



universität
wien

DIPLOMARBEIT

Titel der Diplomarbeit

Foundational Issues in Government Phonology

Verfasser

Benjamin Fischer

angestrebter akademischer Grad

Magister der Philosophie (Mag.phil.)

Wien, 2013

Studienkennzahl lt. Studienblatt:

A 328

Studienrichtung lt. Studienblatt:

Diplomstudium Allgem./Angew. Sprachwissenschaft

Betreuer:

Ao. Univ.-Prof. Dr. John Rennison

Acknowledgements

I want to thank, most of all, Aneta Gašiorek for her continuing support during the creation of this work. Her suggestions improved every level of this text. Of course, all errors that remain are my own. I also wish to thank my supervisor John Rennison for giving me the opportunity to pursue this topic. I thank Sabine Laszakovits and David Djabbari for their companionship during most of the writing process. I want to thank Dagmar for distraction from work, and Günter for the occasional calm weekend. Finally, I wish to express gratitude to the libraries of the department of linguistics, the department of physics, and the department of computer science of the university of Vienna, as well as the Wiener Linien, for providing me with suitable workplaces.

Contents

Acknowledgements	i
Contents	ii
List of abbreviations	v
1 Introduction	1
2 Government Phonology	5
2.1 The Representational Model	5
2.2 Theoretical Principles	10
2.2.1 Non-Arbitrariness	10
2.2.2 Generalized Autosegmentalism	13
2.2.3 A Representational Theory of Phonology	15
2.2.4 The Syntax/Phonology Isomorphy	17
2.2.5 A Principles and Parameters Theory of Phonology	19
2.2.6 The Purpose of Phonology	20
2.2.7 Nativism	22
2.3 Closing Comments	26
3 Generative Grammar	29
3.1 Early Generative Grammar	29
3.2 Late Generative Grammar	37
3.3 Galilean Linguistics	41
3.4 Summary	45
4 Rationality in Linguistic Theory	47
4.1 The Normativity of Rationality	48
4.2 The Logic of Justification	50
4.2.1 Logicist Theories of Justification	52
4.3 The Theory of Method	57
4.4 The Method of Generative Grammar	60
4.5 The Notion of Progress	65
4.6 A Case Study in Theory Comparison	68
4.6.1 Scheer (2004): CVCV vs. sGP	69
4.6.2 Ploch (2006): sGP vs. CVCV	73

4.6.3	Concluding Comments	80
4.7	Summary and Conclusion	80
5	The Issue of Metaphysics	83
5.1	Ontology	83
5.1.1	The Standard Argument	84
5.1.2	General Arguments for Cognitive Realism	86
5.1.3	An Alternative Ontology	86
5.1.4	Closing Comments	89
5.2	Realism	89
5.2.1	Arguments for and against	90
5.2.2	Non-Standard Realism	92
5.2.3	Concluding Comments	94
5.3	Summary and Conclusion	94
6	Conclusion	95
	Bibliography	101
	Appendix	109
	Abstract (English)	109
	Abstract (German)	110
	Curriculum Vitae	111

List of abbreviations

CFG	Context-free grammar
CSG	Context-sensitive grammar
CVCV	Strict CV theory of Government Phonology
ECP	Empty category principle
FL	Faculty of Language
GB	Government and Binding
GP	Government Phonology
LAD	Language-Acquisition Device
NMA	No-miracles argument
PE	Phonological Expression
POS	Poverty of Stimulus
PSG	Phrase-structure grammar
sGP	Standard theory of Government Phonology
SPE	The Sound Pattern of English (Chomsky & Halle 1968)
UG	Universal grammar

Chapter 1

Introduction

This thesis is not a thesis *in* Government Phonology, it is a thesis *about* Government Phonology. It does not deal with linguistic facts, and (mostly) makes no claims about how to properly account for such facts with Government Phonology. It also does not attempt to show that any version of Government Phonology is superior to another. What it instead does is to try to discover some of the philosophical foundations of work in Government Phonology. It attempts to describe the nature of the tradition of Government Phonology, and which parts of it derive from its empirical basis, from accidents of history, or from the philosophical commitments of individual researchers.

The philosophical problem motivating this work was the fairly everyday observation that there is more than one phonological theory available. I approached the situation with the intuition that critical discussion should allow people to agree. However, it appeared to me that the more work is being done on phonological theory, the more it diverged into ever new, wildly different traditions and sub-traditions, with no dialogue occurring between them. To me, this situation was deeply unsatisfying. Luckily, there was some promise to a solution of this problem in the form of a publication aptly titled “What is wrong with linguistics?” (Ploch 2004). This, and the collected work of Stefan Ploch, forcefully presented a proposal to turn linguistics into a proper science. It was promised that this would eliminate all but the strongest research traditions. However, for a variety of reasons, it soon became clear that this was not done as easily as was said. This thesis has the goal of continuing the metatheoretical discussion that Ploch initiated. However, the previous approach will be found to be too strict, and in many places inappropriate to linguistic subject matter. The reason for this will be found to be an overly narrow conception of the goal of research.

The overall structure of the thesis is as follows. The first chapter will introduce the theory of Government Phonology, followed by a chapter introducing the theory of Generative Grammar. After that, we will discuss the role of rationality in linguistic theory, and finally, we will discuss the issue of metaphysics.

Since the technical machinery of Government Phonology is not relevant beyond the way it appears in later discussion, the introduction will be very brief. In fact, counter to standard practice, I will distinguish between two sides of the

theory. One is what I call the representational model, while the other is what I describe as the theoretical background. This theoretical background comprises of the theory of the character of both individual grammars, as well as universal grammar, as well as the general goals of research. The following chapter on Generative Grammar is designed to provide historical context for this distinction. It will be argued that the initial publications of Generative Grammar proposed theories that intentionally were little more than formalisms, and that subsequently, these formalisms were embedded into a mentalist support structure. It will furthermore be argued that the goals of formalism and its theoretical superstructure had distinct goals, which sometimes agreed, and sometimes brought them into conflict.

After these introductory chapters, it will be possible to tackle a number of problems that arise within the tradition of Government Phonology. A number of problems of this kind are discussed in the fourth chapter concerned with the role and character of rationality, which deals, most of all, with the problem of the existence of multiple theories. The question will be whether there is a notion of rationality that is strong enough to uniquely determine theory choice. The tentative answer given here is that there is not, that any notion of rationality would itself have to be theoretical, and would not be inherently justified. The consequences for both the practice of theory comparison and the notion of progress will then be spelled out. While conceding that some of these might indeed be less “reasonable” than others, it will be found that in general, one cannot declare one particular form of rationality to be privileged. This will be supported by an investigation of two cases where such a thing has been claimed, both of which will be found to be opportunist, and poorly argued. Since the previous literature was strongly based on the work of Karl Popper, this work will also feature this philosopher strongly, perhaps more than would be independently justified. However, it must be strongly stressed that Popper is only one of many writers in the theory of methodology, which is a field alive and well, and burgeoning with controversy.

We will then move to the issue of metaphysics. In this section, claims that have been made in Government Phonology with regard to psychological reality will be evaluated. It will be found the standard set of arguments is insufficient. Following this, one alternative ontology will be discussed, one which capable of supporting work in Government Phonology, and has a number of arguments that make it appear to be a valid option. The second half of this chapter is dedicated to the doctrine of realism. Some classic arguments for and against a realist interpretation of scientific theories will be discussed, and it will be concluded that the notion of realism needs to be regarded with caution. Following that, a non-standard concepts of realism will be introduced, namely the theory of *Structural Realism*, a formal theory attempting to restrict which parts of a theory are held to be real. The value of this theory to linguistics is that it allows one to claim that several distinct theories can describe the same actually existing objects in different ways, and can therefore be equally true.

To summarize these points, the most important result of this thesis will be support of the claim that the introduction of concepts from the philosophical

literature can serve to illuminate problems in linguistics. However, it can never solve truly linguistic problems, or decide theoretical controversies.

Chapter 2

Government Phonology

The goal of this chapter is to introduce and discuss the theory of Government Phonology. First, basic ideas concerning the *representational model* are introduced. The second part of this chapter discusses more general, theoretical issues that Government Phonology is concerned with. Particular interest is paid to the way in which they function to direct the community's research activities by providing a shared set of goals. Therefore, they can be referred to as guiding principles.

The distinction between a model and a theoretical background that is used here is not very common in the literature of Government Phonology, but I argue that it is necessary to solve the problem in the theory of method that is discussed in chapter 4. The representational model is defined as the collection of assumptions that are directly involved in the representation of linguistic objects. This includes the quasi-phonemic, “pre-theoretical” representation in which basic facts are presented, as well as the diagrammatic representations of GP that encode claims about the possible forms of linguistic structures. The second section of this chapter is concerned with the theoretical background, which is meant to contain general ideas that were relevant in the construction of the representational model, but which are not directly expressed by it, and do not determine it fully.

At the end of this chapter, I argue that there is a certain disconnect between the representational model and the guiding principles of Government Phonology in the sense that the former is connected to the empirical base, while the individual principles of the latter are generally supported by conceptual arguments.

2.1 The Representational Model

Representations are a major focus of Government Phonology, in line with the generative tradition in general. The term “representation” is intentionally ambiguous. On the theoretical level, representations are understood as descriptions of mental structures involved in human linguistic ability¹. On the level of model-

¹This point is further discussed in section 2.2.7.

building, the term refers to a particular kind of diagram used in the description of the form of language(s)². The technical term for these diagrams is *structural description*, which indicates the purpose of specifying the internal structure of a given linguistic object. These claims generally pertain to well-formedness or ill-formedness of certain structures, as well as to morphological relatedness and similar notions.

The purpose of the representational system is not only to provide a notation in which linguistic elements can be written down, but also to encode claims about the range of possible linguistic structures, both in a single language, as well as in languages in general. In other words, the notational system is supposed to be restrictive³, in the sense that it should be incapable of describing states of affairs which are logically possible, but do not hold in the particular language, or which never hold in any of the languages that exist in the world.

In the following, the form of structural representation within Government Phonology will be introduced. The version of the theory sketched here is intended to be fairly conservative, incorporating features that are widely adopted. At the end of this introduction, two alternative versions will be commented on.

A defining feature of GP that is shared by the major variants is a partition into two parts, the theory of melody and the theory of constituent structure. These will be discussed one after another.

Melody. The theory of melody was developed as an alternative to classic feature systems. In opposition to the well-known matrices of binary-valued features, GP represents the quality of segments by monovalent features. That is, features are present or absent, not positively or negatively valued. Additionally, to distinguish them from features of earlier theories, they have been renamed into “elements”. For this reason, the theory of melody is also known as Element Theory.

The set of elements is usually defined as follows:

$$(1) \quad E := \{A, I, U, H, L, ?\}.$$

In Element Theory, every element is individually pronounceable. A single element A could, for example, be interpreted as [a], or [ɑ]. The element I is usually pronounced as [i] or [ɪ]. The combination of the two, the expression {A, I}, is usually pronounced as either [e] or [ɛ]. However, one of the most important things in Element Theory is that elements are not defined phonetically, neither acoustically nor articulatorily⁴. Instead, segments are assigned elements based on the phonological processes they participate in. For example, consider a process by which [k] turns into [c] when preceding an [i]-type or [e]-type vowel, in other words, sequences such as [ki] are replaced by [ci]. Assuming Element

²Section (5.2.2) will expand on the distinction between a description and the object of description.

³Cf. Kaye (1989:97,111).

⁴Backley (2011) proposes an acoustically grounded version of Element Theory. However, this author stands outside the tradition of Government Phonology and in fact stresses that Element Theory can be pursued independently of GP (p. xii).

Theory, one expects that the involved vowels both contain an I element. The natural conclusion is that the process consists of I-sharing, in which an element from the vowel is spread to the consonant, leading to the further conclusion that the segment [c] must contain an I element as well. Only phonological analysis such as this can determine the elemental make-up of any given segment. In Government Phonology, phonetic investigation is not seen as a viable substitute.

Elements are combined into so-called *melodic expressions*⁵, short ME. These expressions can be either unheaded or headed. An unheaded ME is defined as any subset of the set of elements, including the full set of elements and the empty set. However, this system is insufficiently expressive to describe the phonologies of most languages. Headedness, which essentially promotes one element to a privileged position, allows for the description both of a larger vowel space, and of variation in the behavior of segments which contain the same elements. A headed ME is defined as a pair of *operator* and *head*. The head is a single element (of *E*), or alternatively the empty set⁶, in which case we speak of an empty head. The operator is defined as a subset of *E*, with the additional condition that it may not contain the element that is the head. Schematically, a ME with headedness is written as (O, H). One example of a full, headed expression is ({A, U}, I), while the corresponding unheaded expression is ({A, U, I}, {}). There is a common alternative notation, which merely underlines the headed element, if one is present, and uses round brackets. The previous expressions would then be written as (I, A, U) and (A, U, I).

The differences in incarnations of Element Theory generally consist of either a different number of elements, or differences in the roles of individual elements. In general, the trend is towards the reduction of the number of elements. As such, the earlier elements N for nasality, or R for rhoticity, have been merged into L and A, respectively. A result of these reductions is that the work-load of individual elements increased. The element L, for example, is generally tasked with representing not only low tone, but also nasality and voicedness.

Structure. The second major component of GP's representational model is the theory of structure. The most important notions within this sub-theory are the *skeleton* and *constituent structure*, itself divided into constituent labels and a number of structural relations. The skeleton is a linear string of positions, usually interpreted as timing slots. For example, a short vowel consists of one skeletal point, while a long vowel demands two. Skeletal points by themselves contain no information. Only through their relations to the two other representational levels can they receive interpretation. One of these is the melodic level, which determines the interpretation of a skeletal point through association with an ME. The other representational level is the level of structure, whose three possible constituent labels O, N, and R determine whether a sound is a vowel or consonant. The combination of these two levels determines the pronunciation of each

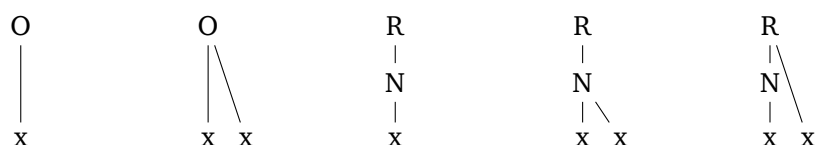
⁵These are also alternatively called *phonological expression*, or PE.

⁶The formalization is not always uniform, for example, Kaye (2000) uses an identity element _ in this case, resulting in MEs such as ({}, _).

skeletal element. For example, a skeletal point associated to the ME (A) and dominated by the label O(onset) or (R)hyme is pronounced as an [r]-like sound. The same ME, but with the label N(ucleus) results in the pronunciation of [a], or a similar sound.

The typical classes of constituents are given below:

- (2) Types of constituents in standard GP⁷ (Kaye, Lowenstamm and Vergnaud 1990:199)



All bigger structures in Government Phonology, such as those corresponding to full words, are concatenations of these basic types.⁸ Now only *structural relations* are missing for a (reasonably) complete picture. These relations vary heavily between particular versions of the theory and only a brief sketch is provided here.

One major relation is *government*, which is involved in, for example, a simple account of distributional restrictions within consonant clusters. Government comes in two variants of *inter-constituent* government, which holds between skeletal positions dominated by different types of constituents, and *intra-constituent* government, which holds in so-called branching structures. Both relations are assumed to be directional. Inter-constituent government moves from right to left, while intra-constituent government moves the other way. Furthermore, it is stipulated that government is responsible for restricting the possible content of skeletal positions. In a branching onset, an onset dominating two positions, the right position is governed. In a rhyme/onset configuration⁹, on the other hand, it is the left position that is governed. This corresponds to the fact that in the languages of the world, clusters at the beginning of a syllable are usually so-called TR clusters, consisting of an obstruent and a sonorant, while clusters at the end of a syllable exhibit the inverse pattern. The inversion of clusters is reconstructed in terms of the different directionalities of government relations.

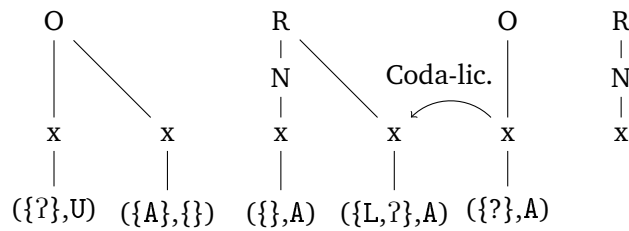
As a further illustration of GP's methods for the representation of linguistic structures, an exemplary diagram is shown below.

⁷Some authors (cf. Kaye 2000) have an additional constituent that is an Onset without skeletal position. Since this is undesirable on theory-internal grounds, and since there are only few convincing analyses that make use of it, many authors reject this constituent.

⁸There is a universally accepted requirement that no constituents with the same label may be adjacent.

⁹An example of this configuration is given on the page below.

(3) An exemplary GP representation of the word “brand”¹⁰



The series of “x” at the center of the graph constitutes the skeleton. Individual points of the skeleton stand in different relations to the two other representational dimensions of structure and melody. The melodic level, diagrammatically below the skeleton, connects via the relation of association. The structural level above the skeleton is bridged via the domination relation. These combined components constitute the basic form of a graph. There are also some more minor relations, which vary with the particular formulation of the theory, and are often omitted from a diagram. One widely accepted relation is indicated as “Coda-licensing” in the graph above. This relation is part of a proposal of Kaye (1990) to analyze word-final consonants universally as onsets, and to restrict rhyme-dominated codas to consonant clusters. For this reason, Kaye introduced the following principle.

(4) *Coda Licensing Principle*

Post-nuclear rhymal positions must be licensed by a following onset. (Kaye 1990:311)

Another notable relation of this kind is Charette’s (1990) government licensing. Finally, there is a widely used convention of replacing MEs for simple alphabetic representations. This is often done to increase readability, as many structural analyses do not need to make reference to the elemental make-up of individual segments.

Theoretical variants. When restricting attention to the representational system, two major theoretical variants become apparent. These are the *standard theory* and *strict CV*. The standard theory is called thus by virtue of being the first and original form. Its most important early statements are given in Kaye, Lowenstamm and Vergnaud (1985, 1990). This type of theory was the basis of the presentation above.

The major alternative, the strict CV approach, alternatively called “CVCV”, was originally developed by Jean Lowenstamm (1996), which was soon followed by other researchers pursuing similar ideas (Scheer 2004, Rennison and Neubarth 2003, Szigetvári 1999), and is defined most of all by the rejection of hierarchical structure, instead employing exclusively flat representations. This means that the branching structures in example (2) are rejected, leaving only the onsets and

¹⁰The PEs are taken from Kaye (2000).

nuclei that dominate a single position. With the requirement for the pairwise appearance of onsets and nuclei, this means that the only type of structure consists of alternating ON pairs. Approaches of this kind contain no notion of rhyme at all, and as such are even further removed from classical treatments of syllabification than the standard theory. It is fitting, then, that the terminology has been renewed as well. The labels “onset” and “nucleus” were foregone in favor of the more everyday terms “consonant” and “vowel”. This turned ON pairs into CV pairs, which motivated the name of these theories. In the context of this thesis, the CVCV approach is interesting through the meta-theoretical controversy that ensued over the question whether the standard theory or CVCV were more scientific. This issue is discussed in the later section 4.6.

There is also a more recent third approach, called GP 2.0 (Pöchtrager 2006), that elaborates the theory of structure at the expense of melody. However, this approach uses a completely different representational system, replacing standard GP’s graphs with single-rooted, exclusively binary-branching trees as are standard in syntactic theory. Due to size constraints this system cannot be summarized here.

This concludes the discussion of the representational model. The following section moves on to a discussion of the theoretical principles that were relevant in the construction of this system.

2.2 Theoretical Principles

This section discusses a number of theoretical principles within the literature of Government Phonology. The principles listed here are of various types; most are usually presented as statements about Universal Grammar, but others constitute explicit methodological guidelines. In the following presentation particular attention is paid to the way that principles can function to set a goal of research, or to determine the quality of an analysis, and to the ways these are argued for.

2.2.1 Non-Arbitrariness

Government Phonology was initially portrayed as a theory of markedness. To understand what this means, some exposition is in order. Chomsky and Halle’s (1968) book *The Sound Pattern of English* (hereafter “SPE”) was without doubt the most influential text of early generative phonology. SPE’s chapter 8 and 9 are a famous discussion of what we call α -rules, the name being derived from SPE’s use of Greek symbols (α , β , γ , etc.) as variables for feature valuations. The existence of these rules posed a serious challenge for the theory presented in SPE. The reason is briefly presented below.

A common type of voicing assimilation in clusters can be captured by the rule $C \rightarrow [\alpha \text{ voiced}] / _ [\alpha \text{ voiced}]$. This rule states that any consonant must agree in voicing with a following sound. The theory of SPE also contains a notational convention for the inversion of a feature variable, written as $-\alpha$. This allows us to state the dissimilation rule $C \rightarrow [-\alpha \text{ voiced}] / _ [\alpha \text{ voiced}]$, which has the conse-

quence that two adjacent segments will always have opposite values of voicing. Another possibility is a rule such as $C \rightarrow [-\alpha \text{ voiced}]/_ [+high]$, which will invert the voicing of a consonant before high vowels. However, we know of no language that would require these rules. Because of this, we would wish our theory of Universal Grammar to exclude these rules, that is to make them inexpressible in the formalism. For this reason, Chomsky and Halle (1968) introduced the notion of markedness into generative phonology. In its wide sense it came to refer to all proposals for the restriction of the notion of possible rule. GP is a continuation of this theoretical discussion, which it tries to resolve through the *non-arbitrariness principle*.

The non-arbitrariness principle is as central to the enterprise of Government Phonology as it is difficult to pin down. Pöchtrager (2006:20) describes it as “the very core of GP”. The standard formulation of this principle is the following:

(5) *The non-arbitrariness principle:*

There is a direct relation between a phonological process and the context in which it occurs. (Kaye, Lowenstamm and Vergnaud 1990:194)

The way this statement is phrased leaves much room for interpretation. Kaye, Lowenstamm and Vergnaud explicate their principle further by using an example, as has become customary. Specifically, they say that autosegmental treatments of tone assimilation satisfy non-arbitrariness, while rule-based treatments violate it. Consider the analytical schemes below:

(6) a. An autosegmental treatment:



b. A rule-based treatment:

$H \rightarrow LH/L_$

$*H \rightarrow HL/L_$

$*H \rightarrow LH/_L$

These examples try to show that a representational system such as in (6a) is more restrictive than the alternative. In the autosegmental system of (6a), the only possible operation is the addition of an association line, restricted by a constraint against line crossing. In this system, it is impossible to reorganize two autosegments in such a way that their linear order would end up being reversed. In terms of phonetic interpretation, the result is that when a low tone is followed by a high tone, the high tone can be replaced, for example, by a rising tone, but never by a falling tone. On the other hand, given traditional rewrite-rules, any combination of symbols can be produced from any earlier state. This is because, for any rule $A \rightarrow B/C_D$, the variables can be filled with any segment, in every possible combination. The relationship between A , B , C , and D is *arbitrary*.

The definition of this notion of rule does not allow for any type of constraints on possible relations between input/output segments, or between these and the context. It is in reaction to this problem that the non-arbitrariness principle has been formulated.

In the following a general definition of the notion “to constrain the notion of phonological process” is attempted. If we forgo feature notation and additional tools such as bracketing, and instead adopt a phonetic alphabet, an SPE-type system of rewrite-rules can be reconstructed in the following way: We interpret a rule $A \rightarrow B/C_D$ as a quadruple (A, B, C, D) , each element being a member of the alphabet. We arrive at a way of characterizing the set of all possible phonological rules as the set of all such quadruples. In this scheme, a particular grammar can be reconstructed as a subset of the set of possible rules. A goal in the construction of the representational model is the reduction of this set of possible phonological rules. This corresponds to the goal of constraining UG.

The non-arbitrariness principle goes about achieving this goal by introducing a relation between input and output, and between process and context. The input/output relation is mostly a task of the theory of melody. The previously discussed case of a palatalization of $[k]$ to $[c]$ in the context of an I element is an example of this. The output is just the input with a single added element. With the primary phonological process of (re-)association, no analysis can reasonably be concocted that transforms $(\{A, U\}, I)$ into $(\{L, H\}, \{\})$. The process/context relation plays a part in this as well. The palatalization is non-arbitrary, since it adds an I element in the context an I element. If, however, a U is observed to cause the appearance of an I, then, barring any special circumstances, the analysis is arbitrary and must be rejected.

However, it is important to distinguish the goal of restricting UG from the narrow meaning of the non-arbitrariness principle. The principle itself is only concerned with the properties of phonological processes. Consider the following thought experiment. Given GP’s nativism, we suppose that the non-arbitrariness principle is an empirical claim about the structure of the mental faculty of language, and we consider phonological processes as computation that is performed by this faculty. We then assume that we have complete knowledge of this faculty. Theoretically, it could then turn out that computation is arbitrary, by being a rewrite system that replaces characters without regard to their identities. On the other hand, it might turn out that computation is non-arbitrary, that it works roughly along the lines that GP assumes, but that the structure of representations is so elaborate, and the possibilities for reorganizing it so many, that ultimately every phonological change can be expressed. In this case, the system is non-arbitrary, but also non-restrictive. We see that the motivation for the principle, the desire for a restrictive UG, can be distinguished from the narrow content of the principle.

A distinction needs to be made between a principle and a representational model which embodies it. While the non-arbitrariness principle motivated certain properties of Government Phonology, it did not determine its exact form. Most of the mutually incompatible versions of GP embody the same or a very similar

non-arbitrariness principle. This has consequences for any attempted evaluation of the principle. For example, the claim that a certain process cannot occur is trivially shown false by evidence that it does in fact occur. But the principle itself makes no particular claims of this sort. These can come only from a specific formulation of a non-arbitrary representational model, and it is only such models that can be falsified. On the other hand, the principle of non-arbitrariness has had a great number of successes, contained in the many analyses that Government Phonology has produced over the years. A determination of the empirical value of this principle requires an elaborate theory of confirmation and cannot be investigated here.

There is also a notable non-empirical dimension to be considered. Scheer (2004) is of special interest here. There, he makes clear how the non-arbitrariness principle can be justified through a philosophical commitment. In his book (2004:372), Scheer summarizes the arbitrariness of a classical SPE-type rule system, to proclaim that “argumentation is hardly needed in order to understand that nature does not work like that”. His version of the principle is also more restrictive than the basic account given above. In particular, he claims that “it is not reasonable to assume that a given object may trigger a process X and its reverse”, which itself is justified by saying that “there are precise causalities in nature” (Scheer 2004:372).

These comments show three things. First, they indicate the connection to the problems of SPE, since it is exactly the possibility of inverting a variable with “- α ” that allows SPE to “describe any process and its reverse”. Second, they express a belief in determinism motivated by current physical theory, and third, they show how this belief is used to justify a grammatical principle. The last two show Scheer’s belief that it is valid to transpose a philosophical principle such as determinism from the physical disciplines into grammar. While such a belief is far from obvious, Scheer presents it as self-justifying. To repeat his words, “argumentation is hardly needed”. This episode shows how expectations about the basic nature of the world can have consequences for grammatical theory.

In conclusion, this section has shown that it is important to distinguish the non-arbitrariness principle from any non-arbitrary representational model. The former is more general, and of a philosophical character that is discussed in the conclusion of this chapter.

2.2.2 Generalized Autosegmentalism

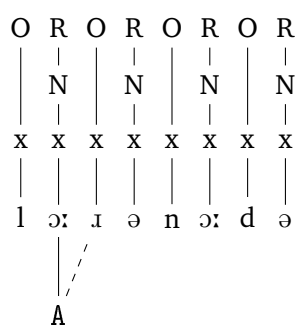
Autosegmentalism is the position that phonological features are in some way *autonomous* from the *segments* of phonological words. According to this view, features are not properties of segments, but rather objects in their own right. This opens up analytical possibility that when two segments express the same type of element, they can be associated to a single token, or two different tokens of that element. An important intuition that motivated the introduction of this principle in Government Phonology was the belief that in a case of assimilation, there is really only one element involved.

The principle of autosegmentalism manifests itself in Government Phonology in the form of the melodic level. To repeat, Government Phonology assumes a tripartite distinction of melody, structure and the skeleton. Segments interact with the melodic level through the association relation. When Elements associate to a segment they influence its quality. The possibility of multiple association is what allows an element to have effect in more than one segment, and constitutes the representational tool that gives rise to autosegmentalism. Essentially, the basic process of autosegmentalism is the reorganization of association lines, manifested as various forms of feature spreading.

A minimal case of an autosegmental analysis is that of tone spreading. Suprasegmental phenomena such as this were the focus of the earliest autosegmental literature. At the time of its formation, it was one of the chief goals of Government Phonology to apply this logic as many cases as possible. Illuminating application has been achieved with various segmental assimilations, though the most notable successes are found in the description of various processes of vowel harmony, such as in Charette and Göksel (1994, 1996).

In the following, a typical autosegmental analysis will be provided in the form of an account of a phenomenon called *intrusive-r*. A number of non-rhotic dialects of English require that a hiatus be broken up by the introduction of an /r/ sound, the most famous example being the first two words of the phrase “law and order” (Katalin 2011). However, the context of this phenomenon is restricted to positions after non-high vowels. In terms of Government Phonology, this means that /r/ appears only after vowels containing the element A. We also note that the segment /r/ consists of the single element A attached to a consonantal position. Consequently, in terms of Government Phonology one can easily give an account of the intrusive-r by positing that a vowel’s A element spreads into any following empty consonantal positions¹¹. An exemplifying diagram is shown in (7) below.

(7) A representation of the phrase “law and order” including intrusive-r



This type of analysis can easily be generalized to similar patterns in English dialects, where the breaks between “play again” and “no other” (Michalski 2009:337) are filled with a semi-vowel with its place of articulation determined by the earlier vowel. These cases differ only in the identity of the element

¹¹A comprehensive accounts of these facts is provided by Michalski (2009:336ff.).

that spreads. However, to appreciate autosegmental accounts that have been achieved, it is important to have a sense of the difficulties that they bring with them.

For example, it is informative to contrast autosegmental accounts with ones that are rule-based. The intrusive-r data above suggests a rule of the form “ $\emptyset \rightarrow r / V_{[+low]}-V$ ”. In such an account, it is not necessary that the epenthetic element and the trigger share any features. The formalism makes the identity of elements irrelevant, depriving them of a causal role, furthermore suggesting that any arbitrary segment could be introduced to break a hiatus.

Also, autosegmental accounts are only possible in the theory of melody. The structural sub-component of Government Phonology does not contain any analogy to autosegmentalism, and it works on very different principles. This leads to issues in cases such as Pöchtrager’s (2006) reinterpretation of the element A as a structural configuration, which was motivated by the existence of over-sized structures in the presence of A. Given that structure cannot spread, the above analysis of intrusive-r is rendered impossible in his theory.

An entirely different problem results from the fact that the possible autosegmental analyses depend on the set of elements. The early theory of elements contained an R element, particular to rhotic consonants and vowels. This element was instrumental in accounts of the Sanskrit phenomenon of *nati*, in which all vowels after a rhotic consonant are pronounced with a rhotic quality. A simple analysis in terms of R-spreading provides an ideal account of these facts. However in later form of the theory, R had been merged into A. The account of *nati* was made impossible, but the account of intrusive-r above is only possible with this change. That is, one autosegmental explanation has been lost, and another has been gained.

As we see, there are certain obstacles to the proliferation of autosegmental analyses. Nonetheless, Government Phonology has always been committed to applying the logic of autosegmentalism to as many cases as possible. As was the case with the non-arbitrariness principle, it must be noted that the principle of autosegmentalism is distinct from a representational system that embodies it.

2.2.3 A Representational Theory of Phonology

Government Phonology is a so-called representational approach to phonology. Of course, every generative theory necessarily makes use of representations in some sense. However, especially in earlier theories, representations were of no interest beyond their use as a notational system. They were not developed beyond necessity, since the goal was to formulate rule-systems which alone would carry the predictive power of the theory. This approach can be said to have been brought to its conclusion in the contemporary anti-representationalist tradition of Optimality Theory¹². In this theory, predictions follow exclusively from a system of

¹²It must be noted that given the popularity of OT, it has expanded in many directions. The statements here refer to the classical form of the theory due to Prince and Smolensky (1993), which has often been opposed in the tradition of GP.

constraint-interaction, while representations are marginalized to the extent that they are, in principle, interchangeable¹³.

Theories that are described as representationalist attempt to oppose this line of thinking. Instead of regarding representations as an unfortunate necessity, they opt to put them at the center of investigation, by assigning them predictive and explanatory responsibilities. In Government Phonology, counter to earlier tradition, it is the theory of processes and derivations that is marginalized.

In Government Phonology, the predictive content is encoded directly into the structure of representations. Unbounded consonant clusters, for example, are ruled out by the principle that representations consist of alternating ON-pairs in conjunction with a principle governing the distribution of silent, empty vowels. In opposition to this, a non-representational, derivational theory such as the one presented in SPE can allow for the representation of clusters of any length and still arrive at the same prediction by positing a rule of vowel-epenthesis ($\emptyset \rightarrow \text{ə}/\text{C_CC}$) that breaks up excessive clusters on the way to the surface.

Scheer (2004) correctly points out that the formulation in terms of *syntagmatic* relations, that is, relations between elements within a structure, is a crucial quality of GP and representational theories in general. In the example above, the GP account follows from the requirement that an onset receives government from a nucleus. No structure with excessive numbers of consonants is possible, since it would not be able to support the necessary government relations. A major part of the theory deals with the relations of government, licensing, and association. On the other hand, in the derivationalist alternative, the exact content of a structure is immaterial. The only thing that is important is which structure can be replaced by what other structure, that is, what kind of structures can follow each other in a derivational chain. In the example above, an illicit trinary cluster is replaceable, and must be replaced, by the corresponding cluster broken up by a schwa.

There are multiple sources of GP's representationalism. For one thing, the late 70s, and more so the 80s, exhibited a general trend towards representational theories. An important phonological exemplar of this trend is the theory of Autosegmental Phonology mentioned earlier. However, while it is clear that GP's theory of melody owes very much to autosegmental theory, the theory of structure, which was quite innovative in GP, appears to be more indebted towards syntactic thinking¹⁴. This is apparent in the common references to Government & Binding, both explicit and in homage, that appear wherever the theory of structure is discussed.

Representationalism is rarely perceived as a principle in the sense above. However, from the point of view that is adopted here, there are remarkable similarities. First, there is the question of empirical confirmation. In much the same way as with the previous two principles, we have to conclude that representationalism does not make any empirical claims by itself, and that it cannot easily be empirically distinguished from derivationalism (cf. Roberts 2001). Again, we

¹³While quasi-phonetic representations are most common, some studies have used, for example, GP representations (Polgardi 1998).

¹⁴This claim is substantiated in section 2.2.4 below.

find that representationalism is a basic principle about the architecture of the representational system, that guides its construction but does not fully determine it.

2.2.4 The Syntax/Phonology Isomorphy

An important goal of Government Phonology is to create a phonological theory that strongly resembles syntactic theory. Kaye, Lowenstamm and Vergnaud (1990) describe the need for a “syntax of phonological expressions”. Scheer (2004:xliv) continues this line of thought when he writes that “the research program at hand seeks to identify cases where phonological structure and processes, eventually against intuition and the surface mirage, have syntactic peers and hence could be unified with them”. Honeybone (1999:182) calls this “one of the chief motivations for the original development of the theory”.

This goal of converging syntax and phonology interacts with the belief that both syntax and phonology constitute mental faculties in some form. This is noted by Kaye, Lowenstamm and Vergnaud (1990:194), who write the following:

[w]hat is at stake here goes well beyond a mere search for interesting or suggestive similarities. Rather, if (some of) the same principles can be shown to underlie phonological as well as syntactic organization, the idea that such principles truly express special, idiosyncratic properties of the mind (such as the kind of asymmetries typical of natural language) will be correspondingly strengthened.

The motivation of this claim becomes especially clear when put into contrast. Let us consider for a moment that grammatical principles are instead interpreted as descriptive fictions. In that case, similarities between syntax and phonology would be accidental, and more importantly, there would be no reason to expect that there are any. Methodologically, the only benefit of a convergence of both domains is a form of simplicity. If the descriptions of syntax and phonology could be made sufficiently similar to contain identical statements, these would not need to be stated multiple times. As a result, the full grammar in its totality would be more simple. However, this benefit disappears if one’s phonological theory is not intended to be paired with a *specific* syntactic theory. But if all claims to truth are removed, and if grammar is mere description, then the choice of a particular syntactic theory that should be emulated is made more difficult, if it is not entirely arbitrary. We see that under the fictionalist, or instrumentalist, account of grammar the principle of syntax/phonology isomorphy has less motivation.

If, on the other hand, the principles of syntax are real mental operations, then the discovery that both domains function similarly is a factual discovery. Specifically, this would imply that both domains access the *same* mental operations. This would not only lead to increased formal simplicity, but actually enrich the empirical basis of both theories, since evidence for one domain would count as evidence for the other. Under this assumption, to do phonology without regard for syntax means a restriction to the available evidence, which would more likely lead to

factually wrong theories. So we see that the belief in the reality of grammatical theories provides a good reason to connect phonology and syntax.

However, while this relationship is in principle symmetric, with phonology being as important to syntax as vice versa, in practice this has not been so. The dependency between Government Phonology and Government & Binding can only be described as one-sided. There are multiple reasons for this. One is that at the time of the formation of Government Phonology, the Government & Binding theory of syntax was thought to be already well-established. Another reason is that Government Phonology is a predominantly European tradition, and therefore is geographically removed from the global center of the tradition of Government & Binding.

Another reason is that syntax is generally seen as more important than phonology. A simple reason for this is the fact that syntax is seen to require recursion due to the infinite number of sentences, while phonology is thought to constitute a finite domain, the words in the lexicon. In Chomsky's most important book of the time, *Lectures on Government and Binding* (1981), discussion or even mere mention of phonology is notably absent, as is the case with *Barriers* (1986). Somewhat more recently, Chomsky (1995:380) proclaimed that it appears likely "that Bromberger & Halle (1989) are correct in holding that phonology, unlike the rest of C_{HL} [= the computational system for human language], is rule-based".¹⁵ These and other reasons conspire to make GP a phonological theory that, at least initially, tried to emulate a syntactic framework that did not reciprocate the effort.

An additional problem for the goal of a syntax/phonology isomorphy is the fact that there is more than one syntactic theory. It is roughly at the same time that the standard theory of GP took a rather definite form, with the publications of Kaye (1990, 1992, 1995) and Charette (1990) that syntactic theory started to take a new shape in the form of the Minimalist Program (Chomsky 1995). This posed great problems for GP's goal of approaching syntax, as the Minimalist Program constituted a decisive turn away from representationalism and back towards derivationalism. To approach Minimalism without giving up important parts of what defined Government Phonology can be seen as a contradiction. The literature of Government Phonology adopted no unified response.

Some authors have done away with GP entirely and started to pursue other phonological theories, but it is unclear what the role of the change in syntactic theory was. By far the most common response is simply not to react. The most recent large-scale innovation in GP theory, Pöchtrager (2006), was decidedly oriented towards GB theory, and not Minimalism. Others have tried to keep the representational system of GP as it is, but to introduce Minimalist machinery into the computational system, which is normally rather neglected. For example, Ulfsgjorninn (2008) proposes an account of vowel-zero alternations couched in terms of CV-metathesis driven by agree and internal-merge, the basic operations

¹⁵Bromberger & Halle (1989) itself is a notable publication that argues in favor of SPE-type rule systems, including extrinsic rule-ordering, and against representational theories similar to those in the syntax of the time. In other words, they are directly opposed to the ideas that are framed in this section.

of Minimalist syntax. Another possibility is to reject or redefine the principle that phonology and syntax need to approach each other. Scheer (2004) accepts Chomsky's position that phonology functions differently from syntax, but at the same time he attempts to embed his theory of CVCV into the modular architecture of Minimalist theory.

A general historical review of the syntax/phonology isomorphy is found in Bermúdez-Otero and Honeybone (2006), who try to trace the development, both in favor and in opposition to the syntax/phonology similarity, from structuralism to the then-present. Here, it shall only be commented that for every major syntactic theory, there appears to be a corresponding phonological framework, as evidenced by e.g. Head-Driven Phonology based on HPSG, and Dependency Phonology based on Dependency Grammar. The other direction of influence is attested as well. *Aspects of the Theory of Syntax* (Chomsky 1965) introduced a feature system that essentially mirrors distinctive feature theory and more recently, the very successful framework of Optimality Theory initially began as a theory of phonology (Prince & Smolensky 1993) before being applied to syntax. Attempts to converge syntactic and phonological thinking are a common theme in the grammatical literature.

The purpose of the principle appears very straightforward. It introduces a criterion that in the degree that a phonological theory resembles syntactic theory, it is judged to be successful. But this solves the problem of theory evaluation only locally. The problem reappears as the question of which syntactic framework one should emulate in the first place. In summary, as with all the principles discussed here, the claim that syntax and phonology function similarly does not make any specific predictions, and needs to be regarded as a principle that is more general than a particular representational system. The function of this principle is to provide a conceptual reason for a criterion that will constrain theory construction. However, the principle is not powerful enough to uniquely determine theory choice.

2.2.5 A Principles and Parameters Theory of Phonology

One of the strongest indications that GP's representationalism is due to syntactic, and not phonological, precedents is the endorsement of the theory of Principles & Parameters. The P&P theory was a radical restructuring of the architecture of grammar. Its impact on the grammatical literature was so strong that Chomsky declared that "[f]or the first time, there are several theories of UG that seem to have some of the right general properties" (Chomsky 1981:4).

As the name indicates, a P&P grammar consists of two parts. *Principles* are statements that specify the nature of linguistic objects, and provide specific conditions for grammaticality. At the same time they constitute most of the content of Universal Grammar. The variation of individual languages is accounted for with *parameters*, which function very much like principles except that they allow for a number of pre-specified options. These options range from several pre-specified values of a variable to much more common binary parameters which are either

on or off, such as in “Domain-final nuclear heads (but not their projections) are p-licensed (YES/NO)” (Pöchtrager 2006:121).

The P&P theory is itself indirectly connected to representationalism. In earlier derivational theories, language acquisition was conceived of as the creation of a set of rules that would account for the language. That is, the learner could freely form their hypotheses within an infinite space of possible grammars, only restricted by the notion of possible rule, which made up the core of linguistic theory. This was understood to lead to a learnability problem, since no method for the proper identification of an adequate grammar in an infinite hypothesis-space could be provided. The theory of P&P was a reaction to these difficulties. Instead of requiring the learner to invent their own grammatical statements, they would be provided by UG. The only obstacle in language acquisition then was to identify adequate settings for every parameter. In other words, P&P was designed in an attempt to solve a problem that was seen as inherent to rule-based grammar. It is no surprise that the rule-component of the theory of Government & Binding was marginalized as far as possible, reduced to the ideally invariant X-bar scheme. From this, it was only a small leap to interpret the Principles and Parameters of grammar as a description of the nature of representations.

This line of thinking had a profound influence on Government Phonology, which consistently self-identifies as a P&P theory of phonology. The following remark by Lowenstamm and Kaye (1986:97) betrays the fact that a relation between P&P and the rejection of rules has been understood: “our approach reflects a strong commitment to what has been called the ‘Principles and Parameters’ approach to the study of the language faculty, or to what Jean-Roger Vergnaud has called with reference to our work the ‘no rule’ approach”.

In line with the previous principles, we observe that the theory of P&P guides model construction, but is evaluated based on an intuitive sense of the success of its application, instead of any specific empirical criterion.

2.2.6 The Purpose of Phonology

In the tradition of Government Phonology, much theorizing was concerned not only with the description of phonological facts and the investigation of the character of phonological systems, but also with the question of why there are phonological processes at all. This interest is expressed in the dictum that “The most remarkable fact about phonological phenomena is that they exist at all” (Kaye 1989:16).

There exist a number of ideas on this topic, however, most of the work has not been put into print. Luckily for the interested reader, Scheer (2011) provides an excellent summary of much material that was previously only accessible in teaching and conference presentations. The study by Ploch (2005) is valuable in this regard as well. There are three notable suggestions as to the purpose of phonology. These are, in order of importance, the *Parsing Hypothesis* (Kaye 1989), the *Lexical Hypothesis*, and the *Acquisition Hypothesis* (Ploch 2005).

The Parsing Hypothesis is the most notable of these. It found its most elabo-

rate expression in Jonathan Kaye's 1989 book, where it is written that "[i]t is the existence of phonological processes that makes possible the speed of oral communication that we observe in the languages of the world" (p. 50). The most important argument that is provided for this position is concerned with the detection of non-phonological information, primarily phrasal boundaries¹⁶. Kaye provides a number of examples, most notably the language Desano (a Tucanoan language spoken in Brazil and Colombia) which exhibits a system of nasal harmony such that a single word contains either only nasal vowels, or only oral vowels, but never a combination of these. This means that whenever there are adjacent syllables featuring an oral and a nasal vowel, one can deduce that they are separated by a word boundary. However, Kaye appreciates that not all boundaries are detectable in this manner, since two equally harmonized words can follow each other. Nonetheless, given the general success of this method, Kaye is confident that this mechanism has relevance to the study of language acquisition. In conclusion, Kaye writes that "[l]anguages typically have a fair number of different phonological phenomena. Collectively, they may well supply clues for a substantial number of divisions; enough at least to give the parser a fighting chance to do its work in the allotted time" (p. 53).

Interestingly, the representational character of GP is motivated by the claim that "rule-based theory gives little insight into possible applications of phonology such as parsing, learning theory, and automatic speech recognition" (p. 147). This claim is supported by reference to problems with rule-based machine learning systems, which were able to provide countless possible lexical entries for even the simplest phonetic surface forms, allegedly providing too many options to reconstruct a message. However, Kaye's remarks on this matter are ultimately only programmatic. They span a mere 4 pages in a book that is aimed at non-specialists, and cannot be claimed to constitute a thorough analysis.

The second approach is the so-called Lexical Hypothesis. As Scheer (2011:291) comments, Jonathan Kaye has never published any of these thoughts, and as such this idea is somewhat more obscure than the Parsing Hypothesis. The Lexical Hypothesis is the conjecture that the representational system of Government Phonology in fact describes the way the mental lexical access system is constructed. To use a common metaphor, consider the organization of a dictionary, and how it depends on the alphabet that is used. According to Kaye, the mental lexicon is organized based on the entities of GP theory, that is in elements and constituency structure. That means that to look up an entry, and to retrieve the syntactic and semantic information that is stored, one needs to know the phonological form. An interesting consequence is that any well-formed phonological structure constitutes a valid address for lookup. This means that grammatical, but non-existing words in fact point at empty lexical entries.

The most elaborate expression of the Lexical Hypothesis can be found in the work of Sean Jensen (2000, 2003), which in many ways stepped outside of the tradition of GP. Unfortunately it was Jensen's conclusion that a lexical access system conceived of in this way does not allow for the existence of phonological

¹⁶Scheer (2011) relates this to the much earlier work of Trubetzkoy.

processes, and that every tentative alternation must be lexicalized, which is incompatible with GP thinking. Still, despite this potentially problematic status, Government Phonologists have expressed interest in the general idea of the Lexical Hypothesis, taking it into a different direction by suggesting that experimental evidence such as response-time tests could be exploited to develop explicit hypotheses. Sadly, this has not materialized in the form of detailed studies.

The third approach is the so-called Acquisition Hypothesis of Stefan Ploch, who conjectures that “an analysis of what segments trigger which phonological phenomenon helps the child to make heuristic shortcuts about the internal representations of these triggers, i.e. the phonology narrows down the analytical options the child has” (Ploch:2004:415). The reason that a child would need help in identifying the make-up of representations at all lies in the rejection of a phonetic definition of elements. Since the phonetic signal does not (fully) determine which elements a certain segment contains, there will always be a number of analytical alternatives. An [e] type vowel usually has three possible elemental make-ups, ({A}, I), ({I}, A), or the unheaded ({A}, I, {}). In rarer cases a language will have a three vowel system including [e], which would point towards an analysis as ({I}, {}) or even ({}, I). The assumption is that a child must be able to uniquely identify the phonological expression for every sound, and that it is the existence of phonological processes that allows this to happen.

It must be noted that these three hypotheses do not entirely fall in line with the principles discussed before. On the one hand, these principles had much less influence in the construction of GP’s representational model, and on the other, they are much more explicitly intended to guide future research. So in a way, the difference is mostly of a historical nature, in that they have only been stated but not used.

2.2.7 Nativism

The previous sections have repeatedly claimed that theoretical principles function as constraints of the form of possible grammar formalism, and are generally not susceptible to empirical confirmation or disconfirmation. However, principles are generally presented as empirical claims about the structure of UG. The result is an apparent contradiction. It is the goal of this section to argue that these views can be reconciled with each other.

Nativism is the belief that linguistic structure is in a non-trivial way determined by genetic endowment, in a way that obviates the need for (some amount of) learning. A related, but distinct, notion is cognitive realism, which holds that grammatical descriptions describe psychological reality. This often extends to the entities that grammar assumes, entailing that e.g. the phoneme (or an alternative) is a category that is actually used by the brain. Under this view, grammars and their entities must be relatable to cognitive structures. The assumption is that with a full understanding of the structure of the brain, one could identify components and mechanisms that corresponds to theoretical entities. Both nativism and cognitive realism usually appear together.

It is certain that virtually everyone in the tradition of GP ascribes to linguistic nativism. The issue is what the character and motivation for this position are, and whether this endangers the claims of this chapter.

The most important publication on the topic of GP's nativism is Jonathan Kaye's (1989) book *Phonology: A Cognitive View*. The book makes ample use of a traditional Chomskyan nativism. The subject matter of linguistics is defined as the "cognitive faculty that underlies our linguistic abilities" (Kaye 1989:2). The standard notion of competence is employed, being defined as the "knowledge that permits [anyone] to speak and understand [their own] language" (ibid.). This constitutes evidence of both the biological and the mental dimension of nativism and cognitive realism. It is said that "the understanding of the exact nature of this linguistic competence [...] is the primary objective of linguistics" (p. 3). When these positions are elaborated, it becomes clear that the motivation of this cognitive realism is connected to Universal Grammar, as opposed to individual grammars. It is because the theory of Universal Grammar attempts to model the range of possible human grammars that it is cognitive in character (p. 7-9).

Importantly, the book itself proclaims that it "has a markedly cognitive orientation" (Kaye 1989). The following explication of the meaning of "cognitive" is provided: "Within linguistics itself, evidence supporting a given theoretical position is no longer limited to internal data of the sort provided by linguistic analyses of a given system. Issues such as parsing, 'learnability', child language acquisition, and aphasia form a significant part of the grist for the linguist's mill. Such issues [...] should make clear what I mean by a cognitive orientation" (ibid.). This could be interpreted to introduce an *evidential* criterion. The book states that there is grammatical data, which has always been used, and which does not suffice for a cognitive theory. Then, there is external data, which had not been used before, and which is necessary for a cognitive approach.

However, despite the promises that are made, the book rarely deals with grammar-external issues. In fact, the exact words "learnability" and "aphasia" are only used once in the whole book, which is in quote above¹⁷. Of course, the corresponding concepts are alluded to in the text: parsing is discussed in the form of his Parsing Hypothesis, which has been introduced earlier. However, the Parsing Hypothesis exists only in a very rough state and takes up about half a dozen pages in this book. No experiment is performed, even if Kaye speculates that a phonological string whose phonological boundary phenomena have been removed would need to be played back at a much slower pace to be intelligible (p. 50). Kaye concludes that "[t]o the extent that phonological theory narrows the scope of possibilities, the work of the parser is facilitated" (p. 148). As for learnability, child language acquisition features only once to illustrate the P&P theory, being defined as the setting of parameter values (p. 9). No case studies or acquisitional data are discussed in any way. Language acquisition in general is only relevant in the sense that "[t]o the extent that there exists a common core of grammar, the burden of acquisition is correspondingly reduced" (ibid.). How-

¹⁷It is also notable that of all these "cognitive" considerations only "parsing" receives a single mention in the index of the book.

ever, no reason is provided for the claim that the burden of acquisition needs to be reduced in the first place. While this appears to be an implied reference to the argument from the Poverty of the Stimulus (POS), which says that human language could not be acquired from data alone, there is no mention of the name of the POS and no literature reference. As it stands, the comment constitutes no argument, raises no evidence, but instead appeals at a belief that is common in the generative tradition.

We must conclude that the way Kaye (1989) presents the cognitive approach, it appears to be another entry into the list of theoretical principles. This is, first, because it is not supported by evidence¹⁸, and, second, because its purpose is to introduce conceptual criteria for the evaluation of grammars. Essentially, the function of nativism is to provide a conceptual reason for a restrictive UG, which is a central criterion in favor of GP.

In summary, it can be said that Kaye's book falls short of its goals based on the requirements that proclaims itself. External, cognitive considerations are primarily speculative, and the evidence that is considered consists of observations about linguistic structure. While this book does not exhaust nativist thinking in GP, it is interesting that a book about the cognitive aspect of the theory of grammar can say surprisingly little about cognition.

Jonathan Kaye's other publications present a somewhat conflicting view. He did ultimately fulfill his promise to pursue the direction of research in the form of Dresher and Kaye (1990), which promotes an acquisitional model that was influential beyond the boundaries of GP. On the one hand, there are two incidents in which Kaye appears to promote decidedly anti-cognitive views. On the other hand, in Kaye (1997), he "tried to show that discussion of the acquisition of phonology is futile until we know what it is that is being acquired". That is, it is claimed that a theory of grammar is required before any work on acquisition can occur. It is further commented that "[i]t should be obvious by now that acquisition models will vary enormously according to the component model with which they are paired". While the conclusion does maintain that it is possible to reject a grammatical theory based on its failure to provide a mechanism for acquisition, the proposed relation between grammar and acquisition is very distant. The implication is that grammar is constructed independently, and that the acquisitional model is to be constructed post-hoc, as an external component.

The other major case is Kaye's "phonological epistemological principle". This principle states in plain language that "the only source of phonological knowledge is phonological behavior" (Kaye 2005). While the intention is primarily to exclude phonetics, it serves equally to disqualify all other kinds of external evidence. Interestingly, the omission of any mention of other evidence could mean that it has not even been considered. In any case, this principle clearly contradicts any evidential criterion for a cognitive approach.

If we return to the quotation that led to the evidential criterion, we find that there is an alternative interpretation of the claim that "issues such as parsing, 'learnability', child language acquisition, and aphasia form a significant part of the

¹⁸This is not to say that cognitivism cannot be supported, only that Kaye does not.

grist for the linguist's mill". Instead of proposing an evidential criterion, it can be understood to mean that issues which conceptually belong to these domains are discussed. That way, a purely formal, a priori study of learnability, such as Gold (1967) is enough to satisfy the cognitive criterion, because it is concerned with "learnability". If conceived like this, nativism reduces to another principle that is used to constrain theory choice on conceptual grounds but is insufficiently explicit to determine a specific proposal. But while Kaye was without doubt influential in the tradition of GP, his is by no means the only position that exists.

In the following, we will turn to the literature of GP in general. Below, a number of comments that display some form of cognitive realism by various authors are collected:

- (8) (a) These three elements [=A, I, U] are cognitively, as opposed to phonetically, defined objects (Yoshida 2006:255)
- (b) GP makes use of monovalent cognitive units, so-called elements (Pöchtrager 2006:12)
- (c) The simple assumptions that formed the foundation of this chapter have produced a somewhat unexpected model of the human language lexicon, and the way it interfaces with other cognitive modules. (Jensen 2000:36)
- (d) [T]he purpose of this article is to support the claim and to advocate the idea of a strong parallelism between syntactic and phonological components by claiming that a single set of innate, universal principles exists which applies to both these components (and perhaps to others) of the language faculty (Ritter 2003:29)

Of these, items (8a) and (8b) fit into a more general belief that the denial of a phonetic basis of phonology is understood to mean that a cognitive approach has been chosen. However, this is a false dilemma, as there exist more alternatives which have not been considered. This will be elaborated in chapter 5. Importantly, these quotes constitute the only references to cognition in both works. That means, neither are concerned with cognition by itself, and merely use the predicate "cognitive" to mean "non-phonetic". Example (8c) is notable as a piece of writing by an author who appears to have become disillusioned with the adequacy of Generative Grammar and GP, but still holds on to cognitive realism. Example (8d) is from a publication that actually focuses on language acquisition. However, this publication is also notable for being one of only two papers that deal with language acquisition out of the 28 papers contained in the *Festschrift* for Jonathan Kaye (Ploch 2003). This ratio itself might be used to indicate the relative disinterest in language acquisition of followers of GP¹⁹.

There are two authors that deserve some additional scrutiny. Tobias Scheer's earlier book (2004) hardly mentions the issue of cognitive reality at all, even

¹⁹At the same time, this quote serves as additional piece of evidence of the perceived connection between the syntax/phonology convergence and the cognitive interpretation of grammar, as has been discussed earlier.

though it implies adherence to the traditional view (Scheer 2004:xliv, 240). However the author's later work strengthened ties with cognitive science. His more recent book (2011) is concerned entirely with the modular structure of the language faculty, framed in an interface-based architecture inspired by Minimalist thinking. That is, this body of work pays more than just lip service to cognitive issues. At the same time, it falls in line with standard Minimalist thinking, which is concerned less with experimental evidence, and more with considerations based on notions such as conceptual necessity. Again, this work is cognitive in a conceptual sense, and not by any evidential criterion.

Another notable author is Stefan Ploch. This notability derives from several different problems this writer worked on. First, he possibly produced the definitive statement of the earlier mentioned position that the negation of phoneticism entails cognitivism in the form of Ploch (1999). Another relevant point is his support of scientific realism, expressed in numerous metatheoretical publications (2003, 2004). In all of these works, the realist interpretation towards grammatical categories is taken for granted. Finally, there is his work on the Acquisition Hypothesis that we encountered earlier, which presupposes cognitive realism with respect to grammatical categories (2005). Again, none of these contain or cite any experimental studies, instead relying on exclusively linguistic methods and evidence.

At this point, the evidential criterion itself should be questioned. The importance of the criterion is very straightforward and pragmatic. If the goal is to judge the quality of a theory, then agreement with evidence serves as one of the most excellent criteria. It is clear that all things being equal, it is better to use evidence. Of course, evidence is not the only criterion by which a theory is judged. Even worse, it does not make sense to fault a theory which does not use evidence which does not exist or is unacquirable. In the end, it is clear that Government Phonology has no commitment to the evidential criterion, and it is unclear whether a grammatical theory can do much better than that. But ultimately the fact remains that this turns GP's nativism into a collection of a-priori, formal considerations, regardless of whether that is understood to be good or bad.

In summary, it can be said that the evidential criterion is generally not satisfied by work in Government Phonology. To the extent that the non-empirical character of this form of nativism has been established, the contradiction that was noted at the beginning of this section disappears. Nativism turns out to be another principle aimed at reducing the number of acceptable theories. As before, nativism is not sufficiently restrictive, or explicit enough to make its application unambiguous. We can end with Rennison's (1987) comment on the way psychological reality is invoked in the generative literature, saying that he "wonder[s] whether we are not making things a bit too easy for ourselves".

2.3 Closing Comments

This chapter had two goals. First, it introduced some basic properties of Government Phonology to a reader not acquainted with them. The second, and primary,

goal was to argue for a distinction between a representational model and a number of more general theoretical principles. It was argued that the representational model is a self-contained, formal system that makes linguistic predictions, while theoretical principles do not make predictions by themselves, but instead have the purpose of constraining the development of a model, while not actually entailing any specific model. With this distinction in mind, expressions such as “the standard theory” or “the CVCV theory” need to be reconsidered. Only if the theoretical principles are significantly changed do we have reason to describe the two approaches as different *theories*. However, if the differences are exclusively in the representational system, then we would only be speaking of different *models*. This result is not merely terminological, since the character of both systems was argued to be different. If it is a question of models, it should be resolved on linguistic, empirical grounds, while two opposing sets of principles require an argument on conceptual grounds. The distinction will be elaborated in the following chapters.

Chapter 3

Generative Grammar

This chapter will provide an example of the range of variation possible in Generative theory²⁰. We will compare an *early* form of the early 60s, and a *later* form of the theory developed in the 1980s. It will be shown that Generative Grammar underwent a profound change in this time, and that both forms differ in their foundations, with the late form featuring less of an explicit methodology than the early form, while relegating more responsibility to conjectures that demand empirical investigation. This ties into the previous chapter, since the way in which Government Phonology is determined by guiding principles, identifies it as an approach adhering to the later form.

3.1 Early Generative Grammar

The goal of this section is to describe the form of the earliest Generative Grammar. Since a full history of Generative Grammar is well beyond the scope of this work, we will make due with a somewhat artificial state that is constructed from, most of all, Chomsky (1956, [1957] 2002, 1963). This section begins with a brief summary of the historical role of formal language theory in the creation of Generative Grammar. This is followed by a discussion of the definition of the term *generative grammar* as it would be given in the late 50s and early 60s. After this, a number of points of interest of early Generative theory will be introduced. Special attention will be paid to the way these are related to the definition of generative grammar, to the use of formal methods, and how these topics serve to indicate areas of future research. Finally, the absence of any reference to mentalism in the definition of generative grammar will be justified.

Historical Overview. Generative Grammar can be described as the result of the confluence of several lines of thinking from disparate fields of research which have converged in the person of Noam Chomsky. It is said (Nevins 2010:104)

²⁰The following convention regarding the capitalization of the phrase “generative grammar” is adopted here: whenever the term refers to the tradition and to the research program, it is spelled with upper-case, when it refers to a specific grammatical formalism, it is spelled with lower case.

that Chomsky was not originally interested in an academic career, and considered dropping out of university, and that it is only due to the insistence of Zellig Harris this did not occur. Nevins further reports that Harris urged Chomsky to attend classes not only in linguistics, but also in the formal sciences²¹. Regardless of how these events unfolded exactly, it is clear that Chomsky began to study the work of a number of notable researchers in the formal disciplines, such as Nelson Goodman, Rudolf Carnap, Willard Van Orman Quine — most of which taught at Pennsylvania. Further influence was derived from colleagues such as Yehoshua Bar-Hillel. These individuals communicated important ideas from the formal sciences to Chomsky, who used them in the construction of Generative Grammar.

The content of this influence has been various. An excellent study detailing these influences is provided by Tomalin (2006). There, the importance of simplicity as an evaluation measure in most of generative grammar is shown to derive from similar considerations by Nelson Goodman. This work also shows that the notion of transformational theory of Chomsky's is derived not only from the linguistic theory of Zellig Harris, but formally resembles Rudolf Carnap's *transformation rules*. An interesting side-note is that Bar-Hillel (1953) appears to be the first to suggest the use of recursive definitions to the linguistic community. At the time, Chomsky responded with uncertain interest: "Bar-Hillel suggests that recursive definitions may be useful in linguistic theory; whether this turns out to be the case or not, I agree in this instance with the spirit of his remarks" (Chomsky 1956:45). Bar-Hillel would later be described as a "constructive participant" (quoted in Kasher 1991:6) for early Generative Grammar.

Definition. Even if one restricts their attention to only a few notable publications, one can observe some amount of variation in the suggested definitions. Exactly identical definitions are a rare find, and most are at least different with respect to which properties of a common core are stressed to be essential. Still, it is possible to identify a dominant single property, and to show that all other relevant properties are connected to it, even if they are not entirely derivable from it. Some notable definitions of the notion of "generative grammar" in the early literature are listed below:

- (9) (a) Assuming the set of grammatical sentences of English to be given, we now ask what sort of device can produce this set (equivalently, what sort of theory gives an adequate account of the structure of this set of utterances) (Chomsky [1957] 2002:18).
- (b) A grammar of L can be regarded as a function whose range is exactly L. Such devices have been called "sentence-generating grammars". (Chomsky 1959:137)
- (c) A grammar [...] specifies this set (or generates it, to use a technical term which has become familiar in this connection) (Chomsky 1964:120)

²¹This term is used in a broad sense, cf. Tomalin (2006:2f.)

- (d) The most restricted goal acceptable to linguistic research would be an exact and rigorously formulated characterization of the grammatical sentences of some language. This characterization is accomplished by enumeration of the sentences from a finite, iterative set of rules which we call a “grammar” (Lees 1963:xvii)
- (e) The grammar, then, is a device that (in particular) specifies the infinite set of well-formed sentences and assigns to each of these one or more structural descriptions. Perhaps we should call such a device a *generative grammar* to distinguish it from descriptive statements that merely present the inventory of elements that appear in structural descriptions, and their contextual variants. (Chomsky 1964:51)

One of the most important ideas contained in these quotes is the definition of a language as a set. This notion was taken over from formal language theory, and is the reason for the use of the term “generate”, as evidenced by example (9c). The importance of this idea is furthermore shown by the first non-introductory sentence of *Syntactic Structures*, which reads:

From now on I will consider a language to be a set (finite or infinite) of sentences (Chomsky [1957] 2002:13)

In other words, the pre-theoretical notion of “language” is reconstructed as a set of sentences. The picture that presents itself is the following: generative grammar is a specification of a possibly infinite set of sentences by means of the combination of a finite set and a number of (recursive) operations. A generative grammar generates a language in the same sense as the Peano axioms generate the natural numbers. The purpose that a grammar is constructed for, is to give a finite, and hopefully fairly small, description of a possibly infinite language. With this in mind, there is some amount of justification to the claim that this is the central notion of generative grammar. As said before, this definition is where Generative Grammar derives its name from. And while there are alternative definitions which stress other properties, all of these are in general tightly connected to the basic set-theoretical reconstruction of language. For example, the quotations above make reference to “structural descriptions” and “the structure of [a] set of utterances”. In the following section, it will be shown how these, and other notions, are connected to the set-theoretical definition of language, even if they are not entirely equivalent.

Axiomatic Grammar and Grammaticality. Tomalin (2006:60) writes that “it was the axiomatic-deductive nature of TGG [=Transformational Generative Grammar] that bedazzled some of its earliest commentators”. As Robert Lees’ famous review of *Syntactic Structures* pointed out, the theory presented in that book featured “an overt axiom system” (Lees 1957:378). To Chomsky, this axiomatic character allowed the use of an important metaphor, which is that “[a] grammar

of the language L is essentially a theory of L " (Chomsky [1957] 2002:49). The same way any other scientific theory is based on a number of finite observations, which are used in the construction of a general theory that allows one to deduce an infinite number of consequences, or theorems, a grammar is based on a finite number of sentences and their descriptions and projects into an infinite domain, a complete language. That is, a consequence of a theory, a theorem, is essentially comparable to an assignment of grammaticality through a grammar. The metaphor is continued when we find that the way a grammar assigns grammaticality is "roughly analogous to a proof" (Chomsky 1956:117).

Early theories of generative grammar were based on rewrite systems, so called phrase structure grammars. These would consist of a set of rewrite rules, such as $S \rightarrow NP VP$, which would be read as "S can be rewritten as NP VP". A *derivation* consists of a series of strings that result from iterative rule application. Traditionally there is only a single initial symbol S , which is the first member of every derivation. Given the single rule above, we can produce a derivation consisting of two strings ("S", "NP VP"). In the theory of Syntactic Structures, a string is well-formed with respect to a particular grammar if it is possible, given the rules of grammar, to expand the symbol S into the string under consideration²². In other words, there must be a derivation beginning with S and ending with the string. The notion "grammatical in L " is defined as "derivable in G_L ". If we merely change the names of our terms, if we call S an "axiom", phrase structure rules "rules of inference" and the string under consideration a "theorem", then we are very close to a description of a syntactic proof-system²³. Given the terminological convention that a rule $X \rightarrow Y$ can also be read as " Y is (an) X ", extended to derivations, we can say that a derivation from S to any sentence s "proves" that s "is a S(entence)" (Lees 1963:2).

An important consequence of this definition of "grammatical in L " is that an arbitrary string is either derivable or not derivable by a given grammar. On the one hand, this means that the predictions of a grammar can be determined without any doubt. On the other hand, this means that every grammar splits the set of all possible strings into exactly two subsets, the set of strings derivable in the grammar, and the set of those which are not. This is the reason that a (binary) notion of grammaticality implies the feasibility of the set theoretical interpretation of languages.²⁴ In summary, the formal, axiomatic character of generative theory implies the set-theoretical view, and also provides ideal grounds for a research program whose community is not bogged down with intuition-bound evaluation of theories.

²²Later theories of grammar mostly adhere to this general picture, but elaborate it extensively.

²³Tomalin (2006:178) interprets this as a reference to the finitist proof theory of David Hilbert.

²⁴McCawley's (1987) rejection of the set-theoretical view is specifically argued for on the basis "that sentences belong to a language only relative to contexts and interpretations rather than absolutely, or that the syntax of a language is not exhausted by the syntax of its sentence". That is, he claims that sentences are not either grammatical or ungrammatical, and that languages have no clear-cut boundaries.

Generative Capacity. The theory of generative capacity deals with the expressive power of formal systems. Different formal systems are capable of expressing different structural relations and different types of languages. These differences in generative capacity were codified in a classification system that is generally known as the Chomsky hierarchy. For example, consider a language defined by which two characters can be adjacent to each other. Such a language could be noted as a set of pairs of characters, and the generated language would be any collection of strings which is exclusively made up from these pairs. That is, the grammar $\{ab, bb\}$ generates the language which consists of the strings “ab”, “bb”, “abb”, “abbb”, etc. These languages are called *strictly 2-local languages* (Rogers and Pullum 2011).

Crucially, grammars of this type are incapable of expressing long distance dependencies. Since the well-formedness of a string is defined only over adjacent symbols, it is impossible to state that a certain character may only appear if another appears at an arbitrary distance, with arbitrary characters in-between. In a phrase structure grammar (PSG), long-distance dependencies are expressible, which is why it has a greater generative capacity. The languages a PSG can define are a superset of the strictly local languages, the so-called “recursively enumerable languages”. One goal in the study of generative capacity was to find a type of grammar that would specify a type of language that characterizes the human languages²⁵.

The study of the generative capacity of different formal systems was of immense importance to early generative grammar precisely due to its proof-theoretic nature, which assigned critical priority to the formalism itself. The usual form of a phrase structure grammar is a context-free rewrite grammar of the form (Σ, F) , Σ being a start symbol, usually the singular symbol “S”, and F being a set of rewrite-rules of the form $A \rightarrow B$, A and B being strings in some alphabet (Chomsky 1956)²⁶. Additionally, rewrite-rules are stipulated to have maximally one symbol on the left of a rule, turning the grammar *context-free*, as well as stipulating that the right-hand side of a rule may contain either two non-terminals, or one terminal, which puts the grammar in the so-called *Chomsky normal form*. A transformational grammar goes beyond this scheme by the addition of transformations, functions from terminal strings into terminal strings. The only possible variation between particular grammars are the exact members of the sets of non-terminals, of terminals, and of rules. Consequently, the formal system itself has an immense influence on the consequences of the theory²⁷. While in some cases an inadequate grammar can result from a false set of rules or non-terminals, more interest was

²⁵That is, it was thought that human language would naturally fall into a class of formal languages. This belief has since been given up on, and the connection to formal language theory has been severed.

²⁶The details of these definitions vary with specific publications, as well as with the field of study. In the mathematical literature, such grammar are generally defined with explicit sets of terminal or non-terminal symbols, while in the linguistic literature these are left implicit the set of rewrite-rules (cf. Chomsky [1957] 2002).

²⁷The theory of Government & Binding still contains a context-free grammar of this type within its base component. However, the universal x-bar scheme, together with the representational modules, which do constitute direct statements about the form of sentences, effectively trivialize this

shown for cases when a grammar either seriously overgenerates or undergenerates by being incapable of describing certain structural relations, which was seen as indicating that the grammatical formalism itself is inadequate and in need of replacement.

An important requirement for a grammar to generate a language is not only that it enumerates the actual sentences of a language, but also that it excludes all sentences which are not in a language. To fail to generate all acceptable sentences is called “to undergenerate”, to generate additional sentences beyond those these is “to overgenerate”. Any grammar that cannot account for long distance dependencies cannot account for verbal agreement, among other things. Such a grammar will either undergenerate, and generate either only singular patterns or only plural patterns, or it will overgenerate and be able to derive additional sentences that exhibit mixed patterns. To guarantee that a certain grammar will fit the set of sentences (or well-formed structures) of a language accurately, it is necessary to determine the generative capacity of that type of grammar.

The relation between generative capacity and the set-theoretical definition is fairly straightforward, since the theory of generative capacity even before Chomsky’s work on it was occupied with formal languages which are sets. Furthermore, the formal nature of the theory of generative capacity allows for the use of the method of proof. This guarantees a level of inter-subjective agreement in a research community. In addition to that, the influential discussion provided in *Syntactic Structures* (Chomsky [1957] 2002) constitutes an archetypical piece of theoretical discourse that future research could easily emulate. In that book, first the formal system of *Markov Chains* is introduced, which is then shown to be inadequate²⁸, after which a more powerful grammar, a PSG, is introduced. The argument is then iterated, the PSG is found to be inappropriate, and a more powerful transformational grammar is introduced. This discussion both displayed the virtue of a formal approach, as well as providing an excellent example to be followed in future research.

Structural Descriptions. Another notion that is tightly connected to the set-theoretical view is that of “structural description”. This is because to determine whether a given structure is in a language or not, the grammar must give an explicit enough account of the notion of well-formed linguistic structure in a language. If the range of possible structural descriptions is known, it should be possible to determine of any structure whether it is a well-formed structure, and it should therefore be trivial to define a set that contains all and only the well-formed structures. This is in line with several other of Chomsky’s remarks on the matter, for example that “[i]f we hope to go beyond traditional grammar in some significant way, it is essential to give a precise formulation to the notion *structural description of a sentence* [...]”. (Chomsky 1964:119) and that “[w]hen we speak of the linguist’s grammar as a ‘generative grammar’, we mean only that

component.

²⁸The argument for this was later found to be faulty (Pullum 2011), but at the time, the whole field accepted it as valid.

it is sufficiently explicit to determine how sentences in the language are in fact characterized by the grammar” (Chomsky 1980:220).

Anti-Mentalism. The previous discussion has omitted any mention of either mentalism, nativism, or cognitive realism. This is because the goal was to show that generative grammar can be, and has been, non-mentalist, and purely formal. However, Scheer (2011a:5) writes that “Noam Chomsky and generative linguistics root in the Cognitive Science programme of the 50s and the rationalist/dualist tradition. Nothing could be called generative that lies beyond these benchmarks”. These claims build upon the kind of historiography of generative grammar that was initially presented in *Cartesian Linguistics* (Chomsky 1966). This tradition maintains that the most important influences in the development of generative linguistics were the so-called Cartesianians, which include, among others, Descartes, Humboldt, the clerics that wrote the Port-Royal Grammar, and Galileo²⁹. This tradition further claims that the most important problem of linguistic theory is to account for linguistic creativity. It is obvious that this account of the history of generative grammar is highly incompatible with what has been said before, which is that the most important influence came from the formal sciences. However, this is not troubling since it is often admitted that Cartesianism played no role in the initial invention of generative grammar, and that the philosophical relevance of these earlier traditions was discovered only afterwards. Therefore, in the following, I will regard Scheer’s claim as false and focus on building up the opposite case, the claim that generative grammar initially was not mentalist. Fortunately, one can find explicit rejection of mentalism in the earliest major document of generative grammar, *The Logical Structure of Linguistic Theory* (Chomsky 1956). A short and concise statement is given in (10) below.

- (10) [T]he introduction of dispositions (or mentalistic terms) is either irrelevant, or trivializes the theory (Chomsky 1956:21)

An even more direct statement, albeit also somewhat longer, can be found a page earlier.

- (11) The fact that a certain general criterion of significance has been abandoned does not mean that the bars are down, and that ‘ideas’ and ‘meanings’ become proper terms for linguistics, any more than it means that ghosts are proper concepts for physics. [...] if this new sense [of significance] is at all adequate, it seems to me that it will rule out mentalism for what were essentially Bloomfield’s reasons, i.e. its obscurity and general uselessness in linguistic theory. (Chomsky 1956:20)³⁰

²⁹The interpretation of these people as an intellectual tradition has been severely criticized in Miel (1969) and Aarsleff (1970).

³⁰Scheer (2011a) actually quotes this exact comments but writes that his earlier claim “is true despite the fact that in his earliest writings Chomsky was influenced by Bloomfield’s anti-mentalism”.

It is true that one should not remove these remarks entirely from their context. Chomsky had at least two goals in the section that contains these comments. One was to argue for the applicability of operationalist methods, which Chomsky himself would very soon afterwards reject. A much more important goal appears to be the rejection of the relevance of semantics. It appears that mentalism and meaning were here conflated, which was commonly done at the time. An argument could be made that the anti-mentalism exhibited by these passages was merely instrumental in an attempt to marginalize the study of meaning. Nonetheless, the bottom line is that the lengthy text deals with the matter of mentalism in only this section, and that it is explicitly and forcefully rejected.

Admittedly, comments as dismissive of mentalism as the ones above are absent from later publications such as *Syntactic Structures*³¹, while opposition to meaning remained as stern as before. Still, in Chomsky ([1957] 2002), it is possible to find the very unambiguously phrased position that the “two tasks which the speaker and hearer must perform are essentially the same, and are both outside the scope of grammars [of the form proposed here]. Each such grammar is simply a description of a certain set of utterances, namely, those which it generates” (Chomsky [1957] 2002:48). There is, however, a single passage mentioning the interpretation of a grammar as an explanation of a speaker’s linguistic behavior. This somewhat lengthy comment is cited below.

- (12) Any grammar of a language will *project* the finite and somewhat accidental corpus of observed utterances to a set (presumably infinite) of grammatical utterances. In this respect, a grammar mirrors the behavior of the speaker who, on the basis of a finite and accidental experience with language, can produce or understand an indefinite number of new sentences. Indeed, any explication of the notion “grammatical in L” (i.e., any characterization of “grammatical in L” in terms of “observed utterances in L”) can be thought of as offering an explanation for this fundamental aspect of linguistic behavior. (Chomsky [1957] 2002:15)

However, conceptually, this remark deals with the linguistic *behavior* of speakers³². It is also the case that views of this kind were not entirely unusual in the structuralist literature, as the following comment shows:

- (13) [T]he analysis of the linguistic SCIENTIST is to be of such a nature that the linguist can account also for utterances which are NOT in his corpus at a given time. That is, as a result of his examination he must be able to predict what OTHER utterances the speakers of the language might produce [emphasis his] (Hockett 1948:269).

In the more modern, biolinguistic reception, Lightfoot (in Chomsky [1957] 2002), notes about *Syntactic Structures* that “what is striking about this little

³¹In fact, the word “mental” and its derivatives are completely absent from that book.

³²In a 1962 paper, this approach would already be rejected: “Clearly the description of intrinsic competence provided by the grammar is not to be confused with [...] an account of potential performance” (Chomsky 1964a:52)

book is that it contains nothing on cognitive representations". The bottom line is that the earliest generative grammar did not deal with the mental interpretation of grammars, and when it did, it dismissed such ideas.

With this, the interpretation of early generative grammar as non-mentalist is regarded as established. Tomalin (2006:207) has come to the same conclusion: "It should be noted, just for clarity, that while the conspicuous, mind-based philosophy that has been associated with generative grammar since the early 1960s is usually assumed to be a crucial part of Chomskyan syntax, it is (in theory) entirely separable formal procedures and theoretical constructs that constitute the machinery of generative grammar"..

3.2 Late Generative Grammar

This section is concerned with the shape that generative grammar took in the 1980s. First, it will be argued that this later form of generative grammar rejects the set-theoretical view. After this, a number of more recent definitions of the term "generative grammar" will be presented, and argued to be significantly different from the earlier definitions, in particular through the mentalism they require. Some consequences of the adoption of mentalism will then be spelled out. Finally, the doctrine of "Galilean Linguistics", which constitutes a new relationship to formal explicitness, will be discussed, and it will be proposed that Government Phonology can be understood as a Galilean research program.

Fate of the set-theoretical view. In current generative grammar, the set-theoretical reconstruction of the term "language" is largely rejected. A new opposition of *E-language* and *I-language* has been introduced. What used to be "language", the collection of sentences, is now designated "E-language", and is said to be of only minor importance since it refers to "artificial, somewhat arbitrary, and perhaps not very interesting constructs" (Chomsky 1986:29). What has taken its place is "I-language", which is "some element of the mind of a person who knows the language, acquired by the learner, and used by the speaker hearer" (Chomsky 1986:22), or "a state of the mind/brain" (Chomsky 1995:17). Simply said, the object of study has changed from a set to a mental organ. Rejection of the set-theoretical view goes even further when Chomsky (1981:232-233) claims that "[c]ontrary to what is commonly believed, the notion 'language', if it is even coherent, is at a much higher level of abstraction from actual mechanisms than grammar".[One could object that the mental organ still somehow defines a set, allowing the theory of grammar to be both about a set and a mental organ, but it is notable that this view is rejected by Chomsky (2000b:91), who writes that "[n]o questions arise about the ontological status of the set of expressions {Exp} generated by L; its status is somewhat like that of potential visual images or plans for limb motions". That is, grammar is said to be about a set only to the extent that the study of human anatomy is.

However, one can still find advocacy of the set-theoretical view in works such as Radford (1988:131f.), an introductory textbook on transformational gram-

mar. On the other hand, McCawley (1987:236) proposes that by the time of the 80s, most of those who still claimed to uphold this view had never really taken it seriously and did not let it guide their research. Specifically, he terms the belief in the set-theoretical definition of language a “red herring”, for which he provides the formal definition “a proposition p is a red herring for a scientific community C if the members of C generally assent to p but do not believe p ”. Given the force of Chomsky’s rejection of the set-theoretical view, and its incompatibility with the notion of “I-language”, this judgment appears accurate.

Redefinition. The cognitive turn is generally considered to have begun with the *Review of Skinner’s Verbal Behavior* (Chomsky 1959). The review certainly marked the final rejection of the method of operationalist definition which Chomsky had still defended only a few years earlier. But the major, positive statements of mentalism would only come to light some years later. Paul Postal comments that “the real issue is when Chomsky started citing the Cartesians and Humboldt and so forth” (quoted in Huck and Goldsmith 1996:131). The first citations of this kind appear to have occurred in a presentation at the Ninth International Congress of Linguists in 1962, which was published under the title *Current Issues in Linguistic theory* (Chomsky 1964). Only a few years later, two book-length publications would surface that both fleshed out generative mentalism and cemented its position as an essential theory in generative theory. One is *Aspects of the Theory of Syntax* (Chomsky 1965), the other *Cartesian Linguistics* (Chomsky 1966). The first book is a syntactic treatise in which mentalism is presupposed, and which spells out some consequences for syntactic theory. In the course of this it introduces important pieces that for many years played a major part in Chomsky’s mentalism, such as the opposition of competence and performance, and the ideal speaker-hearer. *Cartesian Linguistics*, which was published only shortly later, is a more philosophical text that relates generative grammar to a philosophical tradition called “Cartesianism”. In particular, the book lays out how a theory of linguistic knowledge can surpass certain deficiencies that were attributed to structuralist theory, chief of which was the incapability of accounting for *creativity*. In fact, the occupation with creativity is a defining property of Cartesian Linguistics³³, and mentalist generative grammar.

Chomsky (1964) begins with the declaration that linguistic creativity, understood as the ability to produce and understand novel sentences, is the “central fact to which any significant linguistic theory must address itself” (Chomsky 1964:50). According to the historian of linguistics John Joseph (2003), this was a significant point of originality in generative thinking. So far in fact, that “[s]ince none of the linguistic theories on offer in 1962 did address it [=creativity], this amounted to a declaration of the insignificance of all of contemporary linguistics

³³This is not to mean that creativity was absent from early generative grammar (cf. example (12) earlier in this chapter), instead, the earlier interpretation of creativity was transformed in the light of Cartesianism, from an additional empirical criterion to a “philosophical” goal, that is given a conceptual explanation, in terms of the recursive nature of language.

except Chomsky's own embryonic theory³⁴ (Joseph 2003:122). Crucially, this criterion instantly refuted the basic tenets of earlier structuralist theory, which was occupied mostly with the collection and systematization of linguistic corpora³⁵. But creativity goes even beyond that by proving the requirement of a mental dimension to the theory of grammar. The reason for this is an analogy to one of Descartes' arguments for the existence of the mind. Descartes's simple mechanistic theory of the physical world entailed that everything that is purely physical must be explainable in mechanical terms. He furthermore believed that animals are indeed capable of mechanistic explanation, and that they are really nothing more than automata. On the other hand, humans are capable of acting in novel and *unpredictable* ways, which are nonetheless appropriate to a situation. This was understood to require the existence of a mind³⁶.

One only needs to equate physical mechanism with behaviorist theory to acquire an argument for the rejection of behaviorism and of post-Bloomfieldian structuralism, and for the adoption of linguistic mentalism. However, creativity also had another role. Understood in Humboldt's terms as "infinite use of finite means", it required the use of recursive function theory, which allowed a finite grammar to produce a language of infinite size³⁷.

With the mentalist foundation of generative grammar in place, the machinery of earlier generative grammar could undergo a thorough reinterpretation. This fundamentally changed the character of generative grammar³⁸, as the quotations below show.

- (14) (a) By a "generative grammar" I mean a description of the tacit competence of the speaker-hearer that underlies his actual performance in production and perception (understanding) of speech (Chomsky 1966:75)
- (b) A generative grammar is not a set of statements about externalized objects constructed in some manner. Rather, it purports to depict

³⁴Cf. "[I]t is clear that a theory of language that neglects this 'creative' aspect of language is only of marginal interest" (Chomsky 1964:51).

³⁵But see example (6) of this chapter for a notable structuralist who did concern himself with creativity.

³⁶Cf. "modern generative grammar has sought to address [...] the Cartesian idea that "the true distinction" [...] between humans and other creatures or machines is the ability to act in the manner they took to be most clearly illustrated in the ordinary use of language: without any finite limits, influenced but not determined by internal state, appropriate to situations but not caused by them, coherent and evoking thoughts that the hearer might have expressed, and so on" (Chomsky 2000:17).

³⁷Cf. "There is a perfectly coherent sense to the notion of infinite use of finite means. That is what ended up being the theory of computability, recursive function theory and so on" (Chomsky 2001:62). Through recursion, the notion of creativity is even linked to the current controversy around the claims of Hauser, Chomsky and Fitch (2002).

³⁸It is notable that Chomsky (1965:9) mentions the possibility of replacing the name "generative grammar", given that it led to many misunderstandings, such as the interpretation of a generative grammar as a model of either a speaker or a hearer. However, he decides against it based on the fact that the term is intended in the (set-theoretical) meaning that "generative" has in Emil Post's theory of production systems, and adds that it appears to be "the most appropriate translation for Humboldt's term *erzeugen*" (ibid.), which introduces a link between the term and Cartesianism.

exactly what one knows when one knows a language. (Chomsky 1986:24)

We see that these definitions differ considerably from those discussed earlier. All references to the set-theoretical view, as well as to formal language theory in general, are removed. Instead, one finds various expressions of mentalism, and the characterization of language as a form of knowledge. It is clear that this will have enormous consequences for the shape of the theory.

Consequences. In early Generative Grammar, the term “grammar” denoted a theory of a language. In later theorizing it became an independent natural object. The often noted “systematic ambiguity” of grammar as theory of the knowledge of a speaker and the knowledge of a speaker itself is actually a relic of this conceptual change. Generative mentalism detached the notion of grammar from that of the collection of a language. A maximally clear expression of this can be found in the comment that “[i]t might, for example, turn out that these grammars [...] do not generate languages at all without supplementation from other faculties of mind” (Chomsky 1981:13). Here, the term “language” is used in the sense of “E-language”.

A similar conceptual change happened with regard to the notion of *Universal Grammar* (UG). Earlier, UG was just a theory of general properties of grammars, themselves interpreted as descriptions of languages. UG itself would essentially be a notational system (supported by an evaluation procedure) that is adequate for every human language. The question of whether there is a real-world object that corresponds to UG was left undiscussed. Later UG was entirely different. The new interpretation is that UG is a natural object, existing in the physical world. Even more, UG is “a characterization of the initial state of the language faculty” (Chomsky 1981). Differently said, “[g]rammars exist in the world, as components of steady states attained. [...] Correspondingly, the theory of u.g. [sic] is not the study of general properties of language, but rather u.g. is a postulated component of genetic endowment (Chomsky 1981:232-233). This by itself must change priorities and result in a greater importance of the theory of UG. Given a P&P framework, this effect is increased. The reason is that a description of the initial state, of UG, has to specify all principles, as well as all possible parameter settings, while a particular grammar contains only particular settings for parameters. A grammar of a language tells us only about that particular language, while UG describes all of human language. The particular grammar is thereby made less interesting. In fact, this is proclaimed to be a major innovation: “[t]he focus of inquiry is grammar; language is a derivative and possibly uninteresting notion. [...] I think that this shift is quite proper” (Chomsky 1981:232).

Finally, the interpretation of a theory of grammar as the description of an object situated in the real world provides a context for the belief in a unique true theory. If grammar is a natural object, then its properties should be fixed and definite enough to allow for a definite description. That is, given the belief that a natural object has only one set of definite properties, then there is only one ade-

quate description of these properties. This is in no way a necessary consequence, but the suggestion is very strong.

3.3 Galilean Linguistics

This section will introduce the notion of Galilean linguistics, which can be described as the method of late Generative Grammar, and discuss some of the ways in which it diverges from the method of early Generative Grammar. Finally, it will be proposed that Government Phonology can be understood as adhering to Galilean Linguistics.

Definition. The content of Galilean Linguistics is best illustrated by direct references.

- (15)
- Since the 17th century the Galilean style has marked the natural sciences and it is the adoption of this style that led to their enormous success (Chomsky 1978:9f., in Botha 1981:1)
 - The Galilean style [...] is the recognition that it is the abstract systems that you are constructing that are really the truth: the array of phenomena is some distortion of the truth because of too many factors, all sorts of things (Chomsky 2002:99).
 - [Y]ou just see that some ideas simply look right, and then you sort of put aside the data that refute them and think, somebody else will take care of it” (Chomsky 2009:36)

Quote (a) constitutes the claim that there is a “Galilean style” of research, as well as implying that this style should be adopted in linguistics. The other quotes specify the content of this style. First, it is said that it is valid to ascribe a higher degree of reality to theory, as opposed to appearances. Second, quote (c) states the methodological consequence that sometimes it is valid to disregard data that appears to refute a theory. In short, Galilean Linguistics is the position that a researcher is allowed to have strong commitment to his theory, and to be suspicious of data.

A possible justification for this doctrine could be based on a common piece of reasoning in empirical science. Since the concept of “grammar” is (supposed to be) part of an empirical theory, the concept itself needs to be empirically established. That is, before investigation, it is not known what a grammar actually is. Crucially, the results of empirical research are always tentative, as such, the concept of grammar is up for revision. Since it is not definitely known what a grammar actually is, one also cannot know what the data is that a grammar needs to account for. Therefore one can never know whether the data that apparently falsifies a grammar is actually even relevant. These, and similar considerations, are very common in scientific discourse, and will be elaborated in section 4.2. Ideas such as these also appear to be behind the comment that “if someone were to descend from heaven with the absolute truth about language or some other

cognitive faculty, this theory would doubtless be confronted at once with all sorts of problems and ‘counterexamples’, if only because we do not yet understand the natural bounds of these particular faculties and because partially understood data are so easily misconstrued” (Chomsky 1980:10). However, the validity of this doctrine is not at issue in this section. Here, the focus is instead on how it has been used in the grammatical literature, and how this relates to Government Phonology.

Consequences. An important early critical study of Galilean Linguistics is Botha (1981), who identifies three constituent parts to this doctrine, the most important one³⁹ he terms “epistemological tolerance”. This principle is defined as follows: “theories [that have achieved a certain degree of explanatory depth] should not be abandoned as refuted in the face of what appears to be conflicting evidence derived from ordinary world sensations”. At face value, this does not seem to entail more than the rejection of naive falsificationism. On the other hand, this necessitates an idea of what constitutes explanatory depth.

The search for explanation, as opposed to “mere” descriptions was not entirely new to later generative linguistics. Indeed, from the very beginning Generative Grammar was noted as an attempt at reintroducing the search for explanation which had previously become out of fashion. On the one hand, early Generative Grammar made claims of explanatory power based on the notion of “evaluation procedure”, which is a general term for any method to rank two competing grammars against each other. Such evaluation procedures would include all empirical criteria, as well as considerations of simplicity, which would come into play after empirical facts cease to be enough to distinguish grammars. It was held as essential that a theory of universal grammar be able to determine an ideal grammar, or at least the best grammar of all known alternatives. On the other hand, explanation appears to have been understood as any form of reconstruction in terms of a grammatical theory (Chomsky [1957] 2002:85-91). For example, ambiguity is explained as soon as a grammar is able to provide two alternative derivations for a surface string. This interpretation would make explanation an entirely empirical matter.

Later, Chomsky (1964) distinguished three levels of adequacy that a grammar can conceivably achieve, observational adequacy, descriptive adequacy, and explanatory adequacy. The first two roughly correspond to weak and strong generation of a target language, while “a linguistic theory that aims for explanatory adequacy is concerned with the internal structure of the [learning device]; that is, it aims to provide a principled basis, independent of any particular language, for the selection of the descriptively adequate grammar of each language” (p. 63). This means that explanatory adequacy is concerned with an account of language acquisition. Hornstein and Lightfoot (1981) appear representative of the state of the field during the 80s when they describe this as the *only* explanatory goal of Generative Grammar.

³⁹The other two are “abstractness” and “mathematization”, both of which are declared to be of only secondary importance in generative thinking.

Explanatory adequacy was generally thought to occur *after* the other two levels have already been achieved. That is, each following level necessitates satisfaction of the earlier level, but this is not really so. The proposed answers to the problem of language acquisition, the P&P theory and the Argument from the Poverty of the Stimulus, do not require a grammar to make successful predictions. The P&P theory satisfies explanatory adequacy because it results in a UG that specifies only a finite number of particular grammars, solving the learnability problem, not because it makes accurate predictions about individual languages. Similarly, a nativist theory solves the challenge posed by the POS by providing knowledge of presumably unlearnable information, again regardless of whether the theory makes generally accurate predictions. In this sense, a theory can satisfy explanatory criteria by virtue of, for example, its basic architecture. That is, a P&P theory is explanatory because of the form of UG it assumes, regardless of whether the actual set of parameters can provide for particular grammars appropriate to human languages.

In this context, it is important to note what the stances of early and late Generative Grammar towards formalization are. The way early Generative Grammar has been presented here is as a formal discipline. This manifests itself in many ways. First, most theoretical notions are clearly defined, for example “sentence” as “derivable in a grammar”, or “language” as “collection of sentences”. Similarly, the empirical goal of a theory was clear and well-defined as the enumeration of exactly the sentences of L^{40} . There is a clear epistemology in the form of intuitions about grammaticality, and general methods for theory development were imported from formal language theory. In general, the basic goals were explicit and fixed a priori. Most of all, according to these criteria, the uttermost success, defined as the generation of the correct set, was empirical.

Late Generative Grammar operates quite differently. Definitions are tentative, and are adopted based on the insight that they promise to provide. The notion of UG, for example, is defined alternatively as the initial state of the language faculty (Chomsky 1995:17, Chomsky 2002:8), as a language acquisition device (Chomsky 1997:11). However, each of these definitions stresses only a certain aspect of the theory of Generative Grammar, and it is admitted that a greater level abstraction is required. Evidence is often distrusted⁴¹, given the doctrine of Galilean Linguistics. Even worse, it is not clear what actually constitutes as evidence, since most Generative Grammarian undoubtedly base much of their work on grammaticality judgements, but it has been pronounced that “[t]he concepts ‘well-formed’ and ‘grammatical’ remain without characterization or empirical justification; they played virtually no role in early work on generative grammar except in informal exposition, or since⁴²” (Chomsky 1995:213). Given that the

⁴⁰However, there were additional goals, such as the construction of a Universal Grammar, and additional facts to account for, such as active/passive correspondences, which are somewhat more difficult.

⁴¹See Boeckx’s (2010:4) comment that “the empirical level [is] the weakest in my opinion, in terms of persuasion”.

⁴²This does not only serve as an additional piece of evidence for the rejection of the set-theoretical view, but it also contradicts the foundation of the present interpretation of early gener-

P&P theory was thought to have solved the problem of learnability (Chomsky 1981:12), which made considerations of generative capacity less urgent. Indeed, generative capacity was soon declared to be irrelevant⁴³. It is clear that both kinds of theory have a different stance towards formalization. Early generative grammar is more formal, and late generative grammar less, focusing instead on empirical conjectures.

There is a notable episode in the history of linguistics that is relevant to this difference. Pullum (1989) criticized what he perceived as the slow decline in formal rigor within generative grammar. His basic objection was that most proposals in generative grammar are so insufficiently formal and explicit that it is impossible to tell what they actually entail. His proposal for a solution is the adoption of the following three principles.

(16) Pullum's requirements for a generative theory (1989:138)

1. The concept "structural representation" must be effective. That is, the theory must have an algorithm for determining whether some arbitrary string, graph, or diagram counts as a structural representation in terms of the theory.
2. The concepts of the rule, principle, law, constraint, or whatever must be effective. That is, the theory must have an algorithm for determining whether some arbitrary string, graph, or diagram is a rule, principle, law, constraint, or whatever in terms of the theory.
3. The concept "generates" (or "admits," or "licenses," or "enumerates" or whatever) must be effective. That is, the theory must have an algorithm for determining whether some arbitrary structural representation is generated (or admitted, or licensed, etc.) by a given set of rules (or principles, etc.).

These requirements appear to be an adequate description of early generative grammar. Chomsky's (1990) reply was, essentially, that these requirements are "arbitrary" (p. 147), and that they will not lead to an empirically interesting theory. He concluded that "[t]he serious problem is to learn more, not to formalize what is known and make unmotivated moves into the unknown" (Chomsky 1990:147). That is, we arrive at a certain dilemma. Explicitness requires a fixed and explicit methodology. The choice of methodology is however, to a great degree, arbitrary. That means that explicitness and arbitrariness stand in a trade-off relation. It must therefore be a basic methodological decision to either strive for explicitness and testability, or for a methodology of research that is free from unmotivated constraints. These two classes roughly correspond to early and later generative grammar, as they have been interpreted here. Conceptually speaking,

ative grammar.

⁴³"[M]ost of the results of mathematical linguistics, which in any event have been seriously misinterpreted, become empirically virtually or completely empty, since they deal with properties of infinite classes of grammars" (Chomsky 1981:233).

as long as “language” and UG were formal objects, they were properly investigated with formal methods. However, as natural objects they require empirical investigation, which is inherently tentative, and requires one to just be rigorous enough for the issue at hand.

Relevance to Government Phonology. Botha (1981) identifies Chomsky (1978) as the first statement of Galilean Linguistics. This would mean that it was developed at roughly the same time as the GB and P&P theories, and at the same time as the field turned towards representationalism⁴⁴. As such, it would come as no surprise to find that GP thinking was influenced by these considerations. In the literature of Government Phonology, one author that subscribes to Galilean Linguistics more or less explicitly is Tobias Scheer, who writes that “[s]cience is after insight, rather than after methodological correctness, impartiality or other formal and secondary virtues: this point is constantly made by Noam Chomsky since the 60s” (2011:6).

Regardless, it is clear from the structure of GP itself that it adheres more to the form of late generative grammar, as opposed to early generative grammar. The first chapter of this thesis proposed to distinguish two parts to the theory of Government Phonology, its representational model, and its theoretical principles. We can roughly equate the model with a formal theory in the early sense, that makes prediction about well-formedness and certain structural relations, such as morphological relatedness. The theoretical principles, essentially, constitute GP’s notion of explanatory adequacy. Principles such as autosegmentalism or non-arbitrariness are conceptual criteria that, independently of any specific evidence, provide value judgments about grammars, and allow for their relative ranking. Similarly, formalization and explicitness are secondary to the discovery of new insights, and never a goal in themselves, which is another feature of Galilean Linguistics.

3.4 Summary

The goal of this section was to provide a brief overview of a particular change in the history of generative grammar. It was argued that the earliest generative grammar can be described as formal, while later generative grammar presents itself as more empirical. Crucially, the existence of the later tradition was initiated by the introduction of mentalism. After this, the methodological doctrine of Galilean Linguistics was introduced. It was shown that this doctrine maintains that notions such as explanation and insight are more important goals of research than narrow empirical success. Ultimately, it was argued that Government Phonology, with its focus on theoretical principles, is part of the second tradition.

In the following chapters, these historical considerations will be connected to a methodological discussion within Government Phonology that was initiated by

⁴⁴In a certain way, the notion of explanatory adequacy can be seen (among other things) as replacement and successor of the criteria imposed by the theory of generative capacity.

3. GENERATIVE GRAMMAR

Stefan Ploch (1999, 2003, 2004), as well as to the general ontological controversies within Generative Grammar that have not yet found their way into the literature of GP.

Chapter 4

Rationality in Linguistic Theory

This chapter constitutes the core argument of this thesis. It argues that no absolute, unique theory of method is possible and concludes that the theory of method is itself hypothetical and only conjectured to be true, which means that different methodologies can reasonably be maintained next to each other.

The chapter begins with a discussion of the relation between rationality and the methodology of science. A common post-positivist belief is that methodology has a foundation in logic. We review certain claims to the logical justification of methodology, and find to be baseless. Since logic, the primary source of objectivity, lends no support, no theory of method can be regarded as certain. Instead, methodology is conjectural in much the same way that grammatical theory is, as well as conventional. We then go on to investigate the methodology of Generative Grammar in the form of the doctrine of Galilean Linguistics. We will regard this methodology, while fundamentally different from theories discussed before, to be valid nonetheless. The later half of this chapter discusses the connected problems of theory comparison and of progress. Since criteria for theory comparison as part of a methodology are not given, but assumed, no unique set of criteria can be determined. The result is that it is in principle always possible to state a set of criteria that will justify a particular theory. This claim is backed up by a case study, which shows how proponents of two sub-theories of Government Phonology accuse each other of being unscientific after having constructed their own criteria to guarantee their results.

In conclusion, it is suggested that the theory of method is less powerful than previously thought, and that theory comparison is only possible when there is a shared, but arbitrary, set of criteria. This means that the goal of identifying a unique true theory can only be attained relative to a particular set of criteria. However, this merely replaces the search for a true theory with the search for a true methodology, rendering the result vacuous. Consequently, we appear forced to sanction a form of theoretical pluralism by virtue of necessity, given the absence of any principle prohibiting it.

4.1 The Normativity of Rationality

This section serves as an introduction to the discussion of whether reason can enforce unity in a research community.

Diversity of Tradition. The present linguistic community enjoys a striking wealth of originality. Both inside and outside of the Generative tradition, new models are constantly being proposed and developed, finding or losing adherents, setting an example or sinking into obscurity. For example, in Generative syntax, the adoption of a *standard theory* (Chomsky 1965) was immediately followed by the first large scale division between Interpretative Semantics and Generative Semantics. Since then, fragmentation has only increased. Escribano (1993:229) observes that the first 40 years of Generative literature have seen “30-odd major syntactic frameworks”. Today theories such as Construction Grammar, Cognitive Grammar, Lexical-Functional Grammar, Head-Driven Phrase Structure Grammar, the Minimalist Program⁴⁵ and many more live side by side. Even models that would appear to be outdated, such as the theory of Government & Binding, still have a respectable following. If attention moves to ever more slight details in such large-scale frameworks, it can reasonably be claimed that there is a linguistic theory for every laboring linguist - a claim most certainly appropriate to the field of Government Phonology.

The fact that Government Phonology is developing primarily into greater fragmentation instead of unity is easily evidenced. The two papers by Kaye, Lowenstam and Vergnaud (1985, 1990) were the initial statement of the theory of Government Phonology. Now, there are at least two additional *classes* of alternatives, the CVCV approach and GP 2.0, in addition to a class of theories that more closely resemble the original versions. However, within these classes, there is variety as well. A small number of proposals achieved wider adoption (notably Charette’s 1990 Government Licensing), but even these differ in their details whenever their application to a certain language requires it. Another later innovation, the theory of licensing constraints, led to the highly valued (Ploch 2005) work of Charette and Göksel (1996), but is regarded by others as arbitrary, in the sense of the non-arbitrariness principle. An interesting detail is the fact that Markus Pöchtner’s (2006) revision of Government Phonology is now officially supported by Jonathan Kaye, one of the three founders of GP, which, however, did not lead to wider acceptance of the model. Disagreement goes beyond the level of grammatical models, as even the methodology of the tradition has repeatedly been questioned, notably by Stefan Ploch (2003) and Tobias Scheer (2004). Given this situation, it appears appropriate to say that in the last 30 years, the field of Government Phonology has developed primarily in diverging directions.

⁴⁵The inclusion of Minimalism in this list requires justification. It has been repeatedly stressed that Minimalism needs to be understood as a research program, as opposed to a unified theory. However, it appears to be the case that all the putative “theories” in this list equally deserve the status of research program, owing to their internal diversity and that the distinction therefore loses any value (cf. Postal [1964] 1967:v).

Centripetal powers of Rationality. Accepting the claim that Government Phonology is drifting apart, a problem arises. This is due to the *public character of scientific research*. Science is a social undertaking. Research rarely happens in isolation, but is the subject to criticism by a larger community. This public character of scientific activities interacts with our beliefs about the nature of rationality. In the following, a simple but intuitively appealing notion of *reason*, or rationality, will be introduced. According to this view, reason is normative. That means that to *use reason* and to *be rational* means to follow a set of rules that govern behavior. If one's behavior is not in accord with these rules, then one behaves irrationally. Moreover, we will assume, for the sake of argument, that the norms of reason are strong enough to *justify* a scientist's belief. In other words, we will assume that reason is capable of determining a researcher's decision about whether to regard a certain claim as true. This means that with a good understanding of the nature of rationality, any practising scientist can consistently use good judgment and be guaranteed to progress towards better and more true theories. Sometimes, the application of reason in this way is described as the "scientific method".

If it is assumed that the scientific method has these properties,⁴⁶ and if we further assume that the scientific community with its considerable size is composed of agents that act rationally, then we would expect to see the scientific community develop with a great degree of unity. The reason for this is that as the scientific method governs the decisions of each member in a community, each individual member should, given the same situation, arrive at the same conclusions. Allowing for some variation in the exact circumstances, such as different sets of facts being known to individual researchers, we should still expect that a community of greater size, and moreover one that exists for a longer stretch of time, would exhibit agreement about most of its beliefs. If this general picture is accepted, then the introductory sentence of this chapter needs to be rephrased. Linguistics and Government Phonology *suffer* from a great amount of disunity that threatens their status as rational research activities. In the remainder of this chapter, several ways of resolving this contradiction are investigated.

Possible Solutions. There are two possible solutions to this contradiction which will be pursued in the following sections.⁴⁷ The first of these concerns the question of whether rationality really has the force to bring a research community together. That is, whether multiple individuals will, as long as they use proper reasoning, arrive at the same solutions to the same problems. Stated differently, the problem is whether a truly objective theory of justification, that can remove any responsibility of the individual scientist in the formation of his judgment, can be constructed. The other possible solution to the problem raised above is that the members of the linguistic community, or Government Phonologists in particular,

⁴⁶As it appears, belief in the form of rationality that is sketched here is common in Government Phonology, as well as the linguistic literature in general. The two major polemical publications that are discussed in section 4.6 certainly require it.

⁴⁷In principle, there is a third option which is to deny that Generative Grammar is diverse. This line of thinking will not be pursued here.

are not rational agents. This presupposes the existence of a normative methodology, and proposes that linguistics either do not know about it, meaning they need to be educated, or that do not employ it despite knowing about it, meaning that they are intentionally irrational. This is the approach that several publications imply, and which is explicitly adopted by Ploch (1999:20, 2003:184ff.). Ultimately, it is suggested that there is no basis for an objective methodology, which removes any basis for claiming that the community is irrational. Instead, the plurality of methodological practices is regarded as the rational situation.

4.2 The Logic of Justification

This section pursues the question of whether methodological theory can determine theory evaluation to the extent that it will clash with the apparent diversity of linguistic theory. We propose that rationality is insufficiently restrictive to enforce unity in linguistic theory and to function as a centripetal force in scientific research.

Quid Juris and Quid Facti. We require an explicit definition of the notion of *rationality*, capable of determining ideal scientific behavior. Crucially, this notion must not make reference to scientific practice, since the issue is exactly in what way rationality can be used to guide practice and whether actual practice is sanctioned by the rules of rationality. For this reason, the theory of rationality and the description of scientific practice must be distinct, independent activities. If they were not distinct, we could not ponder the questions we posed without incurring a vicious circularity. In other words, we need to distinguish between what has been termed as the *Quid Juris* (QJ) and *Quid Facti* (QF)⁴⁸, referring to the “question of justification or validity” and to “the question of fact” (Popper 2002:60), respectively.

The term *justification* brings with it a number of problems. Stefan Ploch (2003) introduced Karl Popper’s use of the word into GP literature. Popper (2002:39) described those approaches to the philosophy of science as justificationist that are in search of principles that allow us to justify our theories by “positive reasons, that is, by reasons capable of establishing them, or at least of making them highly probable” (QUOTE). That is, he used this term for theories of verification, for the belief that it is possible to verify the truth of a theoretical statement, which he held to be entirely impossible. As such, within the Popperian framework that Ploch adopted, justificationism is a negative term, and consequently has developed a derogatory connotation in certain publications. However, the present work will use the term in a more general sense. We shall use the

⁴⁸This terminology is due to Immanuel Kant, who introduced both terms in a metaphor to the study of law of his time. See “Die Rechtslehrer, wenn sie von Befugnissen und Anmaßungen reden, unterscheiden in einem Rechtshandel die Frage über das, was Rechtens ist (*quid iuris*), von der, die die Thatsache angeht (*quid facti*), und indem sie von beiden Beweis fordern, so nennen sie den ersteren, der die Befugnis, oder auch den Rechtsanspruch dartun soll, die *D e d u k t i o n*”. (Kant [1781] 1956:126).

term justificationist for a theory of method that proposes to determine decision through methodological principles. To justify a statement will mean to advance a principle that will determine that a certain decision is more proper than its alternatives. This includes both the theories of confirmation and explanation, as well as Popper's falsificationism.

Logic as Foundation. Given that the study of scientific practice has been excluded as a way of approaching a theory of rationality, other criteria will need to be introduced. Recall that it was proposed that rationality should allow different individuals to arrive at the same conclusion. That is, rationality must be non-subjective. Various forms of logic have always been one of the best tools for inter-subjective, public agreement. For example, there is a very strong, if not inescapable, intuition that $\neg(A \wedge \neg A)$ holds, in other words, that a statement cannot be true and false at the same time. A number of basic laws of logic such as this are among the chief candidates for self-justifying knowledge and necessary truth. The details of the justification of logic shall not be discussed here. Instead, we will assume that logic is the ideal foundation for an objective theory of method, an assumption which seems to be shared by Stefan Ploch, as evidenced below.

In 2004, Ploch published a paper with the title "What is Wrong with Linguistics?". In this paper, he identified the error of current linguistics in the fact that it is traditionally identified as one of the humanities and not as a natural science. According to Ploch, this causes linguistic explanations to "suffer from a certain lack of precision and lack of testability which is not unusual in the humanities" (Ploch 2004). The suggested remedy is to apply the scientific method as it was described by Karl Popper, which would turn linguistics into an empirical, natural science. Specifically, it is suggested that with proper knowledge of logic one would be pressed to reject a number of common, but misguided, methodological practices. The alleged consequence is that "phonology could finally leave its pre- or pseudoscientific period and enter an age of enlightenment long overdue" (Ploch 2003:189).

Both precision and testability are strongly connected to what has been said earlier about the objective nature of rationality, as well as the public character of science. Testability requires predictions, which require a method of inference. Owing to their intuitive acceptability, the laws of logic are the most well-established method to achieve inter-subjective agreement with regard to inferences. Ploch (2003) makes this connection explicit, and repeatedly advances logic as the ultimate justification of his methodological proposals. A number of examples are provided below, (17f) being of particular interest as it points out the connection between objectivity and logic.

- (17) (a) Now, on what do I base my claim [...]? On logic and mathematics. (p 167)⁴⁹
- (b) It should be quite clear that it is the logical relationships between propositions and its potential falsifiers that matter for our decision

⁴⁹All page numbers refer to Ploch (2003)

whether there is a scientific point to [...] the Phonetic Hypothesis.
(p. 172)

- (c) Falsifiability is not about usefulness or why people want what they want (which includes their motivations why they are interested in some particular framework), but about a logical relationship between assumptions and their predictions (p. 186)
- (d) Falsifiability is about objective truth, logic, and logical validity. (p. 187)
- (e) Popper's philosophy of science is mostly about questions of logical validity (p. 195)
- (f) [T]estability [...], which is defined by a logical relation between a premise and its class of potential falsifiers, is by that very logical definition not subjective, but objective and thus arguable. (p. 150)

Consequently, it is the goal of this section to discuss theories of the scientific method based exclusively on logic and to evaluate whether these can be applied to linguistic research and whether they can really function as the remedy they are supposed to be.

The structure of this section is the following: first, a simple deductive theory of confirmation, the so-called *Hypothetico-Deductive* method is introduced, and found to be insufficient. Moving on, we shift from confirmation to falsification, and find that the so-called Duhem-problem, inherent to deduction, spells significant difficulties for any attempt to base a methodological theory on the logic of falsification. This is followed by an introduction into a deductive theory of explanation which exhibits different faults that however equally follow from the deductive architecture of the model.

The conclusion is that exclusively deductive theories of justification are insufficient. The lesson to be taken from these findings is the topic of the following section.

4.2.1 Logician Theories of Justification

This section investigates the logic of confirmation and asks what information can be gained from testing deductive consequences of theories.

Hypothetico-Deductivism. In this section, I introduce what could be described as the simplest possible theory of confirmation. With this, I mean the idea that every true consequence of some hypothesis qualifies as confirmation of that hypothesis. The formal, logical reconstruction of this theory is called the *hypothetico-deductive method*, which is potentially one of the most popular reconstructions of the scientific method and agrees to a great degree with informal intuition on the matter. Glymour (1980:322) describes it as “an attractive and apparently indestructible idea about confirmation”, and even those who regard it as ultimately flawed still hold it as the benchmark for all other theories of confirmation.

The method is characterized by its tripartite structure,⁵⁰ the first two steps of which are represented in the name of the method. It is *hypothetical*, in that it starts out with an assumed hypothesis. In the second step one *deductively* derives consequences from this hypothesis. Of course, hypotheses have more than one consequence⁵¹. An important part of the method is to derive new consequences, again and again, and to find those which are the most interesting, perhaps by being the most surprising if they turned out to be true. It is an advantage of a deductive method that it can provide the researcher with interesting consequence in advance, before collecting evidence to test it. This leads to the final step, when the deduced consequences are compared to observational records, which constitutes a *test* of the hypothesis. Crucially, for a deductive method such as this, it is irrelevant how the hypothesis was initially formed. This is because the method makes no reference to the called *context of discovery* and instead allows us to evaluate a hypothesis depending on how its empirical consequences agree with fact.

Now, the central issue is what different test results will tell us about the hypothesis under test. Let us use the letters *H*, *C* and *E* to stand in for *hypothesis*, *consequence* and *evidence* respectively, all of which are statements.⁵² There are three possible situations after such a comparison. Trivially, *C* and *E* might be unrelated. This shall be of no further interest to us. The second possibility of an outcome of a test is that *C* and *E* are compatible. Since we defined *C* and *E* as statements, that means that they should be in some sense the same statement. In this case, we say the theory has been confirmed, or corroborated. The third and final possibility is that there is a conflict, the statements contradict each other, in which case the theory has been falsified. The application of this method is called (H-D) testing.

As for *confirmation*, the term is not intended in an absolute sense. A single true consequence of a hypothesis does not establish the truth of a claim. In fact, the belief that it does is logical fallacy that goes by the name of *affirming the consequent*.⁵³ Furthermore, as Ploch's criticism of inductive reasoning (2003:168-171) has shown, no number of confirmed predictions will in the least be logically indicative of truth. What is meant here is only that a hypothesis receives some form of support from its confirmed consequences, and that this notion has a place in scientific activity. The issue of falsification requires similar qualification. In the following we will ask what, if anything, we can learn from a negative result in the application of the H-D method, that is a falsification of a hypothesis under test. I present two reasons why falsification should be regarded as minimally informative.

⁵⁰Owing to problems with specific definitions of the method, there is a wide variety of statements of it, often with only slight differences. Here, it is sufficient to give only a single, simple and fairly informal version.

⁵¹If a hypothesis does have only one consequence, then it is practically unusable for the H-D method.

⁵²Incidentally, the following discussion is applicable to a generative grammar if one interprets *H* as a grammar, *C* as a structure in the language generated, and *E* as a grammaticality judgement.

⁵³Briefly said, the fallacy is defined as an argument of the form $P \rightarrow Q$, Q , therefore P .

The first argument requires a slight revision to the simplistic account of the H-D method above. Before, we were talking about the consequences of a singular hypothesis *H*. However, for a number of reasons, it is virtually always the case that scientifically interesting hypotheses are sufficiently abstract as to not make any predictions by themselves. Since this is a critical prerequisite to the argument, it is important to substantiate this claim. Luckily, it can easily be shown that this is a normal situation in linguistics. To give a phonological example, Kaye (1995:291) mentions the *minimalist hypothesis* that “processes apply whenever the conditions that trigger them are satisfied”. Given nothing but this statement, it is impossible to derive any predictions⁵⁴. To elaborate on this point, processes, conditions and other terms in that statement are theory internal notions. Their meaning is dependent on an elaborate system for the graphical representation of certain linguistic facts. In that system, each part crucially depends on others to allow the whole system to have logical consequences. If one attempts to separate the statement from its theoretical background, it will have no meaning, and no consequences.⁵⁵ At the same time, the minimalist hypothesis is still an independent statement, that is, it is not implied by the rest of the theory. Two theories can differ only in assuming it or not assuming, so we would still want to test it and to judge its worth. Examples can be multiplied. Piggott (2003:498) proposes that “[t]he head of a nucleus may license a postnuclear rhymal position”, and that “[t]he coda position is not a feature licenser”. Again, it is impossible to claim any observational consequences for these statements without the addition of a theoretical background. Simple universal sentences, such as “all final consonants in German are unvoiced” do in some sense make predictions by themselves, that is, they do not require any additional statements except for instances that they apply to. However, they do not alleviate the problem. Statements of this kind do not actually appear in the phonological literature, except as consequences of a more general theory. This is because they are methodologically ruled out, since as Ploch (2006:184f.) points out, they would be regarded as ad-hoc and uninteresting, since very little follows from them.

The result of this is what Morrison (2008:337) calls the *prediction thesis* of holism: “[t]heoretical claims do not imply their observable consequences individually, but only as collected bodies (‘theories’)”. The consequences are inconvenient in the matter of confirmation, but devastating with regard to falsification. We therefore have to adjust our previous formula of $H \vdash C$ and introduce a new proposition *B*, for *background*, that subsumes everything that is needed to allow a hypothesis under test to actually make predictions. Consequently, we need to adjust our descriptions of tests, because unlike before, it is not *H* that is confirmed, disconfirmed or falsified, but instead the conjunction (*B&H*). That means that in the case of falsification, we need to assign blame to either *B* or *H*, but

⁵⁴This is a different issue than the distinction between the representational model and a theoretical background as laid out in the second chapter. The minimalist hypothesis quoted here belongs to the empirical representational system.

⁵⁵It has been noted (cf. Morrison 2008:339) that the belief that individual statements are incapable of producing predictions amounts to the positions that terms are theory-laden. This is surely the case in the present example.

our method will give us no hint which is actually at fault. Presumably, (*B&H*) consists of many individual statements, each of which, or even several of which, could be to blame. Furthermore, it need not even be that any of the the statements in *B* and *H* is actually untrue, it might be that a statement needs to be added. Then again, it might be that it is not even the theory that is to blame, and that instead the observation needs to be rejected. If it is assumed that observation always requires interpretation, and is thus theoretical, then testing is in fact the comparison of two different kinds of theoretical assumptions. That means, in case of an anomaly, we are entirely in the dark about how to proceed. This dilemma is called the Duhem-problem, after Pierre Duhem, who first raised attention to this issue. Duhem's (1954:185) own, often quoted words on the matter are given below:

[T]he only thing [a failed] experiment teaches us is that among the propositions used to predict the phenomenon and to establish whether it would be produced, there is at least one error; but where this error lies is just what it does not tell us. The physicist may declare that this error is contained in exactly the proposition he wishes to refute, but is he sure it is not in another proposition? If he is he accepts implicitly the accuracy of all the other propositions he has used, and the validity of his conclusion is as great as the validity of his confidence.

A phonological example of this problem is found in Pöchtrager (2006), who notes a relationship between a melodic element *H* and a structural property, length. It appears that in New York City English, vowels before coda consonants that do not contain *H* are pronounced longer. According to Pöchtrager, this is a violation of the non-arbitrariness principle, but it would be more true to say that it contradicts the conjunction of the non-arbitrariness principle, structure/melody independence, the hypothesis that voicelessness in NYC English is an expression of an element *H*, and that length, even additional, "non-phonemic" length, is an expression of structure, among a host of other assumptions. So, as we see, instead of doing what Pöchtrager did, which is to replace the element *H* by a structural configuration, we could as well have rejected structure-melody independence.

In this context, it is worth to note that some theorists, notably Johnson & Postal (1980), have deemed it elegant to define their theories as a single formula that is a conjunction of all individual statements of the theory. This is possible because it makes no difference with regard to consequences of the theory, which is guaranteed by their deductive nature. Of course, this is not to say that for every prediction of a theory, literally all the statements of a theory and background are relevant. In any deductive argument that can be built from the theory, it is only those statements that appear as premises that are relevant to the conclusion. However the point remains that a deductive argument will in all but the most trivial cases contain multiple premises, often so many that they become difficult to enumerate⁵⁶.

⁵⁶It should be noted that actual arguments in the literature often do not state all their premises. See Postal (2004:chapter 12).

The Deductive-Nomological Theory of Explanation. One of the most popular notions of explanation in Generative Grammar since its inception is that of giving a summarized statement of linguistic facts. That means that just by giving a general theory from which the facts of language can be derived, one has explained these facts. Such a view can be found as early as Chomsky ([1957] 2002:15). The general name for approach is “subsumption under law”. One of the most notable modern explications of such a theory of explanation is the *deductive-nomological* model. This model works on the same basic logic as the H-D method, in fact, D-N explanations are sometimes described as H-D predictions that occur after the fact, meaning that the two models are different only in their temporal application.

We distinguish a collection of initial conditions ($C_1, \dots, C_n$), consisting of statements about particulars, together with one or many law-like statements ($L_1, \dots, L_n$), which together make up the explanans, and one particular statement (E) which is the explanandum, what is to be explained. According to Hempel (1965:337), this deductive subsumption is explanatory because “the argument shows that, given the particular circumstances and the laws in question, the occurrence of the phenomenon *was to be expected* [emphasis his]”.

Sadly, this intuitively very appealing theory suffers from a number of problems. One particularly damaging problem results from the symmetrical nature of prediction. The traditional example illustrating this problem is that of a flag pole. Let us assume we know a pole’s height and position, as well as the direction of incoming light. This lets us predict the length and position of the pole’s shadow, and since we were able to predict it, we can claim to have explained it. However, it is equally possible to use the length and position of the shadow, as well as knowledge about the light source, to predict the height of the pole. Suddenly, the claim that we have thus explained the pole’s height is unacceptable. Another issue regards the unrestricted notion of law, leading to issues with accidental generalizations such as in the case of an explanation of one senator’s baldness from the statement that “all senators are bald”, in a situation in which that statement is true. Additionally, there are kinds of deductive entailment which are invariably non-explanatory, such as self-entailment.

One attempted solution to this is the introduction of some notion of causality. It is clear that the pole and light together cause the shadow. This becomes especially clear when we attempt to interfere into the situation. That is, the only way we can change the shadow is by manipulating the pole or light source, but we can never act upon the shadow to make it change the pole. We can reposition the pole, we can shorten or lengthen it. If we are using an artificial light-source, we can change its position, if we are dependent on the sun, we can wait until it moves in the sky. On the other hand, there is no way to manipulate the shadow directly. We take this as a reason to say that the shadow is caused by those phenomena we can interact with, and not the other way. However, there is no *logical* reason that possible interventions imply causal relations. This claim is conjectural in itself, and would require justification.

Therefore, to introduce causation means to go above and beyond exclusively deductive arguments. The initial D-N theory declared an argument explanatory

based only on the form of sentences and their logical relations. Causation, on the other hand, is a highly metaphysical notion and will require a massive elaboration of the theory.

Therefore, if we narrow our focus to the logical structure of the D-N model, then we see that it can provide no justification. Interestingly, it is exactly the deductive nature of the model that ultimately causes its deficiency. It is only with the addition of a metaphysical principle, causation, that a subset of valid deductions becomes explanatory. In fact, Laudan (1990), in his case against underdetermination, concedes that no purely logical theory of confirmation or explanation is possible, and that it is necessary to go above and beyond deductive certainty.

Concluding Comments. The previous sections were an investigation into what the logical relations between statements of theories and observational statements can tell us about their truth or falsity. It has been established that logic itself is, in any practical sense, uninformative. The lesson to be taken is that logic alone is not sufficient to determine scientific methodology, and that additional principles need to be introduced to make theories of confirmation, falsification or explanation work. The following section is concerned with the question of what the character of methodological theory is, if it is not logical.

4.3 The Theory of Method

This section discussed what the character of methodology is, if it is not founded on logic.

Popper's Conventionalism. At this point, the methodological theory of Karl Popper will be reconsidered. Since it was said that the Duhem-problem undermines the informativeness of falsifications, falsificationism could not have a logical foundation. It will be argued that Popper's methodology instead has a conventional character. The most important claims of Popper's methodological theory, then, will be found to constitute statements that go above and beyond what is determined by logic, which is a situation that Popper himself appreciated and regarded not as a necessary evil, but as one of the major benefits of his own theory.

Let us use, as an example, one of Popper's most notable ideas of how a scientist should approach theory development. Popper's theory of *bold conjectures and ingenious attempts at refutation* holds that one should strive to invent new theories that are both creative and easily falsifiable,⁵⁷ and to consciously try to consequently falsify them. This is because only if a theory has been attempted to be refuted, but could not, it has proved its worth. What is the character of this doctrine? It indubitably relates to the logic of falsification. Since Popper believes that the only humanly attainable knowledge is of successful falsification,⁵⁸

⁵⁷In the sense of being logically improbable.

⁵⁸Even if that falsification is holistic and the knowledge attained thereby only of diminished interest.

it follows that falsification needs to be at the core of his theory of the scientific method. But the methodological principle that an unlikely theory that could not yet be falsified is *more likely to be true* (and not merely pragmatically interesting by being highly informative) does not follow *logically*.⁵⁹ In fact, there was a considerable controversy around the counter-intuitive nature of Popper's claim that a logically improbable theory is more likely to be true.

Since Popper's principles do not follow logically, they must be determined in a different way. A suggestive idea is that they were designed with a goal in mind. One of the major characteristics of Popper's writing is the manifest belief that criticism is essential to a scientific discussion. The biographical reason for this belief might be Popper's early experiences with Marxism and Freud's theory of psychoanalysis (Popper 2002:45, 2002:chapter 8). This dissatisfaction was fueled by the difficulty with which proponents of these theories would engage in arguments and be open to change their views. Subsequently he formed the idea that these theories were problematic because they were not amenable to criticism. Popper set the goal of his methodological theory to guarantee the possibility of criticism. With this goal in mind, he went about the construction of his falsificationism.⁶⁰

Since criticism is a central part of science, it follows that it must be possible to show that a theory is false. For this reason most of Popper's methodological theory is concerned with falsification. Furthermore, this is the reason that Popper must somehow provide an answer to the Duhem-problem, which he attempted in his theory of critical tests, a doctrine that provides conditions for when a falsification needs to be accepted as decisive, even if it could logically be evaded. The exact content of the theory of decisive tests is a matter of a decade-long controversy, and is not entirely relevant at the moment. The only thing that is essential to the present argument is that Popper did not deny that the Duhem-problem is real, and that logic provides us with tools to evade falsification, and that he instead attempted to undo these problems by introducing conventions that go beyond what logic dictates and which were intended to be consciously applied by practicing scientists. Most of Popper's methodology has this character, down to his famous treatment of the problem of demarcation of science and pseudo-science. Instead of proposing to have found out what it means to be scientific, which he would have rejected as a form of essentialism, he proposed a *convention to call certain things "scientific"*. This means that it would be misguided to use Popper's writings to prove that a certain theory or publication is pseudoscientific. The only thing one can prove is that the conventions proposed by Popper imply that certain things should not be called "scientific".

If we interpret the theory of justification as normative, conventional and goal-oriented, a certain relativism appear to force itself upon us. Indeed, Esa Itkonen (1991:326) pointed out that any normative methodology "is an [sic] historical

⁵⁹Cf. "Methodological rules are thus closely connected [to our criterion of falsifiability]. But the connection is not a strictly deductive or logical one" (Popper 2002:33).

⁶⁰The central position of criticism within Ploch's philosophy is evidenced by the fact that in an early publication (Ploch 1999), he proposed to synthesize the position of Stirner ([1845] 1972) and Popper's falsificationism, which have little in common except for sharing the theme of criticism.

and social entity”. By investigating the practice of scientists, then, we can reveal those scientists’ actual goals, which is a requisite to creating a methodology that will serve these goals. “If scientific normativity is taken to be at odds with historicity/sociality, this entails an implausible commitment to an atemporal, Platonic norm of science” (ibid.).

Characteristics of a Conventional Methodology. The conventional character of methodology has two further consequences. First, a methodological theory is tentative, since it is not derived from logic. Instead a methodological theory is hypothetical. It is first freely invented, and subsequently used and tested as to whether it can perform the function it was designed for. This way one might even refine it in the light of new findings and critical discussion. It might even be said that methodology is an empirical discipline, especially if the term is understood in the same sense as Chomsky used it to describe his theory of evaluation procedures. Second, given that each methodology is designed for a specific purpose, the methodology can be valid only relative to that purpose. However, since there are multiple possible purposes to methodology, we arrive at a form of relativism in which a methodological decision can only be determined by a methodological theory which itself has been chosen without justification. Any attempt to provide justification for the methodological theory itself can only transpose the locus of an arbitrary decision, and will run into an infinite regress. This means that there is no absolute justification. While an answer to *quid juris* can give us justification relative to some convention, no theory can be justified in an absolute sense, such that everyone is forced to agree.

However, this does not undo all of the benefits of adopting a methodology. It is true that it poses a difficulty for the position that the purpose of methodology is to determine what the method of proper science, as opposed to pseudoscience, has to be. It is also true that this means that an “objective” methodology is unattainable. However, the adoption of an explicit methodological theory has another important benefit, which is to *objectivize* methodological decisions. Objectivizing is here not meant in the sense of objectively justified that has been used before, meaning that there is a methodology which is true independently of humans that employ it. Instead, we mean that subjective decisions are transformed into public objects. Once any methodology has been accepted, decisions concerning the acceptance or rejection of a theory are determined by an explicit set of criteria. This allows any individual that has knowledge of the standards that are employed by the community to determine whether a given researcher’s decisions are sanctioned by the community. This benefit is not undone even if the choice of method is arbitrary. It is present as soon as there is some kind of explicit methodology.⁶¹

The following section will investigate the consequences of the assumption of a conventional, arbitrary character of methodological theory has for Generative

⁶¹We are reminded of the similar situation of the relationship between different stages of Generative Grammar and formalization. In both cases there is a trade-off between explicitness and the arbitrary decisions it requires.

Grammar.

4.4 The Method of Generative Grammar

Since there does not appear to be a single, objective methodology, we are forced to assume that there is a multitude of possibly valid methodological theories. Furthermore, it has been proposed that a methodology is determined to some degree by a goal of research. The question poses itself whether Generative linguistics shares a single goal that should determine a shared methodology, or whether the discipline can allow for a multitude of views. We will find that, among others, two families of approaches can be distinguished, roughly corresponding to the distinction between a representational model and its theoretical background in chapter 2 and to the distinction between early and late Generative Grammar in chapter 3.

A Defence of Confirmation. Two issues will be discussed in this section: Ploch's arguments against a confirmational approach and the original reasons that Generative Grammar does, for the most part, adopt a confirmational approach.

Ploch (1999:25-28) identifies two strategies which he regards as the result of a faulty inductivist approach to science. These strategies are *denial*, and *flexibility of applicability*. Denial consists of the rejection of any contradicting evidence, while flexibility of applicability refers to the non-application of a theory when it would be proven wrong. In fact, both strategies can receive a straightforward justification based on the logic of testing which was previously discussed in (4.2). Given that a hypothesis can be tested against evidence only with respect to a collection of background assumptions, it is always possible that an anomaly must be resolved by changing the background assumptions. In particular, it is always possible to claim that the problematic evidence does not fall within the responsibility of the hypothesis under test, and that more assumptions need to be introduced.

Let us examine an example from the history of linguistics. Geoffrey Pullum and Paul Postal collaborated on a series of papers attempting to disprove various versions of trace theory. In Postal and Pullum (1982), they criticize certain proposals for claiming that trace theory achieves explanatory success on the ground that a theory that cannot even account for some data cannot be said to explain it. This in turn was commented on in the following way:

[Postal and Pullum] find it theoretically suspicious that trace theory advocates can claim to have achieved explanatory success when in fact their descriptions fail. We would argue that one can explain some facts even if others are left undescribed; it is unreasonable to say that one has no explanation until all facts are described. In order to have an explanation (of greater or lesser depth) one needs to describe the *relevant* facts. It is important to note that there is no theory-independent way of establishing which facts are relevant. (Aoun and Lightfoot 1984:472)

Aoun and Lightfoot rightly assume that it is not necessary to change trace theory, because the problematic sentences could be explained by another module of grammar. Interestingly, as Aoun and Lightfoot mention, this is because facts only exist in relation to a theory. This is meant in two ways. First, observation requires interpretation, which means that observation itself consists of theoretical knowledge, and is theory laden. This means that facts and their contents exist only relative to a theory.⁶² Second, observation is not labeled for any theories it is relevant to, meaning that during theory construction, it is often unclear what evidence the theory should actually be able to account for. Differently said, a theory is required that will determine which evidence is relevant to a theory. Interestingly, this allows for two strategies. One is to construct an auxiliary theory that will determine what evidence the major theory has to account for.⁶³ The other is that a theory determines its own evidence. Essentially, this means that the only evidence relevant to a theory is the one it (successfully) accounts for. That is, the strategies of denial and flexibility of applicability can be understood as a position regarding the way the notion of relevant evidence is defined. Crucially, both strategies follow from nothing more than the assumption that observation is theory-laden, and are therefore justified. To take away the justification of these strategies, one must either reject the theory-laden nature of observation, or introduce further criteria that will have this result. Crucially, there do not appear to be any logical reasons that could be advanced for this goal. However, conventionally speaking, there are good grounds for the rejection of the second strategy on the basis that it trivializes the notion of confirmation and removes the possibility of falsification, that is, it removes any basis of criticism. Given the assumption that criticism is essential to the scientific activity, and since the second view makes criticism impossible, we have established a *reductio ad absurdum*. Still, it appears that the second strategy has been used to a degree⁶⁴ within the Generative literature. In fact, one of the differences between Generative Semantics and Interpretative Semantics can be said to relate to the choice of these two different options, with Generative Semantics choosing to adopt a phenomenological definition of its data, while Interpretative Semantics adopted an unrestricted approach. Similar issues pose themselves for Government Phonology, in particular whenever sound

⁶²Cf. “[t]he principal point that we wish to make here is that syllable structure, in the absence of a theory, is not discernible by mere inspection. This point should not be controversial but it is often overlooked in discussion related to syllable structure” (Kaye, Lowenstamm and Vergnaud 1990:203).

⁶³Even if facts are relative to a theory, it is possible to feed one theory with facts that are laden by a different theory. An extremely prominent example of this is the practice of giving a “pre-theoretical” account of facts, before one even attempts to formulate a theory. Obviously, the so-called “pre-theoretic” facts are still established using some kind of theory. In the context of Government Phonology, it regularly happens that one starts out with a set of linguistic forms in some alphabetic notation, before attempting to give an analysis in the form of GP. Here, the initial dataset is laden with a host of theoretical commitments, from the details of the notation down to the metaphysics of what real-world structure these letters represent. Another case is the common practice of citing facts from publications in foreign frameworks.

⁶⁴As will be shown below, most of the relevant evidence is determined by general research questions. It is only where these cannot determine the admissibility of certain evidence that the second strategy is adopted.

change and morphology result in phenomena that could be interpreted as phonological. Classic examples are the question of whether a derivation of *electri[s]ity* from *electri[k]* must be possible, and whether *keep* and *kept* are different lexical entries.

In this sense, it is unclear whether the second strategy must be unconditionally rejected. Furthermore, wider adoption of the first strategy, that evidence must be defined externally, is subject to the same constraints as any attempt at higher degrees of explicitness, meaning it will incur a certain arbitrariness. Most commonly, one's core theory is conjectured to be true, while an external definition of the relevant evidence, to the extent that it is distinct from the core theory, could not be, since only one of two distinct theories can be true. This problem is not only theoretical, it exists in practice. Current Generative Grammar and Government Phonology are both conceived of as theories of the language faculty, while especially in GP, most evidence still consists of grammaticality judgments. Since these two notions are distinct, one must specifically assume a relation between them, one that allows us to draw conclusions about the structure of the language faculty based on grammaticality judgments. However, there is a certain flexibility to this relation, meaning that its exact characterization can exclude evidence that would be problematic for a grammatical theory. Furthermore, in this scheme, the extreme position that grammaticality judgements always accurately depict the language faculty has no inherent justification. In fact, it is dubious, since it can be understood as falsely equating two notions which are thought to be distinct. We must conclude that a certain flexibility with regards to evidence is a somewhat natural position.

This concludes a rudimentary defence of the two strategies of denial and flexibility of applicability. The issue of the reason for a confirmational approach inherent to Generative Grammar is still open. Recall that a "grammar can be regarded as a device that enumerates the sentences of a language" (Chomsky 1959:137). One of the major goals in early Generative Grammar was to provide a compact description of a language. To repeat, a language was defined as a set of sentences, the content of which was determined by grammaticality judgments. For this reason, early Generative Grammar did essentially equate grammaticality judgements with the subject matter of grammar, in the sense that a grammar primarily needed to accurately predict grammaticality judgements. Every theory of grammar in this sense is empirical, in the sense of being determined by past and future observation, and is falsifiable, since it is potentially false. Now, given this framework, it is natural to evaluate a grammar according to how well its predictions match up with the data, that is, how well the grammar is confirmed. In this scheme, it makes sense to react to a falsification with ad-hoc hypotheses that save the theory, if it generally covers the data well. Even if Generative Grammar ultimately went beyond these narrow, descriptive aspirations, the evaluation of a representational model still essentially works along these lines.

This section has provided some basic reasons that could be adopted to argue for a confirmational approach. The following section will investigate how some explicit methodological comments within Generative Grammar relate to the issue

of justification.

Galilean Linguistics. Luckily we are in the situation that Generative Grammarians do in fact, at least on special occasions, explicitly describe their methodology. That is, the general Chomskyan outlook of Generative Grammar has (in some sense) a clear characterization in the form of Galilean linguistics. This doctrine has previously been introduced in section 3.3. Here, we will only discuss it to the extent it relates to the issue of justification. The general approach is described and advocated in the quote below.

If you go back to the time of Galileo, and you looked at the array of phenomena that had to be accounted for, it was *prima facie* obvious that the Galilean theory, the Copernican theory could not be supported. That is, there were just masses of refuting data. And, Galileo sort of plowed his way through this, putting much of the data aside, redefining what was relevant, and what was not relevant, formulating questions in such a way that what appeared to be refuting data were no longer so, and in fact, very often just disregarding data that should have refuted the system, and did this, not simply with reckless abandon, but because of a recognition that explanatory principles were being discovered that gave insight into at least some of the phenomena. (Chomsky 1978:14, in Botha 1981:15)

It is interesting that Galileo is chosen as both example and name-giver of this doctrine, since Feyerabend's charge against Popper's methodology was based on the evidence of Galileo's actions. Is then unsurprising that the content of Galilean linguistics draws essentially the same conclusions, which are that a well-defined, static methodology is unfeasible and arbitrary, and that a certain amount of opportunism is required. In fact, Botha (1981) analyses a particular piece of Chomskyan argumentation, and tries to show that it employs strategies that Feyerabend described in his account of Galileo, in particular the method of *anamnesis*.⁶⁵ Furthermore, the reference to Galileo's repeated redefinition of the domain of relevant evidence, which is accepted as a valid practice, connects this doctrine to what we previously learned about the Duhem-problem, agreeing with our conclusions. In that sense, Galilean linguistics embodies the results of our investigation into the logical situation of confirmation and falsification. For this reason, Galilean linguistics could be said to qualify as "reasonable".

Two problems pose themselves at this point, which constitute major offenses to Popperian sensibilities. The first is that Galilean linguistics relies heavily on some notion of *understanding*. Reference to understanding is remarkably common, appearing to be regarded as the major goal and achievement of current Generative Grammar. Given that understanding refers to, among other things, a

⁶⁵Anamnesis is a form of argument that ostensibly reminds the reader of something they already know, while really changing one of their beliefs. The name of the doctrine "refers to the Platonic doctrine of reminiscence or recollection" (Botha 1981:60).

personal feeling of understanding, the comments above could be read as betraying a fatal subjectivism. The degree of understanding that an individual experiences when reading a particular piece of grammatical analysis is an inherently private phenomenon, and not accessible to investigation by the scientific community. This subjectivist interpretation receives further confirmation when one encounters comments such as (18) below:

- (18) However obscure it may be, that intuition about what Ernst Haeckel called nature's "drive for the beautiful" ("Sinn fuer das Schoene [sic]") has been a guiding theme of modern science ever since its modern origins.
(Chomsky 2006:180)

This explicitly acknowledges that such feelings are to be relevant in grammatical research. Still, this by itself does not constitute a full blown subjectivism, as the pursuit of any research activity will always demand some arbitrary decisions. On the other hand, there is another dimension to these comments. If understanding is defined as having been acquired when one has an answer to a research question, then the subjectivism disappears. Whether understanding has been attained can be evaluated by investigation of the question and the proposed answer. To provide an example, Chomsky asks how language can be acquired given the poverty of stimulus. His answer is (or was, at one point) that the language faculty has a P&P architecture, which solves the problem as it makes the class of possible grammars finite. Since this properly answers the question that was asked, we have acquired both an explanation, as well as the understanding that comes with it. Framed like this, the criteria of evaluation are public. One can object to the criteria chosen, to the questions that are asked, but it cannot be denied that the questions are out in the public world, and objective in a weak sense of the word.

Another objection from a Popperian methodologist might that Galilean linguistics exists mainly as a defensive measure, saving theories that would otherwise be regarded as false. Indeed, Botha (1981), an author entirely in favor of the approach, comments that the most remarkable property of Galilean linguistics is what he terms "epistemological tolerance". That is, Galilean Linguistics is peculiar by allowing itself to freely reject problematic evidence. Again, this might incur the charge of subjectivism and arbitrariness, and while this might as well be true in some cases, it would appear that there are often principled reasons for the dismissal of certain evidence, determined by the research question that is posed. For example, one could make an argument for the existence of n-ary branching structures, based on the fact that the additional constituents that are necessary to turn n-ary structures into binary ones are unmotivated by standard constituency tests. The rejection of such an argument would not necessarily be arbitrary, but could be based on the assumption that a binary merge facilitates language learning while a form of merge that admits an arbitrary number of arguments would make language unlearnable. Assumptions like this are, as is usual in scientific research, often without solid foundation, but as long as they are stated explicitly, they are made accessible to the public and, crucially, to criticism.

A completely different justification of this defensive measure has to do with the common assumption that every scientific theory contains anomalies, that is, problematic evidence. In fact, Kaye, Lowenstamm and Vergnaud (1990:226) regard this as obvious, writing that “It goes without saying that there is an impressive number of problems to be resolved in this framework”. They (Kaye, Lowenstamm and Vergnaud 1990:208f.) expand upon this thought with the following passage that is very Galilean in spirit:

It is to be expected that any interesting proposal will be confronted with a significant number of apparently contradictory data. This theory is certainly no exception. We repeat the point made above that raw, unanalysed, fragmentary data extracted from a given phonological system are of very limited utility. This theory is by no means immune from criticism but its replacement would require a theory of the same scope with a still better fit.

Ultimately, every researcher is entitled to reject this methodology, but to say that it is unjustified and that any grammarian who entertains it is unreasonable needs to be regarded as unwarranted. There can be legitimate criticism of this method, but it must stem from one’s particular scientific interest. Such is the case with Geoffrey Pullum’s complaint about Chomsky’s alleged anti-formalism. For Pullum, as a formalist, Galilean linguistics and its disinterest in the derivation of theorems are entirely inadequate, but for Chomsky, who conceives of grammar as an empirical discipline, Pullum’s criticism, as was discussed in section 3.3, is based on arbitrary formalist requirements. A researcher’s theoretical commitments determine his stance to different methodologies, but to regard any of these as objectively false is at the present moment unfounded.

The argument up to now has shown that the general practice of Generative Grammar is, in its own way, reasonable. The argument has been based mostly on the Duhem-problem, and connected issues, which allow one to disregard problematic evidence with the blessing of logic.

4.5 The Notion of Progress

This section is concerned with the consequences for theory comparison that result from the conventional and hypothetical nature of methodology.

Criteria of Theory Comparison. The notion of “progress” goes beyond the more basic notion of “change” by the addition of a value judgement, meaning that the change has been for the better. There are a number of ways one can approach a theory of scientific progress, and we will begin with the most basic approach, which is the comparative use of theory evaluation. In other words, one applies a theory of confirmation to two separate theories, and then compares the results to acquire a relative measure of confirmation.

Of course, since a truly logic theory of confirmation was rejected, the conventional and tentative character of confirmation must therefore also hold for any theory of comparison of this kind. Given that methodological principles are not based on logic, they are uncertain, and themselves subject to revision and criticism. For this reason, we have described them as hypothetical, and given their problematic justification, we have been pressed to allow for the existence of alternatives. This means that one's commitment to a certain methodology is ultimately based on choice. The consequence is that the meaningfulness of theory comparison is highly limited. Theory comparison is possible, but it can only occur in the light of one methodology. The problem is that each theory will be paired with its own methodology, such that the methodologies of two different theories are expected to be different. This is because it is the purpose of methodology to determine theory construction, and to the extent that they succeed at this, two different theories must also use different methodologies.

The question is now, which methodology should one use when comparing two theories that use their own, distinct methodologies? The most self-evident answer is that a scientist uses the methodology of the theory they adhere to themselves. A scientist will generally have reasons to believe in their own methodology, and so they will be able to advance these reasons as the justification they need to apply their methodology to a foreign theory. The problem is that the resulting judgment is irrelevant to proponents of the other theory, who could only have constructed their theory in the first place because they adhere to a different methodology. Ultimately, if we regard a theory's methodology as part of the theory, then theory comparison will always be partisan to one theory, and can never be impartial. This problem is insurmountable. Even if one were to attempt to construct a third, non-partisan methodology to compare theories, there would be no obligation for any researchers to accept the results.

Now, there is at least one other view that needs to be discussed, which is to ground the notion of progress in the notion of truth. In particular, Ploch (1999, 2003) proposes to adopt Popper's theory of *verisimilitude*,⁶⁶ or *truthlikeness*. The basic intuition of this theory is that science progresses towards *the truth*, meaning that as time passes theories become closer and closer to the truth. However, the belief in the existence of a truth, that is *realism*, is a fundamentally metaphysical principle, concerned with the basic structure of the world,⁶⁷ and Popper himself refrained from mentioning truth in any of his early writings, for the fear that such reference would, in the best case, not add anything to his theories and was more likely to harm them. Ultimately, in the form of a metaphysical principle, truthlikeness cannot be used in the justification of a methodology, which is why it received a methodological expression.

Ploch (1999:17-18) presents the theory of verisimilitude in the following way:

⁶⁶In fact, it is precisely this part of Popper's theory that allows for the rejection of the form of relativism that has been argued for above.

⁶⁷The metaphysical aspect will be discussed in the following chapter, while here we will discuss whether this doctrine can change anything about the previous conclusions about the restricted nature of theory comparison.

First, one needs to distinguish *truth* from *truth content*. This is necessary because it is assumed that every theory is literally false, and that instead one needs to focus on truth content, which consists of true consequences, as well as falsity content, which consists of all false consequences. This means that the theory of verisimilitude builds on the same deductive structure as the hypothetico-deductive method discussed earlier. Ploch (p. 18) then provides the following definition: “Popper argues for a concept as the aim of (empirical) science which encompasses both the demand for relatively high truth content and relatively low falsity content: this concept is verisimilitude (relative ‘close-to-truth-ness’)”. This is as explicit a definition as is provided.

Sadly, Ploch’s proposals are founded exclusively on the writings of Popper himself, and entirely disregard the decades of formal, explicit, and logically grounded philosophical discussion that has, in general, concluded that verisimilitude does not work (cf. Oddie 1986), with even some proponents of the doctrine agreeing that it can only be used in an intuitive way (Koertge 1978:276). Ploch’s own definition is not explicit enough to receive any conclusive criticism of the sort that has been provided in the literature. One refutation of a naive notion of verisimilitude is derived from the fact that the number of predictions of a (grammatical) theory is assumed to be infinite. This is because as an empirical theory, it is intended to predict past and future events (Ploch 2003:168-171), and because as a generative theory, it is intended to generate a language that has an infinite cardinality. This means that both the truth content and the falsity content of every generative theory will be infinite, with the result that the contents of different theories cannot be compared in any straightforward way. Ploch speaks of a “relatively high truth content” (Ploch 1999:18), when the truth content will always be infinite. This is why Popper employed set-theoretical inclusion for his definition of relative truth content or falsity content,⁶⁸ which is the form of theory that has been refuted by Tichý (1974), showing that given Popper’s definition no false theory can ever be more closer to truth than another false theory.

Still, one could argue that if a theory A has a true consequence that theory B lacks, then theory A has more truth content. However, what if B also has a true consequences that A does not have, and what if both theories also have false consequences that the other theories do not have? When Popper created his theory, the cases he tried to account for occurred in the physical disciplines. In particular, they were cases when the earlier theory could easily be presented as a special case of the newer theory. Such has been said to be the case with Newton mechanics, which can be reconstructed as a special case within special relativity. However, it is unclear whether this theory can be generalized into the field of Generative Grammar. For example, it might be said that Government Phonology had a lesser falsity content than earlier rule-based theories, because it was incapable of describing putatively impossible phonological processes, but at the same time, Government Phonology has always been *too* restrictive, so much that it could not describe real processes, decreasing the truth content. The same

⁶⁸This approach requires that for progress to occur, the new theory must entail every true prediction of the older theory.

is the case in GP 2.0, which rejected most of the machinery of earlier GP, thereby lost all its explanatory power, but was designed to account for one particular set of data which did not only not have an account in the earlier theory, but was in fact not even regarded as relevant.

Even worse, it is unclear which kinds of theoretical successes count as truth content (or falsity content). Let us consider a piece of linguistic behavior, such as the alternation of Polish *leka*[z] “doctor”, and its related adjective form *leka*[r]*ski* “related to doctors”. Let us assume there are three theories, one which gives a phonological account, one which gives a morphological account, and one which gives a lexical account. The lexical account is removed from the situation as it is unfalsifiable, even though it is possibly true. Now, do the other two theories have the same truth content?

It is for situations like these that an explicit theory of verisimilitude is required. Its absence allows us to claim that the quantification of truth content and falsity content are unclear, and that the relation between the both sets are so elaborate that theories are ultimately incomparable, or incommensurable, to use a term that has become common in this context.

To repeat, we have distinguished truth from truth content, which means that the principle therefore does not constitute realism, but is the methodological expression of it. This in fact severs any inherent relation between this doctrine and *truth*. While a high verisimilitude is usually interpreted as closeness to *the truth*, the principle actually does not entail this view. It can be used without believing in a single true theory, or in any form of truth at all. The principle itself is, when explicitly stated, nothing but an elaborate measure of empirical success. As such, it has the same character as any other arbitrary, conventional method.

This concludes our discussion of theory comparison. We have proposed an explanation of why methodological theory has not been able to act as a centripetal force in the Generative community, and we have received a resolution to the contradiction between the normative character of rationality and the diversity within the linguistic community. “Rationality” cannot uniquely determine a method, and normativity is relative to a set of criteria whose adoption is a matter of free decisions.

4.6 A Case Study in Theory Comparison

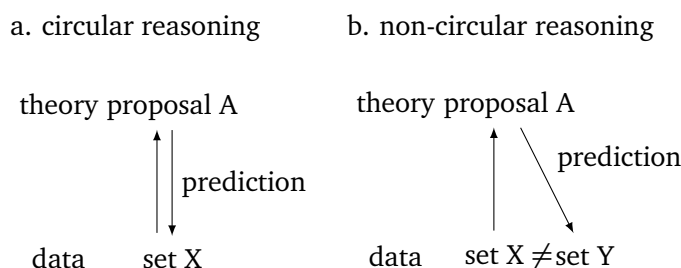
The previous sections have established that theory evaluation and theory comparison are less than straightforward. In the following, two major polemical publications in Government Phonology will be discussed, one claiming that the CVCV version of the theory is more scientific than the standard theory (sGP), and the other claiming the opposite. It will be found that both publications contain a number of flawed arguments and ultimately fail in achieving their goals for reasons that are connected to the previously discussed limitations of the logic of justification and theory comparison.

4.6.1 Scheer (2004): CVCV vs. sGP

Tobias Scheer's "A Lateral Theory of Phonology" (2004) has a subtitle that reads "What is CVCV, and why should it be?". Sadly, only the first of two volumes has actually been released, which is the one that deals with the first question of what CVCV actually is. The "why should it be?" is planned to be the topic of the forthcoming second volume. However, the first volume fortunately does contain one major passage that deals with justification and theory comparison. Specifically, there is a chapter that outlines Scheer's notion of explanatory adequacy, and argues that it shows that CVCV is a more sensible approach than the standard theory of GP. I will here attempt to repeat his arguments as faithfully as possible, to minimize the risk of misrepresenting his views.

Scheer discusses "the relation between observation and theory" (p.473). He appears to accept the doctrine that observation is theory dependent, and that there is no observation in absence of theory. At the same time however, he distinguishes between "empirical sources and theoretical constructions" (p. 474). No detail for this distinction is provided. He then goes on to point out the importance of predictions in science, and that "scientists" are convinced by "predictions, which happen to be borne out by facts" (ibid). However, he immediately qualifies this by mentioning that according to Popper,⁶⁹ a theory can only be falsified, never verified. This shows that he would in some sense identify as a falsificationist. He then presents as a fact that "[t]he very essence of a prediction is that it embodies a logical consequence of a theory that has been constructed on the grounds of a set of observations X, but concerns another set of observations Y, where $X \neq Y$ ". This subtly pairs the widely used hypothetico-deductive method with a rather idiosyncratic requirement given in the second half of his comment. In fact, the rest of his chapter revolves around this requirement, which he illustrates with a diagram that is repeated below:

(19) Scheer's (2004) definition of circular reasoning.



This is intended to represent two possible relationships between a theory and a body of observations. In the first case everything a theory predicts is known before, and in the other, predictions and prior observation differ in some way. What exactly this difference is supposed to consist of is unclear. At one point, Scheer states that the set of predictions and the set of observations must be unequal,

⁶⁹Incidentally, most philosophical quotations in this chapter are to works of Karl Popper. Second after that is Paul Feyerabend.

cf. “ $X \neq Y$ ” in the diagram. In other words, they must not be exactly the same. However, he also later writes that the sets must be “independent” (p.474, 475), which, in the context of set-theory, is synonymous with disjoint, and means that they must not have any members in common. On the other hand, Scheer gives an example that is supposed to be acceptable under his criterion, which is an inductive generalization, projecting from known facts into the unknown. Furthermore, the example is an accidental⁷⁰ generalization that all animals with hooves that are not cloven do not ruminate. The induction moves from an observed collection of animals or species to the collection of all species (that have hooves). As such, the set of prior observation is a subset of the set of predictions. I have enumerated three possible interpretations, but it seems sensible to assume that it is the third that was intended, that a theory must project beyond the set of observations. Another unclarity is whether the set of observations refers to the observations made by a scientist or by a research community, and whether it refers to observations that are “known” or those which have actually been used in the construction of a theory.

Scheer (2004:475) then gives another example. Since I intend to object to this example, it will be necessary to quote him at length.

Suppose somebody says that a storm has been caused by the fury of Zeus. One way of evaluating the wealth of this statement is to ask how we can be sure that Zeus exists in the first place. An irrefutable answer to that question is “just look at the storm, how could it exist if Zeus were not there to make it?”. Hence, the observation “there is a storm” is the empirical basis for the explanation advanced (“the fury of Zeus causes the storm”), as well as the incarnation of its associated prediction (“Zeus exists”).

This is advanced as an example of circular reasoning. However, it is not exactly clear how Scheer’s criterion will result in that judgment. To make the issue exactly clear, let us assign each statement to one of the relevant sets. The statement that there is a storm must belong to the set of observations, while the other two, pertaining to the existence of Zeus and him having caused the storm, would be in the set of predictions. Therefore, the requirement that both sets be unequal is satisfied. By Scheer’s definition of circularity, this hypothetical explanation is non-circular. Let us for a moment consider the state of affairs that would be necessary for Scheer’s condition to hold. All predictions would have to be contained in the set of observations. Since the existence of Zeus is presupposed by the prediction, a corresponding statement would have to be in the set of observations.

⁷⁰Counter to Scheer’s claim, there is no “necessary relation between non-cloven hoofness and non-rumination”. There are two standard definitions of “necessity”. One is that a claim is necessary if and only if its negation results in a contradiction. The other is that a necessary truth is true in every possible world. Classic examples are $1+1=2$ and the sentence “every bachelor is unmarried”. Even if there are no animals that ruminate that have non-cloven hooves, such animals could exist, and would not create a contradiction.

That is, the we would have had to have actually observed Zeus, and have observed him causing a storm. If this was the case, we would be pressed to regard the proposed explanation as observationally confirmed. This situation is in principle possible, given the theoretical character of observation, but if these cases qualify as observation, then it is unclear what could not be observed in this way. We could easily claim direct observation of e.g. the non-arbitrariness principle within the language faculty. Clearly, this analysis is problematic.

The suggestive resolution to these problems is the recognition that *circularity* is normally defined not in terms of observation and prediction, but instead of premise and conclusion.⁷¹ This fact is appreciated by Foley (1977:143), who writes that an “argument is circular if what is to be proved is included in the assumptions. It does not refer to theories; to say that a theory is circular is meaningless”. Stated differently, an argument (but not a theory) is circular if it assumes what it attempts to prove. Given this definition, Scheer’s example is circular because it assumes that there can only be a storm if it is caused by Zeus, which is then used to prove that the Zeus is the cause of the storm. But to describe the premise “without Zeus there can be no storm” as an observation is of doubtful validity. This criticism might be regarded as hair-splitting, but as we will see, this problem reappears in his following linguistic argumentation. Scheer continues with an attempt to use this condition to show how CVCV is more explanatory than traditional GP. He does this based on data about the restrictions on word-initial consonant clusters, or in terms of standard GP, so-called branching onsets. His basic claim is that any theory that contains a statement of the form “within a branching Onset sonority must increase” is circular in the sense above.

Two objections can be brought forward, which are, however, less than decisive. First, there is the question of whether a grammatical theory makes predictions situated in space-time.⁷² If it does, then no theory will ever predict exactly the observations it has been based on, because it will predict future events, which could not have been observed. If it does not, then the empirical nature of the whole discipline is in doubt.⁷³ The other objection has to do with the creative aspect of language. If a phonological theory is intended to predict the grammaticality of phonologically well-formed non-words, then there will likely be predicted grammatical non-words which have not previously been observed.

Scheer continues with the claim that sGP’s left-headedness condition instantiates a statement of the form “sonority must increase” while CVCV’s initial CV analysis is truly explanatory. According to Scheer, GP constituents are head-initial

⁷¹Scheer also provides a different explication of the notion of *circularity* with comments such as “[c]ircularity is introduced by the word ‘must’” (p. 477) and that “[c]ircularity is an intrinsic property of constraints” (Scheer 2004:478, Scheer 1999:202). These comments appear to result from a confusion between superficial statements with low deductive depth, or low truth content in the sense of Ploch (2003:184f.), with the notion of *constraint*, which is essentially equivalent to any other declarative statement with regard to deductive consequence.

⁷²Some authors, such as Lass (1980), regard only theories which make spatio-temporal predictions as empirical, which is standard in the physical disciplines.

⁷³For example, if a grammar specifies only an abstract collection of linguistic structures, without any straightforward real-world consequences, then one could argue that grammar is non-empirical in the same sense as mathematics or philosophy are.

only because of branching onsets which are the syllabic interpretation of a rising sonority slope. This is however untrue, since branching nuclei are left-headed as well. The correlation between branching onsets and sonority does hold, admittedly. However, Scheer's personal CVCV theory contains a similar correlation. This is because Scheer's account of branching onsets assumes an initial-CV which is present exactly when there is a cluster with a falling sonority slope. Since Scheer's definition of circularity, counter to his insistence, fails to distinguish between GP and CVCV, he proceeds to attempt another charge by claiming that GP could be easily rewritten as to have right-headed constituents, which would make the theory predict languages with initial clusters that are restricted to a falling sonority slope. Supposedly, CVCV is more explanatory because the initial CV that it assumes interacts with the ECP to result in the distributional facts. As Scheer claims, his account is truly explanatory because it could not easily be changed to allow for counterfactual languages. We will soon see that this claim does not hold true.

To show the problem, it is necessary to understand Scheer's version of the empty category principle. His definition is given below:

(20) Scheer's version of the ECP (Scheer 2004:67)

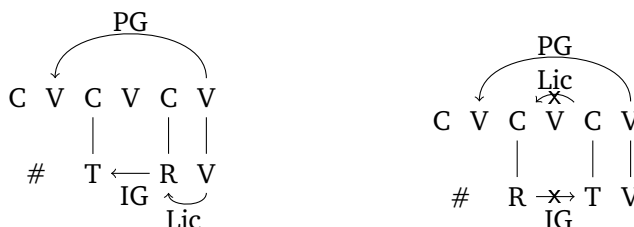
a nucleus may remain phonetically unexpressed iff it is

- a. properly governed
- b. enclosed within a domain of Infrasegmental Government or
- c. domain-final

Proper government is defined as it is in standard theory, with an additional clause that it might reach over a domain of infrasegmental government, a so-called closed domain. Now, it will be instructive to look at two graphs that Scheer uses in his discussion.

(21) word initial restrictions in CVCV (reproduced from Scheer 2004)

- a. well-formed structure #TRV.. b. ill-formed structure #RTV..



According to Scheer, this way of accounting for the facts precludes the existence of RT-type cluster word-initially. It is said that RT clusters cannot stand in an infra-segmental government relation, hence not forming a closed domain, consequently blocking the proper government of the initial CV's V. As Scheer says,

(21b) is “ungrammatical because Government cannot simultaneously silence two empty Nuclei”. This, as I want to argue, requires a critical theoretical misunderstanding. My reasoning is the following: The ECP is essentially a function from structural configurations into phonetic interpretations, and it will never result in making it impossible for a valid underlying representation to have a grammatical surface form. As it is usually defined, the ECP will determine a suitable pronunciation for any empty category that might be contained in a structural diagram. “Suitable” in this context means simply that a p-licensed nucleus is or may be unpronounced, while all other nuclei will be pronounced in some way. Again, it needs to be stressed that the mechanism specified as such will produce a pronunciation for *every* structure.

If the ECP is interpreted like this, then the subgraph in (21b) is not ungrammatical, and will instead be pronounced with an initial vowel. As such, Scheer’s account of the facts is flawed. Instead of predicting languages with only TR clusters, it predicts that languages with “branching onsets” have alternations between VRT/RVT. This is only avoided by the addition of an unstated constraint that the V of the initial CV needs to be governed to not result in ungrammaticality - a constraint that holds for no other empty vowel. This is a highly arbitrary assumption that is relevant to no data besides initial clusters. In other words, it is a typical ad-hoc hypothesis. This makes dubious any claim that Scheer’s account of the facts follows from independent principles. Even worse, with a trivial change, the addition of negation (“the initial V must not be governed”), his account would predict non-existent languages with ubiquitous initial schwa-like vowels which can only be followed by RT clusters. We can therefore feel confident in rejecting his claim that the CVCV approach is metatheoretically more sound because it could not be made to accommodate non-existing types of languages.

This concludes my discussion of Scheer’s argumentation. We have seen Scheer’s account of the situation is based on dubious principles that are applied inconsistently, and that his arguments suffer due to a low level of explicitness.

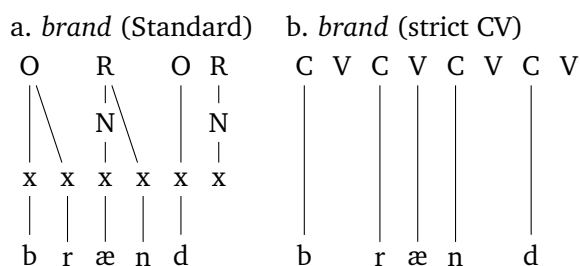
4.6.2 Ploch (2006): sGP vs. CVCV

Stefan Ploch’s view of the philosophy of science is strongly grounded on the work of Karl Popper. I will attempt to show that Ploch’s excessive focus on the problem of demarcation, combined with the apparent ignorance of the problems discussed in the earlier chapters, led to a number of highly problematic methodological suggestions and analyses.

As a unique event in the literature of Government Phonology Ploch dedicated a lengthy paper specifically to a discussion of the scientific method (Ploch 2003). The paper is primarily concerned with criticising two criteria of theory development and choice, “simplicity (Occam’s Razor) and non-arbitrariness (non-*ad-hoc*-ness)” (Ploch 2003). According to him, these are “the most important reasons for the high degree of unscientificness observable over the last decades in phonology”. However, only his discussion of simplicity deals with the comparison of the standard theory and some form of a CVCV theory, and for this reason only this

part of his analysis will be discussed here. Luckily, Ploch (2003) bases his argument on the same phenomenon and a similar set of data as was used in Scheer (2004) above, that is, branching onsets. Let us reproduce Ploch's (2006) example (1) in (22) below:

(22) Distribution of empty categories according to sGP and strict CVCV.⁷⁴



The two graphs above are (partial) representations of the English word *brand* in the standard theory of Government Phonology and the strict CV approach respectively.

We are here faced with two mutually exclusive theories with the same empirical coverage. At face value, the CV version contains less hierarchical ordering, but more unpronounced nuclei. In fact, whereas the sGP theory has only one, domain-final, empty nucleus, CVCV has four empty nuclei in total. Since Ploch is committed to there being only one true theory, he needs to a way of distinguishing between the two, a problem he approaches through methodology.⁷⁵ Ploch's approach is based on a reinvestigation of Occam's razor, "entities should not be multiplied without reason". As he says, the principle needs to be more explicit with regard to the entities we are talking about. According to him, through the lense of falsifiability, we can distinguish between two kinds of entities, *assumed universals* and *predicted existentials* (Ploch 2003:154). He argues that only predicted existentials should "not be multiplied", which he argues for by advancing the asymmetry of falsification (Popper 2002).

Strictly universal statements, combined with certain existential statements will have existential consequences. As an example,⁷⁶ given the particular, existential, "this thing is a shark" and a universal law "all sharks have teeth", we can deduce another existential statement, that "this thing has teeth". Furthermore, suppose that we assume that the universal statement is true, and further suppose that observation leads us to accept the statements "this thing is a shark" and "this thing does not have teeth" as both true. We are lead into a contradiction, since our beliefs entail that the object in question does and does not have teeth. Now, given our confidence in observation, we would think that there is a fault with the universal law, and we regard it as falsified.

⁷⁴This label is added by the present author and not present in Ploch (2006).

⁷⁵Even though this might be said to go against his principle that "the more empirical a decision is the more objective it is" (Ploch 1999:20), which implies that as a non-empirical, methodological decision his account is not objective.

⁷⁶Examples are due to Ploch (2003)

Generally, we say that universal laws are falsified by empirically establishing a false consequence. For any consequence C of a theory T , we want to show that $\neg C$ holds. How, on the other hand, would falsification of an existential statement proceed? Assume an existential such as, for example, the claim that “there is a spell that, spoken at the right time and place, will summon the devil”.⁷⁷ As has been pointed out by Popper, this claim is verifiable. It can be shown true by using a spell to summon the devil. But, critically, to be falsified, it leaves open too many variables - the exact pronunciation of the spell, or where and when to pronounce it. Practically speaking, to falsify this statement, one would have to pronounce every possible spell at every point in space and time. This is a practical impossibility, if only for the reason that the past is inaccessible. Therefore, we cannot conclusively show that the statement is wrong. To falsify any existential, what is needed is a universal statement with its negated existential consequence, in this case, e.g. “there is no spell that will summon the devil”. This means that a universal can be falsified by a single existential, while an existential can only be falsified by a universal. However, since universals are unacquirable, they cannot be used to falsify existentials, hence only universals are falsifiable in practice. This is described as the asymmetry of falsification.

To return to Occam’s razor, Ploch claims that when we talk of entities, we should distinguish between assumed universal entities and predicted existential entities. According to him, the difference between sGP and CVCV can be reduced to that distinction. He writes that constituency consists of universals, while skeletal points are individuals. Supposedly, what is achieved in CVCV is “that the number of assumed universal entities, like the assumption of constituents or of a postnuclear rhymal position, is kept low via (the probably unconscious application of) the trick of multiplying the number of empirically unfalsifiable existential statements” (Ploch 2003:152-153). Since unpronounced empty positions are not directly observable, Ploch demands that they at least be falsifiable. But, as he points out, the empty categories that CVCV assumes that sGP doesn’t can never be observed, as they do not engage in vowel/zero alternations. This lets Ploch conclude that they are unfalsifiable, except by contradicting a universal, which, per asymmetry of falsification, is unacquirable in principle. Therefore, he claims to have shown that falsifiability allowed him to derive a truly scientific version of Occam’s razor, “[p]redicted existential entities must not be multiplied beyond necessity” (Ploch 2003:154).

In the following, I attempt to show that Ploch’s (2006) conclusions are wrong. My most important claim is that Ploch confuses falsifiability and observability. In addition, I show that he does not appreciate the holistic nature of deductive consequence and I challenge the relevance of the asymmetry of falsification. Since my first claim might seem bold, so to better justify myself it is necessary to quote Ploch at length:

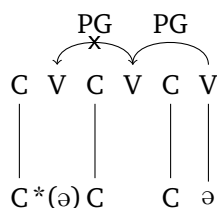
- (23) [W]hile the test for those (domain-internal) empty nuclei which are predicted by both Standard Government Phonology and the strict CV

⁷⁷This example is adapted from Popper (2002).

approach consists in the demonstration of language-specific syncope/epenthesis (so there is some degree of observability, i.e., precisely then, when such an empty nucleus is phonetically realised), there is no test for the very empty nuclei which are additionally predicted by the strict CV approach: that there is an empty nucleus between /n/ and /d/ in veranda cannot be observed nor is it evident from any vowel epenthesis in some morphologically related form; more generally, the statement that there is such a silent empty nucleus cannot be falsified by any observation. (Ploch 2003:155-156)

First, it will be necessary to show that Ploch's contention that CVCV's empty nuclei are unfalsifiable is wrong. I will do this by presenting a class of potential falsifiers of the assumption of empty nuclei. For the sake of argument, let us assume a very simple theory, consisting just of a syllable structure of invariably alternating Cs and Vs without any form of branching, as well as the ECP of the standard theory. In that theory, the schematical (sub-)graph below, showing a cluster of three consonants, will be ungrammatical.

(24) A potential falsifier of the CV template.



In this theory, it is a consequence of the CV syllable template, in combination with a law on the non-pronunciation of empty categories, that there can be two consonant clusters, but no three consonant clusters. Consequently, evidence of three-consonant-clusters would show this theory wrong, and falsify the principles which result in the false consequence - both the subtheory of syllable structure and the ECP. This proves wrong statements of Ploch that strict CV's empty nuclei are unfalsifiable *tout court*. At best, an argument based the notion of truth-content, or, alternatively, falsity-content could be made, but that is not any argument that Ploch advanced. It should be noted that Ploch does not discriminate against hypotheses with low truth-content the same way he does with unfalsifiable assumptions, even if he naturally finds them uninteresting. It might be possible to take issue with my counterargument, as it is based on the holistic nature of consequences. There is only one comment of Ploch regarding holistic testing, which is dismissive. As he attempts to prove all proposals of Optimality Theory to be unfalsifiable he admits that "there can be language types that prove a proposed *set* of constraints wrong". That, however, does not satisfy Ploch, as "even if someone were to find a set that, even though falsifiable, cannot be shown to be false, this set would still exclusively contain untestable constraints, i.e. constraints that no evidence can be provided for" (Ploch 2003:200). Since "we can-

not ‘narrow’ the problem down to its source” (ibid), such a theory is supposedly still metatheoretically inadequate.

In this context a comment made in an unpublished paper is of interest (Ploch 2001). The paper, among other issues, deals with transparent segments in nasal harmony, and it is there that Ploch makes the following remark: “[a]ny data that can show that spreading jumps over skeletal points at some projection proves, *ceteris paribus*, the projections wrong”. (Ploch 2001:7). However, conflicting data will not show projections wrong, it will show the combination of at least the theory of projections and the specific analysis of nasal harmony wrong. Ploch can only dodge the problem of holistic falsification by adding the words *ceteris paribus*, “all else equal”. This is more or less an explicit acknowledgment of the problem resulting from holism, as it admits that only if we assume that everything else is without fault that we can assign fault to a specific part of the theory. I have previously shown that in the absence of a specific theory of evidential relevance, all confirmation, falsification, and prediction in general will be holistic. Holism is in fact the null hypothesis, given the logical situation. It is Ploch’s responsibility to either face the consequence that the arguments for his dismissal of Optimality Theory can be generalized to work against any form of Government Phonology, or to propose a more elaborate methodological theory.

On the other hand, Ploch intends falsifiability as a comparative notion. Since, however, the domain of falsification is still a (part of a) theory and not a single hypothesis, this will not change the result. Elaborate versions of CVCV are, as is admitted by Ploch (2006:161), extensionally equivalent to sGP, they have the same potential falsifiers. With this, I conclude to have shown that empty nuclei are, in fact, falsifiable, contra to Ploch’s claims.

The next step is to show how Ploch confused falsifiability with observability. For this, I merely need to refer back to the quote in (x) above, which gives an example of what counts as a test according to Ploch. An empty nucleus is (comparatively) acceptable only if it is involved in some form of alternation such that there is at least one form in a group of morphologically related⁷⁸ forms that has an audible nucleus in that position. In other words, it is Ploch’s position that it is only valid to posit a nucleus if it is at least occasionally observable. Relevant to my case is also that, next to empty nuclei involved in alternations, there exists one more class of empty nuclei in the sGP, so-called final empty nuclei (FEN).⁷⁹ FENs are parametrically licensed to be inaudible or not. As such, they do not engage in alternations. They are assumed whenever there is a word that ends in a consonant. Ploch rejects the existence of FENs, ostensibly because they presuppose the “Grammaticality Hypothesis” (Ploch 2003:198). On the other hand, in a talk held in 2002, which was titled “Evidence-based phonology”, Ploch noted the intention of formulating a version of GP which posits “an empty nucleus when there is an audible vowel and no nucleus when there is not” (Ploch 2002).⁸⁰ The

⁷⁸The problem of what is to count as morphologically relevant is not discussed by him, but he gives several examples of an alternation.

⁷⁹These are argued for in detail by Harris & Gussmann (1998).

⁸⁰This is quoted from the abstract to the talk, a link to a digital copy is given in the references

same sentiment is expressed in his comment that “the standard theory should be changed to one without any silent categories” (Ploch 2003:158).

All these considerations give me the confidence to claim that Ploch’s rejection of CVCV’s empty nuclei has nothing to do with them being unfalsifiable (since they are not), but instead, it has its source in them being not directly observable. It is clear that Ploch rejects silent categories on the ground that they are unobservable entities. His invocations of Popper’s theory of the scientific method are therefore problematic, as Popper never discriminated against unobservable entities. Instead, being a well-known realist, he believed that with adequate corroborations of the theory they are part of, one can tentatively believe in their existence.

Additionally, I find fault with Ploch’s reference to the asymmetry of falsification. Disregarding the fact that it does not apply, since empty nuclei are falsifiable, Ploch’s claim that empty nuclei correspond to predicted existentials, but not constituency, is of dubious justification.

We know that Ploch is both realist and cognitivist. These positions seem to imply that, for every word, there is some kind of structure in the brain or mind that directly corresponds to the skeletal positions of the representation of that word, but nothing of the sort is the case for all other positions in a graph, all well as all structural relations. Why would skeletal positions have this privileged position? It is hardly controversial to state that Government Phonology was not designed with these issue in mind, and therefore has no clear position on this matter. As Heil (2006) rightly points out that “ontology cannot simply be “read off” our ways of talking about the world”.⁸¹

It appears that with the same justification one could claim that sGP contains more predicted existentials, because it contains more structural positions, while the CVCV theory replaces them through structural relations. Ploch insists that the standard theory interprets constituency as relations, just as CVCV does, but it is unclear to what degree this interpretation is actually shared by other researchers in the tradition. It might be said that to single out the skeleton as constituting an existential claim creates an ontological divide between classes of objects that are, arguably, both just points in a structure. Even if Ploch’s interpretation were necessary, a proponent of CVCV might disentangle C and V constituents from the skeleton and claim that empty constituents do not in fact govern empty skeletal positions. If sGP constituency does not constitute existential claims, then this definitional trick is valid.

Ultimately, if this discussion seems to border on incoherence, this would be a result of the confused ontological interpretation of the term *universal* as “universal entity” (Ploch 2003:152-154). Popper’s distinction in fact refers only to the syntactic form of sentences that are part of theories, and to whether they contain an existential or universal quantifier. Understood this way, we can imme-

under Ploch (2002).

⁸¹Immediately preceding this comment, Heil points out that properties are, according to most people, universals, but that sizable opposition, notable the followers of John Locke, believe that properties are particulars. So we see that interpretations in these matters vary.

diately appreciate that any Generative theory will make innumerable existential statements, virtually by necessity. On the one hand, the general linguistic theory would contain statements of the sort “there is a language faculty”, “there are phonological representations”, “there are melodic elements”, etc. Without these, in some sense, there can be no theory. In the literature, we find claims of this sort, such as “there is a hard core of linguistic structure that is common to all human languages” (Kaye 1989:53). More specific examples are the enumeration of elements, constituency labels, the existence of a skeleton, etc. Again, the literature is abound with statements of this sort: “[w]e propose the existence of three syllabic constituents” (Kaye, Lowenstamm and Vergnaud 1990:199), “[l]et us assume that there are charmed elements [...] and charmless elements” (Kaye, Lowenstamm and Vergnaud 1985:311), “[n]egatively charmed vowels exist” (p. 312). To convince oneself of this fact even further, one should look at an explicit formalization of Government Phonology, such as that in Graf (2010).

If “unfalsifiable” existential statements were to be done without, we would essentially enact a ban on theoretical entities⁸². Conceivably, the only acceptable terms left would be *observational* or *phenomenological*, those that can be interpreted directly against experience. Even if optimism with regards to these notions is applied, it is doubtful that interested grammatical work can be achieved in this manner. It is also worth comparing this situation to the physical sciences, where such a ban would restrict the field to the collection of experimental laws, excluding any attempt at a unifying theory. Given that any type of GP theory, standard or CVCV, necessarily contains a host of existential statements anyway, and since only a highly arbitrary method of counting these will result in a disadvantage for CVCV, the claim that CVCV contains more unfalsifiable existential statements and is therefore more unscientific need not be believed in.

Rather than spelling doom for our theories, the use of “unfalsifiable” existential statements is essential. This is because existential claims are employed to make possible the derivation of statements that are falsifiable, in the manner of e.g. the hypothetico-deductive method. It is not important that all individual statements of a theory are falsifiable. This is impossible for multiple reasons. Instead, we build theories in the hope that they, as a whole, entail testable predictions, which we selectively, according to our personal interest, regard as interesting or trivial.

This concludes my discussion of Ploch’s attempt to establish the superiority of standard theory over the CVCV phonology. As we have seen, his attempt was not founded on facts of any kind, even admitting that with regard to facts the theories stand as equals. Instead, he has attempted to discredit the opponent based on a-priori philosophical considerations, which however failed for a number of reasons.

⁸²If we recall our distinction between a representational model and its theoretical background from chapter 1, we note that according to the requirement that all statements have direct empirical consequences, all statements belonging to the theoretical background would have to be excluded as unscientific.

4.6.3 Concluding Comments

This section discussed two opposing polemical publications in the literature of Government Phonology. While not explicitly directed at each other, the attacks have targeted each other's theory's, and have been based on essentially the same data. Crucially, both participants have agreed that both theories are empirically equivalent, and decided to approach the issue of theory comparison in terms of the philosophy of science. Both have produced flawed versions of common philosophical notions in the attempt to prove wrong their opponent not with respect to data, but based on non-empirical, a-priori considerations. The authors were also alike in their practice of implying that their philosophical principles are established, when they really constitute rather idiosyncratic theories. This situation suggests that the practice of theory comparison should be reconsidered.

4.7 Summary and Conclusion

The goal of this section was to remove the possibility of claiming any single methodology as authoritative. First, the attempt to use one of the highest authorities in the matter of intersubjective agreement, logic, as the foundation of methodological theory was shown to be a barren undertaking. It was then shown that methodological rules, instead of being discovered through logic, should rather be understood as tools designed for a specific purpose. These rules take into account the laws of logic, but are not determined by it. Their power derives the ways in which they go beyond what can be determined by logic. Their validity is only as great as their acceptance by a community. The methodology of Generative Grammar has been characterized and subsequently found to be structured very differently from the post-positivist form in the methodological discussion within Government Phonology. At the same time, no sufficient grounds for the rejection of this methodology could be provided. Then, some consequences for theory comparison were spelled out, which concluded that a certain relativism could not be averted, since the criteria of comparison are necessarily partial to a theory. Similarly, some doubt has been cast on the possibility of providing an explicit account of scientific progress, as the notion of progress appears either in the form of a metaphysical principle or as an arbitrary methodological principle. Finally, two cases of theory comparison in the literature were discussed, and found to be deeply flawed.

In relation to the earlier discussion, we can note that the theoretical background of a theory such as Government Phonology can be regarded as a major part of that theory's methodology. This derives from the fact that the doctrine of Galilean Linguistics maintains that research is to be guided by theory internal questions such as are embodied by theoretical principles, as well as the fact that GP's theoretical principles constitute tools for theory evaluation. This dimension has not been considered in much of the previous methodological discussion, and the conclusion suggests itself that methodological principles from foreign disciplines should not be introduced into the phonological discussion without regard

to the pre-existing methodological theory.

Chapter 5

The Issue of Metaphysics

This chapter provides an alternative philosophical foundation that does without the problematic requirement of a unique true theory. The first half of the chapter discusses matters of ontology, the theory of existence, of grammatical objects. It is shown that the standard position is less than sufficiently argued for, and that a number of alternative approaches are possible. If the argument is accepted, then the basic form of existence of linguistic objects is unknown to us. Discussion will then move to the theory of realism. Some arguments for and against realism are summarized, and a number of non-standard theories of realism are presented. These weaker forms of realism could defuse the problems posed by the existence of alternative sub-theories of Government Phonology, or different grammatical theories entirely. For this reason, it is suggested that a weaker forms of realism should be more widely adopted. Weak forms of realism give explicit expression to the intuition that different theories can all be partially true. In contrast, excessive realism can have the result of escalating rather mundane theoretical differences into major controversies.

5.1 Ontology

An ontology is a theory of what exists, and how it exists. In the context of linguistics, ontological questions are about the existence of linguistic entities. While the term “ontology” is rarely explicitly used, ontological discussions feature prominently in the Generative literature in the form of arguments for and against a psychological interpretation of linguistic theory. It is certainly true that almost each of Chomsky many publications contains some arguments for his ontological position. This is because one of the major effects of Chomsky’s work was the conversion of the linguistic community, which earlier advocated a positivism-inspired nominalism, to a form of cognitive realism. Jerrold Katz (1981) went as far to state the main innovation of the Chomskyan revolution was, in fact, this ontological change.

This section is split into two parts. First, I will review and criticise the mainstream psychological ontology of Generative linguistics. Subsequently, a defense of an alternative ontology is provided. No attempt is made to declare any po-

sition superior. Instead, the goal is to show that there are viable alternatives to the standard position. The major alternative discussed here is one that seeks a greater proximity to mathematics, by adopting an abstract, Platonist ontology.⁸³

5.1.1 The Standard Argument

Government Phonology strictly adheres to a methodological principle of autonomy that holds that phonology is a self-contained system that can be described without reference to any external phonetic, psychological, or non-phonologically linguistic facts. The ontological interpretation of this autonomy is that phonology constitutes a biological system that functions with a certain degree of independence from the other parts of the assumed language faculty. The standard argument in favor of this view is the refutation of phonetic reductionism, that is the view that phonology can be sufficiently described in purely phonetic terms, obviating the need for the assumption of any strictly phonological entities. This view is in the following be described as the *Phonetic Hypothesis*, cf. Kaye (1989). Ploch (1999:15) defines the phonetic hypothesis as “the mainstream view that phonological phenomena [...] are motivated by the properties of a phonetically characterised system, e.g. the articulatory or auditory system”.

Kaye (1989:42) contains the standard arguments for the refutation of the Phonetic hypothesis. The first argument is based on a type of phoneticism that employs the notion of *ease of pronunciation* to explain processes such as assimilation. Kaye suggest that if ease of pronunciation is grounded in the anatomy of speech production, then, given the (virtual) universality of human speech organs, the criterion of ease must be universal as well. Therefore, the forces that introduce phonological processes into languages are the same for all languages. The conclusion is that languages should, at least slowly, tend to converge on a final point of maximal ease. Such a convergence could not yet be observed, and there are reasons to expect that it will never happen. One of these is based on cases of so called *backtracking*. Occasionally, it has been observed that languages will introduce a certain rule, only to lose it some time later. Such was the case with Yiddish, which introduced and lost a rule of final devoicing, which is still evidenced by reflexes in certain non-alternating forms. Another argument that Kaye proposes is that if the existence of phonological processes is due to the desire to reduce articulatory effort, then individuals which are particularly interested in reducing effort, such as people who are tired, or the elderly, should introduce processes for their own purposes. This, to our best knowledge, has never been observed. Finally, Kaye reminds the reader that even if phonological phenomena are generally describable in terms of phonetics, that alone is no reason to assume that they are also caused by phonetics. Kaye also suggests that even if a great many of phonological processes do in fact reduce effort, they are still very different from (genuine) effects of the articulatory systems, such as coarticulation. Some of these effects, such as the formant differences in vowels depending

⁸³It might be appropriate to say that Platonist realism is the most popular ontology for mathematicians, while philosophers of mathematics have become suspicious of it.

on preceding voiceless or voiced consonants are truly universal, as is the speech system, while particular kinds of assimilation happen on a language particular basis.

This standard pattern of argumentation has been very popular, and has been repeated several times. A important development of this line of thinking is Ploch (2003). Ploch goes beyond Kaye's treatment by introducing references to the work of Popper, specifically, by phrasing his discussion in terms of falsifiability. An attempt is made to characterize the phonetic hypothesis as unfalsifiable and unscientific. In fact, phoneticism is described as essentially equivalent to astrology in its scientific soundness.

According to Ploch, defense against Kaye's arguments often proceeds by introducing additional forces opposing the tendency of increased ease, like a tendency to maintain a perceivable signal, or to discriminate contrasts. The crucial issue is, "[w]hich force has what kind of influence in what kind of circumstances?" (Ploch 2003:172). In the absence of any explicit, independent principles governing the application of such opposing forces, it is easy to invoke one or the other as it is convenient.⁸⁴ Suppose we observe a change from *kt* to *tt* in the history of Italian, such as in the word *dottore*, then it is easy to ascribe this change to the fact that *kt* as a cluster is very difficult to pronounce. If we accept this explanation, we seem to open ourselves up to some objections. For example, classical Arabic *katab* corresponds to the modern Moroccan Arabic *ktīb*. This means that a sound change removed a vowel only to produce a consonant cluster that was so inconvenient to the latinate community that it had to be removed. How could it be that a cluster that was too much effort and could not be maintained was introduced into a language, most of all by syncopating a relatively unmarked CVCVC structure. Ploch argues that problems of this sort are insurmountable, and that for the phoneticist to maintain their theory it will be necessary to introduce a growing number of counteracting forces, to restrict the application of phonetic principles to only those cases in which they are not refuted. This is described as a degenerating problem shift (cf. Ploch 2001). As such, phoneticism is said to be unacceptable, and no serious contender for the alternate view. This concludes our summary of the standard argument.

This alternate view, according to many authors, is that phonology describes cognitive entities. At this point, it must be pointed out that the standard argument consists only of a refutation of the phonetic hypothesis, and lacks any positive reasons for the adoption of the cognitive interpretation. That this, the argumentation can only lead to the adoption of the GP position if it is assumed that one can only choose between cognitive and the phonetic position, which is not the case. Essentially, we are faced with a false dilemma. The only positive reasons for the cognitive view that appear in the (core) literature of GP are

⁸⁴Hale & Reiss (2008) criticised the interplay of ease and perceivability by proposing their intuitively absurd inverses, OBFUSCATE and NOPAINNOGAIN. Their claim is that since this inverted set of tendencies behaves in exactly the same way, it is the obligation of proponents of phonetically grounded approaches to empirically establish the superiority of their own principles versus Hale and Reiss' equivalent alternative.

those which have been taken over from Generative syntax. These arguments are summarized in the following section.

5.1.2 General Arguments for Cognitive Realism

Since the cognitive character of Generative Grammar is well-established, only major arguments will be discussed here. These are the argument from the creativity of language use and the argument from the poverty of the stimulus. The first argument establishes grammar as the theory of linguistic knowledge, while the second introduces support of the assumption of an innate faculty for language.

The topic of linguistic creativity has already been mentioned earlier in section 3.2. To repeat, at the time of the invention of Generative Grammar, grammatical theory was most of all occupied with the systematization of corpora. Generative Grammar changed then the focus by stressing that a grammar needs to make predictions beyond a corpus, by predicting novel sentences which will be accepted by a speaker of the language. Therefore, if a grammar succeeds at this goal, it will function as a predictive theory of the judgements that a speaker forms about utterances that they have not heard before. Since it is assumed that it is the knowledge of a speaker that allows them to form their judgements, the grammar is equivalent to a characterization of the linguistic knowledge of a speaker.

The argument from the Poverty of the Stimulus is somewhat more recent. The argument comes in several forms. In one of its more powerful incarnations, it is based on the assumption that language acquisition requires knowledge that is not available to a language learner.⁸⁵ Since this makes language unlearnable, and since languages are learned, we face a contradiction, which is then resolved by the introduction of innate knowledge. This serves as one of the central arguments for the assumption of an innate faculty of language.

These are the most basic reasons in favor of the cognitive interpretation of grammatical theory. As we see, there is a valid positive characterization of this doctrine. In the following section, an alternative Platonist conception will be presented.

5.1.3 An Alternative Ontology

Platonic Realism, or short “Platonism”, is only distantly related to any theory of Plato’s. Instead, it refers to a modern interpretation of abstract entities, specifically, the position that they really exist abstractly, in one way or another. The fundamental claim that makes up Platonism is that abstract objects really exist as such, independently of any of their physical or mental instantiations. They are said to exist before and independently of any observer. Moreover, they are typically characterized as existing outside of space and time and being causally inert. In other words, they are unchangeable and do not take part in causal relations.

⁸⁵Pullum and Scholz (2002) is a survey of a number of specific proposals of unlearnable linguistic structures.

The classic form of this is credited to Gottlob Frege. Frege's book *The Foundations of Arithmetic*⁸⁶ (1884) was, as the name implies, an attempt at providing a solid foundation for mathematical theory. One of the ways in which this was attempted was to make mathematical formalism more explicit, and in fact the book is credited with motivating the logicist movement in mathematics. However, Frege also pursued an entirely different strategy of securing the foundations of mathematics, which was by elaborating and fixating the notion of mathematical object. His way of approaching this task was connected to his referential semantic theory. Some of his basic arguments are still used to support Platonic Realism. Essentially, these have to do with the way mathematical terms appear in natural language. As such, Frege claimed that numbers exist outside of space because sentences about their location have no meaning.⁸⁷ Similarly, numbers could not be mental entities, since mental objects are inherently private.⁸⁸ Someone's thoughts and sensations are only their own, while numbers are the same to everyone.⁸⁹ Frege bases this argumentation on his semantic theory. On the one hand, his semantics bestows truth values to sentences by virtue of their reference, and as such, arithmetical sentences can only be true if the number terms in them refer to objects. On the other hand, Frege assumes that mathematical terms and those referring to more straightforward, physical entities require analogous semantical analyses. A common example (Benacerraf 1973) is the position that the two sentences "There are at least three large cities older than New York" and "There are at least three perfect numbers larger than 17" require essentially the same semantical analysis. While there has been a notable controversy about the validity of arguments of this kind, Platonic Realism enjoyed considerable popularity within the mathematical community. Ultimately, one of the strongest draws of this doctrine was that it was a very straightforward philosophy that made sense of mathematics exactly as it was practiced.

However, this mathematical popularity has hardly translated into similar success in the field of linguistics. Still, there is one major Platonist tradition within Generative Grammar that will be discussed here, the one that has often been labeled as *New York Platonism*. The source of this tradition is Jerrold Katz, one of the earliest Generative Grammarians, who was instrumental in the construction of the rationalist polemic against structuralism. Further notable members are Paul Postal and Scott Soames. Each of these individuals have produced their

⁸⁶The original German title is *Die Grundlagen der Arithmetik*.

⁸⁷See "[A]ber wo ist die Zahl 4? sie is weder ausser uns noch in uns. Das ist in räumlichen Sinne verstanden richtig. Eine Ortsbestimmung der Zahl 4 hat keinen Sinn; aber daraus folgt nur, dass sie kein räumlicher Gegenstand ist, nicht, dass sie überhaupt keiner ist. [...] Nicht jeder objective Gegenstand hat einen Ort" (Frege 1884:72).

⁸⁸In a linguistic context, this argument supports grammatical Platonism because most of grammatical theory is, essentially, about a notion of language such that language is invariant in a community. Some mentalist replies to this attack are the doctrine of the ideal speaker/hearer, or the position that all members of a linguistic community must have a sufficiently "similar" state of their language faculty.

⁸⁹See "Während jeder nur seinen Schmerz, seine Lust, seinen Hunger fühlen, seine Ton- und Farbempfindungen haben kann, können Zahlen gemeinsame Gegenstände für Viele sein, und zwar sind sie für Alle die gleichen" (Frege 1884:105).

own interpretations of the Platonic theory of grammar, and have constructed their own arguments. In the following, each member's major arguments will be briefly summarized.

Jerrold Katz was primarily a philosopher, specifically a rationalist philosopher. His early interest in Generativism was due to the hope that the doctrine of nativism would be able to provide a foundation for the kind of a priori knowledge that rationalist philosophy provides. However, after almost 20 years of working within the framework, this optimism had vanished, and Katz (1981) proposed the replacement of Chomsky's mentalist philosophy for a more rationalist, Platonist philosophy of language. The reason for this change of mind was that Katz realized that Chomsky's philosophy was incapable of providing a notion of necessary truth. As a philosopher, Katz' argument was again semantic in character. Katz held that the sentence "Every bachelor is unmarried", is analytic, and therefore necessarily true, and that this is a fact about linguistic structure. However, as he argued, if linguistic structure is mental structure, and ultimately reducible to the physical system of the brain, then linguistic facts must be as contingent, that is non-necessary, as the physical world is. If the sentence "Every bachelor is unmarried" is true because of some mental structure, then conceivably, the mental structure could be different, and with that the truth of this sentence. To Katz, this proved Chomsky's mentalism to be incapable of advancing the philosophical problem of a-priori knowledge.

Paul Postal adopted Katz' Platonism, and transformed it into a foundation of syntactic theory. He furthermore in collaboration with Terence Langendoen (Langendoen and Postal:1986) created a different argument against Chomskyan mentalism, which could be said to be based on the set-theoretical interpretation of Generative mentalism. Essentially, the argument claims a contradiction between the infinite size of languages and the fact that languages are said to be physical structures, in particular, state of the language faculty. Since physical systems must be finite, no physical system could correspond to an infinite collection. The claim that languages are, in fact, of infinite cardinality can be found in, for example, Hauser, Chomsky and Fitch (2002), where it is that that "FLN yields discrete infinity (a property that also characterizes the natural numbers)". The claim that a "language" is a physical system can be found in e.g. "[w]e can take a language to be nothing other than a state of the language faculty" (Chomsky 2001:8).⁹⁰ It is comments such as these that provide the basis of Postal's charge. Chomsky's defense has consisted, essentially, of the claim that most of these comments have been misinterpreted, but there have also been comments that would weaken one's commitment to the literal interpretation of his comments, cf. "[expressions, outputs of FL] are not entities with some ontological status; they are introduced to simplify talk about properties of [the language faculty], and they can be elim-

⁹⁰Another issue for this stance is the fact that (virtually) every grammar is a characterization of only one language, even though a speaker might have knowledge of more than one language. Replies to this argument are, again, the ideal speaker/hearer, or the Minimalist assumption that the combinatorial system of grammar is truly universal, and that all language particular information is encoded in the lexicon.

inated in favor of internalist notions” (Chomsky 1999:34).

Scott Soames’ (1984) arguments are of a different, more conceptual and methodological character. To him, language as an abstract object and the biological mental faculty are two different notions, that are conceptually different and require different methods of investigation. As such, language as an abstract non-spatio temporal structure is investigated based on data such as truth conditions and logical relations. In opposition to this, the investigation of the mental basis for language needs to proceed ideally with an experimental method. Interestingly, one can generalize Ploch’s argument for the independence of phonology and apply it to this issue. Recall that Ploch insisted that phonetics and phonology need to be investigated independently, and that only after each domain has been sufficiently characterized one can compare them and draw conclusions about any relationship. This is because it was said to be invalid to assume in advance that phonology is reducible to phonetics. Interestingly, one can make essentially the same argument and claim that abstract linguistic structure and their mental and biological basis need to be investigated by themselves, and that their relationship must be established through the comparison of two independent theories. It is precisely for this reason that a Platonist will regard the interpretation of a Generative theory as a characterization of the “knowledge of language” as an invalid conflation of the notions of “language” and “knowledge of language”.

This concludes our brief overview of the Platonist interpretation of linguistic theory. The arguments discussed here should suffice to establish that Platonism is a valid interpretation of grammatical theory.

5.1.4 Closing Comments

The goal of this section was to establish that the mentalist and cognitive interpretation of the entities of Government Phonology has only received insufficient support and that it has not been distinguished from any possible alternatives. This situation increases the risk of applying methods to phonological theory which are inappropriate for that ontology, and the suggestion for further research is to provide an explicit ontological position for the theory of Government Phonology.

5.2 Realism

We have already encountered the notion of truth in section 4.5. This section will introduce a number of additional considerations. In general, systems which seek to incorporate *truth* in some fashion are traditionally known as *realist*, or, collectively, as *realism*. A very important point of many theories of realism is that they posit only a *single* truth.

One of the most important questions is what realism can offer beyond empirical success⁹¹. The basic, and most common, answer is the metaphysical claim that things are really the way they are described by a theory. This type of answer

⁹¹As we have seen in section 4.5, Popper’s theory of verisimilitude can be collapsed into an empirical criterion.

has been somewhat unsympathetically represented in Fine (1984:97), where it has been described as “a desk-thumping, foot-stamping shout of ‘Really!’”. Of course, there are many different kinds of realism, with very different properties. The history of realism is long and abound with controversy, which is far beyond the scope of the present work. Here, we will only focus on summarizing two classical arguments for and against realism, and on presenting two non-standard theories of realism.

5.2.1 Arguments for and against

This section presents one of the major arguments for realism, followed by an important argument against it.

The No-Miracles Argument. One of the most famous arguments in favor of realism is the so-called *no miracles argument*, short NMA. The original statement is due to Hilary Putnam, who wrote that “[t]he positive argument for realism is that it is the only philosophy that doesn’t make the success of science a miracle” (Putnam 1975:73). Psillos’ (1999:71) repetition of the argument speaks of “the overall empirical success of science”. Intuitively, it seems agreeable that science has been successful, especially the physical sciences, which are generally regarded as paragons of scientific virtues.

Still, the “success” of science, is, as pointed out by Chang (2001), a very “nebulous and heterogeneous” (p. 29) phenomenon. Several attempts have been made to spell out what the success of science actually consists of. One avenue that has been attempted was to focus on instrumental success, and the fact that scientific theories are valuable instruments to achieve real-world goals, such as engineering.⁹² Arguments of this kind are however problematic, as theories which are known to be false can still have a wide range of applications. For example, the performance of global positioning systems (GPS) is reliant on the theory of general relativity, as orbital GPS satellites have to adjust their atomic clocks according to the principles of that theory. At the same time, however, these satellites are kept in place with Newtonian mechanics (Chang 2012:266), and the maps end users can navigate can be said to presuppose a flat earth geography. Consequently, an inference from applicability to truth seems to be invalid. False instrumental theories are in fact the norm rather than exception. One apparent reason for this is that instruments will naturally be constructed to be as simple as possible, meaning that they will employ theoretical models that are as far simplified as is possible for them to still fulfill their purpose, far beyond what we think we know to be true. This situation is in fact what motivates one of the most important rivals of scientific realism, the *instrumentalist* interpretation of theories. Instrumentalism holds that theories are nothing more than instruments, which are used for their true predictions, without any commitment for the truth of the theories themselves.

⁹²Explicit rejection of this view can be found in Scheer (2010:502), “[s]cience is about gaining insight, not about engineering”.

A more promising attempt to put for weight behind the NMA, which is also the one that is advanced by most of its supporters, is based on *novel* predictive success of theories. At face value, the fact that certain theories, which were constructed based on an already known collection of facts, can be extended to cover new phenomena that were hitherto unexpected seems surprising and in need of explanation. Many have argued that this is in fact the most important quality that a theory can have to qualify for a realist interpretation. The type of novel prediction that is of the primary interest is when a theory makes predictions that are qualitatively different from the kind of data the theory was initially designed for. A linguistic example would be a theory of grammar that be found to predict, e.g., human response times in a certain experimental setting. This would count as a critical success for that theory. In especially strong language⁹³, Whewell writes the following about the epistemic force of novel predictions:

No accident could have given rise to such an extraordinary coincidence. No false supposition could, after being adjusted to one class of phenomena, exactly represent a different class, where the agreement was unforeseen and contemplated. (in Musgrave 1999:55)

Karl Popper's theory of corroboration contains some similar considerations. In particular, Popper regarded a true deductive consequence to be a stronger corroboration if it was predicted before its truth was unknown. That is, two theories that make the exact same prediction can have a different level of corroboration if one was stated before a certain observation was made, while the other theory was invented afterwards when the observation was already available. In that case, only the first theory is said to have "predicted" the fact, while the second "accommodated" for it. Following up on Popper's work, Imre Lakatos's methodology of research programmes regarded only such programmes that produce novel predictions as successful, while those that failed to do so were labelled "degenerating". Lakatos also held that the same principle can indicate the truth of methodological theories, arguing that his own methodology is only productive as long as it can continue to account for the value judgments of scientists in new situations of theoretical conflict. In general, methodological theories which credit novel predictions with special epistemic status are called *predictivist*.

The bottom line is that the NMA is in its many variations widely regarded as the best argument for realism currently available. Of course, the argument does not carry enough force to make it impossible to adhere to Anti-Realism,. The NMA is more of a suggestion of realism. Still, for the Anti-realist, a successive novel prediction could only be a lucky accident, and their continuing appearance would remain mysterious.

Pessimistic Meta-Induction. On the other hand, the anti-realist also has a very powerful argument at their disposal. One argument that recently gained some

⁹³However, contemporary philosophers phrase their proposals more carefully. Alan Musgrave, who works in a generally Lakatosian framework, only speaks of a theory's increased likelihood after such a success.

special attention is the so-called *argument of the pessimistic meta-induction*, which is originally due to Laudan (1981). In short, the argument presupposes that the history of science contains many theories which were once judged to be the best theories, but which were subsequently found to be false. The claim is, indeed, that this happens again and again. The argument then generalizes from past cases and concludes that we can expect that the same will happen to our present theories as well. In other words, we can expect our theories to be false, and that they will always be false, and that a realist interpretation therefore is not sensible.

5.2.2 Non-Standard Realism

This section discusses two ways in which scientific realism can be restricted to remove any unnecessary existential commitment from accidental properties of our theories.

Structural Realism. One major objection to the NMA is to point out that when an earlier theory is superseded, it is not necessarily entirely wrong. For this reason, it is important to explicate the notion of similarity between successive theories. One attempt to solve this problem is the theory of *structural realism* (Ladyman 1998, 2001, Frigg 2011, VanFrassen 2007).

As with any other philosophical theory of this kind the discussion becomes technical very quickly, while we are interested mostly in the basic intuitions. The basic goal of structural realism is to reconstruct scientific theories in a way that will allow for structural comparisons between theories, and set theory has been chosen to achieve this purpose. An important part of the machinery of structural realism is therefore to transform the content of scientific theories into a set-theoretical structure, such that isomorphisms can be defined between the structures of different theories. One major consequence is that this removes any existential commitment towards entities, instead replacing them with structural descriptions that describe their behavior. As long as an entity behaves as is expected from a structure, it qualifies as an instance of that structure.

The consequence for grammar is immediately apparent. As long as an isomorphism relation can be defined between the structural descriptions of different representational models, the theories are structurally equivalent. Understood like this, the CVCV and sGP representations of branching onsets are equivalent, because (at least in common versions of the theory) it is possible to describe a rule that will mechanically reconstruct a valid sGP graph into a valid CVCV graph, and vice versa. The initial CV and a branching onset will appear in the same contexts. It is only if the initial CV somehow causes patterns in the behavior of classes of words to change that it will be distinguishable. Essentially, this is a generalized notion of natural class, extended to all level of the grammatical theory.

Reconstruction. If we remain realist, but choose to restrict the degree of our realist commitment, there is another option that allows us to introduce some distance between our theory and objective reality, which is to take seriously the

distinction between a theory as description of reality, and reality itself. A relevant problem has been noted in the philosophy of mathematics (Benacerraf 1973).⁹⁴ The early 20th century saw a promising research program that, essentially, sought to reduce all of mathematics to set theory. The reformulation of the basics of arithmetic was an early success in that project, as the natural numbers lent themselves very easily to a set theoretic definition. The earliest such definition, given by Ernst Zermelo, assumed the base case, interpreted as “0”, to be the empty set, and then provided an inductive step, the successor function, $S(n) = \{n\}$. However, other definitions were equally possible, and as such John Von Neumann proposed a different definition of the inductive step, $S(n) = n \cup \{n\}$. Both approaches, if suitably extended, allow one to do adequately describe the properties of the natural numbers.

However, as Benacerraf (1965) noted, both set-theoretical definitions have properties that go beyond what is necessary for arithmetic. When one poses extra-arithmetical questions, the different reconstructions give different answers. For example, if we ask whether 2 is a member of 3, we will have to answer “no” according to Zermelo, and “yes” when using the system of Von Neumann.⁹⁵ But this runs afoul of the goal of reducing arithmetic to set theory, since what one wanted was to say that the natural numbers actually *are* sets. The existence of equivalent but mutually exclusive definitions leaves us incapable of declaring one alternative to be the actual characterization of the natural numbers. For this reason, Benacerraf, and following him, Pullum, insist on distinguishing between the natural numbers and their set theoretical *reconstructions*, which are different entities, that may stand in a certain relation, but are also independent.

We can immediately transpose this lesson into linguistics. The problem of formally different statements of the same facts is extremely common. A close analogy to the case above could be made to transformational accounts of WH-movement, and non-transformational accounts of the type of an HPSG theory. One could say that a language is not either a transformational grammar or a non-transformational grammar, but that these grammars are reconstructions of (parts of) a languages.

This point of view has two consequences. First, it gives us a perspective from which we can appreciate that different grammatical theories might illuminate different parts of the structure of a language. Even more than that, it allows us to actively seek a multitude of view points. The success of a single theory can deceive us as to what the object of investigation is. An accidental property of a formalism can be misunderstood to be a feature of the object under study. The methodological suggestion is that we should seek to push the boundaries, and find novel kinds of theories, as long as they are empirically successful.

⁹⁴Geoffrey Pullum has noted its relevance to linguistics, but has not yet published on the topic.

⁹⁵Incidentally, this is the reason that the Von Neumann definition is more popular today.

5.2.3 Concluding Comments

The section provided some discussion of scientific realism in its original form as a metaphysical doctrine. Two prominent arguments for and against realism were summarized, and regarded to be inconclusive. Nonetheless, ideas on how to restrict realism to remove any existential commitment where it is not required have been reviewed.

5.3 Summary and Conclusion

This chapter provided a number of different observations about relevant issues that are discussed in the linguistic and philosophical literature, that have however not yet found their way into the methodological discussion of Government Phonology. First, we discussed the ontological dimension of grammatical theory. Government Phonology adheres to a standard form of Generative mentalism, which entails that phonological entities are reducible to structures in the brain. This was contrasted with an alternative ontology that has roots in mathematics. Incidentally, these positions resemble the positions of late and early Generative Grammar that were distinguished in chapter 2. The suggestion for further research is to develop a positive characterization of Government Phonology's mentalism and to demarcate it from Platonic Realism.

In the second half of this chapter, the doctrine of realism was discussed in its metaphysical dimension. As a metaphysical belief realism shapes, but does not fully determine, methodological theory. As such, it is important to provide an explicit metaphysical position to increase the intelligibility of both a methodology as well as its associated theories. Following that, we discussed two major arguments, one in favor of, and the other opposing scientific realism. The controversy was regarded as inconclusive, and we continued to discuss the possibility of maintaining realism, but restricting it such that excessive commitment to problematic entities is removed. The beneficial methodological consequence is that this removes the foundation of the kind of flawed practice of theory comparison that was discussed in section 4.6.

Explicit metaphysical discussion appears to be rare. Indeed, the word *metaphysical* generally has noticable negative connotations, influenced by Karl Popper's use of the word which was essentially synonymous with "pseudo-scientific". Nonetheless, every researcher necessarily has a metaphysical belief structure, the investigation of which can only enrich the tradition. In the ideal case, metaphysical discussion can even remove flawed methodological or theoretical systems, since the basic conceptualization of the domain of investigation is dependent on it.

Chapter 6

Conclusion

This thesis began by pondering the problem of the existence of multiple theories, influenced by methodological suggestions that sought to bring about a practice of large scale inter-theoretical criticism, and the assumption that only one theory would stand up to rigorous testing. In the course of investigation, we have found reasons to regard this program as unfounded and fundamentally misguided. Let us repeat the course of discussion.

The first chapter, **Government Phonology**, introduced the theory of GP with particular focus on the more fundamental theoretical assumptions, rather than the representational model, which were argued to be distinct. A number of properties were proposed that distinguish background assumptions from the model itself. In general, the principles of the theoretical background were shown to have no direct empirical consequences and to be argued for on conceptual grounds. For example, while it might be said that the Non-Arbitrariness Principle derives support from the fact that it restricts the notion of possible phonological rule, it has been shown that in principle, a non-restrictive non-arbitrary theory is possible. That is, it has been argued that the content of the principle can be regarded as more general and more abstract than the properties of any model that instantiates it. Incidentally, to the extent that the Non-Arbitrariness Principle posits the necessity of certain phonological processes, it is relatable to the metaphysical theory of essentialism (Ellis 2001).

This means that the relationship between a model and its theoretical background is not one of implication, but rather one of consistency and coherence, with the background decreasing the space of valid possibilities, while forcing no choice among the options. In a way, the background functions as a theory evaluation tool, and it is in this way that a model and theoretical background appear analogous to a theory and its methodology. However, in the literature, principles belonging to both domains are presented as equivalent. The Coda Licensing Principle that introduces a constraint on the form of possible graphs is described as a “principle” the same way the Non-Arbitrariness Principle is, which determines the representationalism of Government Phonology. The neglect to observe this distinction increases the risk of misconstruing the character of different kinds of principles.

The second chapter, **Generative Grammar**, presented a distinction of a different kind. With a certain amount of justification we distinguished between an early and a late form of Generative Grammar, which were argued to exist on rather opposite ends of a scale. That scale is one between explicitness and the minimization of arbitrary decisions. Under a slightly different interpretation, the scale is between a mathematical and an empirical notion of grammar, and similarly, these distinctions can be compared to the one between a representational model and its theoretical background. Specifically, it has been argued that the earliest work in Generative Grammar conceived of grammar roughly as a formal discipline, while later Generative Grammar introduced mentalism and a number of empirical ambitions that over time started to take precedence over the formal aspect. The discussion of this change in Generative theory shows how a change in the focus of research can lead to very different theories, that, most importantly, require different methodological approaches. Ultimately, a historical dimension in a metascientific activity is valuable, since it will determine which properties of a theory are due to theory internal considerations, and which were inherited from earlier theories that did not try to achieve the same goals. One notable case is the notion of generative capacity, which originally was intimately connected to the study of generative capacity, which investigates the properties of formal systems. Since then, this connection has been lost, and the term started to refer rather to the goal of restricting the notion of possible rule by any means.

The third chapter, **Rationality in Linguistic Theory**, is, among other things, an attempt to continue the meta-scientific discussion within Government Phonology, with particular focus on the line of reasoning exemplified by Ploch (2003). The discussion sets out from the view that Ploch implies, but does not necessarily hold, that the laws of logic are sufficient to determine an authoritative methodological theory. This view was forcefully rejected, given that purely logical theories of induction, deductive confirmation and deductive falsification are insufficient. In particular, we have noted that the well-known Duhem problem, based on the holistic nature of deductive falsification, has the consequence of making cases of falsification minimally informative, and worthless in a practical sense.

Since the logical character of methodological theory has been rejected, it was replaced with a conventionalist interpretation of methodological theory. Given that the justification of methodological theories is not derived from logic, and therefore not certain, it was proposed that these theories are instead hypothetical, and are evaluated based on whether the consequences of their principles agree with methodological intuitions. The result is that the construction and evaluation of the theory of method functions analogously to (certain kinds of) Generative Grammar. Crucially, it has been proposed that methodology is relative to a certain goal which can be general and abstract, or more specific and related to particular empirical questions. We then considered the status of the methodology of Generative Grammar, as it finds expression in the doctrine of Galilean Linguistics. We found that this methodology is structured very differently from the logicist and post-positivist approaches discussed earlier in the chapter, but we

found at the same time that it is an expression of the belief that specific empirical questions can determine the course of research. To the extent that these questions are stated explicitly, they are objective and can enter into critical discussion, and it is in this sense that the approach of Galilean Linguistics has been determined to be valid.

We continued to discuss the implications for the practice of theory comparison. Given that any given methodology is hypothetical, and therefore itself theoretical in a sense, one could say that the methodology that a theory employs is a part of that theory, the same way that the theoretical background of a representational model is part of that model. Furthermore, if we consider the fact that it is the goal of a methodological theory to determine the content of its associated theory, then whenever there are two theories which are distinct and mutually exclusive we can expect that the underlying methodologies of both theories are different. At the same time, given that each theory was constructed according to their own methodology, it is to be expected that the opposing theory will be judged to be inferior. For these reasons, it is to be expected that theory comparison will always be partial to one of the theories. This effect increases as the compared theories become more and more different, which is why entirely different theories are for all practical purposes incomparable. Following this, we turned to the notion of progress, asking whether it can improve upon this situation. The result, again, was negative, and we found that to the extent that a notion of progress provides an explicit measure of success, it has the character of a conventional methodology, while as a metaphysical principle it is incapable of determining non-intuitive judgments. Finally, two particular cases of theory comparison were investigated (Scheer 2004, Ploch 2003). It was concluded that in both cases, the authors constructed flawed, idiosyncratic methodological principles with the purpose of determining the inferiority of their opponent. These flaws are what is to be expected given the previous discussion on the nature of methodological theory.

The fifth and last chapter, **The Issue of Metaphysics**, presented a number of very preliminary comments on possible lines of investigations that are open to us after we accept the claims of the previous chapter. Explicit metaphysical discussion is very scarce in the literature of Government Phonology, a fact that might be related to the negative connotations that the word received in particular in the work of Karl Popper, where the term functions as a synonym of “pseudo-scientific”. However, this chapter proposed that scientific theories necessarily have a metaphysical dimension, and that the neglect to discuss them can only lead to confusion. In the first half of the chapter, the issue of ontology was introduced. Specifically, the cognitive interpretation of phonological theory was regarded as an ontological position to the extent that phonological entities really are cognitive entities, ultimately reducible to the physical structure of the brain. Common arguments for this position, which is standard in Government Phonology, were summarized and found to consist of nothing more than the refutation of phonetic grounding, leaving us with no positive characterization of the doctrine, except in reference to the general Generative literature. We then compared the standard

cognitive view to one that has been introduced from mathematics into the theory of grammar, called Platonic Realism. After a brief characterization of that view, we considered it a valid position. The suggestion is that further research should determine the character of Government Phonology's cognitivism, and delimit it from alternative positions such as Platonic Realism. Failure to do this increases the danger of applying methods in Government Phonology that are inappropriate for its ontological position.

The second half of the chapter re-examined the theory of realism. After the arguments of the fourth chapter cast some doubt on the appropriateness of scientific realism, we attempted to survey the two most notable arguments for and against that theory. These were the No-Miracles Argument, which posed that science is successful in a way that is only explainable by a realism, and argument from the Pessimistic Meta-Induction, which held that all earlier theories were ultimately be found to be false, and that it is therefore reasonable to expect that this will continue to be the case. Following this, we considered a number of ideas that would let us restrict realism in a way that would remove unnecessary commitment to problematic entities, while circumventing the problem that every theory is literally false. The most notable of these is Structural Realism, which gives an explicit expression to these ideas. It is notable that the cases of theory comparison in chapter 4 included arguments that appear to have been based on overly literal interpretations of certain terms, that is, of excessive realism. At the same time, the theory of Structural Realism gives as a framework in which we can claim that several theories are equally true, even if distinct. In fact, the suggestion is that multiple theories must be maintained, to provide for a fuller picture of object under study.

This concludes the overview of the content of this thesis. Several issues that were mentioned could not be sufficiently solved due to size constraints, and are therefore left for future research. One is the task of explicating the ontology of Government Phonology. A connected issue is the fact that several issues in this thesis, such as the apparent compatibility with Platonic Realism, and the non-evidential character of the principle of nativism, have cast doubt on the empirical nature of the research program. However, there are multiple ways to phrase this question. One way is to ask whether or not Government Phonology is empirical, another is to ask what the notion of empiricity used by Government Phonology is, and whether it is acceptable. Similarly, the methodology of Government Phonology in general requires a more detailed investigation, most of all with respect to the internal variety. Also, the proposed restrictions on realism need to be developed in detail, and a different question is what the connection between an apparently excessive realism and the representational character of the theory is. Another general issue is what the character of criticism in theoretical discussion is to be, if it is subject to the many restrictions that were discussed in chapter 4.

Ultimately, this thesis has attempted to construct an alternative view of the purpose of meta-scientific discussion. In opposition to the common post-positivistic approaches that seek to determine an ideal methodology that will remove any responsibility from the individuals that pursue scientific activities, I have attempted

to characterize this field of study in a way that is more concerned with increasing the clarity and explicitness of theoretical discussion. Stated differently, the question is not which methodology one should use, but what kind of methodologies there are, what their properties are, and what goals one can achieve with them. Keeping in mind that every theory is constructed with a goal in mind, this thesis was an attempt not to enforce unity, to return to the initial problem posed in the introduction, but instead to facilitate mutual understanding.

Bibliography

- Nancy A. Ritter. 2003. On the logical order of development in acquiring prosodic structure. In *Living on the Edge, 28 Papers in Honour of Jonathan Kaye*, ed. Stefan Ploch, number 62 in *Studies in Generative Grammar*, 29–54. Mouton de Gruyter.
- Hans Aarsleff. 1970. The History of Linguistics and Professor Chomsky. *Language* 46:570–585.
- Joseph Aoun, and David Lightfoot. 1984. Government and Contraction. *Linguistic Inquiry* 15:465–473.
- Phillip Backley. 2011. *An Introduction to Element Theory*. Edinburgh University Press.
- Paul Benacerraf. 1965. What Numbers Could not Be. *The Philosophical Review* 74:47–73.
- Benacerraf, Paul. 1973. Mathematical truth. *The Journal of Philosophy* LXX:661–679.
- Cedric Boeckx. 2010. What Principles & Parameters Got Wrong. URL [<http://ling.auf.net/lingbuzz/001118>].
- Hasok Chang. 2001. How to Take Realism Beyond Foot-Stamping. *Philosophy* 76:5–30.
- Hasok Chang. 2012. *Is Water h2o? Evidence, Realism and Pluralism*, volume 293 of *Boston Studies in the Philosophy and History of Science*. Springer.
- Monik Charette. 1990. Licence to govern. In *Phonology Yearbook 7*, volume 2, 233–253. Cambridge: Cambridge University Press.
- Charette, Monik, and Aslı Göksel. 1994. Switching and vowel harmony in Turkic languages. *SOAS Working Papers in Linguistics and Phonetics* 4:31–52.
- Charette, Monik, and Aslı Göksel. 1996. Licensing constraints and vowel harmony in Turkic languages. *SOAS Working Papers in Linguistics and Phonetics* 6:1–25.
- Noam Chomsky. 1956. *The Logical Structure of Linguistic Theory*. Cambridge: MIT Library. Microfilmed; revised version of a 1955 unpublished manuscript.
- Noam Avram Chomsky. 1956. Three models for the description of language. *IRE Transactions on Information Theory* 2:113 – 124.

- Noam Chomsky. 1959. A Review of B. F. Skinner's Verbal Behavior. *Language* 35:26–58.
- Noam Chomsky. 1964a. Current Issues in Linguistic Theory. In *The Structure of Language. Readings in the Philosophy of Language*, ed. Jerry A. Fodor and Jerrold J. Katz, 50–118. Englewood Cliffs, New Jersey: Prentice-Hall Inc.
- Noam Chomsky. 1964b. On the Notion "Rule of Grammar". In *The Structure of Language. Readings in the Philosophy of Language*, ed. Jerry A. Fodor and Jerrold J. Katz, 119–136. Englewood Cliffs, New Jersey: Prentice-Hall Inc.
- Noam Chomsky. 1965. *Aspects of the Theory of Syntax*. Cambridge: MIT Press.
- Noam Chomsky. 1966. *Cartesian Linguistics: A Chapter in the History of Rationalist Thought*. Studies in Language. New York and London: Harper & Row.
- Noam Chomsky. 1978. A theory of core grammar. *Glott* 1:7–26.
- Noam Chomsky. 1980. *Rules and Representations*. Number 11 in Woodbridge lectures delivered at Columbia University in november of 1978. New York: Columbia University Press.
- Noam Chomsky. 1981a. Knowledge of language: its elements and origins. *Philosophical Transactions of the Royal Society of London, series B* 295:223–234.
- Noam Chomsky. 1981b. *Lectures on Government and Binding*. Studies in Generative Grammar. Dordrecht: Foris Publications.
- Noam Chomsky. 1986a. *Barriers*. Number 13 in Linguistic Inquiry Monographs. MIT Press.
- Noam Chomsky. 1986b. *Knowledge of Language: Its Nature, Origins, and Use*. Greenwood Publishing Group.
- Noam Chomsky. 1990. On Formalization and Formal Linguistics. *Natural Language & Linguistic Theory* 8:143–147.
- Noam Chomsky. 1995. *The Minimalist Program*. Number 28 in Current studies in linguistics. Cambridge, Massachusetts: MIT Press.
- Noam Chomsky. 2000a. Minimalist Inquiries: The Framework. In *Step by step : essays on minimalist syntax in honor of Howard Lasnik*, ed. Howard Lasnik, Roger Martin, David Michaels, and Juan Uriagereka, 89–155. MIT Press.
- Noam Chomsky. 2000b. *New Horizons in the Study of Language and Mind*. Cambridge: Cambridge University Press.
- Noam Chomsky. 2001. *The architecture of language*. Oxford University Press.
- Noam Chomsky. 2002a. *On Nature and Language*. Cambridge: Cambridge University Press.
- Noam Chomsky. 2002b. *Syntactic Structures*. Berlin and New York: Mouton de Gruyter. First edition published in 1957.
- Noam Chomsky. 2006. *Language and Mind*. Cambridge University Press.

- Noam Chomsky. 2009. Opening Remarks. In *Of Minds and Language: A Dialogue with Noam Chomsky in the Basque Country*, ed. Massimo Piattelli Palmarini, Juan Uriagereka, and Pello Salaburu, 13–43. Oxford: Oxford University Press.
- Noam Chomsky, and Morris Halle. 1968. *The sound pattern of English*. Studies in language. New York: Harper & Row.
- Terence D. Langendoen, and Paul M. Postal. 1986. *The vastness of natural languages*. Oxford: Blackwell.
- James D. McCawley. 1987. Reviewed work(s): *The Vastness of Natural Languages* by D. T. Langendoen and Paul M. Postal. *International Journal of American Linguistics* 53:236–242.
- Dresher, Elan, and Jonathan Derek Kaye. 1990. A computational learning model for metrical phonology. *Cognition* 34:137–195.
- Pierre Duhem. 1954. *The Aim and Structure of Physical Theory*. Princeton: Princeton University Press.
- David E. Johnson, and Paul Martin Postal. 1980. *Arc Pair Grammar*. Princeton, New Jersey: Princeton University Press.
- John E. Joseph. 2003. Rethinking linguistic creativity. In *Rethinking Linguistics*, 121–150. London: RoutledgeCurzon.
- Brian Ellis. 2001. *Scientific Essentialism*. New York: Cambridge University Press.
- Arthur Fine. 1984. The Natural Ontological Attitude. In *Scientific Realism*, ed. Jarrett Leplin, volume 323. University of California Press.
- James Foley. 1977. *Foundations of theoretical phonology*, volume 20 of *Cambridge studies in linguistics*. Cambridge University Press.
- Gottlob Frege. 1884. *Die Grundlagen der Arithmetik*. Breslau: Verlag von Wilhelm Koebner.
- Frigg, Roman, and Ioannis Votsis. 2011. Everything you always wanted to know about structural realism but were afraid to ask. *European Journal for Philosophy of Science* 1:227–276.
- José Luis G. Escibano. 1993. On Syntactic Metatheory. *Atlantis* 15:229–267.
- Clark Glymour. 1980. Hypothetico-Deductivism is Hopeless. *Philosophy of Science* 47:322–325.
- Mark Gold. 1967. Language identification in the limit. *Information and Control* 10:447–474.
- Graf, Thomas. 2010. *Logics of Phonological Reasoning*. Master's thesis, University of California, Los Angeles.
- Mark Hale, and Charles Reiss. 2008. *The Phonological Enterprise*. Oxford University Press.
- John Harris, and Edmund Gussmann. 1998. Final codas: why the west was

- wrong. In *Structure and interpretation in phonology: studies in phonology*, ed. Eugeniusz Cyran, 139–162. Lublin: Folia.
- Marc Hauser, Noam A. Chomsky, and Tecumseh Fitch. 2002. The Faculty of Language: What Is It, Who Has it, and How Did it Evolve? *Science* 298:1569–1579.
- John Heil. 2006. Kinds and Essences. In *Metaphysics in Science*, 33–46. Blackwell Publishing Ltd.
- Carl Gustav Hempel. 1965. *Aspects of scientific explanation: and other essays in the philosophy of science*. Free Press.
- Yehoshua Bar Hillel. 1953. On Recursive Definitions in Empirical Science. *11th International Congress of Philosophy* 5:160–165.
- Patrick Honeybone. 1999. I blame the Government. *Language Sciences* 21:177–221.
- Norbert Hornstein, and David Lightfoot. 1981. *Introduction*, chapter 1, 9–31. Number 25 in Longman linguistics library. London and New York: Longman Publishing Group.
- Geoffrey Huck, and John Goldsmith. 1996. *Ideology and Linguistic Theory: Noam Chomsky and the Deep Structure Debate*. Routledge.
- Esa Itkonen. 1991. *Universal history of linguistics: India, China, Arabia, Europe*, volume 65 of *Studies in the history of the language sciences*. Amsterdam: Benjamins.
- Sean Jensen. 2000. *A Computational Approach to the Phonology of Connected Speech*. Doctoral Dissertation, School of Oriental and African Studies, University of London, London.
- Sean Jensen. 2003. Metaphonological speculations. In *Living on the Edge, 28 Papers in Honour of Jonathan Kaye*, ed. Stefan Ploch, number 62 in *Studies in Generative Grammar*, 131–148. Mouton de Gruyter.
- Geoffrey K. Pullum. 1989. Formal Linguistics Meets the Boojum. *Natural Language and Linguistic Theory* 7:137–143.
- Geoffrey K. Pullum. 2011. On the mathematics of Syntactic Structures. *Journal of Logic, Language and Information* 20:277–296.
- Geoffrey K. Pullum, and Barbara C. Scholz. 2002. Empirical assessment of stimulus poverty arguments. *The Linguistic Review* 19:9–50.
- Asa Kasher. 1991. *The Chomskyan Turn*. Oxford: Basil.
- Balogné Bérces Katalin. 2011. Filling the hiatus: a changing face of English. In *Faces of English*, 30–41. Piliscsaba: Faculty of Humanities, Pázmány Péter Catholic University.
- Jerrold Katz. 1981. *Language and other abstract objects*. Totowa, New Jersey: Rowman and Littlefield.

- Jonathan Derek Kaye. 1989. *Phonology: A cognitive view*. Hillsdale (New Jersey): Lawrence Erlbaum Associates.
- Jonathan Derek Kaye. 1990. 'Coda' Licensing. In *Phonology Yearbook 7*, volume 2, 301–330. Cambridge: Cambridge University Press.
- Jonathan Derek Kaye. 1992. Do you believe in magic? the story of s+C sequences. *Working Papers in Linguistics and Phonetics* 2:293–313.
- Jonathan Derek Kaye. 1995. Derivations and Interfaces. In *Frontiers of Phonology*, ed. Jacques Durand and Francis Katamba, 289–332. London & New York: Longman Publishing Group.
- Jonathan Derek Kaye. 2000. A User's Guide to Government Phonology (GP). Unpublished manuscript, available at [<http://www.unice.fr/dsl/nis01/guideGPpdf>].
- Jonathan Derek Kaye. 2005. GP, i'll have to put your flat feet on the ground. In *Organizing Grammar: Studies in Honor of Henk van Riemsdijk*, ed. Hans Broekhuis, Norbert Corver, Riny Huybregts, Ursula Kleinhenz, and Jan Koster, 283–288. Berlin: Mouton de Gruyter.
- Kaye, Jonathan Derek. 1997. Why this article is not about the acquisition of phonology. *SOAS Working Papers in Linguistics and Phonetics* 7:209–220. School of Oriental and African Studies, University of London.
- Kaye, Jonathan Derek, Jean Lowenstamm, and Jean-Roger Vergnaud. 1985. The internal structure of phonological elements: a theory of charm and government. In *Phonology Yearbook 2*, 305–328. Cambridge: Cambridge University Press.
- Kaye, Jonathan Derek, Jean Lowenstamm, and Jean-Roger Vergnaud. 1990. Constituent structure and government in phonology. In *Phonology Yearbook 7*, 2, 193–231. Cambridge: Cambridge University Press.
- Noretta Koertge. 1978. Towards a New Theory of Scientific Inquiry. In *Progress and Rationality in Science*, ed. Gerard Radnitzky and Gunnar Andersson, volume 58 of *Boston Studies in the Philosophy of Science*, 253–278. D. Reidel Pub. Co.
- Glyne L. Piggott. 2003. The phonotactics of a "Prince" language: a case study. In *Living on the Edge, 28 Papers in Honour of Jonathan Kaye*, ed. Stefan Ploch, number 62 in *Studies in Generative Grammar*, 401–425. Mouton de Gruyter.
- James Ladyman. 2001. Science, Methaphysics and Structural Realism. *Philosophica* 67:57–76.
- Ladyman, James. 1998. What is structural realism? *Studies in History and Philosophy of Science Part A* 29:409–424.
- Larry Laudan. 1981. A Confutation of Convergent Realism. *Philosophy of Science* 48:19–49.
- Larry Laudan. 1990. Demystifying Underdetermination. In *Scientific Theories*,

- ed. Wade Savage, volume 14 of *Minnesota studies in the philosophy of science*, 267–297. University of Minnesota Press.
- Robert Lees. 1963. *The grammar of English nominalization*. Mouton.
- Jean Lowenstamm. 1996. CV as the Only Syllable Type. In *Current Trends in Phonology Models and Methods*, ed. Jacques Durand and Bernard Laks, volume 2, 419–442. European Studies Research Institute, University of Salford.
- Lowenstamm, Jean, and Jonathan Derek Kaye. 1986. Compensatory Lengthening in Tiberian Hebrew. In *Studies in Compensatory Lengthening*, number 23 in Publications in Language Sciences, 97–132. Dordrecht: Foris Publications.
- Paul M. Postal. 2004. *Skeptical Linguistic Essays*. New York: Oxford University Press.
- Grzegorz Michalski. 2009. *Phonology with interfaces. The morphophonology and post-lexical phonology of English and Polish (lingbuzz version)*. Doctoral Dissertation, Adam Mickiewicz University in Poznań. Available at <http://ling.auf.net/lingbuzz/000986>.
- Jan Miel. 1969. Pascal, Port-Royal, and Cartesian Linguistics. *Journal of the History of Ideas* 30:261–271.
- Joe Morrison. 2008. Just how controversial is evidential holism? *Synthese* 173:335–352.
- Alan Musgrave. 1999. *Essays on Realism and Rationalism*, volume 12 of *Series in the philosophy of*. Rodopi.
- Bruce Nevins. 2010. Noam and Zellig. In *Chomskyan (R)evolutions*, ed. Douglas A. Kibbee, 103–168. John Benjamins Publishing Company.
- Graham Oddie. 1986. The Poverty of the Popperian Program for Truthlikeness. *Philosophy of Science* 53:163–178.
- Rudolf P. Botha. 1981. On the Galilean style of linguistic inquiry. *Stellenbosch Papers in Linguistics* 7:1–73.
- Stefan Ploch. 1999a. Egoist arousal of empirical ideas for self-enjoyment. *SOAS Working Papers in Linguistics and Phonetics* 9:319–356. School of Oriental and African Studies, University of London.
- Stefan Ploch. 1999b. *Nasals on my Mind. The Phonetic and the Cognitive Approach to the Phonology of Nasality*. Doctoral Dissertation, School of Oriental and African Studies, University of London, London.
- Stefan Ploch. 2001. Review of Rachel Walker’s ‘Nasalization, Neutral Segments, and Opacity Effects’. First accepted, then rejected by Glot International.
- Stefan Ploch. 2002. Evidence-based phonology - the elimination of ghosts. URL [http://www.univie.ac.at/linguistics/tagungen/phon02/abstract_files/ploch.pdf], Talk held at the Ninth International Phonology Meeting, Vienna.
- Stefan Ploch, ed. 2003a. *Living on the Edge, 28 Papers in Honour of Jonathan*

- Kaye. Number 62 in *Studies in Generative Grammar*. Mouton De Gruyter.
- Stefan Ploch. 2003b. Metatheoretical problems in phonology with Occam's Razor and non-ad-hoc-ness. In *Living on the Edge, 28 Papers in Honour of Jonathan Kaye*, ed. Stefan Ploch, number 62 in *Studies in Generative Grammar*, 149–201. Mouton de Gruyter.
- Stefan Ploch. 2004. What is wrong with linguistics. *SOAS Working Papers in Linguistics and Phonetics* 13.
- Stefan Ploch. 2005. On the purposes of phonological phenomena: phonetics, parsing and/or acquisition? *Southern African Linguistics and Applied Language Studies* 23:405–429.
- Markus Pöchtrager. 2006. *The Structure of Length*. Doctoral Dissertation, University of Vienna.
- Krisztina Polgárdi. 1998. *Vowel harmony: An account in terms of government and optimality*. Holland Academic Graphics.
- Karl Raimund Popper. 2002. *Unended Quest. An Intellectual Autobiography*. Routledge Classics. London and New York: Routledge.
- Paul Martin Postal. 1967. *Constituent Structure: A Study of Contemporary Models of Syntactic Description*. Bloomington: Indiana University. Originally published as pt. 2 of the *International Journal of American Linguistics*, v. 30, no. 1, 1964.
- Paul Martin Postal, and Geoffrey K. Pullum. 1982. The Contraction Debate. *Linguistic Inquiry* 13:122–138.
- Alan Prince, and Paul Smolensky. 1993. *Optimality Theory: Constraint Interaction in Generative Grammar*. *Rutgers University Center for Cognitive Science Technical Report 2*.
- Stathis Psillos. 1999. *Scientific Realism: How Science Tracks Truth*. London: Routledge.
- Hilary Putnam. 1975. *Mathematics, Matter and Method*, volume 1 of *Philosophical papers*. Cambridge University Press.
- John R. Rennison. 1987. *Tridirectional autosegmental phonology and the PC: with special reference to Koromfe, Moore and other West African languages*. Doctoral Dissertation, University of Vienna, Vienna. Habilitation treatise.
- John R. Rennison, and Friedrich Neubarth. 2003. An x-bar theory of Government Phonology. In *Living on the Edge, 28 Papers in Honour of Jonathan Kaye*, ed. Stefan Ploch, number 62 in *Studies in Generative Grammar*, 95–130. Mouton de Gruyter.
- Andrew Radford. 1988. *Transformational Grammar. A First Course*. Cambridge Textbooks in Linguistics. Cambridge University Press.
- Ian Roberts. 2001. Who Has Confused What? More on Lappin, Levine and Johnson. *Natural Language & Linguistic Theory* 19:887–890.

- James Rogers, and Geoffrey K. Pullum. 2011. Aural pattern recognition experiments and the subregular hierarchy. *Journal of Logic, Language and Information* 20:329–342.
- Tobias Scheer. 1999. A Theory of Consonantal Interaction. *Folia Linguistica* 32:201–237.
- Tobias Scheer. 2004. *A Lateral Theory of Phonology. What is CVCV, and why should it be?*, volume 1 of *Studies in Generative Grammar*. Berlin and New York: Mouton de Gruyter.
- Tobias Scheer. 2011a. *A Guide to Morphosyntax-Phonology Interface Theories: How Extra-Phonological Information is Treated in Phonology Since Trubetzkoy's Grenzsignale*, volume 106 of *Studies in Generative Grammar*. Berlin: Walter de Gruyter.
- Tobias Scheer. 2011b. Aspects of the development of generative phonology (unabridged version). In *The Continuum Companion to Phonology*, ed. Bert Botma, Nancy Kula, and Kuniya Nasukawa, 397–446. New York: Continuum.
- Soames, Scott. 1984. Linguistics and Psychology. *Linguistics and Philosophy* 7:155–179.
- Max Stirner. 1972. *Der Einzige und sein Eigentum*. Number 3057 in Universal Bibliothek. Stuttgart: Philipp Reclam jun. Re-edited 1981. First published 1845 by Otto Wigand. 'Max Stirner' was a pseudonym used by Johann Caspar Schmidt.
- Péter Szigetvári. 1999. *VC Phonology: a theory of consonant lenition and phonotactics*. Doctoral Dissertation, Eötvös Loránd University/Hungarian Academy of Sciences.
- Pavel Tichý. 1974. On Popper's Definitions of Verisimilitude. *The British Journal for the Philosophy of Science* 25:155–160.
- Marcus Tomalin. 2006. *Linguistics and the Formal Sciences*. Cambridge Studies in Linguistics. Cambridge University Press.
- Shanti Ulfsgjorninn. 2008. MOVE as AGREE and I(nternal)-MERGE in Phonology. (ms.). URL [<http://ling.auf.net/lingbuzz/001012>].
- Yuko Z. Yoshida. 2006. Accents in Tokyo and Kyoto Japanese. Vowel Quality in terms of Duration and Licensing Potency. *SOAS Working Papers in Linguistics and Phonetics* 14:249–264.

Appendix

Abstract (English)

This thesis proposes an alternative approach to the philosophy of science as applied to Government Phonology (GP), one that is concerned less with determining an ideal methodology, and more with improving the clarity and explicitness of theoretical discussion. This approach means that GP appears in this thesis not as the theory assumed, but rather as the object of study itself.

For the purpose of the discussion, a distinction between a representational model of GP and more fundamental theoretical principles is introduced. Similarly, a distinction between an early and a late form of Generative Grammar, theory closely related to GP, is presented and argued to display a different focus on the representational model in the first case, and the theoretical background in the other. Subsequently, the methodological discussion in GP is presented and responded to, and the possibility of a logical foundation for the theory of justification is rejected. Instead, methodological theory is argued to be conventionalist, tentative and goal oriented. The adverse effects for the practice of theory comparison and criticism in general are discussed, and found not to threaten the status of Generative Grammar as a scientific research activity. The final chapter provides preliminary comments to a metaphysical discussion of GP and tries to show that metaphysical assumptions form beliefs about the appropriateness of methods and theoretical assumptions. For this reason, the statement of an explicit metaphysics increases the intelligibility of a theory, while the omission of this it in theory construction increases the risk of mutual misunderstanding.

Abstract (German)

Diese Arbeit handelt von der Grundlagenproblematik der Rektionsphonologie in zwei Bedeutungen des Wortes. Erstens im Sinne der Rechtfertigung, und zweitens im Sinne von grundlegenden Eigenschaften.

Kapitel 2 dieser Abhandlung präsentiert die Theorie der Rektionsphonologie. Es wird gezeigt, dass sich sinnvoll unterscheiden lässt zwischen einem repräsentationellen Modell, das die Basis für den empirischen Inhalt der Theorie darstellt, und dem grundlegenden theoretischen Hintergrund, der die Gestaltung des Modells anleiten, aber nicht endgültig bestimmen kann. Das dritte Kapitel handelt von der Generativen Grammatik im Allgemeinen, wobei zwischen einer frühen Form und späten Form unterschieden wird.

Kapitel 4 reagiert auf die methodologische Diskussion innerhalb der Rektionssphonologie, und lehnt die Vorstellung ab, dass eine Methodologie auf rein logischen Grundlagen gestellt sein kann. Es wird gezeigt, dass eine methodologische Theorie stattdessen einen konventionellen und zielgerichteten Charakter hat. Die negativen Konsequenzen für die Praxis des Theorievergleichs und der Kritik im allgemeinen werden diskutiert, und für ungefährlich für den Status der Generativen Grammatik als wissenschaftliche Aktivität eingestuft. Das fünfte und letzte Kapitel präsentiert vorläufige Beobachtung über die metaphysische Dimension der Wissenschaftstheorie. Das Ziel dieses Kapitels ist, zu zeigen, dass metaphysische Annahmen formativ auf methodologische und theoretische Annahmen wirken.

Zusammenfassend ist zu sagen, dass diese Arbeit ein alternatives Verständnis der Wissenschaftstheorie fördert. Eines, das weniger mit der Bestimmung einer idealen Methodologie beschäftigt ist, sondern um die Klarheit und Eindeutigkeit der theoretischen Diskussion bemüht ist.

10/2007 – current	Diplomstudium in General Linguistics; (Equivalent of Master of Arts)
Summer 2012	EGG summer school, Wrocław, Poland
Summer 2011	EGG summer school, České Budějovice, Czech Republic
Summer 2010	EGG summer school, Constanța, Romania
Summer 2009	EGG summer school, Poznań, Poland
10/2007	School leaving examination ('Matura')

10/2010 – 01/2011	Teaching assistant for phonetics and phonology, Prof. Rennison, University of Vienna
08/2009 – 05/2013	Archivist at the Austrian Audiovisual Research Archive, Austrian Academy of Sciences

Native	German
Excellent	English
Basic	Polish
Structural knowledge	Latin, Sanskrit, Japanese