THE EMERGENCE OF INOSTENSIBLE REFERENCE

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THE EMERGENCE OF INOSTENSIBLE REFENCE

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Thesis Abstract

Gökhan Doğru, "The Emergence of Inostensible Reference"

This thesis is a struggle to combine the developments in modern linguistics and philosophy of language by focusing on the emergence of inostensible reference. Inostensible reference is a linguistic tool that allows speakers/thinkers to refer to the unknown. My thesis claims that two stages in the biological evolution of language were necessary for inostensible reference to flourish: i) lexicalization: the operation transforming concepts into lexical items. ii) Merge: the operation combining lexical items according to grammatical principles. Though these two operations are foundational for inostensible reference, I claim that they are not sufficient because these same operations are also the basis of ordinary ostensible reference (and of the birth of full language faculty itself).

I think that a third factor must have contributed to the rise of the inostensible reference. This third factor is glossogenetic in nature, namely it is due to a cultural change, not biological. And lastly, I suggest that a new connection between the core language faculty and conceptual-intentional system (allowing inference) may have allowed human being to use ostensible terms to form inostensible terms from them. By making us of the findings in different disciplines studying language such as philosophy of language, linguistics, cognitive science, evolutionary biology and cognitive psychology, the thesis aims at encouraging interdisciplinary collaboration.

Tez Özeti

Gökhan Doğru, "Gösterimsiz Gönderimin Ortaya Çıkışı"

Bu tez gösterimsiz gönderimin ortaya çıkışına odaklanarak modern dilbilim ve dil felsefesindeki gelişmeleri birleştirme çabası içerisindedir.

Gösterimsiz gönderim konuşan/düşünen kişinin bilinmeyene gönderim yapmasını sağlayan dilsel bir araçtır. Bu tez, gösterimsiz gönderimin ortaya çıkabilmesi için dilin biyolojik evriminin iki safhanın gerekli olduğunu öne sürmektedir: i) sözcükleştirme: kavramları sözcüksel öğelere dönüştüren operasyon. ii). Birleştirme: sözcüksel öğeleri dilbilgisel prensipere göre birleştiren operasyon. Bu operasyonlar gösterimsiz gönderimin temelinde olsalar da bunların gösterim gönderim yapabilmek için yeterli olmadığını savunuyorum çünkü bu operasyonlar olağan gösterimli gönderimin de (dil yetisinin doğuşunun da) temelini oluştururlar. Gösterimsiz gönderimin ortaya çıkışına üçüncü bir etmenin de katkı koyduğunu düşünüyorum. Bu üçüncü faktör glosogenetiktir, yani biyolojik değil, kültürel bir değişimin sonucudur. Son olarak, temel dil yetisi ile kavramsal-yönelimsel sistem arasındaki yeni bir bağlantının (çıkarım yapmaya izin veren), insanlara gösterimli terimleri kullanarak gösterimsiz terimler oluşturabilme imkanı verdiğini öneriyorum.

Dil felsefesi, dilbilim, bilişsel bilim, evrimsel biyoloji ve bilişsel psikoloji gibi farklı disiplinlerin bulgularından yararlanan bu tez, dil üzerine çalışan alanlar arasında disiplinlerarası işbirliğini teşvik etmeyi amaçlamaktadır.

ACKNOWLEDGEMENTS

To Esra Çinar, the light
and beauty of my life…

CONTENTS

CHAPTER ONE

INTRODUCTION

> *"There may be nothing new under the sun,*
> *but permutations of the old*
> *within complex systems can do wonders."[1]*
> *-S. J. Gould*

"The closest planet to the earth with water has mass." This sentence consists of

meaningful words known by any normal human beings. However, it talks about "the

closest planet to the earth with water" which is, for now, unknown to all human beings.

Furthermore, the sentence ascribes a property "has mass" to this unknown planet, which

is most probably true. Language, rather magically, allows us to refer to objects, events,

states of affairs etc. that are unknown to us. How come we, human beings, can think and

talk about things that we do not know at the time of thinking/talking, using our linguistic

abilities? This aspect of language is termed *inostensible reference[2]* by Ilhan Inan. Simply

it means reference to the unknown by using inostensible terms. In classical philosophy

of language, linguistic terms are distinguished into two: singular terms and general

terms. Singular terms include proper names such as "Esra", singular definite descriptions

such as "the biggest table in the room" and demonstratives such as "this dog". General

terms are words that refer to properties or kinds such as "bird", "round" or "blue". In

order to make his point clearer about inostensible reference, Inan further distinguishes

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[1] Quoted from: Boeckx, C. "Some reflections on Darwin's problem in the context of Cartesian Biolinguistics". In *The Biolinguistic enterprise: New perspectives on the evolution and nature of the human language faculty*, ed. A. M. di Sciullo and C. Boeckx, 42-64. Oxford: Oxford University Press. 2011. For Gould's original work, see: Gould, S. J. (1977). *Ontogeny and Phylogeny*. Cambridge, MA: Harvard University Press.

[2] Inan, I. 'Inostensible Reference and Conceptual Curiosity'. *Croatian Journal of Philosophy*, 10 (1): p. 21.

between two types of terms: ostensible terms and inostensible terms. Ostensible terms are single words or collection of words (phrases) that we use to think or talk about objects and events that we experience directly or get the knowledge of them through testimony of others. Terms such as "the shortest tree in the garden", "the father of my friend Osman", "the current president of Turkey", "the marriage date of Ümit and Virginia" and "Barack Obama" are all ostensible terms for me. I can use these terms to refer to particular objects, persons and states of affairs. The second type of terms, inostensible terms will constitute the core of this thesis. Inostensible terms are terms whose referents are not known by speaker/thinker[3] when they are expressed. "The governor of Bartin province in Turkey", "the richest man in the world", "the salary of my uncle" etc. are all inostensible terms for me. By means of these types of terms, speakers/thinkers can conceptualize the unknown referent in their minds, can realize their ignorance about it and thereby wonder the existence of the referent. The act of using such an inostensible term to refer to unknown referents is called inostensible reference. I think that the emergence of this aspect of language has created a revolution in the brain of *Homo sapiens* which seems related to the birth of curiosity, hence science and philosophy. For this reason, I think that the exploration of the emergence of inostensible reference is very important for our full understanding of human mind. In this thesis, I claim that two stages in the biological evolution of language were necessary for inostensible reference to flourish: i) lexicalization: the operation transforming

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[3] The issue of what is the core function of language is still a matter of big debate in language-related fields. While some scholars think that the core function of language is thinking (such as Chomsky, Berwick), the others (such as Hurford, Pinker) think that the core function of language is communication. My thesis will not choose side explicitly in this debate. My conclusion will only have some implications for this debate. Therefore, throughout the thesis, I will use "speaker/thinker", "think/talk" terms together.

concepts into lexical items. ii) Merge: the operation combining lexical items according to grammatical principles. Though these two operations are foundational for inostensible reference, I claim that they are not sufficient because these same operations are also the basis of ordinary ostensible reference (and of the birth of full language faculty itself). I think that a third factor must have contributed to the rise of the inostensible reference. The language faculty could have existed without inostensible reference. Not all functions and structures of language faculty were possible when language faculty emerged for the first time in early populations of *Homo sapiens*. In a recent paper[4], Inan claims that even if the structural evolution of language has been complete since a long period of time, our language continues to change. Based on this change, he makes a distinction between "object language" and "concept language". According to Inan, object language is the first phase of the language and in this language, humans use language to refer to objects mostly and concepts only occur in predicate position, not in subject position. This language lacks concepts such as truth, falsity, existence, non-existence, inostensible reference and questions. Then, there was a leap from object language to concept language. Concept language is not a completely different language. It contains the object language, the ability to use concepts in subject position and hence concepts such as truth, falsity, existence, non-existence, inostensible reference and questions. Hence, it can be said that after the emergence of concept language, object language and concept language have begun to co-exist in our species. From this claim, it can be inferred that our present language faculty has a hard-to-divide two aspects: object

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[4] Inan, I. "Dilin Evrimi: Nesne Dilinden Kavram Diline". *Bilim ve Gelecek Dergisi.* 2013.

language and concept language. In the chapter about the emergence of inostensible reference, this distinction will be explained in more details.

As it is obvious, Inan puts inostensible reference in the second set: concept language. Inan leaves open the question of how the passage from object language to concept language occurred but speculates that it may be due to a glossogenetic, namely cultural, change. I take the emergence of inostensible reference in line with this way of thinking. This change may have resulted from cultural accumulation of ostensible terms and a drive to combine these terms in novel ways and to wonder the existence of the referents of these newly constructed terms (through science and philosophy, in the simplest sense). Hence, I claim that the emergence of inostensible reference have resulted from two evolutionary (phylogenetic) changes and at least one, most probably, cultural change. However, future empirical studies may prove the distinctive biological basis of this change and show that this change is also biological in nature. For the sake of the thesis, it is sufficient to claim that i) inostensible reference was a later development in the history of the emergence of full language faculty and ii) together with lexicalization and Merge, one more change was needed since these two operations does not necessarily ensure the existence of inostensible reference. The emergence of an important component of faculty of language in broad sense, inferential thinking, may have also played a significant role in shaping inostensible reference since through inferences we can form inostensible terms by inferring them from ostensible terms. It is possible that when this ability of inference interfaced with the core language faculty in the history of language evolution, our language faculty became possible to form

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inostensible terms.[5] And as Hurford states animals (scrub jays, squirrel monkeys etc.) seem to have an ability for transitive inference[6] in varying degree of sophistication. From this, we can conclude that inference was already present before the emergence of language faculty in human beings and that its interface with language faculty must be a later stage.

Contingently, the language may have remained only with ostensible terms or even if inostensible terms exist, their presence may have been regarded insignificant or simply meaningless. Nonetheless, it seems that the use of inostensible terms both in thinking and talking proved to be advantageous for the early human beings in that seeking the unknown and trying to control it (the drive to make their environment known due to safety concerns and other reason) have become nearly ubiquitous in most linguistic societies. It seems that most languages have inostensible terms and inostensible reference. However, if the change that opened the way for inostensible reference is proved to be cultural, it may be demonstrated in the future that some linguistic societies lack inostensible terms and inostensible reference.

I will begin exploring my central theme firstly by looking at the relevant developments in the study of the evolution of language, which will provide a framework for my thesis. Without the current developments in linguistics and philosophy of language this thesis would not be possible.

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[5] I am grateful to Assoc. Prof. Mine Nakipoğlu for her comments about the necessity of inference for understanding inostensible reference. The evolution of inference and its close relation with inostensible reference deserve more attention in understanding the evolution of language.
[6] Hurford, 2007. p. 45.

CHAPTER TWO

CURRENT APPROACHES TO THE EVOLUTION OF LANGUAGE

<u>Introduction</u>

The study of human language has gained impetus since the linguistic turn in philosophy in the beginning of the 20th century and the cognitive revolution pioneered by Noam Chomsky in 1950s. Since those times, many studies have been made to understand the nature of language, how it is acquired, how it is put to use and how it emerged in human beings. These topics have yielded research areas for many disciplines ranging from linguistics, philosophy, neuroscience, psychology to cognitive science, evolutionary biology etc. Each discipline has had their own methods of dealing with language, which, seemingly, have yielded incommensurable and inconvergent results. Though each disciplines' findings are quite relevant to the understanding of the nature of language, the inability to collaborate between them has impeded further and more complete understanding of language. Towards the end of the 20th century, a new approach to language which is called biolinguistic approach has been adopted by leading scholars conducting study on language. Having its root in the Chomksyian Cognitive Revolution of 1950s, this approach calls scholars studying language in different disciplines to collaborate and look for a common ground and a common framework to understand language in different explanatory levels (genetic, computational, biological, philosophical etc.). The two editors of *Biolinguistic Enterprise* (2011) book, Boeckx and Di Sciullo define biolinguistics in the general preface of the book like this: "[It] is an important new interdisciplinary field that sets out to explore the basic proper ties of

human language and to investigate how it matures in the individual, how it is put to use in thought and communication, what brain circuits implement it, what combination of genes supports it, and how it emerged in our species."[7] My thesis will concentrate on the last issue, namely the evolution of language. On its own, this issue is a fairly broad issue and it has yielded a huge literature since 1990s, especially after the advent of the biolinguistic approach. I think philosophy of language has not contributed much to this interdisciplinary initiative. Hence, my aim will be to investigate inostensible reference as understood and characterized by philosophers of language and base it within a biolinguistic framework, if possible. Inan (2010) claims that inostensible reference is "a fundamental linguistic tool which allows us to become curious of what we do not know."[8] I believe that this tool is closely related to our language faculty. The emergence of this aspect of human language is very important for human beings since it allows them to conceptualize the unknown and, in most cases, wonder and try to obtain information about it. As Inan points out, without this central aspect of language, most probably we would lack important intellectual abilities such "discovering, inventing and creating"[9] novel things. Conceptualizing and referring to the unknown, whether it exists or not, has helped human beings wonder and discover the world around them; hence, its emergence is very central in the evolution of human beings. However, there is no study that isolates this ability and studies its emergence in human beings. Even its characterization has been newly made by Inan (2010). I think a focus on its nature and

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[7] Biolinguistics. *The Biolinguistic Enterprise: New perspectives on the evolution and nature of the human language faculty*, ed. A.-M. Di Sciullo and C. Boeckx. Oxford: Oxford University Press. 2011
[8] Inan, I. 'Inostensible Reference and Conceptual Curiosity'. *Croatian Journal of Philosophy*, 10 (1): p. 21.
[9] *Ibid, p.1*

evolution will be a new and important contribution for the study of language. My thesis

will benefit from new perspectives and insights of modern (bio) linguistics and try to

combine them with the inostensible reference idea in philosophy of language; namely, it

will be interdisciplinary in character. Before passing to the evolution of inostensible

reference, I think it will be useful to give more details about the evolution of language.

The Study of the Evolution of Language

The study of the evolution of language is not new. Even before the arrival of the

evolution theory of C. Darwin, philosophers as early as Rousseau[10] (1781), Herder[11]

(1772) and Humboldt[12] (1836) tried to explore the origins of human language. However,

the number of publications about the issue has become so huge that notoriously *Société*

de Linguistique de Paris declared that it would not accept articles any more about the

origins of language because the speculations were abound while the evidence was

scarce. Whether directly or indirectly related, after this notorious ban, new studies on the

evolution of language had to wait the second half of the 20th century. This period

beginning in 1950s witnessed the new characterization of language as a part of the

cognitive system in the human mind by Chomsky, that is to say, a perspective to

consider language as a part of the human biology started to flourish. But it was only after

1990s that the number of studies on the evolution of language has boomed, especially

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[10] Rousseau, J. J. and Scott, J. T. *Essay on the Origin of Languages and Writings Related to Music*.
Hanover: Dartmouth College Press, 2000. (first published posthumously in 1781).
[11] Herder, J. Treatise on the Origin of Language. In *Philosophical Writings*, ed., Michael N. Forster.
Cambridge University Press. 2002.
[12] Humboldt, Wilhelm. *On Language: On the Diversity of Human Language Construction and
its Influence on the Mental Development of the Human Species.* Ed. Michael Losonsky.
Trans. Peter Heath. Intro. Hans Aarsleff. Cambridge: CUP, 1988. Rpt. 1999.

after the article by Pinker and Bloom[13] (1990) which proposed an adaptationist Darwinian view about how language emerged in human beings. Following this article and criticisms of it, and other developments in relevant disciplines, the studies on evolution of language began to increase. And the developments in generativist linguistics towards a minimalist understanding of language and towards a biolinguistic approach seeking the biological foundations of language have increased the interest in the evolution of language. However, the fact that now there is a vast literature on the evolution of language does not necessarily mean that we are close to understanding the evolutionary foundation of language. A very recent article, *The Mystery of Language Evolution[14]*, written by eight influential scientists including linguist N. Chomsky, evolutionary biologist R. Lewontin and anthropologist I. Tattersall reviews the current developments in the area and concludes that the common idea that we now know a lot about how the language evolved is just an illusion since neither the empirical studies on nonhuman animals nor the archeological findings have provided enough solid evidence about the evolution of language. I will return to their criticism later. Yet, for now, the insight that there is still a long way to travel to understand language evolution is enough to bear in mind. We are still far from a comprehensive and well-grounded theory of language evolution and, I think, as well as methods of scientific inquiry, the philosophical approach that utilizes the results of scientific studies, combines and/or contrasts them and ask new questions. By this, I do not mean the unfounded just-so stories of language evolution. These kinds of stories are dismissed by nearly all scholars

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[13] Pinker, S. and Bloom, P., "Natural Language and Natural Selection", *Behav. Brain Science*, 13, 1990.
[14] Hauser Marc D, Yang Charles, Berwick Robert C., Tattersall Ian, Ryan Michael, Watumull Jeffrey, Chomsky Noam, Lewontin Richard. "The mystery of language evolution". *Frontiers in Psychology*. v.5. 2014

of language evolution who seek scientific, testable grounds for the study. I mean there is a space for philosophy to think on the evolution of language and ask fruitful questions about it, and produce arguments and useful concepts and insights based on the developments in (bio)linguistics, evolutionary biology and philosophy of language (and other relevant disciplines).

The Framework of the Study: Hauser, Chomsky, Fitch (2002)

Marc Hauser, Noam Chomsky and W.T. Fitch published a very influential article in 2002 called *The Faculty of Language: What Is It, Who Has It, and How Did It Evolve?*.[15] In this article, Hauser, Chomsky, Fitch (hereinafter referred as 'HCF') provided an extensive framework for the relevant disciplines studying the evolution of language because, at that time, there were many studies taking one component of language faculty, defining it as the language itself and claiming that its evolution is the evolution of language itself. According to HCF, this approach was misleading because as Fitch, then, assumed in his book, *Evolution of Language*, "language must be viewed as a composite system, made up of many partially separable components."[16] Isolating a component and claiming that it is 'language' do not yield fruitful results and in fact cause unfruitful debates among scholars who concentrate on different components. Hence, a study that draws a framework and characterizes all the relevant components of language and their relationship with each other was necessary for providing a tenable

[15] Hauser, M. D., Chomsky, N., & Fitch, W. T. "The faculty of language: What is it, who has it, and how did it evolve?" *Science*, 298, 1569-1579. 2002.
[16] Fitch, W.T., *The Evolution of Language*. Cambridge University Press, 2010. p. 4

research framework and interdisciplinary collaboration. One of the virtues of this approach is that it allows an efficient way to use comparative methods to compare the components of language faculty with relevant components in the brains of nonhuman animals.

"The father of the father of the father of Aristotle was a man" is a sentence, again containing an inostensible term, the referent of whom is unknown to the writer of this thesis. Although I do not know the referent of this term, I can use my language faculty to construct such an expression[17] and I can construct an infinite number of such expressions without much effort. Now comes the important question: what is language such that it allows us to produce infinite number of expressions? This question is very central since its answer determines the target of the evolutionary study of language. Therefore, HCF begins their study by defining the properties of language. For them, language is "hierarchical, generative, recursive, and virtually limitless with respect to its scope of expression."[18] The basic insight here is that language is a biological property of human beings, a basic tenet of Chomskyian linguistics and it is this system in the human brain that allows the production of hierarchical, recursive expressions. Chomsky calls this I-language. Here, "I" highlights the properties of language as being Internal, Individual and Intentional. Ott (2009) aptly characterizes how Chomsky's I-language system works: "Minimally, the I-language must comprise a generative procedure (syntax) that operates over a finite lexicon of atomic units or words (in the technical

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[17] Any user of language (Turkish, French, Persian, Arabic etc.) can construct and understand this expression, though most of my examples in this thesis will be in English. I will provide cases from other languages when necessary.
[18] Hauser *et al.,* 2002. p. 1569

sense) and maps the resulting complex objects onto representations that are accessed by performance systems. Since syntactic operations apply recursively to atomic units and combinations thereof, the I-language yields an infinite array of structural descriptions linking 'sound and meaning', that is, representations encoding phonetic, semantic and structural properties."[19] As may be understood from this characterization, language system in the brain interacts with performance systems. Some scholars confuse these interactions between these systems and think that they are one and the same thing: language. For example, when the *FOXP2* gene was discovered, some thought that it was "the language gene". However, it was then understood that this gene plays a role in the control of the tongue and lips. So the mutation in this gene does not affect the faculty of language itself but the externalization of the constructed expressions, namely their ability to utter the expressions in their minds through vocal means is affected. As Fitch (2010) puts it: "[D]espite their early problems with speech, affected members of the KE family do, eventually, attain relatively normal language skills and communicate successfully."[20] Hence, one should be more specific about their claims regarding the biological foundations of language. This was the aim of HCF. For this reason, they make a distinction between faculty of language in the broad sense (FLB) and faculty of language in the narrow sense (FLN). "FLB encompasses all of the mechanisms involved in language acquisition and use (many of which are shared with other animals, or

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[19] Ott, D. "The Evolution of I-Language: Lexicalization as the Key Evolutionary Novelty". *Biolinguistics.* 3.2–3: 255–269. 2009. p.255
[20] Fitch, 2010. p. 362.

with other human cognitive capacities such as music or vision)"[21] and includes the FLN and "at least two other organism-internal systems, which [they call] 'sensory-motor' and 'conceptual-intentional'"[22]. Sensory-motor system includes mechanisms for vocal production and vocal perception while conceptual-intentional system includes mechanisms for conceptual representations, theory of mind, intentional communication. When biologists, anthropologists etc. uses the term "language", generally they mean this faculty of language in broad sense and hence they characterize properties of language shared with other animals and finding these shared properties, they claim that language faculty has evolved gradually from preexisting communication systems in other animals. However, seemingly, some component(s) of language are not shared with other animals. That's why HCF put forward the FLN which includes properties that are unique to language and special to human beings. They argued that "a key component of FLN is a computational system (narrow syntax) that generates internal representations and maps them into sensory-motor interface by the phonological system, and into the conceptual-intentional interface by the (formal) semantic system".[23] That is to say, the capacity for recursion may be the key novelty creating the qualitative change leading to full language faculty.

To sum up, HCF argue that there are components of language that we share with other animals or that are put to use in other domains of cognition and there *may be* components of language which are unique to human beings and special to language. The rigorous application of the comparative method will probably show which parts of FLB

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[21] *Ibid,* p. 21.
[22] Hauser *et al.,* 2002, pp. 1570-1571
[23] Hauser *et al.*, 2002, p. 1571

are unique and which are shared. Logically, the research may prove that all components

of language faculty are shared with other animals and their qualitatively and/or

quantitatively "special" or "new" combination in human beings may have created

language faculty. This is a matter of empirical study, and better characterization of the

components of language will also help achieve this goal. HCF emphasize that this

distinction between two sets of components need not correspond to reality but it is vital

to promote interdisciplinary study and provide a common terminology and framework

for the study of the evolution of language. In my thesis, I assume the basic framework of

HCF since it provides a solid foundation for studying a component of language faculty.

It is in this framework and understanding of language faculty that I will deal with the

emergence of inostensible reference. This framework also allows me to compare the

capacity of inostensible reference with the relevant capacities of other animals and with

those of our common ancestors. Most probably, prelinguistic hominids could not

produce inostensible terms since the capacity to do it necessitates the arrival of particular

linguistic operations. Probably, they could think and communicate in primitive forms,

namely only by reference to functional matters in here and now, like do vervet

monkeys[24]. My thesis, in collaboration with this framework, will enable me to situate a

philosophy of language issue into a biolinguistic framework. The last stop before

entering the characterization of inostensible reference will be about what we know about

how, when and why language evolved.

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[24] Vervet monkey calls. When vervet monkeys are on the tree and hear the alarm call of their fellows, they
escape to the ground (probably, interpreting it as a threat of an eagle) and when they are on the ground and
hear the alarm call of their fellows, they climb up to the trees (probably, interpreting it as a threat of a
leopard). In both cases, they produce different alarm calls.

The Evolution of Language: What We Know

Answering satisfactorily the question of how and why language evolved may be one of the most difficult and ultimate questions of science. One of the main reasons is that language faculty does not fossilize. We do not have direct fossil records to date when language first emerged. We only have indirect archeological evidence to infer possible time ranges about the origins of this phenomenon. Discoveries of complex tools, traces of wall paintings, the beginning of burials have been regarded as indicators of the birth of symbolic behavior which dated back to 50.000-150.000 years ago. I agree with Boeckx that "it is hard to imagine the emergence of these artefacts and signs of modern human behavior in the absence of the language faculty."[25] Accordingly, many leading scholars Hurford[26] [27](2007, 2014), Hauser et al. (2014), Fitch (2010), Chomsky[28] (2007) argue that the full language capacity (language ready-brain) emerged in between 50.000-150.000 years ago. The fact that anatomically modern *Homo sapiens* emerged around 200.000 years indicates that the evolution of language came into being around the time of the split between *Homo sapiens* and *Homo neanderthelensis*[29]. And as Fitch states in a recent paper, "[o]ur [*Homo*] clade split from that of chimpanzees in late Miocene, 6-7

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[25] Boeckx, C. "Emergence of Language, From a Biolinguistic Point of View". In *The Oxford Handbook of Language Evolution*. Edited by Kathleen R. Gibson and Maggie Tallerman. 2011a. p. 495
[26] Hurford, J. *The Origins of Meaning*. Oxford University Press. 2007.
[27] Hurford, J. *The Origins of Language. A Slim Guide*. Oxford University Press. 2014
[28] Chomsky, N. "Biolinguistic Explorations: Design, Development, Evolution". *International Journal of Philosophical Studies*. Vol. 15(1), 1-21. 2007.
[29] There are still debates about whether Neanderthals had a kind of language faculty or not. Whether language faculty emerged before the split is still debated since the fossil evidence does not allow for solid inferences about language faculty.

million years ago (MYA)"[30]. From these two points, we can conclude that the emergence of language is a very new event in the evolutionary history of human beings. And since the artifacts representing the symbolic behaviors of human beings have emerged and exploded in a short period of time, some scholars like Tattersall and Chomsky argue that the emergence of language was abrupt in evolutionary terms, that is to say, human beings passed from a stage without language to a stage with a language-ready brain at a short time. This idea does not dismiss the possibility that earlier human forms could think and communicate in different forms. As argued in the faculty of language in broad sense (FLB) and faculty of language in narrow sense (FLN) distinction, some components of language predate it and evolution needs some foundations/already-existing traits to operate on. As Hurford highlights in his book *The Origins of Meaning* "[s]ome of the semantic properties that we see in modern human languages can be traced back to these pre-linguistic foundations."[31] And most probably, we share some of these foundations with other animals. However, no matter how close we are to other nonhuman animals, especially to chimpanzees and bonobos, our full language capacity creates a huge gap between us and other animals. Sometimes this gap is called "Hauser's Paradox". We have words and rules to combine them and we use them to construct infinite expressions and that ability is the basis of our human nature.

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[30] Fitch, W.T. "The evolution of language: a comparative perspective". In *Oxford Handbook of Psycholinguistics*, edited by G. Gaskell. Oxford University Press, Oxford. 2009. p. 790.
[31] Hurford, 2007. p. 8.

Conclusion

The faculty of language is a newly emerged trait of *Homo sapiens* between 50.000-
150.000 years ago within the 6-7 million years of the evolution of human since the last
common ancestor with the chimpanzees. Language faculty consists of components
shared with other animals and most probably properties unique to human beings and
special to language. And recently scholars from different disciplines dealing with
language call for collaboration to understand these components. The challenge is to
characterize these components as explicitly as possible and to try to place them in their
accurate evolutionary development. The question why these components evolved and
led to the emergence of language may still be unknown. Adaptationist views that argue
that language evolved gradually through natural selection seems to be inadequate since
they assume that the main function of language is communication and human beings that
communicated better were selected and adapted more properly that those who could not.
As stated below, externalization of language (by means of sensory-motor systems) may
have come after the emergence of language and communication may not be the primary
property of human language. I think before assuming a function of language as primary
in the study of language, we shall explain and understand all components of language
better. Thus, as Hauser et al. (2014) states, "the most productive way forward […] is to
define important details of the language phenotype, recognize generally accepted
methods and evidence in evolutionary biology, and work within this framework to assess
what we may learn about the evolution of language."[32] That will be my strategy
throughout my study. In the next chapter, I will define an important detail of language

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[32] Hauser *et al.,* 2014. p. 3

phenotype: the capacity for inostensible reference (it should be noted here that I will draw a line between the biological and cultural aspect of inostensible reference in Chapter 6), then I will argue that the operations, lexicalization and Merge, underlie this capacity and their evolution in the human brain lead the way to inostensible reference.

CHAPTER THREE

THE NATURE OF INOSTENSIBLE REFERENCE

Introduction

I will begin this chapter with a slight modification of Chomsky's three of his five central questions for the study of language and biology and apply these questions to the study of inostensible reference[33]:

(1) What constitutes the capacity for inostensible reference?

(2) How do we put to use our capacity for inostensible reference?

(3) How does this capacity for inostensible reference evolve (in the species)?

These three questions will constitute the structure of this chapter and the following ones. Firstly, I will try to define the nature of inostensible reference according to Inan. Then I will try to explain how we put to use this capacity and finally I will discuss its evolutionary foundations.

Inan develops his term inostensible reference in his article "Inostensible Reference and Conceptual Curiosity" (2010) and in his book *The Philosophy of Curiosity*[34] (2012). In both of these studies, Inan views inostensible reference as "the most important pre-condition for being curious"[35]. For this reason, he develops his

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[33] These questions are quoted from: Jenkins, L. *Biolinguistics – Exploring the Biology of Language.* Cambridge University Press. 2000. p. 1. Chomsky's five central questions are: (1) What constitutes knowledge of language? (2) How is this knowledge acquired? (3) How is this knowledge put to use? (4) What are the relevant brain mechanisms? (5) How does this knowledge evolve (in the species)? Questions (2) and (4) seems irrelevant for now.
[34] Inan, I. *The Philosophy of Curiosity.* Routledge Publishing House. 2012.
[35] *Ibid.,* p. 75.

theory of curiosity on this term. In Inan (2010), he firstly distinguishes between two kinds of reference: ostensible reference and inostensible reference, and two kinds of terms: ostensible terms and inostensible terms. From a linguistic point of view, terms are collections of words that constitute proper names, general names, definite descriptions etc. which are "denoting phrases"[36], to use Russell's expression. During thinking or talking, we use these terms and refer to the external world (successfully if the relevant objects or states of affairs exist, and unsuccessfully if they do not exist). According to Inan, when our epistemic connection to the objects or states of affairs is stronger, we can talk about ostensible reference. He has four degrees for this kind of connection. In the first two degrees, we can refer ostensibly:

"(i) objects of which we have had sense experience,

(ii) objects that we have heard (or read about) from others about (who have had sense experience of the object)"[37]

In the first case, speaker/thinker perceives with his/her five senses the object that he/she refers to. His/her knowledge of it depends on his/her sense experience. In Inan's words, "[i]n such cases there is a sense in which we first experience the object which we wish to talk about, and only afterwards we pick a term from our idiolect, or construct a description to refer to that entity."[38] In the second case, the objects are known solely through testimony of other people. Though we have not had any sense experience of the bearer of the name "Aristotle", we have knowledge of him through testimony of other

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[36] Russell, B. "On Denoting". *Mind*, New Series, Vol. 14, No. 56. (Oct., 1905), pp. 479-493.
[37] Inan, 2012. p. 71.
[38] Inan, 2010. p. 2.

authors. Inan claims that in these cases, we have some "accumulated information of [those entities], some of which amounts to knowledge, and these allow us to refer ostensibly to entities like Socrates, China, First Gulf War etc. "[W]e have in our minds a sufficiently rich file of information of the object in question prior to our act of reference to that entity."[39] But Inan does not draw a strict line between what is sufficiently rich and what is not sufficiently rich. He just states that the first condition for ostensible reference is that we have sense experience of the object or "sufficiently rich file of information of the objects". His second condition is that chosen term shall be known to refer to the relevant object.

After explaining ostensible terms, Inan turns to his main topic, inostensible reference. As we have defined it above, inostensible reference is a linguistic capacity that enables us to refer to things unknown to us. In this case, our epistemic connection is much weaker. This takes us to the third and fourth types of objects we are epistemically connected to:

> "(iii) objects whose impacts or other causal effects we have experienced in some less direct manner
>
> (iv) objects that we can denote without having any direct or indirect experience of the object."[40]

In these cases, our degree of knowledge is closer to the unknown and we are aware of our ignorance. Being aware of this ignorance may and may not lead us to curiosity and

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[39] *Ibid,* pp. 2-3.
[40] Inan, 2012. p. 71.

inquiry into the unknown, which is the topic of Inan's 2012 book. "The centre of mass of the Solar System at the first instant of the twentieth century", Russell's example in "On Denoting", is a good example of an inostensible term. Structurally, it is a definite description. It is clear that it has a meaning. However, I, as a speaker or thinker, do not have the necessary sensory resources to know about this centre. The ability to construct such expressions is a very interesting feature of language since it enhances the potential of the human mind beyond the horizon of here and now. In other words, the revolution of inostensible reference has allowed human beings to move beyond the known. It should be noted that inostensible reference is not just used in particular, peripheral situations. It is very common in our idiolects and is ample in our daily thinking and talking. When someone asks me if I know "the last restaurant at the end of Istiklal Street", I may not know its referent in the time of conversation and only when I have sufficient knowledge about it, its referent becomes ostensible for me. It is also be noted clearly that what counts as ostensible or what counts as inostensible is speaker/thinker relative. It is possible that a term is inostensible for all humanity but in most cases of normal inostensible reference, the inostensible terms are relative to the speaker/thinker. I know the referent of "the father of the father of the father of Onur Doğru" but another speaker/thinker may not know to whom this term refers. Another important consideration is that though it is a linguistic tool, inostensible reference is also an epistemic distinction as may be understood from the criteria above. When the epistemic connection between the term and the referent is strong (according to the aforementioned criteria), we count the terms as ostensible terms and when the connection is very weak (for example, if the formation of the term only depends on inference), we count the

terms as inostensible. Hence this distinction does not have sharp boundaries. Inan recently thinks that this distinction is graded and there are different degrees of ostensible and inostensible reference based on epistemic connection.

Our linguistic expressions are full of inostensible terms and there is no limit to producing inostensible terms. We only need words and grammar rules to construct such terms. The fact that it is so easy to construct such terms leads these terms to be ubiquitous in our language. Hence it is possible to categorize different kinds of inostensible terms. So it is possible to produce different kinds of inostensible terms; proper names, definite descriptions and general terms can be inostensible terms.

<u>Types of Inostensible Reference</u>

Definite descriptions are the most canonical examples of inostensible terms. Examples such as "the closest planet to the earth with water", "the shortest spy in the world", "mother of the mother of the mother of Thales etc. are good examples of inostensible reference, where we use known words to conceptualize and refer to an unknown object in the external world[41]. However, we can also use proper names to refer to the unknown. As Inan states, "[t]he fact that an inostensible term must always come to life by a description, does not imply that such a term always has to have a descriptional content.

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[41] By "external world" I mean the external reality to speaker's/thinker's mind. But I do not assume that there is an independent reality outside the mind. I think the way the human mind conceptualizes the external world partially depends on the functioning of the human brain. For example, when we refer to a mountain, it seems to me that it is we, human beings, that determine the border of that object because there is objective limit to what counts as a mountain. In fact, as we will mention later, our ability to construct inostensible terms that refer and fail to refer is a good indicator that our mind/brain firstly subjectively construct our concepts and then lexicalizes them, which then refers or fail to refer.

Assuming that it is possible to fix the reference of a name by description in the Kripkean way such that the name does not merely abbreviate the description, then we may have at our disposal inostensible names with no descriptive content that enable us to express singular propositions and even singular thoughts."[42] Inan gives the example of the planet Neptune. Before its discovery, Le Verrier observed that there must be a planet that perturbs the orbit of Uranus. At that time, no one knew the existence of that planet; thus he refers to that unknown planet with the definite description of "the planet perturbing the orbit of Uranus" and he replaced this definite description with a proper name: "Neptune". Then came the discovery of the planet Neptune and therefore the proper name "Neptune" became an ostensible term. But before the discovery, this proper name was an inostensible term. Here, we observe two important properties of inostensible terms. Firstly, following the fixation by description, we can replace them with proper names, though according to Kripke, their semantic property change in this case[43]. Secondly, terms that begin their life as inostensible terms can turn into ostensible terms for speakers/thinkers following the fulfillment of the two conditions above.

The other type of inostensible term is general inostensible terms. Here Inan firstly warns us that there is no consensus in the literature as to what general terms are and what they refer to. Then he makes a distinction between "singular occurrence" and "predicative occurrence" of a general term. He gives examples for both cases,

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[42] Inan, 2010. p. 6.
[43] According to Kripke, proper names are rigid designators. Namely proper names designates the same objects in all possible world. When it comes to definite descriptions, they may be rigid such as "the successor of 2" or they may not be rigid but contingent such as "the brightest non-lunar object in the evening sky". Hence the semantic properties of the proper name "Neptune" and "the planet perturbing the orbit of Uranus" are different thought they refer to the same object (See: LaPorte, Joseph, "Rigid Designators", *The Stanford Encyclopedia of Philosophy* (Summer 2011 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/sum2011/entries/rigid-designators/>).

accordingly, the general term "blue" is a singular occurrence in the sentence "blue is my favorite color" while it is a predicative occurrence in the sentence "my shirt is blue". Then based on these two occurrences, Inan distinguishes between three forms of designations: "what a general term designates when it has a singular occurrence, what it designates when it has a predicative occurrence, and what a predicate designates that contains that general term within a sentence."[44] Inan argues that this distinction is necessary because the same general term may designate an abstract entity while in singular occurrence and it may designate something different while in predicative occurrence. Then Inan concentrates only on singular occurrences of general terms. My thesis will only focus on singular occurrence of them as well because predicative occurrence has no special status in my grammatical point of view. Predicative structure is a grammatical structure in my perspective and all the grammatical structures that can construct inostensible terms from general terms have the same status in my view. General terms can be single words or descriptions. Inan states that general terms such as "table", "blue", "chair" are ostensible terms because we are acquainted with their instances or we have sufficiently rich information about them. But for example, the color magenta was inostensible for me the first time I heard the term "magenta". And for the general term with description, Inan gives the example of "the color of the sky in daylight on Saturn" the referent of which is most probably a color represented with a general term. Like in the case of singular terms, it is also possible to replace a general term having descriptive content with a one-word general term. Inan gives a nice example illustrating this case. Pierre Jansen firstly thought that the bright yellow line that he

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[44] *Ibid,* p. 7.

found in the spectrum of the light emitted by the solar chromosphere was sodium. Then the chemist E. Frankland and the astronomer J. Lockyer realized that this element was not sodium and called it "helios", this name became "helium". Finally, W. Ramsey discovered the existence of helium on our planet.[45] Before its discovery, both the single-word "helium" and the description of "the element that is causing the bright yellow light in the spectrum" were inostensible terms for the reference fixers Lockyer and Frankland.

The last type of inostensible reference I will include in my thesis concerns declarative sentences and whether it is possible to talk about inostensible reference in declarative sentences. Here the important criteria is the question: what do sentences refers to, if anything? And this is dependent on our theory of sentential reference. As Inan states, if we agree with Frege and says that the sentences refer to the "True" and the "False", if the sentence is true, it refers to the True and if the sentence is false, it refers to the False. In cases when we do not know whether the sentence refers to the True or the False, this sentence may be inostensible for us. This distinction seems odd to me, I do not agree with Frege that a sentence can refer to the False. I prefer another distinction that Inan[46] mentions: "sentences denotes an actualized states of affair if true, and a non-actualized one, if false"[47]. So the sentence "the number of people with blue eyes is larger than the number of people with brown eyes" is inostensible for me since I do not know whether it is actualized or not actualized state of affairs.

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[45] For the details of the discovery of helium, see: Inan, 2010. pp. 9-10.
[46] Inan, in his recent book which is expected to be published in 2015, prefers to take falsity as failure of reference. (p. c.)
[47] *Ibid*, p. 11.

<u>Do Inostensible Terms Always Have Referents?</u>

Inostensible terms are generally constructed with the assumption that there is a referent in the world that corresponds to it. However, sometimes inostensible terms fail to refer. One such example again from the history of science from the realm of singular terms, Le Verrier believed that there was a unique planet perturbing Mercury which he described as "the planet perturbing the orbit of Mercury" and gave the proper name of "Vulcan" to it. However, then it was discovered that no such planet exists. Thus, this name proved to be an empty name in this context. I take this aspect of inostensible reference as being very important for two reasons. Firstly, the construction of these terms and the struggle to explore whether these terms refer or not is what makes science develop and understand reality. So we have a two-fold operation for science[48]:

    i). Construct inostensible terms about the external world.

    ii). Seek to find whether your terms really refer or they fail to refer.

This insight is sufficient for our first point. Secondly, when we construct inostensible terms, whether singular or general, whether referring or failing to refer, we construct linguistically meaningful expressions, and in the cases when we fail to refer with our inostensible terms (as in the example of "Vulcan"), we organize the meaning in our head and then seek whether there is a counterpart of it in the real world and the fact that these terms prove to be empty names does not lead them to be meaningless.

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[48] It should be noted again that we form inostensible terms not only in scientific contexts but also in normal Daily contexts.

<u>How do we put to use our capacity for inostensible reference?</u>

In *The Philosophy of Curiosity,* Inan tells us how ostensible and inostensible reference are put to use in a human beings' mind. Firstly, he explains how the mechanism works for ostensible reference: Let me reformulate his steps[49]:

    i). Have an experience of an object in question or learn about it through testimony; thus you have an object in mind to talk/think about.

    ii). Form complex concepts that picks out that object.

    iii). Pick words from the idiolect[50] to construct a description that you believe to express that concept and in effect denote the entity in question.

    In the case of inostensible reference, the situation is a bit different because the first step is missing. (i) We begin with the concept formation step. (ii) Then we pass to the lexicalization process and construct the inostensible term and (iii) finally we seek the referent of our inostensible term. That's why the experience phase is in the final stage in inostensible reference. I think here inostensible reference is achieved thanks to the property of language to be detached from the present time and space of speaker/thinker[51], namely since language can be detached from experience, we can

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[49] Inan, 2012. p.74

[50] In a linguistic perspective, the idiolect mentioned here is the lexicon.

[51] While sitting at our table, we can talk and think about the economic situation in China, about the North Pole, about Ancient Greece etc. We are not limited to the external stimuli when we use our language faculty. It is never possible to predict the next sentence of a human being. On the other hand, it seems that

construct inostensible expressions but there is a cost for that we then have to construct a link between experience and language again. As Hinzen and Sheehan stresses "freedom from experience is bought at the cost of having to re-establish a link with experience. It is what we are trying much of our waking lives to achieve (when we are not day-dreaming): saying something true rather than false, seeking evidence, exercising doubt."[52]

Conclusion

To sum up, inostensible reference is an important aspect of our language faculty allowing us to think and talk about beyond the here and now, thus taking us from stimulus-dependence to stimulus-independence. Based on prior experience of known objects, now we can conceptualize unknown objects and seek their referents (whether these referents exist or not).

We can see that the inostensible reference process begins with concept formation. Hence our ability to construct concepts and the nature of concepts prove to be important in the way to understand the nature and evolution of inostensible reference because logically, in the evolutionary scale, we first need to have concepts to operate on and from them, we construct lexical terms. In the next chapter I will focus on the nature of concepts and their relation to lexical items from a biolinguistic perspective. I will conclude that, phylogenetically, the emergence of a mechanism that turns concepts into

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animal calls are dependent on the external stimuli. If the context is known, it is possible to know when an animal will produce its call.

[52] Hinzen, W. and Sheehan, M. *The Philosophy of Universal Grammar.* Oxford University Press. 2014 p.47

lexical items is one of the key novelties leading the way to inostensible reference. The second novelty will be Merge. I will try to explain them in detail in the fourth chapter. In the final chapter, I will characterize the details of the emergence of inostensible reference based on these two operations and the third step which is glossogenetic in nature.

CHAPTER FOUR

REPRESENTATIONS IN THE MIND

<u>Introduction</u>

In this chapter, I claim that meanings in simpler forms emerged before language, that is to say, early humans already had mechanisms that produced meanings. And I subscribe to a representational theory of mind. I think we experience the world indirectly by the intermediation of the mind. I agree with Hurford that "the mental representations were phylogenetically prior to words and sentences."[53] Hence, I conclude that concepts (representations)[54] are prior to language, which implies that other animals can have concepts as well.

One of the most well-known advocate of representational theory of mind is J. Fodor. He thinks that a representation theory of mind shall have a theory of concepts. For this reason, he states five "non-negotiable" properties of concepts[55]: i) "concepts are mental particulars, ii). concepts are categories, iii). concepts are the constituents of thought, iv). many concepts have to be learnt and v). concepts are public. In his book *The Origins of Meaning,* Hurford develops his theory of origins of meaning based on these properties of concepts. He disagrees with Fodor only about the fifth property. Hurford thinks that animals have concepts as well and that their concepts are not public.

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[53] Hurford, 2007. p. 5.
[54] For the purpose of the thesis, I do not draw a strict line between concepts and representations.
[55] Fodor, J. *Concepts: Where Cognitive Science Went Wrong*. Oxford Cognitive Science Series. Oxford: Clarendon Press. pp. 23-29.

And this important difference between humans and other animals is a defining difference. He adds that the fact that we ascribe concepts to animals does not necessarily mean that the concepts of humans and the concepts of animals are the same. Cognitive psychology seems to endorse a consistent view about the representational nature of the mind. Here I will follow cognitive psychologist E. Spelke[56] (2000) who argues that humans have at least four core knowledge systems which "serve to represent inanimate objects and their mechanical interactions, agents and their goal-directed actions, sets and their numerical relationships of ordering, addition and subtraction, and places in the spatial layout and their geometric relationships"[57] (based on her new studies, she then adds the fifth core knowledge system which produces representations about social relations, groups, partners etc.). She comes to this conclusion by studying nonhuman animals and infants in her struggle to understand the ontogenetic and phylogenetic roots of human knowledge. I agree with Boeckx that "[n]on-human animals must be endowed with such systems too; they wouldn't be able to make sense of the world around them."[58] Therefore, we can draw the conclusion that humans and other animals share core knowledge systems that yield representations of the external world. In the following parts of this chapter, I will sketch out these five core knowledge systems which yield representations. I think these representations are important because they constitute the raw material of our language faculty. The basic insight here is that evolution of a trait operates upon already-existing traits. François Jacob's analogy of "evolution as tinkerer" is highly illustrating: "Evolution behaves like a tinkerer who, during eons and eons

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[56] Spelke, Elizabeth. "Core Knowledge". *American Psychologist.* 55 (11): 1233–1243 (2000).
[57] Spelke, E. S. and Kinzler, K., D. "Core Knowledge". *Developmental Science*. 10:1. pp 89– 96 (2007).
[58] Boeckx, C. *Language in Cognition. Uncovering Mental Structures and the Rules Behind Them.* Wiley-Blackwell. 2010. p. 121.

would slowly modify his work, unceasingly retouching it, cutting here, lengthening there, and seizing the opportunities to adapt it progressively to its new use."[59] Since following Chomsky, I think that language is part of the biology of human brain, I assume that language faculty is the product of the tinkering of the pre-existing means in the brain. I think this follows logically. Hence there should be some pre-existing traits to evolve into language. Either the introduction of a new trait that operates on these old traits or the new wiring of these present traits lead the way to the language faculty. Thanks to these systems, humans and other animals can form concepts about the world and survive.

As mentioned above, core knowledge systems are mental modules that produce representations in specific areas. According to Spelke, they share these features:

i). "domain specific: each serves to represent (categorize) only a subset of the entities in the child's (/animal's) surroundings.

ii). task specific: the representations (/categories) constructed (made available) by each system guide only a subset of the actions and cognitive processes in the child's/animal's repertoire.

iii). relatively encapsulated: the internal workings of each system are, as it were, in-accessible to other representations and processes found in other cognitive systems.

iv). isolated: the representations that are constructed by distinct systems do not readily combine together."[60]

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[59] Jacob, F. "Evolution and Tinkering". *Science*, New Series, Vol. 196, No. 4295. (Jun. 10, 1977), pp. 1161-1166.

[60] These list is conveyed from Boeckx (2010). For original reference see: Spelke, E. S. 2003a. What makes us smart? Core knowledge and natural language. In
D. Gentner and S. Goldin-Meadow, eds., *Language in mind: advances in the investigation of language and thought* (pp. 277–311). Cambridge, MA: MIT Press.

The importance of these features will be understood better when we deal with lexicalization. Now let us give brief information about these five systems[61].

a. Core system for representing objects

This system is responsible for representing objects. "It centers on the spatio-temporal principles of cohesion (objects move as connected and bounded wholes), continuity (objects move on connected, unobstructed paths), and contact (objects do not interact at a distance)."[62] Spelke's experiments on infants and other animals such as adult monkeys and newly hatched chicks shows that we share these core knowledge system other animals.

b. Core system for representing actions

The second core system is responsible for representing agents and their goal-directed actions. Infants can distinguish between animate and inanimate entities and they expect that the motion of the agent is goal-directed, even if the agent does not have a face, they still expect it to be directed towards a goal. When the agents have faces, infants follow their gazes. Similarly, "Newly hatched chicks, rhesus monkeys, and chimpanzees are sensitive to what their predators or competitors can and cannot see."[63] From this, we can infer that this system also precedes language and evolutionarily it is older, and hence human beings share it with other animals.

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[61] Spelke provides experimental evidence about each core knowledge system in based on her experiments on infants and nonhuman animals. It is beyond the purpose of my thesis to recount all these experiments. I will only briefly explain the constituents of her hypothesis.
[62] Spelke and Kinzler, 2007. p. 89.
[63] *Ibid,* p. 90.

c. Core system for representing numbers

The core system represents numbers and sets of objects at a time. As Boeckx states in line with Spelke humans and other animals can represent several objects at a time, but only a few of them (three or four[64]). Interestingly, human infants and nonhuman animals fail to track objects beyond this set size limit (when counting is not included, only by perception and categorization)[65]. Spelke counts three properties of our number representations: i) they are imprecise (when the number gets bigger the precision decreases), ii) they are abstract (they can be applied to objects, sounds, actions) iii) they can be compared and combined by operations of addition and subtraction[66].

d. Core system for representing space

The fourth system for representing space "captures the geometry of the environment: the distance, angle, and sense relations among extended surfaces in the surrounding layout[67]." This system allows us to represent space and navigate through it. Most probably, other animals also have such systems in varying degrees of sophistication.

e. Core system for representing social interactions

Spelke and her colleagues have begun to investigate a new core knowledge system. This system produces representations about possible social partners and social group members. Though work in this area is still not mature enough, it is argued that "[i]nfants show a visual preference for members of their own race; infants also look preferentially

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[64] Hurford (2007) calls this "the magical number 4". "[It] is a limit on what is attended to with some kind of awareness- the 'non-target' objects are in some sense also unconsciously present to the mind. (p. 93.)
[65] Boeckx, 2010. p. 123
[66] Spelke and Kinzler, 2007. p. 91.
[67] *Ibid*, p. 91.

at faces of the same gender as their primary caregiver, and listen preferentially to speakers of their native languages."[68] This core knowledge system may also be related to theory of mind (namely, the ability to represent the beliefs and thoughts of other people). And this system is also present in some animals. For example, in some monkey species that live in big groups, there are hierarchies and monkeys behave and interact with others according to their ranks.

Signature limits and Modularity

The idea of core knowledge systems is parallel to Fodor's idea of encapsulation of the mind/brain. As Fitch puts it, "encapsulated cognitive mechanisms have specific tasks, defined by a set of specific inputs to which they are sensitive, and specific outputs that they produce"[69]. Similarly, Spelke thinks that core knowledge systems have "signature limits" in prelinguistic infants and nonhuman animals since these systems are domain specific, task specific, isolated and relatively encapsulated. And as Boeckx highlights they "quickly reach combinatorial limits"[70]. The fact that human infants and nonhumans cannot track more than four objects illustrates this phenomenon because the connection between two core knowledge systems is not established (or very weak). In fact, these signature limits allows researchers to distinguish between different core knowledge systems. But if we share these core knowledge systems with other animals, why is our intelligence is so different from them? According to Boeckx, the evolution of

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[68] Boeckx, 2010. p. 125.
[69] Fitch, 2010. p. 81.
[70] Boeckx, 2011a. p. 497.

lexicalization is the answer. Core knowledge systems produce concepts and the operation of lexicalization lexicalize all these concepts from different domains into a uniform format, hence "the signature limits" are surpassed in human beings.

Conclusion

This chapter provided the background for the two operations that we will mention in the next chapter. The main idea is that we share our conceptual resources with other animals. However, although our concept-forming resources are similar, our mental life is quite different from them. This difference is due to the evolution of language, which allows us to lexicalize these concepts and combine them infinitely.

CHAPTER FIVE

TWO OPERATIONS: LEXICALIZATION AND MERGE

Introduction

In this chapter, I will discuss two foundational operations that have constituted our

language faculty. These are lexicalization and Merge. I will firstly explain lexicalization

which turns concepts into lexical items that can be joined together and then I mention

about the operation Merge which makes this conjoining possible. I think the emergence

of these two operations constitutes the basis of the evolution of language, and their

presence is indispensable for inostensible reference because they have opened the way to

form inostensible terms.

A. Lexicalization

In the previous chapter, I talked about Spelke's core knowledge systems which yield

representations from different domains such as numbers, space, objects, agents etc. This

hypothesis, in line with Fodor, assumes that mind is modular (though not massively

modular as Fodor thinks; there are at least four-five modules producing concepts). And

these modules (or core knowledge systems) works partially independently since they are

domain and task specific according to Spelke. Another insight of Spelke is that

nonhuman animals also share these core knowledge systems but they come across

"signature limits" which isolate representations of each system and impede them from

combination. This leads to the great cognitive gap between humans and other animals,

what Ott[71] calls Hauser's Paradox. Hauser states that "[A]nimals share many of the building blocks that comprise human thought, but paradoxically, there is a great cognitive gap between humans and animals."[72] It is argued that the reason why there is such a great gap is that humans can go beyond signature limits and combine the representations of each module. But how can humans combine representations from different domains? The hypothesis that Boeckx endorses is that the evolution of lexicalization that turns these representations (concepts) of different domains into lexical items in a uniform format: "The roots of our knowledge are ancient, and continuous with other species, but our kind of thought, our creative bent, as it were, required the evolution of lexicalization, which applies a uniform format to concepts that would never combine otherwise. Human language, under this hypothesis, takes the form of a central processing unit that creates a *lingua franca*, a genuine language of thought, out of the mutually unintelligible dialects of thoughts that are the core knowledge systems."[73] As Ott highlights, according to this view, "radically different types of concepts are 'just words', once lexicalized."[74] Boeckx uses the term "lexical envelope" for this procedure. The concepts enter into this "envelope" and become lexical items. Concepts such as RUN, THREE, TREE, NORTH, BROTHER[75] become lexical items (words) that can be used infinitely by language faculty, once lexicalized: "run", "three", "tree", "north", "brother". Boeckx equates his term "lexical envelope" with Chomsky's term "edge feature" and states that lexical items have the feature of merging with each other.

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[71] Ott, 2009. p. 260
[72] Quoted in Ott, 2009. p. 260.
[73] Boeckx, 2010. p. 131.
[74] Ott, 2009. p.265.
[75] I will follow the tradition and use capital letters when I use a concept.

Therefore, with this feature lexical items can combine with other lexical items, which makes Merge possible. Lexicalization also demodularizes the concepts (namely they become dissociated from their modules) and allows for cross-modular thought. Hence word formation out of concepts was a very important cognitive achievement in the phylogenetic history of human beings. However, although the significance of lexicalization for language faculty is so clear, for now it is not clear how this operation emerged in humans, and was fixed and became part of our biology. Boeckx chooses to remain silent about its evolution: "I am silent on precisely how it evolved. It may be the result of random mutation, or an exaptation. Perhaps we will never know for sure, but it is something that is now part of our biological endowment (albeit maybe indirectly coded, perhaps as part of brain growth)"[76]

B. Merge

Lexicalization on its own is not enough to yield the infinite number of expression in language. It produces lexical items with "sticky" properties, namely items that can come together. Another operation that was needed to join the process was an operation that takes these lexical items and combine them. Chomsky calls this operation Merge: "an operation that takes objects already constructed, and constructs from them a new object."[77] In 1990's Chomsky proposed a new program for linguistics which is called

[76] Boeckx, C. "Some reflections on Darwin's problem in the context of Cartesian Biolinguistics". In *The Biolinguistic enterprise: New perspectives on the evolution and nature of the human language faculty*, ed. A. M. di Sciullo and C. Boeckx, 42-64. Oxford: Oxford University Press. 2011. p. 54.
[77] Chomsky, N. "Biolinguistic Explorations: Design, Development, Evolution". *International Journal of Philosophical Studies.* Vol. 15(1), 1–21. p. 15.

Minimalist Program. This is not a new theory. It does not deny the insight of the previous theories of Universal Grammar but proposes theoretical linguists to formulate their questions in a minimalist manner and to think of linguistic computations as optimal computations. Accordingly, Chomsky looked at Universal Grammar "from below" and claimed that the operation Merge is sufficient to give language the recursive power it has. Merge operation takes two elements and combines them as a set. For example, let us take two lexical items: *red* and *car*. This operation combines them as "red car". There are two kinds of Merge: Internal Merge and External Merge. External Merge, as is in the aforementioned example, takes two different elements. And Internal Merge "combines two elements, one of which was already contained inside the set to which the other element is merged."[78] For example, "red car" is an already merged expression, the operation Merge can operate on it and create "new red car". We can show this in a set: {new,{red, car}}. We can further merge this expression by adding a new item: {bought, {new,{red, car}}}. Computationally, this seemingly simple operation can produce infinite number of hierarchically-structured expressions. But Boeckx emphasizes that set formation on its own may not be the answer since "set formation is a very basic computational operation, one that is unlikely to be unique to humans or specific to language"[79]. Like Chomsky, Boeckx thinks that the fact that lexical items are "sticky" gives them their unique property. Chomsky calls these features "edge features. These features allow lexical items to merge with other lexical items. Hence, lexicalization

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[78] Boeckx, 2011b. p. 52.
[79] *Ibid,* p. 52.

operation turns representations of different core knowledge systems into conjoinable lexical items while Merge operation takes these items and combines them hierarchically.

Conclusion

Current understanding of biolinguistics gives us two seemingly simple but very powerful cognitive tools to understand how language faculty is put to use and how it is connected to other cognitive domains. And it seems that the evolution of these two operations has brought the cognitive advantages that *Homo sapiens* enjoy. Thanks to lexicalization and Merge, different domains of the mind can be combined seamlessly, and hence our thinking ability has advanced significantly. By means of these operations, we are able to think and communicate more efficiently since we are now stimulus-free and can think and talk about things, events etc. which are not immediately in our perceptual domain. Most importantly for this thesis, after the emergence of lexicalization and Merge, no biological boundary remained to limit the formation of inostensible terms. The next chapter will be about the emergence of inostensible terms and inostensible reference.

CHAPTER SIX

THE EMERGENCE OF INOSTENSIBLE REFERENCE

Introduction

In this chapter, I will claim that the evolution of lexicalization and the evolution of

Merge were necessary for the emergence of inostensible reference but they were not

sufficient. These two operations provided the foundation for inostensible reference.

However, it seems that humans first used their language faculty in cases of ostensible

reference. Putting language faculty into use for inostensible reference requires

something more.

Inan's distinction between object language and concept language will be

essential in this chapter. Inan claims that the leap from object language to concept

language gave new properties to our language faculty. One of these properties is to refer

inostensibly. How and why this leap happened are important questions to be dealt with.

It is not hard to imagine that the first *Homo sapiens* members who had language used

their language only to refer ostensibly. Seeing a mammoth, an early human could point

to that animal and say "mammoth!" Of course, not by using that English word but by

using a word that is understood by the other humans. This usage of the word functioned

to focus the attention of a group of people. M. Tomasello conducts research on children

and chimpanzees about pointing behavior and its function to provide shared

intentionality. He concludes that pointing behavior is a very central feature of language.

Because nonlinguistic infants first begin pointing at objects and try to focus the attention

of the adults to the object that they are attending to[80]. If we consider this fact in a phylogenetic manner, we can claim that early humans firstly started to point to the external world and use some words to focus the attention of the hearers (not only by finger, but also by sound). I think these were the first instances of language use.

Based on the above mentioned evolution of lexicalization, we can say that the first lexicalized concepts were concrete objects or events that were related to the lives of early human beings. Concepts such as PREY, MEAT, MAMMOTH, WATER, HOT, COLD etc. may be the first lexicalized concepts because of their functional importance. Once lexicalization operation began to be used fully in the human mind to lexicalize the concepts, it continued to lexicalize nearly all relevant representations from different domains: objects: TREE, ROCK, MOUNTAIN; numbers ONE, TWO, THREE; social relations FATHER, UNCLE, SON etc. Namely, as Boeckx states, lexicalization turned all concepts into the same currency: words. Concepts of different domains all become words. These lexical items (words) have edge features, that is to say, a capacity to be combined. Then came the Merge operation which created, in Bickerton's terms, the "catastrophic syntax". The combination of these two operations allowed language faculty to produce infinite number of expressions. But did these two operations present the whole story behind our fully-fledged language faculty? Was it possible for early human beings to construct inostensible terms and seek their referent once these two operation were put to use? The answer to this question is "no". In this form, language faculty is close to Inan's object language which we use to talk about objects and give certain properties to these objects. Of course, object language also had abstract concepts

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[80] See: Tomasello, M. *Origins of Human Communication*. MIT Press. 2008.

such as COLOR, SHAPE etc. But in Inan's view, it was not possible to use them in subject place in a sentence. For example, in object language, it was possible to construct this sentence: "My body is red" but it was not possible to construct this sentence: "Red is a color". In other words, early humans could not construct concepts of concepts. They can only use such concepts in predicate place. Because as Inan states, "in order to conclude that there is a common thing between [these] color names, they shall realize a similarity between concepts, not objects."[81] And as mentioned above, inostensible terms were not possible in object language. Because, as it is obvious, the object is not present to speaker/thinker when we use inostensible terms. And we need to be aware that we do not know the referent of the inostensible term that we constructed. Hence, even if an early human is, in principle, able to construct an inostensible term such as "the biggest bird in the jungle" in object language, it is not possible for him/her to use this term to refer inostensibly since he/she is not aware that she/he does not know the referent of the term.

<u>Never Ending Debate: Cultural or Biological?</u>

In the evolution of language literature (and maybe in the literature of evolution theory), there are always debates about whether the emergence of a trait is due to a cultural (glossogenetic) change or a biological (phylogenetic) change. Even in terms of language evolution as a whole, there are some scholars who think that no new trait for language was added to the human brain but as a result of cultural change after the full evolution of

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[81] Inan, 2013. p. 59. The article is in Turkish. All the translations from this article are made by the author of this thesis.

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the present *Homo sapiens,* languages emerged thanks to interactions among people. On the other hand, there are some scholars who think that language has a biological basis and this basis evolved and flourished through the history of *Homo sapiens.* The same issue is also discussed in the ontogenetic level: whether new born babies have an innate language faculty and it develops when they grow up and are exposed to language data or they have general learning mechanisms and learn language thanks to these mechanisms. Undoubtedly, the nature-nurture debate will continue. The insight here is that one should be cautious when he/she claims that the evolution of a certain trait is due to "cultural change" or "biological change". Because it is obvious that language faculty has a cultural aspect. We have to learn words of our language, these words cannot be present in the brain of the new born baby. But it is also evident that a human baby has an instinct to learn words and sentences of language while our closest relatives, chimpanzees, do not exhibit such a tendency[82]. This fact shows that there must be a biological basis for language. In short, language faculty has both a biological basis and a cultural basis. An infant that is never exposed linguistic data (of any language) cannot speak and an infant that has problems in the brain mechanisms related to language cannot speak as well. These facts suggest that language faculty is not 100% innate and not %100 cultural. Hence, there is an interaction between biology and environment; this interactive process is called epigenesis. Fitch calls this process "nature via nurture"[83]. And I think it is logical to think of language evolution and language development as epigenetic

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[82] Herbert S. Terrace tried to teach (sign) language to a chimpanzee, which he called "Nim Chimsky". This chimpanzee was brought up like a normal human infant in a human family environment. However, the repertoire of the Nim remained quite small compared to a human child. And Nim's capacity never reached the capacity of human's to produce infinite number of expressions.
[83] Fitch, 2010. p. 28.

processes. In both processes, both innate factors and environmental factors play roles. These being said, I will narrow my scope now and concentrate on the emergence of inostensible reference and its glossogenetic and phylogenetic basis.

Phylogeny and Glossogeny of Inostensible Reference

My first argument in this chapter is that inostensible reference emerged in human beings as a result of glossogenetic (cultural) change after language evolution was completed. The faculty of language was already biologically fixed in human species when inostensible reference emerged. In the article "Evolution, brain, and the nature of language" written by R. C. Berwick, A. D. Friederici, N. Chomsky and J.J. Bolhuis, the authors state, in reference to I. Tattersall's 2010 article "Human evolution and cognition", that "there is overwhelming evidence that the capacity for language has not evolved in any significant way since human ancestors left Africa, approximately 50 000–80 000 years ago."[84] But in Inan's terms, we shall call the language capacity that emerged 50 000-80 000 years ago "object language". The leap to concept language came later, and therefore inostensible reference came later.

The reason why I claim that the emergence of language was glossogenetic is that firstly, no new biological property was needed to be added to the mechanism of language capacity to produce inostensible terms. It was already syntactically possible to produce inostensible terms. But semantically they were trivial for the early human

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[84] Berwick, R. C., Friederici, A. D., Chomsky, N. and Bolhuis, J.J. "Evolution, brain, and the nature of language". *Trends Cognitive Science*. 2013. p. 89.

beings. At first they neither wondered nor found them meaningful; so these people did not use inostensible terms to refer to unknown objects. During the process of language change, the number of ostensible terms gradually increased in the lexicons of the populations. This cultural accumulation of ostensible terms may be linked to the development and enlargement of the human memory[85]. The reason why and how these terms were stored for long time in the brain probably will be understood better when the neurological relationship between language and memory is investigated more deeply. For now, it is sufficient to say that gradually humans remembered more and more, and their chance of forming inostensible terms increased.

One final thing was needed to achieve inostensible reference: the realization that we do not know the referent of our terms and a cognitive urge to seek the referents of these terms. This two-fold novelty is not directly linguistic and most probably it was part of another domain of the human brain. When it interfaced with our language capacity, it allowed early human beings to realize that they did not know the referents of some terms which they can construct such as "the number of fish in the river", "the safest cave in the mountains". They began to seek the referents of these terms. They realized that in some situations, they can firstly refer inostensibly and then seek and find the referents of their inostensible terms. For example, they could use terms such as "the oldest man in the neighboring tribe" without knowing who that person was and then go and find that very man who was the referent of their term. This ability to refer inostensibly gave them a certain advantage, they realized that there is a world beyond their ostensible terms. Hence it seems that they began to use more and more inostensible terms in their talks

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[85] Hurford (2007) thinks that the evolution language is highly related to the evolution of episodic memory.

and in their thoughts. I think that interface of this cognitive urge with language capacity may be due to a biological reorganization of the brain. However, it should be noted that this biological change shall be considered within the scope of faculty of language in broad sense because it is an interface situation. I argue that conceptual-intentional interface and faculty of language in narrow sense entered into relation in a new way. For this reason, it became possible for humans to be able to talk about "the mother of the mother of the mother of Esra". One may ask what the advantages of using inostensible terms are. Firstly, they allow the individual to conceptualize the horizon beyond him/her. This individual can go beyond his/her spatio-temporal presence. This empowers his/her planning abilities and allows him/her to produce superior plans compared to other people and make inferences beyond time and space.   Secondly, he/she can wonder the referents of his/her inostensible terms and discover/invent new things. Thirdly, he/she may be more prepared against unknown dangerous. Maybe because of these reasons, inostensible reference is so common in many linguistic community. But since I argue that the emergence of inostensible reference is a glossogenetic novelty, I admit that some linguistic communities in the world may not have inostensible terms in their languages. Finding a linguistic community without the ability to seek the unknown (inostensible reference) might be an interesting discovery.

All the Steps Leading to the Emergence of Inostensible Reference

Let me now summarize all the steps that led us to the emergence of inostensible reference. First of all, human beings, just like other animals, had core knowledge

systems[86]. These systems produced the representations and concepts that were necessary

for language. In the second phase, as a result of evolutionary processes, human beings

began to lexicalize these representations and concepts (lexicalization operation). Before

lexicalization, these systems were mostly isolated from each other. But when

lexicalization operation lexicalized the representations from all these different systems.

All lexical items became of the same currency: words. In the third step, another

operation began to combine these lexicalized items. This operation which is called

Merge gave human beings the chance of producing infinite number of expressions from

limited number of linguistic items. It is possible that language was used in this form for

a long time and then in the fourth step people accumulated many ostensible terms.

Through cultural transmission, they transmitted their ostensible terms to their children

and both their number increased and the possibility to produce inostensible terms

increased. In the fifth step, language capacity interfaced with another cognitive capacity,

as a result of which humans came to realize that they can refer inostensibly and that they

can seek the referent of their inostensible terms. Let us think of one final example. Take

two concepts HALF and APPLE. Most probably, early human beings could form these

two representations in their heads. But they could not lexicalize them. But then the

lexicalization operation came. A tribe member could have the lexical items of "half" and

"apple". And thanks to Merge operation, he/she can combine and express them: half of

the apple". But now let us think the extreme. "Half of the half of the half of the half of

the half of the half of the half of the half of the apple". Can the tribe member use this

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[86] It is possible to further go back in history of human evolution and seek the evolution of each core knowledge system in the human brain. Such a struggle can continue till the first living beings. My thesis starts its journey with hominids who had core knowledge systems and takes for granted their evolution.

term or seek its referent? The answer would be "no" since though it (the term) is syntactically possible, it was semantically irrelevant for the speaker/thinker. And that individual lacked the cognitive drive to realize his/her ignorance about the referent of his/her term. This interface may have been between inferential thinking (in conceptual-intentional system of FLB) and core language faculty. After the connection of these two systems, early human beings who use ostensible terms in thinking and talking became able to manipulate their ostensible terms and form inostensible terms. For example, if a person knows that the source of Nile River and the source of Euphrates River, he/she can infer that Yangtze River must have a source and can form the term "the source of Yangtze River" which is inostensible for him. But for these kinds of terms to flourish a cultural accumulation of this terms was need after the arrival of the biological capacity.

Possible Questions and Objections

One may wonder what the function of lexicalization without grammar in its elementary state was. I think this passage from Hinzen and Sheehan provides a satisfactory answer: "[I]n this pregrammatical world, percepts became lexicalized: they were given a phonological identity and became entities freely available in our minds, manipulable irrespective of any perceptual stimulus present. We call this process lexicalization. But these lexical items, as such, did not have a referential semantics yet. As such, they only had a lexical content, and they were not used to refer. Their lexical content, moreover, was still largely defined in terms of perceptual features: the function of the lexicon

remains classification of an experienced world, not reference to it."[87] Secondly, the question of "How did lexicalization and Merge combine?" may arise. There are huge debates about Merge and recursion. Merge is the operation that yields recursion in language. Hauser *et al.* (2002) think that this operation may have been present in other domains of the brain such as navigation, social-scheming and tool-making and then it came into contact with lexical items and yielded infinite number of expressions from them. This contact was sudden in evolutionary terms and its results were revolutionary for the mind. The third question is about animals: Can animal have inostensible reference? My answer is "no". Though we share some primitive concepts and representations with animals, I think animals cannot refer inostensibly for some reasons. Their calls are innate and their activation is stimulus-dependent. So since they cannot produce stimulus-independent expressions and since inostensible reference relies on language capacity, animals cannot refer inostensibly. A study which proves that animals can refer inostensibly shall provide a power counterargument against my claim. Even if it may be proved that animals can have inostensible reference, it can be claimed that they cannot known that they do not know the referent of their inostensible conceptualization, from which we can infer that animals lack a metacognition and that metacognition is highly related to inostensible reference. Another question is related to the human infants: when can a human infant refer inostensibly? It is hard to answer this question without empirical data. An experiment setting which tries to measure the ability of pre- and post-linguistic human infants to refer inostensibly may produce very interesting results. For now, we can guess that since inostensible reference and question

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[87] Hinzen and Sheehan, 2013. p. 36.

asking are closely related, the time when children begin asking questions may coincide with the ontogenetic emergence of inostensible reference. One may also ask the nature of the relationship between question asking and inostensible reference. Inan has an answer for this relationship. He think that "in order to ask question, there should be an unknown thing and the person asking the question shall represent this unknown thing in his/her mind."[88] Namely, the person shall conceptualize the unknown in the form of a description. For example, in order to be able to ask the question of "who stole my axe?"[89], the person shall form a description like "the person who stole my axe" in his/her head and realize that he/she does not know the referent of this term. Another interesting question is about the universality of inostensible reference: can all human beings refer inostensibly? My study does not assume that inostensible reference is innate. As mentioned above, it is highly possible that there are some linguistic communities which does not have inostensible reference. However, it seems that inostensible reference is very common in most languages. The last question that we can consider is: which types of inostensible terms emerged first, singular inostensible terms or general inostensible terms? Based on my line of thinking, I can claim that singular inostensible terms emerged first because it seems that seeking a single referent (such as the person who stole my axe) is easier than seeking a general referent (such the element that is causing the bright yellow light in the spectrum).

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[88] Inan, 2013. p. 65.
[89] The example is taken from Inan (2013).

Conclusion

This chapter concentrated on the emergence of inostensible reference. I concluded that inostensible reference emerged as a result of a glossogenetic change in language capacity and a biological change in the interface between core language capacity and the interfacing conceptual-intentional system. The biological change is indirectly related to language and it is a change in the wider scope of the mind. Because of this reason, I do not consider this change as a linguistic change because language capacity can survive without its presence. I only think that this urge to seek the referent of inostensible terms makes inostensible terms more significant for human beings.

CHAPTER SEVEN

CONCLUSION

Isaac Asimov has a wonderful story called "The Last Question"[90]. As its name suggests, the story is about the last question that human beings intend to answer. In this fictional story, this last question to be answered is: "How can the net amount of entropy of the universe be massively decreased?" Throughout the story, humanity and scientific development jump forward, however no superior technology (super powerful computers etc.) or superior mind could find an answer to this question. Whether this will be the last question to be answered or not, we do not know. But what is wonderful is that we can conceptualize the inostensible term "the last question to be answered" and seek its referent thanks to our language faculty, which, I think, is one of the reasons that keeps our imagination alive.

Inostensible reference is one of the most important product of the evolution of language because it has allowed us i) to realize our ignorance about the external world, ii) to conceptualize what we do not know and iii) to inquire the referent of the unknown. For this reason, the research of this topic deserves more attention. However, studies on inostensible reference are seldomly found. Hence both its philosophical inquiry and the inquiry for its biological foundation are still very new. I think that more studies shall be made in order to understand its nature and its brain correlates. I hope that when our understanding of brain increases, we will be able to study inostensible reference in a more concrete manner. Furthermore, empirical studies on human infants can prove

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[90] Asimov, Isaac. The Last Question. *Science Fiction Quarterly*. November 1956.

useful in our struggle to understand the emergence of inostensible since as Ernst Haeckel's dictum says "ontogeny recapitulates phylogeny". If we can understand when and why inostensible reference emerges in children, we can have some insights about its phylogenetic foundations as well. Finally, the phylogenetic relation between inostensible reference and the birth of curiosity is also very interesting. Future studies may find close interactions between this two aspects of human brain. All in all, it is clear that collaboration between philosophy, (bio)linguistics, cognitive science, neuroscience, speech science etc. is required in order to understand the biological and evolutionary foundations of language. My thesis is an attempt to synthesize the findings of these relevant areas from the perspective of philosophy.

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