Chapter 5

Methods, Laws and Explanations in Linguistics and Science

Introduction
In the two preceding chapters, we discussed science and examined language as an object of scientific enquiry. In chapter 3, we tried to describe science in a traditional sense as well as in light of newer insights from philosophy, history and sociology of science. With regard to the nature of science, we discussed the significance of laws in giving explanations to physical phenomena. In chapter 4, we looked at the problems involved in calling linguistics a science based on what we understand of language as the object under investigation. In this chapter, we will look at how laws, which are considered an essential part of scientific explanations, work for linguistics. Our attempt will be to place the laws in the larger schemes which include methods and explanations in linguistics. First of all, does the discipline have laws? Secondly, even if it has them in non-traditional forms, what kind of roles do they play in explaining phenomena? What are the issues relating to positing laws in linguistics?

This chapter is organised as follows. We start by developing the previous discussion of laws in natural sciences and linguistics from chapter 3. Then we look at the complications posed by phenomena like language change to a law-based scientific treatment of a discipline like linguistics. After that we attempt to examine a sample of lawlike generalisations used in different sub-fields of linguistics, from the generative framework. This is followed by an examination of the explanation of a specific phenomenon – double object construction – in generative grammar. We conclude with a discussion of the metaphysics of laws in linguistics. The significance of this chapter for the thesis is that it helps us examine the discipline along what is considered to be a salient property of scientific explanations. It seems to suggest that the scientific treatment of language leaves several questions unanswered, with respect to the roles of laws or lawlike statements in the explanations offered in the discipline.
Based on the discussion of scientific laws, we will attempt a comparison between laws in science and laws in linguistics. At the first glance, there seems to be considerable diversity among laws in linguistics because of the differences between generalisations in syntax, phonology, language change and so on. In spite of the apparent differences between these sub-disciplines, there seems to be similarities in the ways syntax and phonology give explanations. However, language change seems to be a major point of rupture which clearly demarcates laws of linguistics from laws in physics. But laws in linguistics do have a parallel in laws in biology.

**What are Laws in Science**

A simple way of understanding laws in science is that they are generalisations. Laws typically have the form of generalisations. For example, law statements are not about particulars, do not make use of time and space indices,\(^1\) are not about just one event and so on. Philosophy of science has engaged with the question of laws as generalisations in a detailed manner. In brief, these approaches suggest that laws are not the same as generalisations since laws serve a function different from generalisations. Laws support counterfactuals. A much discussed example is the following. Consider two generalised statements: ‘All gold spheres are less than a mile in diameter’ and ‘All Uranium 235 spheres are less than a mile in diameter.’\(^2\) Both these sentences are generalisations but the first one is a contingent one, in the sense that it is not logically necessary. The statement happens to be true because the universe as we know it does not have enough gold to make a sphere of that diameter. In the second case, it is a necessary consequence and not a mere generalisation since it is impossible for Uranium 235 to form a sphere above its critical mass. The law of radioactivity explains the second generalisation but there is no law that explains the first generalisation. Thus, laws are seen to be entities that support generalisations and particularly counterfactuals. The test sentences for counterfactuals in

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the above cases are 'if there is a sphere of gold, it cannot have a diameter greater than 1 mile' and 'if there is a sphere of uranium, it cannot have a diameter greater than 1 mile.' The sentence about gold is false because we can imagine a universe where it holds true; on the other hand, it is not possible to imagine a universe where the sentence about uranium holds true because laws are supposed to hold good for all possible worlds.

There have also been attempts to describe the nature of laws by using the idea of necessary relations. Firstly, laws are characterised by the idea of necessity in them. A relationship between two properties is necessary for it to be a law. But necessity is a difficult philosophical concept since it is difficult to characterise what we actually mean by necessity. One approach is to claim that laws are necessary relations between universals. A law of the form ‘All Fs are Gs’ is but a necessary relation between two universals, F-ness and G-ness. The 'vacuous law' version of it 'if there were Fs, there would be Gs.'³ For Kitcher and Salmon (1989), laws should have a “universal form”, “unlimited scope”, “not contain designations of particular objects”, and “contain only qualitative predicates.”⁴ Further, a fundamental lawlike sentence has to be universal and true.

Another common example is that when we say salt dissolves in water, we recognise a law when we see that salt necessarily (and not contingently) dissolves in water. And this necessity can be explained by support of laws that show why this should happen. The example of salt suggests that it is the essential properties of things that play a role in law. One version of the essentialist view of laws, due to Swoyer (1982),⁵ suggests that essential properties ground laws and that laws are necessary in a metaphysical sense: relationship between essential properties are laws.

Another influential model of laws draws upon dispositional properties. Such properties are those that manifest under certain conditions. For example, salt has the

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³ Mellor, “Necessities and Universals in Natural Laws.”
property of dissolvability but that does not get to be seen unless it is put into a solution of water. So one understands this property of dissolvability as a potential, dispositionist property which comes into fruition in the appropriate context. In contrast to these type of properties is the categorical properties. These are properties which are inherently present without needing a situation for its manifestation. This distinction between categorical and dispositionist properties has an important consequence for the metaphysics of laws. For the dispositionists, these properties have a causal power and it is the power of these properties to act in ways that they do that leads to the lawlike properties.

The real dispute between these camps lies in the relationship between laws and properties. In the case of categorical properties, these properties themselves are inert and laws are what govern how these properties behave in certain circumstances. Whereas, for the dispositionists, the properties are active and it is their action that ‘creates’ laws. So for the categoricalists, laws dictate how properties behave whereas for the dispositionalists, properties behavior is intrinsic and through that behavior the notion of a law is manifested. Bird, for example, argues that scientific properties are essentially dispositional properties. In such approaches, the importance of law is that laws are to be seen as ontological entities and not mere statements or mere relations between existents.6

Laws of science are often stated in a mathematical manner. But it is not necessary that they be stated in algebraic terms or using other mathematical formalisms. Carnap (1966) points out that laws are essential for explanations.7 He adds that they can be qualitative statements. To illustrate his point, he discusses the problem of ‘entelechy’ and contrasts it with magnetism. Entelechy was an idea proposed by the biologist and philosopher Hans Driesch. It meant something like a life force that allowed a biological activity like the growth of a living thing to happen. Carnap finds issue with it by showing that Driesch's entelechy failed to be a scientific explanation for biological activity

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6 For more on this, see A. Chakravartty, A Metaphysics for Scientific Realism: Knowing the Unobservable, (Cambridge: Cambridge University Press, 2007).
associated with organisms because there was no law – not even lawlike qualitative statements – that could be associated with that. Contrast that with a physical phenomenon like magnetism. A scientist would be able to make lawlike non-quantitative statements about magnetism, such as "All nails containing iron are attracted to the ends of bars that have been magnetized." (p 681) No such statements can be made about Driesch's idea of entelechy, which makes it inadequate as a scientific explanation.

Having made this caveat, let us come back to the mathematical statements of laws. How does science arrive at a law that is mathematically stated? This is a common scenario when they study two variables that are related to each other. They list out the numerical values of these two variables in two columns side by side and then they try to arrive at a mathematical relationship between the two. A clear statement of the mathematical relationship between the two physical properties (or variables) turns out to be a law.

The language of mathematics gives us certain possibilities which is not offered by natural language. As Feynman (1967) notes:

Every one of our laws is a purely mathematical statement in rather complex and abstruse mathematics… It gets more and more abstruse and more and more difficult as we go on. Why? I have not the slightest idea. It is only my purpose to tell you about this fact. The burden of the lecture is just to emphasize the fact that it is impossible to explain honestly the beauties of the laws of nature in a way that people can feel, without their having some deep understanding of mathematics.

Thus, for science, the very notion of laws of nature depend on how science understands nature. First of all, science makes a genuine ontological commitment to nature as a collection of entities. Laws of nature are real processes, real forces, real properties of this collection called nature. This commitment to a realistic picture of nature is important in the context of our comparison with linguistics since the fundamental question we had to engage with was whether language was a natural object. The logical next step would be to ask how rules, principles, laws or lawlike statements in linguistics are natural.

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Given this brief description of the nature of laws in science, we can now try and analyse the nature of laws in linguistics. By drawing on a set of statements that are generally accepted as laws or lawlike statements by linguists, we can ask what kind of metaphysical presuppositions form the core of their claims to being laws. Whether they are laws or not can be tested by asking if they support counterfactuals, if they are part of an explanatory enterprise, what their metaphysical status is, whether it is the case that they ‘rule’ or ‘govern’ linguistic properties or is it that when these properties manifest, they generate the corresponding laws.

**Laws and Lawlike Statements in Linguistics**

It should not be a surprise that linguistics in its attempt to present itself as a science also discovers many laws. These laws do a similar job in linguistics as they do in science in that they capture regularities, they show how certain terms are related to each other and where possible, they also capture the formal structural characteristics of these relationships.

Thus, if linguistics also aspires to be a science, it is legitimate to ask what kind of laws are present in linguistics and whether they share any characteristics with scientific laws, both in their formal structure as well as in their philosophical foundations. We will first discuss some laws in linguistics, following which we will discuss the nature of laws in science and in linguistics.

A very striking observation about linguistics laws, specifically historical linguistics, was made by Jespersen (1933).\(^9\) He makes a comparison between laws in linguistics and laws in science:

> In course of time, languages change in respect to sounds as well as in everything else. Very often these changes affect at the same time whole series of words with great regularity: then we speak of sound laws, though these are not to be compared with natural laws because they are not like these universal with regard to time and space, but are merely formulas of what happened at one particular period in one particular language or dialect. Two famous ‘laws’ in linguistics are Grimm’s law and Verner’s law. Akmajian (2001)

defines Grimm's law as the following: "A set of regular sound changes that took place in Proto-Germanic, in which Indo-European voiceless stops became voiceless fricatives, voiced stops became voiceless stops, and voiced aspirated stops became simple voiced stops." Notice the phrase 'regular sound changes'. It is the regularity that makes it lawlike. These were also both sound changing rules which were proposed to explain how sounds in the reconstructed proto-Indo-European changed to old Germanic, which was also a reconstructed language. Although there seems to be observable regularity in these 'laws', there is no sense in which one could say that such changes are 'necessary'.

The so-called laws in linguistics applied to a particular language family and not to 'language' in the sense of a system of communication common to all human beings. It is possible that the reason why these were stated as laws, despite the fact that they neither had the feature of universality or statement of a mathematical relationship, was to mimic the natural sciences, which had already come up with famous laws like Newton’s laws, Boyle’s law and Charles’s law.

A point can be made about the existence of different linguistic models and their usefulness. An interesting thing to note about models which help scientists work out laws is that there may be radically different ones for making sense of the same system. Even when multiple models exist at the same time, scientists might be open to possibilities of reconciliation among these different models. In linguistics, especially in syntax, multiple models are used. Usually, within the syntactic system, some sub-components like coreference are better handled by models like construction grammar and some other types of dependencies are better handled by generative grammar.

**Nature of Laws in Linguistics**

Following Ramsey's (1928) insight, laws can be thought of as axioms in a deductive system. Deductive systems and their ingredients – basic elements and axioms –

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constitute a platonic world. It is clear why this should have an impact on generative linguistics (biolinguistics). As pointed out in chapter 3, scholars such as Katz and Postal have argued that generative linguistics deals with platonic objects. Even though Chomsky's stated position is mentalism which claims a biological base, it is clear that the enquiry into the principles of language is a formal enquiry, with its assumptions of basic categories and rules. Thus, it does not work with an ontological commitment which demands considerable empirical observations and analyses. It is because they work with these platonic objects that it makes sense to say that generative linguists try to discover the laws or 'truths of human language'. Consider the feature of recursiveness of language, which makes possible phrases embedded within larger phrases of the same type. In principle, it is possible to have a hundred noun phrases embedded within a noun phrase; but in reality, nobody uses that. That is the sense in which we claim that Chomskyan linguistics is platonic – its objects are formal; so are the phenomena it deals with. Chomsky would claim that the programme is to study competence and not performance. But what seems to be the case is that his notion of competence is not quite distinguishable from a platonic object.

One of Postal's main criticism of Chomsky's view of the biological basis of his research programme was that till date the biolinguists have not yet found a single physical property of language. By their very definitions, platonic and biological objects are mutually exclusive sets. Biolinguists' claim that their use of formalism is similar to how physicists use formalism in the sense that by using mathematical equations, the physicists do move away from a realist commitment. But Postal does not find it a compelling

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12 Katz and Postal, “Realism vs. Conceptualism.”
13 Paul Postal, “The Incoherence of Chomsky’s ‘Biolinguistic’ Ontology,” *Biolinguistics* 3 (2009) 104–123. The exact quote is: “I am unaware of any reports by Chomsky of his use of x-ray machines, microscopes, tissue samples, and so on. So in total contrast to actual biological science, in four decades he has not specified a single physical property of any linguistic object, not surprisingly from a realist point of view, since they have no such properties.” Postal, P. (2009). The Incoherence of Chomsky’s ‘Biolinguistic’ Ontology. *Biolinguistics* 3, 104–123.

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argument because his view is that physicists do not “identify” mathematical equations as standing for real entities, whereas Chomsky conflates these two categories. That is why, according to Postal, Chomsky is able to relate set-theoretic descriptions to purportedly biological entities. Axioms can apply to platonic objects and not to biological objects. Ramsey's point that laws work in a way similar to axioms in deductive systems lead us to think that lawlike generalisations apply to linguistics when it is a platonic system. This has a clear parallel in physical sciences because laws apply to idealised models of physical systems and not to the systems themselves. This line of thinking would lead us to think that generalisations of a mathematical nature can be made about language only when it is considered as a platonic object and not when it is thought of as a biological or social object.

As generative linguistics has largely been working based on deductions and axioms more than on empirical data, it has been closer to mathematics than to natural sciences. If it works with more empirical data, it has better chances of being more like a natural science. But we observed in that generalisations in linguistics look more like laws when we assume a platonic system. The real test of whether laws are applicable to linguistics would be the possibility of generalisations when the discipline works with more empirical data.

Laws in natural sciences have to conform to tests of replicability of empirical observations. The idea of repeatability is stated with the subordinate clause, 'everything else remaining the same.' However, disciplines that deal with historical changes such as linguistics have to often account for isolated changes. For example, as pointed out elsewhere there is no particular reason why a particular change happened and not another.

Postal, in “The Incoherence of Chomsky’s ‘Biolinguistic’ Ontology,” comments that, by doing this conflation, Chomsky is contradicting a position he had earlier taken (p. 258).

One of the many examples of how lawlike statements work in an idealised model involving a formal tree description can be seen in a discussion of high and low applicatives. See the class handout: http://web.mit.edu/norvin/www/24.956/handout5.pdf. Here, the analysis of the syntactic data includes the information that tones are not considered. What this suggests is that the idealised model which keeps tones out might be useful for theory building, but it is not by any means a real description of truth.
There is no sense of 'necessity' to a particular change. Additionally, an isolated change cannot be stated with the subordinate clause 'everything else remaining the same.'

Chomsky (1995), which we engaged with in chapter 4, had also addressed a point made by Davidson on the absence of psychophysical laws in the mental realm. Davidson's view was that a plain statements of facts about people's behaviours in certain situations cannot be compared to physical laws such as the one which tells us about the velocity with which an object would fall in vacuum. This is because in the case of the physical laws, we can make specific predictions about events and give reasons why certain predictions were not borne out. But this is not possible in the mental realm. Davidson had called it 'the problem of anomalism'. But Chomsky opposed this argument by giving examples from the purely physical realms – such as balls rolling down hills and a storm brewing in the west – and pointing out that such examples are also not comparable to the law of falling objects in vacuum. So what he seems to imply here is that when stated precisely enough, even generalisations at the mental level can be laws and not merely plain statements or truisms.

Looking at the nature of generalisations in linguistics, Orr notes that while laws in science are supposed to be exceptionless, what is noticed in linguistics are regularities or patterns. A well-known example for regularity from natural sciences is the periodic table of elements in chemistry. He considers the phenomenon of 'third palatalization', seen in Slavic languages. Here, the velar consonant in the third syllable changes to its corresponding palatal affricate when preceded by a high vowel. The following data is reproduced from Orr (2006).

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\begin{align*}
*e_k > c, & e_g > dz, e_x > s/š, e_i/-V[-hi], e.g.,
\*k > c & \text{ Czech otec } < *\text{átíkás} \text{ ‘father’}
\*g > (d)ż & \text{ Polish ksiądz } < *\text{kńęgás} \text{ ‘priest’}
\*x > s/š & \text{ Russian всě } \text{ } < vixā \text{ ‘everything’}
\text{ Czech vše }
\end{align*}
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Orr treats this as a good illustration of the claim that linguistics exhibits tendencies

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rather than exceptionless laws – in the neogrammarians' sense – and as illustrating the
difficulties applying the methods of the 'hard sciences' to many areas of linguistics.” It
refers to Slavic languages in a broad sense and the rule is also not extremely specifically
defined, in the sense that sometimes the rule applies to stops (such as /k/ or /g/) and
sometimes it applies to fricatives (such as /x/). Orr's view that “...the 'laws' of linguistics
are generally far too intricate to be easily equated with the laws of 'mathematics' or
'physics', and linguistics itself is far too intricate to be crudely described as
'mathematical'. Such 'laws' are perhaps best described as regularities, or tendencies.” In
fact, phonological rules such as post-nasal voicing discussed earlier show that they are
biological tendencies resulting from physical principles.

However, as Lass (1980) indicates,¹⁸ the question of laws in history is a very
contentious one. This reflects on linguistics also because rules in language have a strong
historical component – this applies to phonological changes and historical linguistics.
There is also a view that syntax is transformational, with each step corresponding to a
time in history. Lass (1980) studied language change and points out several problems that
arise when observations of regularity concerning language are presented as laws.
Discussing the phenomenon of sound change, he points out the totally random nature of
certain sound changes. If we go by the idea that natural laws have to be 'necessary' in
some sense, generalisations or lawlike statements in linguistics seem to fail.

Lass directs our attention to the fact that language largely belongs to a cultural
universe, which is infested with symbols and their interpretations. On the other hand,
physical laws apply to the natural universe. The notion of necessity which seems to be
central to natural laws does not seem to work for the events observed in the cultural
universe. He quotes the biologist Ludwig von Bertalanffy (1968):¹⁹

Natural science has to do with physical entities in time and space, particles, atoms and
molecules, living systems at various levels, as the case may be. Social science has to do
with human beings in their self-created universe of culture. The cultural universe is

essentially a symbolic universe. Animals are surrounded by a physical universe with which they have to cope: physical environment, prey to catch, predators to avoid, and so forth. Man, in contrast, is surrounded by a universe of symbols. Starting from language which is the prerequisite of culture, to symbolic relationships with his fellows, social status, laws, science, art, morals, religion and innumerable other things, human behavior, except for the basic aspects of the biological needs of hunger and sex, is governed by symbolic entities.

In the context of language change, a very relevant question raised by von Bertalanffy is the whether history can be scientifically studied at all. Language change is, clearly, a historical enquiry.20

Language change was the domain to which Grimm's and Verner's laws applied. The use of the word 'laws' to the changes that happened historically was clearly influenced by the physics model of how a science should be.21 There was a time in the history of linguistics when it was thought that natural laws are central to linguistics; the neogrammarians thought that laws in language are exceptionless. According to Jordan-Baker (J-B), the basic premises of neogrammarians included the assumptions that sound laws were similar to physical principles, language is internal and that new elements come to language by the rational process of analogy.22

J-B goes through a discussion of Roger Lass' (1980) work on the problems related to the difficulties in causality raised by studies on language change. Language change laws seem to be similar to biological laws in Lange's (2007) observation that biological laws are accidents of natural history. The similarity between the domains of biology and language change can also be stretched, it seems, to Beatty's (2007) conclusion that while physical science has laws at its centre, biology applies abstract models on a 'case-by-case' basis, and as a result, the discipline has greater theoretical pluralism.23 This is because for language change too, experts work with cases of specific histories of languages or

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20 Lass, Historical Linguistics and Language Change.
21 Jordan-Baker, “Agency, Structure and Realism in Language and Linguistics,” states: “Sound laws were motivated by an uncompromising attitude that saw physics as the standard of scientificity”, p 14, 15.
22 Ibid., p 16.
language groups.

The question of causality in social sciences and inexact sciences like biology is difficult because people and societies are 'messy'. Like Lass (1980), J-B also argues for a serious consideration of sociocultural factors in linguistics (p 67). An important insight he draws from Aitchison (2001) is about the basis of language change – the idea that it is individuals who change language. The inference we are driven to is that social factors have some kind of causal role in language change. For an individual's use of language is largely a function of social forces – societal norms and roles based on factors such as age, gender, class, networks, caste, race and so on.

This conclusion is important because it marks a rupture between a treatment of language as an object following the approach of discovering natural laws or 'universal principles'. There are two factors that seem to be at work here. One is social causation as suggested by J-B and the other is Orr's (2009) observation that language shows tendencies and not universal laws.

According to Lass (1980), linguistics may become a science with laws if it can develop a sufficiently strong empirical base and if it can evolve an epistemological position which is different from the currently platonic or deductivist one. Observing that laws apply at lower levels, he suggests that if linguistics were reduced to biology, and biology to chemistry and chemistry in turn to physics, we might be able to “reduce to lower-level laws the properties of complex, historically derived and transcendentally structured objects.” His idea of 'reduction' is accompanied by the other side of the coin, namely 'enrichment'. Taking insights from other work, Lass suggests that the domain covered by linguistics would represent an enriched biology, and biology would be enriched chemistry and chemistry enriched physics. This is certainly different from Fodor's (1979) position that special sciences need not be reduced to physics because the former has generalisations that are interesting and informative and there is no clear way

those can be stated in terms of concepts in physics.

One of Carnap's observations concerned the uncertainty of psychological laws because they are of a statistical nature.\textsuperscript{25} The mentalist philosophy which is at the base of the much of the cognitive science approach to language treats linguistics as a part of cognitive psychology. If we accept that view, the lawlike statements that form part of the explanations in generative linguistics are psychological laws of some sort. The fact that such laws are uncertain would at least partly account for why they do not form an integral part of the explanatory system of linguistics.

The Chomskyan framework, with its thrust on symbols and formal operations, has a strained relationship with a statistical treatment of language. They also make the claim that language is a mental object. In chapter 3, we generally agreed with Katz and Fodor (1991) in thinking of generative linguistics as working with the premise that language is a platonic object studied using formal means. If we keep aside our main criticism concerning the real nature of language and work with the Chomsky's philosophy of language or Katz and Fodor's philosophy of language, we are left with two options – either call language a mental object or call it a platonic object. If we look at it as a mental object, Carnap's view of uncertainty of psychological laws is applicable to linguistics. That corpus-based linguistics makes considerable use of statistical data adds credibility to applying Carnap's view of psychological laws to linguistics. This view is echoed by recent analyses of linguistic laws.\textsuperscript{26}

**Examining a Sample of Lawlike Statements in Linguistics**

Although processes like language change do not seem to be ready for a lawlike treatment, there are domains within linguistics which is dealt with using rules, generalisations and lawlike statements. What we see in linguistics are mainly rules and lawlike statements, but not really generalisations that can be called laws. Here we will analyse some of the rules and lawlike statements seen in linguistics textbooks. All the

\textsuperscript{25} Carnap, “The value of laws.”

\textsuperscript{26} For example, J-B also states view that statistical or probabilistic explanations are statements of probabilities and in that sense, it lacks the status of full explanations. P 132.
morphological and syntactic rules or lawlike statements in this chapter are from a
textbook of syntax by Koopman, Sportiche and Stabler (KSS).27 The lawlike statements
and their basic descriptions are given in a smaller font to mark them as distinct from the
main text.

The description of a part of speech

- If a word can be pluralized (and is not a demonstrative or a pronoun), it is a noun. (P 4 of KSS)

This is a conditional statement. This looks like a diagnostic for a noun. It has universal
applicability. But this is a very simple generalisation obtained with very little empirical enquiry.

**Phonology**

- Example: post-nasal voicing
  
  Formal representation: \([-\text{voice}, +\text{stop}] \rightarrow [+\text{voice}, +\text{stop}] / [+\text{nasal}] \) ___
  
  A voiceless consonantal stop becomes voiced when it is preceded by a nasal (which is by default,
a voiced sound). Although this is a language-specific rule, it seems to follow a universal tendency
which we discuss later in the chapter.

**Morphology**

1. Past tense formation rule:
   - V (the verb stem) + the past tense morpheme = the past tense form of the verb
   
   This can be stated trivially as: When you add a past tense morpheme to a verb stem, you get the
   past tense form of the verb. This looks like a plain description for a verb form which has universal
   application. But can such a plain fact be a law? But notice that there is a law that the language-
   learner has to internalise in order to produce the correct past tense form of a verb. This acquisition
   problem becomes more complex because some languages (such as English and German) have
   irregular verbs which don't follow the general rule of past tense formation.

2. C-selection (Category Selection):
   - Each affix c-selects the category to which it attaches. (Adapted from KSS)
     
     For example, the adjective forming suffix -al in English attaches only to nouns that are simple
     roots.

3. The English right hand head rule (RHHR) for compound words: The rightmost element of a
   compound is the head of the compound. (P 25 of KSS)
   
   
   This seems to work in other languages also. Examples: karinkurangu (Malayalam for black
   monkey), mittagessen (German for lunch; literally 'mid-day food').

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27 Hilda Koopman, Dominique Sportiche and Edward Stabler, *An Introduction to Syntactic Analysis and Theory*, manuscript downloaded from www.linguistics.ucla.edu/people/stabler/isat.pdf, (last accessed 13 October 2014) explicitly use the word 'laws' with respect to syntax and morphology (p 2 in the
manuscript available online): “We will also see that there are reasons to think that the way these
units are combined is very regular, obeying laws very similar to those that combine larger units of
linguistic structure.”
Syntax

1. Properties of the heads of phrases look like lawlike generalisations: ((1a) to (1c) from p 91 of KSS)
   a. The head of a constituent tells us the category of the constituent.
   b. The head of a constituent tells us the distribution of the constituent (where it can occur).
   c. The head of a constituent also selects certain constituents to combine with.

   Of these, (a) and (c) are universal and (b) is language-specific. (b) is language-specific because word orders and patterns of word formation differ among languages.

2. Principles of X-bar theory
   - X-bar theory is a scheme of how words combine to form phrases. Every phrase XP is projected from a word X. This is a two-tiered projection, where the intermediate node X' is said to have a modifier (specifier). The word X has a complement. For example, if X is a verb, its complement can be an object noun (as in 'buy an elephant') or a full sentence (as in 'believed he is innocent'). The type of complement a word takes is determined by the word class and the selectional restrictions of the word which is said to be specified in the mental lexicon. ((2a) to (2h) from P 124 of KSS).

   a. Each phrasal constituent has a head.
   b. This head is always a morpheme or a word (a D or N or V or P).
   c. The head is unique.
   d. Every morpheme is the head of some constituent.
   e. In general, no non-constituent has a unique head.
   f. The largest constituent with head H is notated HP or Hmax and is called the maximal or phrasal projection of H.
   g. HP or Hmax is a constituent consisting of a constituent H' and at most one sister called the specifier (or subject) of H. H' is also notated and read H-bar (an H with one bar above it).
   h. H' or H-bar consists of the head H and some sisters. These sisters (if any) are called the complements of H.

Semantics

- Compositionality – The meaning of a compound expression is a function of the meanings of its parts and of the syntactic rule by which they are combined.28 (Partee, ter Meulen and Wall 1990)

All of the above are all stated like universal generalisations. But words like D (determiner) or abstract morphemes like I (Inflection) are made to look like heads because for the system to work, (2 b) has to be true. What I am trying to show here is that the theory tries to create certain empirical realities. It is only in a certain theoretical framework that D looks like a head. The Inflection (I) became a head only because according to the theory every phrase has to be projected from a head and the sentence (which also had to be a phrase because of this theoretical requirement) had to be projected

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from an abstract head (which is the basis of the treatment of the Inflection as a head).

Even without looking at such complications, the theory faces problems when it tries to account for verbs which take two objects. How would the two complements be satisfied in a strictly binary branching structure? The lawlike statements (2 a) to (2 h) under X bar syntax can be understood using the idea of essential properties in the metaphysics of laws.\textsuperscript{29} An essential property of a kind is understood to be something that is indispensable for all members of that kind. So when a syntactician says that a phrase has a two-tiered X-bar structure, what she means is that such a structure is something that a phrase cannot lack. Syntacticians seem to have taken this idea of 'essential properties' really seriously because they even redefined a sentence as a phrase which projects from a head and has a specifier and a complementizer.

Compositionality, on the other hand, can be thought of as a hypothesis regarding how meanings of larger linguistic expressions (such as words, phrases and sentences) arise from the meanings of individual morphemes. This can be considered to be a linguistic law that applies at the interface between syntax and semantics.

At the surface level, linguistics seems to borrow the vocabulary of scientific laws without a careful study of the nature of these laws. Are linguistic laws different – in principle – from laws in physics and other disciplines of science? Do linguistic laws order linguistic phenomena? Does the use of laws in linguistics suggest that somehow language and language use are ‘natural’ like the objects in the domains studied in physics and related subjects? The principles or lawlike generalisations in linguistics are often expressed in a formal or a quasi-mathematical manner.\textsuperscript{30}

Laws should capture a collection of facts; not just one fact. Linguistic rules are indeed generalisations. They capture a collection of facts, although mostly within one language. The condition of universality of laws would not sit well with a sub-discipline of linguistics such as phonology. For example, consider post-nasal voicing in Malayalam. A

\textsuperscript{29} D. H. Mellor, “Necessities and Universals in Natural Laws.”

\textsuperscript{30} The question of whether a biological object which has strong social and historical dimensions can be represented mathematically or not seems to remain an unresolved question.
robust observation regarding the sound pattern of Malayalam is that it can never have a voiceless consonant that follows a nasal. That is, for example, ‘p’ would change to ‘b’ when it is preceded by the labial ‘m’; the dental ‘t’ would change to ‘d’ when it is preceded by the alveolar ‘n’ and the velar ‘k’ would change to ‘g’ when it is preceded by the velar nasal. So, one can propose a general rule that any voiceless stop would become its corresponding voiced stop when a homorganic nasal precedes it. This is called post-nasal voicing because what happens here is that a voiceless stop which follows a nasal becomes voiced. In the language of generative phonology where feature matrices are used to refer to individual sounds, the rule is represented as:

\[
\begin{array}{c}
+\text{Stop} \quad \text{----->} \quad +\text{Stop} \quad / \quad \text{Nasal} \quad \text{-------} \\
-\text{Voice} \quad \quad +\text{Voice}
\end{array}
\]

This shows a pattern of sound change within the set of sounds in a particular language, which is why it is referred to as a rule of sound change in the language. It is a language-specific rule, and not universally applicable as a law in physics. Further, it does not state a relationship between two concepts in a mathematical manner as in physics. However, although not mathematical, a special format which looks more rigorous than a natural language description is adopted to represent the sound change. Here it might be useful to note the distinction between fundamental laws which are global and universal and phenomenological laws that are restricted to specific phenomena. The existence of language-specific laws suggest that perhaps linguistic laws are more like phenomenological laws than fundamental laws.

An observation concerning phonological rules such as post-nasal voicing is that it is consistent with the vacuous law version of the simple characterisation of laws discussed earlier in this chapter. This rule can be stated in that form as 'if there is a voiceless stop (F) in a language, it will turn into a voiced stop (G) when preceded by a

\[31\] The nasal has the same place of articulation as the following consonant.

\[32\] Cartwright also notes that even fundamental laws are ceteris paribus (Nancy Cartwright, How the Laws of Physics Lie, (Oxford University Press, 1983).

\[33\] An objection to this claim can be that an E-language such as Malayalam or Russian is not a natural object. That question is not addressed at this point.
nasal.' One reason why someone might object this observation is that it is the presence of the nasal that makes an F a G. But this is not unusual in science, because certain lawlike statements involve a context, such as 'substance X becomes substance Y when brought into contact with water.'

Having listed and described these lawlike generalisations in linguistics, we will now look at the explanation given for a very specific problem in syntax – that of double object constructions. Although the basic explanation remains the same, it has gone through several refinements as syntacticians working on different languages had to explain the data they were examining. They also had to give their explanations in accordance with the refinements in the theoretical frameworks.

**Examining an Explanation: Double Object Constructions**

Within linguistics, rules and constraints are usually made use of in phonology and morphology in their explanations while principles are made use of in syntactic explanations. If rules, constraints and principles work like universal laws, is it the case that explanations in syntax also follow a D-N model? Let us take the explanation given to a very specific problem and examine it closely. It is the case of the Double Object Construction.

Double object constructions have been an interesting problem in generative grammar involving sentences with ditransitive verbs. Although it is a phenomenon seen in many languages, we will look at the explanation given for English data because that has influenced how the problem was dealt with crosslinguistically. Several analyses have been given for this problem, but we will consider the one offered by Larson (1988), because the solution given has influenced future work.34

The basic observation is the following. Ditransitive verbs such as *give, send* and

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show have two object noun phrases each. In English, two kinds of constructions are possible with such verbs. This alternation is known as dative shift. See (1a) and (1b) below.

1a. Parvez sent flowers to Alice.
1b. Parvez sent Alice flowers.

(1a) involves a preposition and (1b) does not. (1b) is called the Double Object Construction because the verb seems to have two objects, the direct object 'flowers' and the indirect object 'Alice'.

Keeping out the details of some of the questions concerning the interaction between syntax and semantics in such constructions, we will go on to look at how the solution to this problem offers an interesting picture of an explanation in syntax. This becomes relevant to our discussion of laws and explanations in linguistics because of two lawlike statements:

I. The case filter: Every Noun Phrase (NP) needs a case.

II. The objective case is assigned by a verb or a preposition.\(^{36}\)

In (1a), the first NP 'flowers' gets its case from the verb 'send' and the second NP 'Alice' gets its case from the preposition 'to'. So the case filter is not violated. But (1b) raises a problem because a given verb can assign only one case.

Now to get to Larson’s (1988) solution, we need to briefly look at how a sentence with a monotransitive verb is represented in standard X-bar syntax.

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\(^{36}\) Sometimes a distinction is made between the case assigned by a verb and a preposition. The alternative idea is that a preposition assigns an oblique case and not an objective case, like the verb.
The crucial part of the explanation is that V assigns two cases to the object NP – the first, a structural case that is assigned by virtue of the configuration formed by V's structural position within the IP and the second, a lexical or inherent case assigned by V.37

Such an assignment of two types of cases by V is crucial to the explanation of Double Object Constructions. So if we come back to (1b), 'send' assigns structural case to the NP 'Alice' and it assigns lexical case to the NP 'flowers'. So the distinction made between two types of cases – structural and inherent – plays the key role in this explanation.

Note that the explanation tries to ensure that the lawlike statement of the case filter is not violated. Just because of the fact that double object constructions exist in only a small set of languages, something like case filter – which seems to be independently motivated – is not rejected by syntacticians. One can also think of other ways of understanding this explanation. For example, this can also be interpreted as a Deductive-Nomological one. This is because it is arrived at by deduction from a set of premises, most of which are empirical data in English and at least one of which is a lawlike statement, namely the case filter.

What seems to be the case in linguistics is that generalisations are possible –

37 For the structural details, see Larson, “On the Double Object Construction.”
principles, rules, constraints, etc. However, it does not satisfy the causational requirement for laws.\textsuperscript{38} It seems that in linguistics, even if there aren't apparent laws, it is clear that there are lawlike sentences. Sentences such as the binding principles are examples. Binding principles appear like universal laws in monoclausal sentences. However, in longer constructions involving ditransitives and multiclausal sentences, cross-linguistic differences are observed. Often they are explained using a combination of the main hypothesis and one or more auxiliary hypotheses.

A central question that comes up while studying laws is that how many instances of a phenomenon do we need to check in order to arrive at a law. For example, we might need to check each individual in the cookie jar before we can conclude that all of them are ginger cookies. But in the case of a statement that can be considered to have the status of a physical laws, we do not need to check all the individual instances to arrive at a law. To illustrate this point, consider the boiling point of water. We make an observation that a particular sample of water boils at 100 degrees celsius; we do not need to observe the boiling behaviour of a large number of possible samples of water to arrive at the law (or a lawlike statement) that the boiling point of water is 100 degree celsius.\textsuperscript{39}

A comparable instance in linguistics to such a lawlike behaviour concerns pronouns and reflexives in the so-called binding principles.\textsuperscript{40} The linguist makes certain generalisations about the coreference possibilities of pronouns and reflexives. Do we need to check samples of simple sentences from all languages involving pronouns and reflexives in order to arrive at the lawlike statement? It does not seem necessary. In this sense, binding principles – at least for simple sentences – seems to behave almost like natural laws. On the other hand, phonological rules don't seem to be law-like sentences

\begin{footnotesize}
\begin{enumerate}
\item \textsuperscript{38} Cartwright, “Do the Laws of Physics state the Facts?”
\item \textsuperscript{39} These examples are adapted from Lange's (2007) examples on p. 300 in Philosophy of Science: An Anthology. Blackwell.
\item \textsuperscript{40} The original discussion of binding principles is in Noam Chomsky's Lectures on Government and Binding, (Dordrecht: Foris, 1981). I refer to Koopman, Sportiche and Stabler, An Introduction to Syntactic Analysis and Theory. The basic statements of the principles (A, B and C) are as follows (p 179): A. An anaphor must be bound in its domain; B. A pronoun must be free (≠ not bound) in its domain; C. An R-expression cannot be bound.
\end{enumerate}
\end{footnotesize}
because their scopes are limited by the language (or sometimes perhaps the language group) that is studied.

**Language Universals**

A discussion of the feature of universality associated with laws in the context of language studies necessarily leads to Greenberg's typological work involving cross-linguistic comparisons of properties of human languages. Greenberg, in his classic work on language universals,\(^4\) identified universals at various levels – those of word order, syntax and morphology. Broadly speaking, these are all syntactic because they all have to do with the possible arrangements of linguistic elements.

An example of a word order universal proposed by Greenberg is his “Universal 4”, stated here: “With overwhelmingly greater than chance frequency, languages with normal SOV order are postpositional.” This is a rather curious kind of universal because it is stated in a statistical manner. Since this 'universal' is statistical and it is arrived at by an inductive process, it is like an inductive-statistical explanation.

'Universal 24' is an interesting cross-linguistic syntactic generalisation. It is stated as follows: “If the relative expression precedes noun either as the only construction or as an alternate construction, either the language is postpositional, or the adjective precedes the noun or both.” This generalisation also has an interesting structure. First of all, a property X is associated with two other properties Y and Z. But the relationship between X on the one hand and Y and Z on the other is not a clear implication. This can be paraphrased into two logical statements: (1) X implies either Y or Z; or (2) X implies both. For example, Malayalam is an example for a language which has a relativizer that precedes the noun, is postpositional as well as one in which the adjective precedes the noun. But the universal says that there could be other languages where all these properties do not align. The interesting fact about this type of universal is that it has a strong claim as well as a weak claim. The strong claim is that all these properties are observed

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together; the weak claim is that the antecedent (namely the presence of property X) implies at least one of the properties Y or Z.

Having seen examples for word order universals and syntactic universals, now let us consider two morphological universals – “Universal 28” and “Universal 31”. Both these are different from the previous ones because of the presence of the adverb ‘always’, which suggests an ‘absolute relationship’ instead of a ‘statistical relationship’ or a ‘tendency’ which we observed in the word order universal or the syntactic universal we discussed in the previous paragraphs. The statement of “Universal 28” goes like this: “If both the derivation and the inflection follow the root, the derivation is always between the root and the inflection.” This can be illustrated using the English example ‘nationalities’. The plural marker ‘-s’ is an inflection suffix, and ‘-al’ and ‘-ity’ are derivation suffixes. It is clear that the derivation suffixes occur between the root and the inflection. “Universal 31” concerns the gender agreement between the subject/ object noun and the verb: “If either the subject or object noun agrees with the verb in gender, then the adjective always agrees with the noun in gender.” This universal can be exemplified by data from Hindi and German. The absoluteness implied by the adverb ‘always' perhaps makes these universals appear like objects closest to scientific laws.

**Metaphysics of Laws in Linguistics**

Let us consider the lawlike generalisation 'a verb or a preposition assigns objective case to a noun phrase'. That is the idea behind the 'case filter' discussed under double constructions. It is possible to think of a causal account for this fact. What seems to happen is the following: when a verb or a preposition is adjacent to a noun phrase, the shape of the noun phrase changes in that a suffix gets added to it. Still it is not clear if it is the presence of the verb or the preposition that causes the affixation of the case marker to the object noun phrase. It could also be a matter of concomitant occurrence. That is, when a verb is placed in a sentence, the objective case marker is also placed on the object noun phrase. In the spirit of the universals developed by Gass and Ard (1984), it is probably a

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42 Susan Gass and Josh Ard, “Second Language Acquisition and the Ontology of Language Universals” in
principle of cognition or perception that leads to this phenomenon.\textsuperscript{43}

On the other hand, the phonological rules that we discussed earlier – such as post-nasal voicing in Malayalam – seems more to be aligned along the lines of being based on a physical principle, based on the same schema laid out by Gass and Ard. This is because physically it takes much less articulatory effort for two contiguous sounds to have the same manner of articulation. However, we need to still remind ourselves that we are not able to give an explanation for why language X (say like Malayalam) 'chooses' post-nasal voicing whereas a related language Y (say Tamil) does not. The best we can say is that there is a tendency for languages to have a rule of post-nasal voicing because of physical principles.

\textbf{Conclusion}

In this chapter, we saw that laws seem to work differently in the domain of language as compared to the natural world. The possible reasons are questions of variation, problems with notions of 'necessity' and 'universality, which are central to the explanatory device of laws. Also, we noticed that social factors, history and the fact that language belongs to the 'cultural universe' have an impact on why language shows resistance to being captured by laws. However, we did notice that lawlike generalisations may work in linguistics if certain platonic assumptions are made about language.

\textsuperscript{43} The principle/condition that a pronoun has to be free in a sentence also probably has a strong cognitive component, the idea of 'Disjoint Reference Presumption' proposed by Farmer and Harnish (1987). Farmer, Ann K. and Robert M. Harnish 1987 “Communicative reference with pronouns”. In M. Papi and E.J. Verschueren (eds.) The Pragmatic Perspective: Selected papers from the 1985 International Pragmatics Conference (pp. 547–565). Amsterdam: Benjamins.