Chapter 2

Linguistics as a Science

Introduction

Many linguists have been arguing for a scientific status for their field of enquiry. The making of a science is a complex process. It is possible to think of a set of distinguishing characteristics of science as opposed to other inquiries. A science is often identified by virtue of its methods, knowledge, importance of prediction, theory-making, use of mathematics, presence of laws, commitment to truth, emphasis on facts as raw data and applicability of science to practical matters of life (which gets to be called technology). In this chapter, we look at the reasons given by leading linguists for calling it a science.

Generative Linguistics

What does a researcher know about language? She knows that a language consists of its units, starting from phonemes up to a discourse or a text. Somewhere within this spectrum lies the unit of a sentence. She has to account for why a sentence seems to be a salient unit of language. Not all linguists have the same position about sentences. Some consider the subject matter of linguistics to be to uncover the principles of combinations of words and morphemes to form phrases and sentences. In this case, the ordering and combination of words is the main concern. This is the syntactic approach. This is based on a view that syntax is autonomous and is largely independent of functional and contextual factors. One of the methods often adopted in this approach is to take a sentence out of the conversational or literary context in which it came up and then give an explanation for the ordering and combinatorial rules that generated the sentence.

Linguists who focus on pure syntax, also called formalists, are contrasted with functionalists. Functionalists emphasise the communicative role played by utterances in real life language use. For this latter group, context is extremely important and knowledge of rules of combination of smaller units to form larger units is only a component of
knowledge of language. For them, knowledge of language is much richer than mere syntax and it involves the production of utterances appropriate to various contexts. So language involves the broader application of general intelligence in working with an overall knowledge (pragmatics), which includes context, appropriate levels of politeness, felicitousness of speech acts, conversational implicatures and so on.

Since linguistics has to do with knowledge of language, it is considered to be a central part of an interdisciplinary pursuit aimed at understanding learning, knowledge, mind and brain, a collaborative project known as ‘cognitive science.’ The underlying metaphor for the mind in cognitive science is computers. The human mind is conceived as a device which solves problems by performing operations with basic symbols. The outputs of one level of operations might be given as inputs to another level. Because the enquiry is broad, the field is dealt with by experts from psychology, brain sciences, computer science, linguistics, philosophy and anthropology.

The problem to be solved in the case of language could range from the production of the right form of a phoneme in a particular word or the understanding of a sentence with a relative clause. However, a cognitive scientist might not agree that understanding a sentence in a real world context is a problem specific to language. This is because of the argument that the mind consists of various autonomous modules, which has minimal interactions with others.¹

The Saussurean ideas on a science of language emphasised the synchronic and structural approach as opposed to the diachronic or historical.² Saussure's famous analogy of these two approaches to studying language was with how one could go about studying particular configuration in a game of chess. One can either study all the moves that led to that configuration – the diachronic approach; or study how the individual pieces relate to each other at that configuration – the synchronic approach. This example shows the

significance of studying the structure of a language in any particular time. This was more or less the basic insight behind the structuralist movement in linguistics.\(^3\)

In more recent times, there have been theoretical and experimental approaches to presenting linguistics as a science. Many of these attempts had as a basic premise the idea that language is a natural object. Such arguments will be examined in this chapter. The assumptions underlying such approaches, the methods used and the knowledge created will be examined in this chapter. There have been strong attempts from scholars who hold the abstract symbolic position about language to show how their object of enquiry is a natural object. The goal of such attempts is to show that their enquiry is scientific.

The first part of this chapter will carefully examine the theoretical approach and to a small extent the experimental one based on an abstract symbolic approach, namely generative grammar. Several research programs such as Lexical Functional Grammar (LFG), Head driven Phrase Structure Grammar (HPSG) and Categorial Grammar (CG) (to name three) have emerged out of the broader generative grammar scheme. In this chapter we consider the programme that has been associated with Noam Chomsky. The choice of that is based on the impact of his views on the discipline as a whole and its philosophical implications.\(^4\) Although this chapter specifically focuses on Chomsky's 1995 paper, this is a larger criticism of the Chomskyan programme, which started in 1957 with *Syntactic Structures* and still continues with advances on his *Minimalist Program* of 1995, a slightly earlier version of which he refers to in this *Mind* article.\(^5\)

Following this, there is a note on experimental approaches to linguistics. There is a lot of experimental work on psycholinguistics which is based on research in the theoretical generative linguistics. But what will be used as a foil to the generative

\(^3\) With anthropologists like Levi-Strauss getting influenced by de Saussure, structuralism later came to have broader impact on the social sciences.

\(^4\) Many of these other programmes are based on the basic premises of generative grammar. They are refinements or offshoots of Transformational Generative Grammar, which Chomsky started in MIT in the late 1950's.

\(^5\) Textbooks written by scholars inspired by Chomsky's generative grammar also make strong claims to being a science. For example, see Andrew Carnie, *Syntax: A Generative Introduction*, 2nd edition, (Wiley-Blackwell, 2006).
theoretical studies would be approaches to articulation and perception which are based on a more 'direct realism' model. Experimental studies, especially those having to do with a 'direct realism' approach, cannot be excluded from scientific work if we go by the idea that science deals with facts that are obtained by our senses. Thus alternative perspectives based on the real time production and perception of language and functional aspects of language (as opposed to the symbolic approaches) will be brought in. It is important to consider those because they work with a different set of assumptions and methods. The practitioners of articulatory phonology, with a strongly empirical and experimental bend, have a more directly real epistemological position because for them the object of study is the language that is more directly observable around us. For examining articulatory phonology, I will be using an article by Louis Goldstein and Carol Fowler, in which they discuss the model, its assumptions and methods in detail.\(^6\)

**Generative Linguistics in the Chomskyan Tradition**

In the 1995 paper, Chomsky makes a proposal for a naturalistic study of language using an internalistic approach. His basic idea of science and the issues he engages with have been similar even almost two decades after that paper. So there is not really a question of the analysis in this work becoming obsolete. He also tries to provide justifications for his approach. In this detailed and careful piece, he tries to argue how only a certain type of enquiry into the nature of language can be scientific. The way he sets the boundaries for his inquiry by focusing exclusively on the study of computational processes of combinations after seriously considering issues of reduction of language research to brain studies and questions of society and power is a formidable exercise in intellectual discipline. However, there seem to be a few problems with this analysis because he seems to be working with restricted definitions of language and limited notions of science. So in this chapter, we will first try to understand his position by summarising his arguments and then point out some problems with this approach, which we will elaborate in the future.

---

A simple but significant observation that Chomsky makes is the ease with which the human child acquires language. This leads him to the hypothesis that human beings are biologically pre-wired to acquire language. So he contends that the basic principles of human languages are the same on account of all of them being connected to the biological category 'human'. So one of the major theoretical goals he has is to uncover the principles that underlie human languages. In many of his works, he also makes the point from a thought experiment that a highly intelligent Martian scientist (who can look at human beings with some amount of detachment) would observe that every member of the human species has a similar system of language. Then they would try to uncover the basic rules of this system. Chomsky's 'generative grammar' or biolinguistic programme is a research enterprise that works with this objective.

Generative grammar is a conception of language in a mathematical manner. The idea of set theory is used for that. A grammar is conceived as a set of rules which outputs or generates sentences in the language. A language is seen as the totality of all of the sentences it generates. Chomsky had studied the formal properties of languages in his early work. Chomsky and his group examined Context Free Grammars and showed how they were inadequate for explaining the syntactic regularities in natural languages.

The generative framework is not completely new in using formalistic techniques. Structuralists before him had been using them; Zellig Harris is credited with the original use of transformations which Chomsky developed in his 1957 model. But what was new with Chomsky after his publication of his review of Skinner's *Verbal Behavior* is that he brought in a strong psychological component to explanatory accounts on language. Partee (2011) succinctly captures the formation of the science of linguistics in its twentieth century American variety:

---


9 Barbara Partee, “The History of Formal Semantics, with Special Attention to Quantification,”
Starting from linguistics within philology (Europe) /anthropology (US), adding a mathematics-influenced “science” perspective, linguistics emerged as a science. Part of the Chomskyan revolution was to view linguistics as a branch of psychology. According to Chomsky, there are certain questions that come within a naturalistic enquiry of language and some which do not. The question of ‘intentionality’ is one which does not come within that. What Chomsky proposes to make is an internalistic and naturalistic enquiry. He defines an internalistic enquiry as the study of the internal state of an organism. However, an enquiry can be naturalistic, yet not internalistic. For him, the study of language is part of an internalistic enquiry into the human mind. Non-internalistic naturalistic enquiry can be about communities and societies. This is not to dismiss the value of other types of inquiries. For example, Chomsky accepts the usefulness of learning history and reading novels in order to understand people’s thoughts, feelings and actions. Such matters – the way people think and feel and act – are broad questions, which cannot be approached by naturalistic inquiries. Naturalistic inquiries are useful only in narrow domains (p 28). Chomsky speculates that the reason for the association between narrow inquires and naturalism might have to do with the cognitive nature of humans.10

Chomsky's naturalistic enquiry is into the mental and linguistic aspects of the world. The linguistic aspects are also considered part of the 'mental aspects' because language is seen as a part of the mind. However, the word 'mental' has for long had a reputation of dealing with a kind of domain completely different from that of material objects. The origin is roughly traced back to the mind-body dichotomy of Descartes.

Chomsky tries to convince us that he uses 'mental' just like one would use the word 'electrical' or 'chemical'. He starts with stating the idea that the object 'language' is also an object in nature, like molecules, electrical fields and the human visual system. He makes it clear that the hope that drives the project is a gradual unification of the studies of

---

10 Chomsky suggests in “Language and Nature” (p.16) that human beings might have an innate ‘Science Forming Faculty’ (SFF), similar to the innate language faculty.
linguistic and mental aspects of the world with the “core natural sciences.” In Chomsky’s conception of how language has to be scientifically studied, the linguistic aspects of the world come under the mental. He goes on to say that unification problem has been faced in the core natural sciences also, when chemistry got unified with physics and biology, for the most part, got unified with chemistry. The unification of the study of mind with cellular process of the brain also seems likely and about to happen, probably with a radical change in the way brain processes are understood. Looking at the state of the research on mind and brain as it exists now, we cannot make the assumption that questions of the mind can be reduced to brain studies. A rational assumption to start with would be that human intelligence is limited by “initial design,” which has to do with the fact that human beings belong to the natural world. A major transition that could happen in mind-brain research would be if the questions ceased to be “mysteries” that can only be marveled at and became “problems” that we can aim to solve, even if they are tough.

Chomsky notes that around the beginnings of 'modern' science, the predominant epistemological view was “mechanical philosophy.” The whole physical world was supposed to have been working because of an intricate arrangement of everything like parts of a machine. The assumption here was that everything happened because of physical contact between various components that made the machine the world was thought to be. Descartes realised that 'thought' was something which did not work this way and this understanding was central to the idea of mind-body dualism, a philosophical idea that still continues to have an important influence on the study of mind, brain and cognition. This is the reason why a different epistemological treatment is given to issues relating to the mind as opposed to the issues relating to the material world.

As mechanical philosophy was considered central to explanations of phenomena, Newton's discovery of gravitation created a major furore in intellectual circles of his

---

11 This is because he notes that the more fundamental of two disciplines – the one to which the other is attempted to be reduced to – has to change for such unifications to take place. For example, physics had to go through a quantum revolution in twentieth century before chemistry could get unified with it.

12 See also Noam Chomsky, New Horizons in the Study of Language and Mind, (Cambridge: Cambridge University Press, 2000).
times because there was no physical contact that could be given as the reason for the idea of gravitation. This was interpreted as a regressive step into the world view of the middle ages, during which people were thought to give magical and supernatural explanations for phenomena. Newton himself agreed that there was no mechanical explanation that could be given for gravitation. But looking at that period in the history of science from our current position, it seems Newton was right. Chomsky's point is that if we work with the ideological assumption that mental categories cannot be studied as scientific questions, we will not be able to make progress on our understanding of mind using 'tools of rational inquiry'. If a commitment to the reduction of mental categories to brain categories formed the background of our intellectual pursuits, that would hinder certain kinds of research questions altogether. The approach that insists on reduction of mental things to neurological things might also prove to be an obstruction to useful investigations into the nature of language and mind.

This drive to reduce to brain-level explanations, Chomsky claims, in the study of mind is a result of a naturalistic picture of the world which is understood on the basis of a narrow definition of the materialist view. He observes that the materialist view changed in the history of science with Newton's discovery of gravitation and subsequent developments in physical sciences. In the present day, theories of physical nature have gone so “obscure” by invoking “mysterious” ideas such as “curved space” and “strings in ten-dimensional space.” So what we understand from these new notions is that there has been a major reconceptualisation of what constitutes a materialist world picture. He claims that what we mean by such a picture of the world is whatever science constructs, irrespective of how far it departs from “mechanical causes,” which in some sense were more in line with 'common sense.' Now the condition is not that the theory should adhere to common sense, but that it should be an “intelligible explanatory theory”. By eighteenth century, even philosophers like Hume had accepted that some of the

---

13 It is entirely consistent with Chomsky's thinking that the science forming faculty in human beings works by defining narrow domains and using abstract concepts which need not be quite intuitive. From this perspective, science does not seem to be an extension of common sense.
explanations of science would not be all that transparent. Although the rejection of the mechanical philosophy meant that certain aspects of scientific explanations remained obscure, some "scientific naturalists" have continued to question a certain level of agnosticism that the denial of mechanical philosophy has forced on us. What Chomsky achieves to do by showing the example of the breakdown of the mechanical philosophy in physics following the works of Newton is to show that there should be no dichotomy between studies of material objects and mental objects. In other words, this might imply that the mind-body problem is not a problem any more.

In another article in which he deals with a similar theme, Chomsky limits the scope of his enquiry to the idea of 'language' in a narrow sense. As in the previous example about physicists abandoning the mechanical philosophy, here he makes an argument in support of studying language in a narrow sense by making an analogy with the study of locomotion. He observes that just as there is no overarching theory of locomotion which explains the motion of a range of objects from an amoeba to an eagle to a spaceship, there cannot be a highly inclusive theory of communication which explains the modes of communication of cells to human beings to dolphins or extraterrestrials. It can be inferred that this is why he carefully defines the sense of 'language' as he uses it for a 'naturalistic inquiry'.

In the 1994 paper, Chomsky had brought up a point about eliminative materialism. Eliminative materialism is the idea that the way the mind and aspects of the mind are understood leads to an incomplete theory which does not tie in neatly with a materialistic explanation concerning those aspects. This suggests that we should concentrate on neurophysiology instead of on mental objects. Such a position, Chomsky says, has a past parallel to the view that chemistry should be superseded by a study of material particles in


15 However, as we pointed out earlier, in a 2002 article ("The Faculty of Language: What Is It, Who Has It, and How Did It Evolve?") which appeared in the journal Science, Chomsky, Hauser and Fitch makes a distinction between a broad sense of language, as it applies to several species (Faculty of Language in a Broad Sense – FLB), and a narrow sense of language, as it applies to human beings (Faculty of Language in a Narrow Sense – FLN).
motion (physics).

He argues against methodological dualism, which means that physical or natural sciences can use a method of enquiry different from the studies of the mind. It would mean that the level of obscurity or abstraction allowed in physical sciences is not permissible in studies of the mind. This problem arises because of certain philosophical questions that have come up in relation to the study of the mind. The reason why thinkers have argued for methodological dualism is that it does not make sense to assume that matter has intentionality. A pertinent point in this regard was Alan Turing’s question of whether machines can think or not. Chomsky’s position about that question is simply that it is a decision someone makes as to whether the metaphor of ‘thinking’ can or cannot be applied to machines. Searle’s (1980) Chinese room thought experiment is an interesting illustration of the problem of whether a machine or a program can think or understand. In that thought experiment, Searle asks whether a machine that gives a correct written Chinese response to a Chinese question by following certain pre-given instructions about responding to Chinese by drawing characters in Chinese can be thought to know Chinese. Searle refutes the strong AI position that the machine understands Chinese and claims that it is not possible to distinguish between understanding and a simulation of understanding (by means of a computer program). His conclusion is that a program might be able to give a technically correct response, but it is not sufficient for producing intentionality.

The question of intentionality seems to crucially depend on whether the mind exists or not. Chomsky asks how we would relate intentionality to asteroids, bees, chimpanzees or human beings when we talk about asteroids aiming towards the earth, the bee flying to the flower, the chimpanzee reaching for the coconut or the man walking to his desk. What he shows through this example is that we still have not evolved precise

---

17 In fn 3 of John Searle, “Minds, Brains and Programs,” intentionality is defined as: “Intentionality is by definition that feature of certain mental states by which they are directed at or about objects and states of affairs in the world. Thus, beliefs, desires, and intentions are intentional states; undirected forms of anxiety and depression are not.”
terminology to talk about the intricacies involved in these events, which is why we express these using everyday words which signify intentions.

In terms of what we know about the relationship of thought and language with material causes relating to the brain, Chomsky notes that we have not gone far beyond what Priestly and others knew about chemistry in the eighteenth century. Although it is true that we have made important advances in our knowledge of the brain, our understanding of the connection between mental aspects of language and the brain-level aspects has not progressed significantly.

He then goes on to give an overview of the research that has been happening aimed at unifying studies of the mind and brain. Surveying research on notions of discreteness and continuity and electrical activity of the brain, he notes that there has been some advances albeit at the basic level.

He suggests that the reason for variations among languages may be morphological factors. Some languages are morphologically rich (synthetic), like German or Hindi, or an extreme example would be Sanskrit. Some are only moderately so, like English; and some others very poor (analytic) – such as Chinese.

Chomsky notes that there are empirical reasons for thinking that computational properties of how linguistic units are combined maybe a unique system. He gives the example of a person who was studied by Neil Smith and his research group. This person was a remarkable example of the idea of the autonomy of various 'modules' of the mind. He knew about 16 languages but had major deficiencies in his cognitive capacities, including difficulty with daily chores like putting the buttons of his shirt into the right holes. There was an experiment that demonstrated that his linguistic ability was restricted to natural languages and did not include artificially constructed languages.

---

18 In a morphologically rich language, an individual word would potentially have several morphemes attached to a root word; the opposite of that would be languages in which one word would correspond to one morpheme.


When he was taught a human language that was new to him as well as an artificial language which had carefully constructed violations of rules of human languages, he picked up the human language easily and had difficulties learning the artificial one. On the other hand, a control group treated the artificial language as a puzzle and could figure out the problem using their cognitive capacities and solve it. But this control group was not so successful with the natural language. What this showed, in turn, is that the features of natural languages dovetailed nicely with a special ability with respect to natural languages. As his was an extreme case of showing the modular nature of the human mind, what this result seems to suggest is that human mind is well-suited to pick up the features of human languages. This position of Chomsky's, to paraphrase Pateman (1987), can be described in the following way.\(^{21}\) The human organism does not treat the primary linguistic data as an entirely new thing; she meets it halfway because of her biological predisposition to learn it.

A special feature of language is that it is modality-neutral. It can be articulated and perceived through sound as well as the visual modality. Chomsky notes that even more extreme cases of the modes through which linguistic competence gets presented are available.\(^{22}\) These facts as well as the studies about the 'linguistic savant' show the autonomy of the language faculty.

Studies of acquisition of words also show that syntactic knowledge helps children obtain the meanings of words, which points to the autonomy of syntax. He briefly discusses the problems with traditional and structuralist approaches to the study of grammar and goes on to mention the principles and parameters model, according to which the principles of language are universal because of their biological origins and variations are because of differences in a small number of feature settings. So, he thinks it is unnecessary to look at grammars of individual languages in minute detail. This, Chomsky says, was the approach followed in traditional and structuralist grammars. Such


approaches, which focused on rules and constructions that are language-specific, continued up to the time of early generative grammar.23

There are certain clear limitations to human conceptual structures. The first example Chomsky gives is that if you are standing near a house, you must be outside the house and not inside the house although logically there seems to be no reason why the latter cannot be true. The second example is that if somebody says she is painting her house brown, the meaning one gets is that what is referred to is the outer surface of the house and not the inner one.

Regarding word meaning, Chomsky shows that no convincing externalist accounts have been given. He goes on to describe the problem Putnam had raised using the example of the meaning of 'water'.24 According to Putnam, meaning is something external, something defined by the scientific community. There is another notion of externalism and the difference between Putnam's position and Burge's position is captured by JeeLoo Liu (2001) as follows:25

It is generally conceived that Putnam's view is a version of physical externalism, which argues that factors in the physical environment play a role in determining the meanings of natural kind terms. Burge, on the other hand, is regarded as following up Putnam's argument to bring in factors in the social environment for the determination of belief. Burge's view has been commonly referred to as 'social externalism'.

Bilgrami (1992),26 on the other hand, takes the position that word-level meaning is more closely associated with individual beliefs and is not in favour of a position that calls for externality of meanings based on 'independent reference' or notions that give extreme importance to contextual factors. Although Chomsky clearly indicates his support to this position, he has generally been circumspect about the status of semantics. In his 1995 paper, he suggests that a use-oriented approach to meaning is more correct than a

---

23 According to Chomsky, the founder of the movement, generative grammar marks the beginning of a revolutionary new era in the study of language and mind.
Fregean approach based on compositionality and truth-conditions.

Chomsky's view of language, as pointed out earlier, is that it is an internal generative procedure that relates sound and meaning. The technical word he uses for the object of his enquiry is I-language, defining it as “a strictly internalist, individualist approach to language, analogous in this respect to the study of the visual system.” What is contrasted to this is E-language, which Pateman (1987) defines as “an (intentional) object of (mutual) belief, appropriately studied hermeneutically within a sociology of language.” Pateman's project was to defend Chomsky's science of language against its detractors such as Itkonen (1996), who point out its problems.

Chomsky does not think of E-language (E for 'external' or 'extensional') as the object of enquiry for naturalistic approaches to linguistics and he does seem to consider this as a 'legitimate' externalist enquiry that comes under sociolinguistics (p 50). We could infer that Chomsky's position is that sociolinguistics is not a scientific enterprise because it is externalist in nature, although he does not state it explicitly.

Chomsky makes a clear distinction between the cognitive system and the performance system and what according to him is a naturalistic enquiry studies the cognitive system, which is what he means by the I-language. One evidence he gives for the separation between the cognitive system from the performance system are the attested examples where the performance system is damaged and the cognitive system remains in tact. He also accepts the possibility that performance systems maybe specialised enough to fit in very well with a cognitive system. But that would not make the proposal of an independent cognitive system unnecessary.

He distinguishes between two ideas that might get conflated under the notion of I-language (p 18). This distinction was made as part of the statement of the principles and parameters approach. The state of the language faculty at any given point is different.

---

27 Trevor Pateman, _Language in Mind and Language in Society_, 73.
from the “instantiation of the initial state” after the parameters are set in response to the language the human infant is exposed to. The state of the language faculty might depend on or be associated with a variety of factors, out of which only a subset would be related to an “inquiry into the nature of language.” What is of interest to Chomsky is the instantiation of the initial state and not the state of the language faculty because the former seems scientifically tractable and the latter does not. What is epistemologically interesting here is a kind of idealisation, a well-attested feature of natural sciences.

Chomsky asks his critics if there is any principled reason why such idealisations are barred in linguistics, whereas they are fine in physics. He defines this idealisation as “the procedure we follow in attempting to discover reality, the real principles of nature.” Then he goes on to say that such enquiry has led to asking new questions such as how far these “principles themselves can be reduced to deeper and natural properties of computation”. For example, two operations he presents in the minimalist program as fundamental to language are ‘merge’ and ‘move’. Boeckx (2006) discusses the relevance of merge and argues that the current Chomskyan requirement of binary branching follows from that. Moreover, the processes of external merge and internal merge are argued to be sufficient in order to explain the linguistic properties of recursion and movement of units to other structural positions (what Boeckx and others call ‘displacement’).

In the nativist framework, language acquisition is thought of as a process that involves the application of innately specified rules on a given language. Based on her exposure to the ambient language, the child makes hypotheses about it and fixes the states of its parameters. This process leads to the formation of I-language in the child's mind. In that sense, some linguists have thought of a child who is acquiring a language as a

---

30 At this point we might note the use of words like 'deeper' and 'natural' (which I have italicised in the quote; it is not so in the original), which illustrates Chomsky's rhetorical power, an aspect we will explore in more detail in chapter 6.
32 This is different from Charles F. Hockett’s sense of ‘displacement’ where he refers to the property of language that humans can talk about things that are not present in the immediate context (“The Origin of Speech,” *Scientific American* 203 (1960) 88–96).
“miniature scientist” who goes through stages of hypotheses making and confirmations or falsifications. According to this picture of acquisition, the uniqueness of the language-acquiring child as opposed to the scientist is that she goes through these steps in an unconscious manner whereas for the scientist, it is a very conscious process.

He specifically takes up the issue of the relationship between the conceptual world and language. He discusses the problem of referentiality because that is usually the first theory of meaning that anyone starts with because of the apparent connection between a word and the object in the world that gets talked about. One of the problems faced by a view of meaning based on referentiality is that words in human languages seem to be used with a degree of looseness in meaning. For example, one might say that lobsters are the targets of excessive fishing in New England waters and still not mean that lobsters are a type of fish. There are also the well-known problems about the non-referential meanings of quantifiers.

Chomsky goes on to consider some of the problems that come up while studying mental objects. There seems to be a perception that accounts of mentalist objects should be informed by common sense. He says that just as sciences like physics and chemistry give explanations that involve theoretical vocabulary and go much beyond common sense and ordinary descriptions such as 'John took his umbrella because he expected rain,' linguistics can also go beyond descriptions such as 'he speaks Chinese.' The scientific status of common sense entities like 'Chinese' is in question. The problem with common sense accounts, Chomsky notes, is that they are imprecise. In a naturalistic enquiry of language, a word like Chinese would be imprecise. Although it has a social, cultural and political sense, it is not defined precisely enough for it to be a scientific object. He notes that there need not be even a correspondence between common sense notions and precise formulations.

Chomsky points out that it is not possible to draw clear lines between linguistics, psychology and brain sciences with respect to the variety of possible and relevant

---

questions which may be asked (p 33). To elucidate this point also, he uses the analogy with the “hard sciences.” In hard sciences, there are questions that might be addressed by both biology and chemistry, or chemistry and physics. Note that this is a continuation of his rejection of methodological dualism.

This sounds similar to the question that was addressed by Devitt and Sterelny earlier. Can we have a sophisticated (conceptually precise) view of domains that come under natural sciences and hold a grandma's approach towards mentalist domains like linguistics? Chomsky shows his discomfort at such double standards which discriminate mentalist disciplines as opposed to physical sciences. He notes that methodological dualism has been advocated for investigation into language because a psychological theory does not suffice, a higher level goal of philosophical explanation has to be given also. Chomsky does not give much value to the requirement of a philosophical explanation, considering it simply a terminological matter. In fact, he wonders why studies on language need to meet this criterion of philosophical explanation whereas no further requirement than best fit to facts is imposed on studies of other aspects of the world.

Chomsky points out that though anybody might judge that it is an instance of rule following when a child produces one (apparently ungrammatical) sentence with a regular rule application to get the past tense form of an irregular verb, only a linguist trained in careful analysis of narrow domains of language would notice children's adherence to principles governing interpretations of pronouns and reflexives (binding principles). Another example Chomsky discusses as part of his attempt to illustrate the type of questions that come under an internalistic and naturalistic enquiry of language is the part of generative programme that deals with pronoun reference, known as 'binding theory.'

35 Devitt and Sterelny (1989) try to clearly indicate that their idea of grandma's view of linguistics is not one which is fraught with sexism and ageism, instead they claim that the grandma's view is about linguistic units and their combinations and not about the abstract concept of 'competence', which Chomsky holds.
He shows the contrast between *John expects to like him* and *Guess who John expects to like him*. The pronoun (him) in the first sentence cannot refer to 'John' and the one in the second can refer to 'John' or some other person.

Chomsky responds to the demand of philosophical explanation by pointing to us the naturalistic turn in American philosophy that happened in the 1960's. It means that our philosophical accounts of language have to be naturalistic. In other aspects of the mind such as consciousness, Chomsky contends, our understanding has not progressed beyond descriptions and illustrations of phenomena. We are far from giving explanations at the 'physical' level of brain cells. Difficulties in description clearly exist in the case of language. In that domain, we do not have brain level descriptions; nor do we have commonsense expressions which give a precise sense. He gives the examples of the linguistic systems of a cognitively challenged subject (Laura) and his 4-year-old granddaughter.

Chomsky refers to Akeel Bilgrami's point that meaning is related to individual belief. Bilgrami says that there are shortfalls in all the externalist accounts of meaning – Kripke's causal-historical view and Putnam's causal-essentialist view, which ultimately depends on definitions made by the scientific community, Burge's social view and Fodor's causal-information-theoretic view.

Chomsky goes on to respond to arguments against internalist approaches to the study of language. He discusses Lynn Baker's (1988) locust-cricket example, which is a thought experiment about how two individuals' differing beliefs about an object lead to two different groups having different beliefs about a single word. This situation is reinforced by the fact that the two groups migrate to two different places so that there is no chance of language contact between these groups. Also, there is an added condition

---

37 Yamada, *Laura*.
that the languages spoken in these different places are also different from where the individuals originally started from. Further, the original migrants teach the concept to their descendants and that is how the specific beliefs of the two individuals get passed on to the respective future generations. To cut a long story short, what she tries to show is that a set of external circumstances seems to influence word meanings. Chomsky responds to the scenario discussed in this thought experiment by noting that such matters might be of interest to a more or less surface-level 'ethnoscience' or 'linguistic semantics.'

Chomsky claims that matters of how circumstances impact word meanings are not relevant to how individuals attain cognitive states, thus suggesting that issues of cognitive states would be understood by internalistic enquiries. He argues that the mere fact that an individual X's thoughts are available to an individual Y does not indicate that the external world determines the contents of their thoughts. It could come from the much simpler assumption that X assumes that Y’s mental state is the same as X's. Here Chomsky makes a very radical analogy, which is in line with his naturalistic argument for the treatment of mental objects. The argument is that just like there is no external reason why a sound like a bilabial stop has to be related to a certain kind of motion of molecules, there is no reason why external objects have to be related to contents of thoughts. The fact that individuals are able to communicate, Chomsky writes, does not also suggest that different individuals have access to the same external content of thought because communication is often imprecise.

Chomsky goes on to argue that it is not at all clear how to define an externalistic naturalistic way of studying language. He contends that although a naturalistic approach to an investigation into language does not entail an internalistic mode of enquiry, concerns of clarity of enquiry leads us to that. However, he asserts that it is not his position that an externalist enquiry is entirely out of a naturalistic orientation in studying language, as it is often misunderstood by practitioners of sociolinguistics, a field which he considers to be a valid enquiry, as mentioned earlier. We might also recall that when he
introduces the idea of an internalist enquiry into language (p 28), he notes that internalist inquiries are as important as externalist inquiries and usually the former form a necessary base for the latter. He notes that although sociolinguistics borrows methods from an internalist approach, presumably in terms of patterns of internalised rule following in phonology, morphology and syntax, it has not come up with an approach that is different from it. Chomsky is wary of mixing up a scientific investigation of language with a general attempt to understand aspects of understanding various aspects of language, which he refers to, slightly disparagingly, as 'ethnoscience.' The reason why he keeps it distinct from his 'scientific' enquiry is that he thinks it is a very general and everyday way of understanding and speaking about the world.

Putnam's Twin Earth thought experiment is one type of externalist theories of language and thought. Putnam tries to show that meanings are not in the head, but in the world outside. Specifically it is decided by a group of experts (in this case, scientists) who claim authority on the nature of substances. Another type of externalist theories is that meaning is about authority to a powerful group that fixes meaning. Chomsky contests this by noting that Putnam's use of the word 'meaning' is non-technical, which leads to that kind of conclusion.

Chomsky indicates that the analyses done by sociologists and cultural studies scholars do not form serious enough scholarship because they make use of ordinary everyday vocabulary while talking about serious aspects of language. In order to make a serious study of language, the terminology has to be clearly defined, as he and his colleagues try to do in an internalistic exploration into language. Words like 'meaning' and 'reference' have to be clearly defined. Although the sociological or cultural studies oriented approach to language maybe naturalistic, it is not a serious one which leads to a precise understanding of language.

Chomsky does think that there are such things as languages – Malayalam,

---

39 Here he makes the curious observation that the question of how sociolinguistics "illuminates issues of power and status" is a separate one; he seems to suggest that he is suspicious of that claim.
Chinese, etc., – in an ordinary conversational sense of the word. However, if one wants to 
seriously investigate it, the sense of the word 'language' has to be much more precise. 
That is what he and his colleagues try to do in the generative grammar programme which 
follows an 'internalist' and 'naturalistic' approach.

Chomsky's view is that the approach based on reference leads us to the truth 
conditional theory of meaning.\(^{40}\) That view has a long tradition in the twentieth century, 
dating to the correspondence theory of truth. Semanticists who work with that approach 
adapt Frege's ideas, which were originally proposed for explaining arithmetic, to natural 
languages. One of Frege's major contributions to the study of meaning is the application 
of the idea of functions and arguments to make sense of semantic compositionality; that 
is, the question of how meanings of words combine to form the meaning of a sentence. 
Predicates act as functions and names as constants which refer to objects in the real 
world.

According to Chomsky, this is not the way to understand language as a natural 
object. He thinks that it is a dogma that the idea of compositionality makes perfect sense 
in logic; but is not applicable to natural languages. Wittgenstein's ordinary language 
philosophy and Austin's emphasis on 'doing things with words' clearly showed the 
inadequacies of an approach to meaning in language which is based only on logic.\(^{41}\) In 
Chomsky's view, the logic-based methods of formal language analysis are not applicable 
to natural languages.\(^{42}\)

The idea of verification is important in semantics or the study of meaning. In truth 
conditional semantics, the way in which the meaning of a sentence is arrived at is by 
checking the truth of the statement in the real world. For this, an abstract and language-

\(^{40}\) For influential earlier work on reference, see B. Russell, "On Denoting," *Mind*, New Series, 14, 56 

\(^{41}\) Ordinary language philosophy is associated with later Wittgenstein. See Ludwig Wittgenstein, 

\(^{42}\) Partee, “History of Formal Semantics.”
independent idea of ‘a proposition’ is made use of. Thus the sentence ‘Sankaran climbs the coconut tree’ would be true if the proposition $p$ corresponding to that English sentence is true. In spite of the abstract vocabulary, all it does is to check whether Sankaran really climbs the coconut tree. If he does, the sentence is true and if he doesn’t, the sentence is not. The assumption here is that you are able to get the meaning of an utterance if you are able to give a truth value – either True or False – to a proposition.

The roots of truth conditional semantics go back to the school of logical positivism, a movement in philosophy that sprung in Europe in the 1930s. The advocates of this were empirically oriented and skeptical about unverifiable ideas like mental states and thoughts, they insisted that every serious statement be grounded in the real world. So in their view, meaning had to be seen in terms of the real world and not spoken of in abstract, personal and mental terms. Later, there was a decline in the influence of the school of logical positivism. However, formalisms based on a combination of truth conditional semantics and the idea of compositionality are used commonly in contemporary semantics. It seems to be a paradox that the marriage between a strongly mentalist generative grammar enterprise and an approach to meaning which has strong empirical roots has survived for several decades.43

The way Chomsky looks at language – as a generative procedure that relate pairs of sound and meaning – does appear to even a casual observer as a restricted view of language. So a charge of idealisation at the expense of dealing with real situations is laid on Chomsky. When faced with that charge, he defends his position by claiming that this

---

43 Chomsky's proposal that perhaps the study of meaning has more to do with how language is put to use than to linguistic semantics gets support from performative verbs and imperative sentences. Performative verbs perform some function in the real world such as ‘declare’ in ‘I hereby declare the meeting open’ or ‘name’ in ‘I now name this baby Nim Chimpsky’. Imperative verbs are those that demand to be carried out necessarily by the person spoken to. An example is ‘leave’ in ‘Leave the room now’ or ‘jump’ in ‘Jump out of the window’. Questions also do not have a truth value, unlike a sentence like ‘I saw two king cobras outside this building’. Another problem for truth conditional semantics was the availability of meaning for sentences with words referring to imaginary entities such as ‘I photographed a flython last night’ (a ‘flython’ is an imaginary species -- a flying python). Obviously, you can never check the truth value of this sentence because there is no flython in the real world, as far as we know. (These examples are mere adaptations from original pieces on performative verbs and literature on references, discussed in William Lycan, Philosophy of Language: A Contemporary Introduction, (New York: Routledge, 2008).
is how more evolved sciences like physics works. A physicist will not think that his job is to explain the objects and their motions in the world around him because that is far more complicated than the model he is working with. However, by resorting to idealisation, he is able to explain at least a part of the phenomenon he is exploring with a great deal of clarity and precision in such a way that it is open to being tested. Similarly, Chomsky claims that linguists who follow his naturalistic approach to language are able to explain at least a part of the phenomenon of language with great clarity producing testable generalisations.

A Note on Experimental Studies in Linguistics

To study language as an object, as linguistics aims to do, is very difficult because of the complexity of it and the way it connects to various other aspects of the world. In this section, we look at some of the experimental approaches adopted in investigating into language. As theoretical linguistics make use of a formal language to develop explanatory accounts of language, experimental studies make use of elaborate designs and statistical analyses to arrive at a deeper understanding of knowledge and use of language. The fields of psycholinguistics and neurolinguistics are experimental fields which test hypotheses made by theoretical linguistics and psychology. Experimental studies may confirm or falsify principles proposed by theoretical linguistics. Or they might refine explanations by bringing in factors of memory or world knowledge, aspects which a theoretical account may miss. Generally the experimenters are extremely careful about designs and use as null hypothesis an idea opposed to the one they theoretically support. This is to avoid the experimenter’s bias towards an explanation she tends to favour. As standard practice in all experimental studies with human subjects, in addition to the test group, the experimenters also run the study on a control group. In psycholinguistics, reaction time studies and comprehension tasks are very common. Neurolinguistics makes use of observations of electrical activities in parts of the brain or blood flow in the brain.

44 The choice of the generic pronoun 'he' for the physicist is deliberate.
45 Among more empirical enquiries, there are also longitudinal studies, such as the ones studying language development over months. This is treated differently from experimental studies.
Elaborate calculations are made in order to minimise the ‘noise’, the effects of the complex neuronal activities of the brain which are unrelated to the linguistic task.

Sociolinguists adopt careful methods to study effects of social groups on language. They might look at correlations between group-identities and certain linguistic features. For example, they might have the hypothesis that people of a particular social class in New York City would pronounce ‘r’ and it would not be pronounced by people of the contrasting social class.\textsuperscript{46} No matter what they study, they would follow very careful data collection and analysis, be it the grammar of pidgins or creoles or the effects of sexual orientation on the frequencies of vowels.

Theoretical linguistics often collects its empirical material from native speaker intuitions about grammaticality and acceptability of sentences. Psycholinguistics studies the language-mind connection by conducting different types of experimental studies. As the field aims to study the mental processes involved in the production, understanding and acquiring of language, it constructs experiments to test hypotheses regarding these. Reading tasks involving eye tracking and reaction time studies are common in psycholinguistics. Such experiments test semantic priming effects, effects of syntactic structure on parsing and various other syntactic effects based on filler-gap dependencies.\textsuperscript{47} For example, consider the experiment done to test knowledge of filler-gap dependency in 15- to 20-month-old children by Gagliardi, Mease and Lidz.\textsuperscript{48} It specifically looked at the dependency between the wh-word and the gap in sentences where the wh-word was extracted from the subject position and the object position. Note that the extraction from the subject position involves a short-distance dependency whereas the extraction from the object position involves a long-distance dependency. The method used was by showing


\textsuperscript{47} The basic idea of a filler-gap dependency involves instances where words or phrases get displaced from their default positions. When the unit gets displaced, it is said to leave a gap. Since the framework assumes a mapping between syntactic structure and units of meaning, the meaning of the sentence is arrived at by reconstructing the displaced unit in its original position.

children videos of engaging puppets.

In addition to principles proposed by theoretical linguists, experimental studies also test principles in pragmatics such as implicatures. If a structural reanalysis of the syntax of a sentence is needed while parsing it, it will be predicted that the subject will show a delay in comprehension when she reaches the confusing part of the sentence.

Language acquisition studies are an interesting subclass of research in psycholinguistics. A typical psycholinguistics experiment is usually very well-designed and thought out in detail before it is executed. As an example, let us look at how an experiment for testing how children interpret pronouns and reflexives in a sentence. The aim of the experiment is to find out whether children’s interpretations of sentences involving these items are the same as those of adults and if it is not found to be the same, to give reasons for the difference. There is a type of experimental task called the Truth Value Judgement Task (TVJT). The child subject is made to judge whether a sentence is true or false. The sentence is presented in the context of a story because in natural language use, a sentence is used in a particular context. The story is presented by two experimenters, one the story-teller and the other a funny commentator who gives voice to a puppet. The experimenter who lends voice to the puppet’s character is made to look funny in order to reduce the child subject’s attested tendency to agree with an adult who looks serious and mature. Since the experiment is done by researchers who are testing out

---


50 A reasonably well-studied set of sentences that requires reanalysis of the structure ascribed to it by the user has to do with the ‘garden path’ effect. An example for a garden path sentence that is easily recalled from linguistics classes is the following: ‘The horse raced past the barn fell’. The verb ‘raced’ would lead the reader give a particular structural analysis to the sentence with ‘the horse’ as subject and ‘past the barn’ as a direction indicator. When this is followed by the occurrence of another verb ‘fell’, the reader is confused and is made to go back to the beginning of the sentence and give a passive-like structure to the sentence similar to ‘the horse that was raced past the barn fell.’

51 Pronouns are words such as he, she, it, him, her and they. Reflexives are words such as himself, herself, itself and themselves. Their interpretations are said to involve intricate structural knowledge which involve the relation between a name and a pronoun/reflexive with respect to a particular structural configuration called C-command. The node P is said to C-command the node Q if the first branching node dominating P dominates Q.

52 The author has personal experience working as an experimenter of studies that used the Truth Value Judgment Task. For details on the TVJT, see Crain and Thornton, *Investigations in Universal Grammar.*
certain principles supposed to be governing the interpretations of pronouns and reflexives, the null hypothesis would be that the children do not know these principles. This is to make sure that there is no experimenter’s bias. The number of subjects and the number of sentences that are tested in their contexts will be large enough so that statistically significant generalisations can be made. A number of adult subjects are tested as controls to ascertain that the assumptions about the adults’ interpretations are indeed correct. These are used as the baseline against which children’s interpretations are measured.

With the emergence of new techniques to study the brain, it has now become possible to observe the brain while some linguistically relevant process is at work. For example, there are ERP (Evoked Response Potential or Event-Related Potential) or EEG studies, which test the electrical activity of the brain while it is trying to comprehend a sentence. This involves complex calculations of addition of the signals detected by the multiple electrodes placed on the subject’s scalp and the subtraction of irrelevant signals. An interesting research question addressed by ERP studies is the difference between the brain responses to syntactic and semantic anomalies. The effects of the different stimuli are referred to in terms of names of signals such as N400 (a signal on the negative side, 400 milliseconds after the production of the stimulus) or P600 (a signal on the positive side, 600 milliseconds after the production of the stimulus).

Laboratory phonology is an experimental field which makes use of experiments involving production and perception. Like many other experiments in psycholinguistics, these involve the use of considerable technical skill and specialised software. A very simple experiment that produced interesting experimental results goes like this. Take the

---

53 The reader might sense that the bias might enter in subtle ways. It is a possibility that has been overlooked here.
54 Usually N400 is associated with a semantic anomaly. An example is that when the sentence The knight in the shining armour drew his salary is presented to the subject, about 400 milliseconds after the subject reaches salary, there would be a peak in voltage in the negative direction. (This example is from a talk by Douglas Saddy, February 2002; New Delhi.)
55 The TVJT described above does not require sophisticated technical skill or tools.
pair of words ‘splice’ and ‘slice’, which are same except for one phoneme ‘p’. After recording ‘splice’, the experimenter uses the software to remove bits from the duration that marks ‘p’ on the acoustic signal that corresponds to the word. In a number of steps ‘p’ is completely erased. Then these different samples with varying durations of ‘p’ are played to the subjects. Although there are several intermediate stages, the key result was that the subjects categorised the word that was played to them as 'slice' or 'splice', in spite of playing out to them samples where different durations of /p/ were sliced. What this suggests is that it is not really possible for the subjects to discriminate the in-betweens. This result seemed to show that the way humans perceive sounds is based on discrete categories and not as parts that belong to a continuum.

Other perception studies test the ability of the hearer to distinguish factors such as sounds and tonal types. A perception study tested the difference between how musicians and non-musicians who spoke a non-tonal language discriminated between tones in a tonal language. Laboratory phonology also helps study stress placements even in languages which are not standardly treated as stress-timed by correlating stress with measurable features such as pitch or loudness.

So broadly, we can divide data collection in linguistics into the ones that involve systematic observation of nature and the ones that involve intervening with nature and forcing a response from the subject. The second approach is what we see in experimental studies in psycholinguistics and neurolinguistics. The idea of intervening with nature underlies experimental studies and it goes back to Francis Bacon’s idea of coercing nature to reveal her truths to us. These examples seem to show that scientific method has strongly influenced experimental studies in linguistics.

57 From personal memory – of an insightful experiment done in Janet Pierrehumbert's Lab Phonology course.

58 J. Alexander, P. C. M. Wong, and A. Bradlow, “Lexical Tone Perception in Musicians and Non-musicians,” (Proceedings of Interspeech 2005 – Eurospeech – 9th European Conference on Speech Communication and Technology, 2005). The study compared the ability of American English speakers who are trained in music and those who are not trained in music to distinguish between contrastive tones in a tone language (Mandarin). It was found that musically trained speakers were better at the task than the non-musical ones.
Other Approaches

Here we look at some approaches that claim to be more empirical than the mentalist ones which we have discussed so far. This is to evaluate the possibilities of complementarity between the mentalist and the empiricist approaches.

An approach that appeals more to empirically-minded linguists is to study corpora consisting of tens of thousands of instances of language use because it seems to be more real. This is so because we can relate the use of language to the context of use, which we often miss in syntactocentric analyses like Chomsky's. There are several corpora containing samples of English. These corpora can be used to study facts like word choices, sentence structures and frequency effects. There is also a corpus of child language called CHILDES. Language acquisition researchers often search this database to look for the occurrences and frequencies of certain kinds of vocabulary items such as pronouns and quantifiers and certain kinds of syntactic constructions such as relative clauses in children of different age groups. This helps what is called a ‘longitudinal study’ of children’s language development and to understand how it changes in course of time. There is a database of samples of different languages in the University of Pennsylvania called the Penn Language Corpus. The Internet itself can be considered as a huge corpus, containing samples of a number of languages, especially the more widely-spoken and powerful languages of the world.

According to Goldstein and Fowler (2003), the articulatory phonology approach is based on a 'direct realism' model, making use of perception and production data in studying language. Articulatory phonologists do not work with a symbolic model as do generative grammarians. According to the articulatory phonology model, language depends on a correspondence between perception and production. It is not simply about the difference between syntax and phonology because phonologists in the generative tradition use an abstract symbol-and-rule-based approach to studying the sound system.

59 They might otherwise claim to be rationalist or Cartesian, terms that are almost interchangeably used with mentalist.
60 This is called the parity requirement, Goldstein and Fowler, “Articulatory Phonology,” p 175.
What I take 'direct realism' to mean in the context of studying language is that it is more in tune with language in real contexts of speaking and hearing. In that sense, it has a philosophical implication which will closely impact a scientific approach because science claims to study 'real' objects. As it must be clear from this premise of 'direct realism', this approach also assumes the fundamental purpose of language to be communication, unlike the Chomskyan position.

As an extension of the articulatory phonology model, we may consider models compatible with it which are used for studying aspects of language dealing with levels larger than sound – those that deal with sequences of sounds and where such sequences map to meanings. Meaning is a bone of contention in linguistics. A hotly debated question is whether meaning can be understood without calling out to its function in the discourse or not. There are extreme partisans of the functional aspects of language who disregard the value of structural analysis altogether. They also reject the study of meaning – semantics – that does not relate to the discourse functions. The interlocutors have to constantly engage in making sense of the functions of each other's utterances so that they are understood by both.

Functionalist linguists are not a monolithic group; instead they belong to a spectrum. They can be conservatives who think that formalism by itself is insufficient, moderates whose belief in the importance of language functions might lead them to an alternative analysis of linguistic phenomena based on functions or extremists who reject the idea that structure by itself does not mean anything. Systemic Functional Grammar is a top-down model which starts from the discourse level down to grammatical structures. Extreme functionalism abandons the basic conception of language as a structural system,

---

61 Paradoxically, Chomsky – a strong advocate of structural analysis – suggests the idea that perhaps semantics has to be understood in terms of how language is put to use in the 1995 *Mind* paper under discussion.

62 A psychological explanation of this has to do with the 'theory of mind'. When two people are talking to each other, each of them has to be aware of the state of mind of their interlocutor so that the conversation flows smoothly. Such predictions stem from an understanding of social appropriacy and a knowledge of how people respond and feel when certain words are made to convey a message.
an assumption that goes back to Saussure. In that framework, explanations are based on information flow and functional indicators like topic and focus.

Formalists build up theories based on their assumptions and axioms and go on to give theory-internal explanations. That is, for a syntactic phenomenon, a syntactic or structure-based explanation has to be given. On the other hand, functionalists are open to exploring and giving semantics- or pragmatics-based explanations for syntactic phenomena. Van Valin (2001) compares the formal and functional explanations given for a problem of pronominal reference. The formal explanation involves the structural relationship between the positions of the pronoun and its antecedent and the functionalist explanation involves the idea of which NPs occurs in the topic position and which does in the focus position. In the functional frameworks, it is generally agreed that contextual factors and rules of how words combine influence linguistic phenomena. As a result, explanations are not always self-contained.

In the broad domain of linguistic practice, we also see moderate models which aim to synthesise formal and functional approaches to language. Ivan Sag, for example, discusses another approach which assumes a dynamic model involving contextual inferences, integration of linguistic and non-linguistic information and constructions of partial meanings. An example Sag points out for the implausibility of a syntactocentric model is the fact that in real communication people rarely face the kind of scope confusions predicted by logical treatments of ambiguities involved in sentences with quantifiers. Probably what rescues the language user in such situations are non-linguistic

---

64 The sentences he discusses are: (1) As for his, sister, Tom, hasn’t talked to her in three weeks; and (2) *As for his, sister, she hasn’t talked to Tom, in three weeks.
66 For example, a sentence like ‘Every man loves a woman’ can have two meanings. According to one of them, there is a particular woman, say Bipasha Basu, who is loved by every member of the set of men. Another interpretation is where there is at least one woman (not a specific one) that each man loves. Similarly, the sentence ‘every horse did not jump over the fence’ can have the following two meanings: (1) where none of the horses jumped over the fence; (2) some of the horses, but not all, jumped over the fence. Some studies showed that 4-year-olds prefer (1) and not (2) (J. Lidz and J. Musolino, “Children's
cues. A grammar that pays attention only to the syntactic rules misses a lot of important information which presumably help us while dealing with language.\textsuperscript{67} Lexical as well as sentence level meaning, pragmatic factors, information gained from computations of probability, linguistic and extralinguistic contexts are missed by the syntax-only approach. One might be led to think that a consideration of all these factors leads to a very descriptive theory packed with information and not one that is precise and explanatory. This sounds like a relevant criticism and its discussion will be taken up later in chapter 4 (where we examine the idea of scientifically theorising language), but let us for the present purposes just note that language is a type of phenomenon that cannot be explained in a very precise manner because it works in a web that cannot be disentangled easily.\textsuperscript{68} As a result, it is not quite suited to a very analytical treatment. Changes in features of language result from choices and agreements by human agents and hence material reasons cannot be given to historical changes.

\textbf{A Reconciliatory Attempt? The example of Mark Baker's The Atoms of Language}

A strong and compelling comparison between linguistics and chemistry is made by Baker in his 2001 book. He considers the idea of parameters in linguistics as important as that of atoms in chemistry. If the history of chemistry tells us that the idea of the basic component preceded that of a large volume of empirical work on substances and reactions done by the alchemists, what the history of linguistics tells us is that the idea of the basic component of a parameter followed the large-scale empirical studies of diverse languages by anthropological linguists and structural linguists of the pre-Chomskyan jurassic age. He pays detailed attention to the diversity of languages and emphasises the importance of studying native American languages, Australian aboriginal languages, languages of New

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{67} Joan Bresnan, one of the linguists who tried to synthesise a formal approach and a functional approach by formulating a framework called the Lexical Functional Grammar, argued that a generative grammar should be an essential ingredient of a theory that aims to explain the use of language. Joan Bresnan, “A Realistic Transformational Grammar,” in \textit{Linguistic Theory and Psychological Reality}, eds. Morris Halle, Joan Bresnan, and George A. Miller, (Cambridge, MA: MIT Press, 1978) 1--59.
\item \textsuperscript{68} It would be relevant here to remember Robert Graves' poem about 'a cool web of language' that 'winds us in'. Thanks to J Griffin for alerting me to this. Robert Graves, “The Cool Web,” poem accessed from http://www.poetryarchive.org/poem/cool-web; last accessed 11 October 2014.
\end{itemize}
\end{footnotesize}
Guinea, etc., which are endangered because of “the forces of globalization, habitat destruction, and prejudice.” To show the importance of studying language diversity, he notes that while there are only two major language families in Europe, Indo-European and Finno-Ugric, there are fourteen language families indigenous to North America.

Mark Baker's work is important for the following reason. This scientific move in the Galilean times was a move away from human-centred approaches to learning and towards an objective approach. One of the big problems with a human-centred approach was partly that it was subjective and biases and prejudices would come in the way of understanding truth. A major source of prejudice is related to the material wealth and power some groups have and some do not. This is clearly illustrated when linguists study a limited set of languages as a result of the forces listed by Baker. When a number of languages are studied, it helps us make science better, by making it reconcile with a corrected human-centred view which takes into account peoples' habitats, livelihoods, environments and cultures. In that sense, Baker's approach of deeply investigating diversities does indicate a promising direction.

**Conclusion**

In this chapter, we discussed some of the key philosophical positions underlying a scientific treatment of language. These positions presuppose certain assumptions about language and science. In the ensuing chapters, we try to show how these assumptions are flawed. Especially Chomsky's guiding assumptions about science seem to be restrictive; they also seem to have not evolved with more recent insights uncovered by the broader discipline of science studies. This leads us to the next chapter, where we try to present a detailed account of science and then check how linguistics fits in.