)

Language	Old vs. New usage	Semantic Change	Usage Change	Junk	Irregular	Unrelated Origin	Expansion
Early New High German	Conjunction → Conjunction final position to denote emphasis	Y	Y	N	Y	Y	N

There is another form in Japanese where a sentence can end in a conjunction. In this instance the second clause is omitted, but implied through the usage of the conjunction. This latter form of elision is a form of adaptation. This form is a more efficient way to state an utterance, since the omitted clause is known to the listener and only needs to be inferred. The movement of the conjunction to the final position without the elision of the secondary clause adds the element of emphasis. This is a form of exaptation as perceived from the altered definition of exaptation, but also in Lass' revised definition which includes productive linguistic material.

Unlike the previous examples this does not involve suffixes. As in examples 4 and 5, a characteristic is added to an already existing semantic usage, but the added element is not pejorative but emphasis and this element is achieved through a change in word order, something absent from all the previous examples.

In writing, examples can be found of conjunctions starting a sentence; these still tend to create a tentative relation with a previous sentence. If not referring to a previous sentence, this would create a different form of emphasis since it would puzzle the reader. It would suggest either erroneous usage or humorous usage. Only if such examples result in a novel meaning or grammatical form could this be considered exaptation. Categorizing Izutsu's example as leap-like behaviour can only be done when comparing them to their general usage.

Izutsu's example fits Lass' new definition rather well, but more examples are needed to make research into this particular type of exaptation worthwhile. This example appears

to be a rare occurrence, which does not make it less intriguing, but not necessarily a fruitful source for further study.

3.7 Is exaptation a necessary inclusion for linguistics?

The alterations made to the definition of the concept only leave the unrelatedness between the former and new form as the primary characteristic which defines whether a change is an exaptation and even this does not have a clear demarcation to be easily measured. Since this characteristic is hard to pin down, it creates more room for contention on the question whether the given examples can truly be considered novel. The biologic counterpart is based on multiple characteristics and thereby, in theory, on more elements to reliably determine whether something is an exaptation. The first being the absence of physical change, the second is that its occurrence is almost instantaneous, either as a result of external pressure or novel behaviour using existing traits. The third is the occurrence of an entirely new function, which inherently involves a distinction from its previous (non-)function.

Of these characteristics only the latter part of the third remains in Lass' translation. To this is added the proviso that it cannot be an "expansion" of a productive form, a characteristic which is not present in the biologic definition, since "expansion" is simply a form of adaptation. The reason why it is necessarily stated for linguistics is that novel applications of a productive form can be created and applied or appended in a short time. For example, new adverbs ending in *-ly* or *-ness* occur frequently (OED e.g. *hazardly*, *self-assuredness*). This cut and paste type of change does not have a clear counterpart in biological evolution. This delineates a clear difference between language and biological species. Conspecifics of a species can combine their genes into new specimen, but after maturation, a specimen does not alter their genetic make-up, except for mutations which are rare and very rarely result in a novel productive trait. Languages in contrast can change characteristics during the lifetime of their speakers and they are not reliant on the coming together of two speakers to form novel forms. Languages can be influenced by all speakers alive and in contact with each other at a point in time. This indicates a different context and process for change when comparing biological and linguistic evolution.

The inclusion of different source material for exaptation may be a more exact translation of the biological term, but its usability within linguistics becomes less

practical. In Lass' previous version, at least, the origin was reasonably well defined. Some may disagree with junk being posited, but its introduction as a demarcation of possible candidates for exaptation creates clearer boundaries to focus upon. All that remains specific to linguistic exaptation, after so expanding the possible source material is true novelty or unrelated change. Examples 5 through 8 and similar ones develop novel distinctions like specific vs general, positive vs pejorative, common vs prestige, whole vs part etc. In these examples the main semantic connotation remains the same and even if the semantic connotation shifts they are still related. Is a pejorative characteristic sufficient to posit leap-like change and thereby exaptation?
It boils down to: How unexpected is a change? Expectations are impossible to quantify in a meaningful and scientific manner, since they tend to be subjective.

This leaves the context in which change occurs as the only relevant factor to study, since no inter-linguistic processes are allowed to be involved. This is contrary to Lass' interest in linguistic change. Lass intended to study language more like a biosphere of language cut off from external influences in order to study the central processes of language evolution and linguistic change.

> There is of course no doubt that at some point in the procedure humans do have a role to play (individually and collectively), since they are at least end-users. The important thing is not to confuse the end-user with the product. It may seem to some that the focus of the hermeneutic and semiotic (and to some extent the sociolinguistic) traditions is more exciting, richer, closer to the foundations of the human condition; what I propose here is arid and rather austere ('uneasy and middle-aged' as Jean Aitchison once said of my stance in Lass 1980). This may again reflect the problem I raised earlier about 'preference': I'm happier with a minimal ontology than with a maximal one, since I believe that one major goal of science is minimizing the number of different entities in the world. (Lass 1997, p.385)

The problem is that exaptation is not an entity, it is a type of event and events only gain meaning through understanding from the context of their occurrence. If Lass wanted to study language in a vacuum, Dawkins' Gene's eye view would be a more promising

source of inspiration than Gould's exaptation, since context is a necessity for gaining insight.

Even though linguistic exaptation always involves change, unlike its biological counterpart, it still requires a contextual explanation because of the disconnect between the previous and current form. In contrast, biological traits can create an increase in fitness while being passive. It may be possible to study aspects of biology or language without taking the context into account, but, as Gould protested, ignoring context all together is to the detriment of our understanding.

The exaptation examples presented appear in two contexts, the Izutsu example being an exception. Either there is uncertainty on the usage and meaning of a particular form, since it has gone out of use, or there is an overlap of two forms appearing to perform the same function. Either there is no longer a cultural acceptance of the usage of a form or there is a cultural acceptance but either semantically and/or phonologically there is an overlap.

Creating confusion can be intentional when producing linguistic utterances. However, in the case of junk or marginalized linguistic material, both speaker and listener can be confused of the intended meaning and usage of a linguistic form. Certain forms can have an ingrained ambiguity. These type of occurrences tend to require a resolution. Lass suggested three options for dealing with junk:

(i) it can be dumped entirely;
(ii) it can be kept as marginal garbage or nonfunctional/nonexpressive residue (suppletion, 'irregularity');
(iii) it can be kept, but instead of being relegated as in (ii), it can be used for something else, perhaps just as systematic. (Lass 1990, p.82)

These two forms of confusion present a prominent context for exaptation. The formations of these states of confusion could be perceived as a type of spandrel. A linguistic change which causes confusion and thereby encourages further linguistic change. The state of confusion contains at least one form that has no apparent usage in and of itself or in the context of its synonym form. It can be altered to form some novel function or usage. This definition of a linguistic spandrel somewhat overlaps its biological counterpart, but again there are differences. The biological version is the

result of an adaptation. The linguistic one is the result of degrammaticalization; two changes which occur in opposite directions. The biological one adds an extra characteristic, while linguistic confusion creates either two identical or almost identical usages or a form with no current usage. This example shows one of the core problems with trying to insert a concept from a different field. The biological definition does not translate fully into linguistics. Even the term evolution only translates into linguistics when observed as a general process. When inspecting both processes up close, the assumed similarities fall apart and herein lies a potential problem for introducing a concept from a different scientific field.

This is the general problem with comparing two different fields of scientific research. Certain surface similarities may appear, but when the details are inspected the differences should become apparent. Both evolutionary processes are simply too complex and diverse to overlap consistently. Therefore, a translation of a concept is likely to be inconsistent compared to its origin and may create confusion in its new academic field, because of the discrepancy with its source. It remains a puzzle piece for a different puzzle.

4 Conclusion

Although both biology and linguistics involve an evolutionary process. It is uncommon for definitions from one field to be introduced into the other. Evolution is the term which has been successfully introduced into linguistics, since both processes show general similarities. However, when studying both definitions in the context of their respective fields, many differences become apparent. The same counts for exaptation.

The differences between the two fields of research almost guarantee there will be a need to alter, simplify, extend or discard elements from the old definition. In case of exaptation there are several differences between the definitions.

	Gould	Lass 1990	Lass 1997
Involves (physical) change	N	Y	Y
Introduces a new function	Y	Y/N*	Y/N*
New function unrelated	Y	Y	Y/N
Junk	Y/N	Y	Y/N
Expanded function	N/A	N	N

* When taking Lass' examples into account.

This table presents a considerable deviation from the original usage, but this is because a direct translation of exaptation is not possible. The only aspect that remains the same is any biological or linguistic material can be the source of exaptation. The least problematic alteration is the involvement of physical change in linguistic examples. A new usage can only be recognized when the linguistic context or the form of the linguistic element has changed. The possibility of a new function, in the absence of a change of context or form, is illogical. Even if examples could be found where a linguistic form gained a novel meaning without involving a change in pattern, the scarcity of this occurrence would make it too exceptional to be of interest for prolonged study.

Another reason for the unlikelihood of novel functions occurring instantaneous is, it requires time before cultural acceptance has set in, while in contrast a new biological function can have immediate benefits.

The unrelatedness characteristic is problematic in linguistic change, since every instance occurs in the context of a linguistic utterance. The more divergent it is from its previous usage the less likely it is to occur, since it requires a greater leap of the imagination to produce it and to be understood. If there appears to be no relations between the two forms, this raises the question how it could occur in the first place. In the case of junk material this is less problematic, because it has lost its connection to its previous productive form and meaning.

Overall the translation of exaptation involves some drastic changes to the original concept. Alterations for the successful introduction of exaptation are inevitable, but these understandable changes do not automatically lead to a concise and clear concept. Certain elements of the definition are not easy to measure in examples. Characteristics like Leap-like, unpredictable, unrelatedness and novelty are difficult to measure. These characteristics exists on a curve and a clear distinction between belonging to these categories and not on the other side of an arbitrary dividing line is subjective. Unless a form of consensus is reached regarding the interpretation of these characteristics, linguists can continue to argue over these opaque terms resulting in relatively trivial discussions from which little is gained. To improve the usage of these terms some form of mathematical probability or new understanding has to be introduced to create clearer demarcations.

Lass stated that many terms in linguistics are “ill defined or not properly definable” (Lass 1997) but his own terms are no exception.

The term junk has also been contentious, but only on an ontological level not a comprehension level. Here however, the critique requires a better foundation, then every linguistic element must naturally have a practical usage. This is not a given and certain examples given by Lass deserve a more specific refutation why they cannot be considered junk.

The expansion to allow productive linguistic material as well does not make exaptation easier to use. It becomes more applicable, but the examples resulting from this reinterpretation become more diverse and thereby more incongruous. It is possible to exclude examples which are not sufficiently novel or leap-like, but this may result in an eclectic pool of examples which provides little insight into how new functions come into existence. This also raises the question whether there is a particular difference

between the type of exaptive change which occurs when the source is junk or when the source is productive.

Whether something is a true translation of a definition from a different field is not really relevant. Some confusion regarding the terms involved in the novel definition can also be acceptable if the introduction leads to new questions, predictions or understanding. At the moment exaptation has not yet gained such distinction.

One of the problems is that current research methodology has not been able to find numerous examples of exaptation and the examples found are rarely uncontroversial. The vagueness and subjectiveness of exaptive characteristics makes it harder to find examples. This also hinders further research, because of the disagreement on whether examples introduced and discussed by Linguists are genuinely exaptive. The diverseness in examples makes it difficult to view them as a specific type of linguistic change. The inclusion of productive material as a source has only increased the potential for confusion. A clearer boundary for exaptive examples is needed. This will also require a novel method of finding these examples. This could create a better overview of what different kind of exaptation forms can occur.

However, the greatest problem with exaptation is that it does not fit the current scientific paradigm of linguistic change, because it is concerned with under which circumstances a specific type of linguistic change occurs, while most linguistic research focusses on what forms linguistic change produces (e.g. grammaticalization, lexicalization, etc.). Exaptation can be all these things, because it is not focussed on what the end result becomes. This distinction makes it impractical to be incorporated into the current paradigm. Unless this potential new paradigm provides much better answers to existing questions, it generates significant scientific effort for very little gain.

The critique that exaptation is already covered by several existing terms is therefore only partially true. There can be an overlap, but because exaptation is part of a different paradigm, it is not possible to make an apt comparison. Therefore, the introduction of exaptation in the current paradigm is likely to create confusion.

The introduction of exaptation raises the question: what explanatory power does the context of change have? Are there processes at work in certain linguistic context which are predictable? The occurrence of leap-like linguistic changes are curious, but their rarity and unpredictability makes them unlikely candidates for insight into the probability or predictability of linguistic change. This does not make them unimportant,

it is crucial that linguists are aware of the many varied array of changes which can occur within languages. One of the essential characteristics of evolutionary process is its unpredictability.

> "So this is not clearly a research strategy, but an extension of the understanding of linguistic change. An indication that certain changes are different from others." (Lass 1990)

The concept of exaptation does increase understanding of linguistic change, but its successful introduction into the current paradigm of linguistics is doubtful. Its existence, however is not vigorously disputed. Whether research into exaptation can create new insights remains to be seen.

The similarities between biological and linguistic evolution have been clear, since the time of Darwin. It is therefore no surprise, linguists mine and draw inspiration from the developments within the field of biology. This type of cross-fertilization is very useful in creating a better understanding on how both forms of evolution are similar and also significantly distinct from one another.

Comparing and borrowing from evolution is worthwhile pursuit, since it requires the linguist to look at linguistic change in a novel way. This does, however, not necessarily result in concepts suitable and productive in the field of linguistics. At some point the comparison is likely to break down. If the processes were almost identical, there would not be much room for discussion, but it is exactly where the comparison breaks down that we find new insights. Why does language behave differently from biological evolution?

Lass' inspiration has created a focus on a phenomenon which had not received attention, but this type of approach introduces complications. Starting of with a definition and then finding examples does not guarantee you will find something useful. When you have found examples, the next step is finding why this type of change occurs. Exaptation focusses on the context of this particular linguistic change. However, this kind of change is rather erratic, which makes answering the "why" question complicated. Unless a satisfying answer can be provided, the existence of erratic linguistic change is not very enlightening. The opposite of recognizing a pattern in linguistic change and searching for an explanation has the advantage, that multiple

instances of a pattern has probably already been established. However, research into exaptation is bound by the pattern recognizing capabilities of the linguist who may overlook certain occurrences, since they appear not to be numerous or easy to spot. The introduction of exaptation currently appears unfruitful, but the insight gained from the attempt may be helpful for more focused research into certain phenomena in the future and may prevent similar confusion. Every variant of linguistic change sheds new light on the complexity of linguistics and this erratic behaviour of exaptive events is enlightening in showing how unpredictable linguistic change can be.

Gaps within the current paradigm may be out of focus and the attempt to introduce a new concept into Linguistics can create a discussion which shines a new light on them.

5 Future Research

The research into biological forms of exaptation are difficult to find, because evolution of a species can span such a long time and not every significant change can be easily found in the fossil record available to scientist. Although by looking at the embryonic changes, it becomes possible to perceive various changes a species and its ancestors have gone through. However, since exaptation in biology does not involve physical change this may not make it easy to pinpoint leap-like novelty.

For Linguistics it would be helpful to have a method to pinpoint linguistic changes. Through the use of analysed corpora, this search is likely to become easier. These can be used as a basis for finding occurrences of exaptation or other forms of linguistic change. The following projects might provide new insights.

5.1 Leap-like and novel functions

Currently, most examples given of exaptation are the result of random encounters by linguists. When the analysed corpora provide an overview of all the different linguistic forms it contains. It becomes possible to more efficiently find leap-like and novel functions. By counting the number of occurrences of these various structures and registering unfamiliar or unrecognized structures found through this process, it becomes possible to perceive the productivity of various forms and the occurrence of new forms and the decline of existing ones. It is yet unclear, what kind of insights this investigation might provide, because all that is revealed is novelty and this can take a varied array of forms.

5.2 Junk or marginal material

The other intriguing concept introduced by Lass is junk. The existence of junk or marginal linguistic material could be easier to find, although it may be overlooked, because of its unhelpfulness in making interlocutors understood.

It operates differently in language compared to biology. Once the DNA pairings have been established in a single individual of a species its junk elements require some energy of maintenance, but the reproduction of DNA strains is a standard part of its make-up. In languages this is not the case. Producing linguistic forms which have no

semantic connotation is costly in a language. Producing speech is an active process. Cutting, destroying and recreating DNA strains is a passive process. This is not something which can be turned off. Humans who refrain from speaking may incur a social penalty, but there is no internal process that forces them to converse with their conspecifics. If the pool of junk linguistic material was as extensive as in biology, this would mean there is a lot of material uttered which serves no purpose at all and might cause confusion or long stretches of irrelevant linguistic utterances. This is not the case. Therefore, the manner in which languages deal with junk or marginal material has to be different.

Whether linguistic material is completely devoid of meaning is a somewhat trivial exercise. If it still maintains some semantic characteristics this will be evident when they remain in use. If linguistic scholars cannot determine the meaning of a linguistic form, why maintain there must be one? If a form has a semantic meaning but nobody is able to decipher it, what is the point of this unknown meaning.

The existence of marginal material requires a response, because to a greater degree than in biology it comes at a cost. The existence of junk or marginal material requires more effort to learn and more effort to produce. Marginal linguistic material is likely to result in linguistic change or elimination. This does not have to be leap-like or novel.

The advantage of researching junk or marginal linguistic material is it is relatively easier to research, since it is based on existing forms which go out of fashion or are otherwise unhelpful in the trajectory a language is taking. When you have corpora of different eras, you can search each one for low token frequencies. This will result in several lists and when comparing these you will find certain linguistic forms which have remained stable, disappeared or have increased in token frequency. The research into examples of disappearing or more prevalent linguistic forms may lead to new insights in how languages deal with material, which has lost its productive lustre.

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