Generative Phonology

A Rapid Review

The origins

- Noam Chomsky – a student of Zellig Harris; born 1928, interest in language at 10, his father a Hebrew philologist William Chomsky
- Morris Halle – a student of Roman Jakobson; born in Latvia 1923, 1940 in the US, studied engineering, then linguistics

The fall of American structuralism (1)

- rather than the operationalist, verificationist empiricism → theories which have explanatory and predictive power within a domain, bring coherence to it
- rather than behaviourism → more structured & less simplistic psychological theories in perception & learning

The fall of American structuralism (2)

- the strict requirement of bi-uniqueness → led to counterintuitive analyses
- analytic difficulties in the area of suprasegmentals; e.g., to describe stress in English:
  - requires extensive reference to grammatical structure
  - the contrasts are not recoverable from phonetic data alone

The confrontation

- 1957 Chomsky *Syntactic Structures* had impact since structuralist linguistics didn't have a theory of syntax
- the strongest point of Am. structuralism continued by Chomsky: concern for formal analysis and explicit statement
- 1959 Halle *Sound Pattern of Russian* – attacked the bi-uniqueness condition
- 1959 Chomsky's review of Skinner's *Verbal Behaviour*
- 1965 Householder's attack on generative phonology in *JL* 1; Chomsky and Halle's reply in the following issue

Morris Halle and generative phonology (1)

- 1952 Jakobson, Fant & Halle *Preliminaries to Speech Analysis*: Jakobson's distinctive features in acoustic and articulatory terms
- the importance of both morphophonemics and acoustic phonetics

Morris Halle and generative phonology (2): formal conditions which phonological descriptions must satisfy

- representations be organized into sequences of segments and boundaries
- segments are specified in terms of distinctive features

(3). it should be possible to infer the linguistically relevant properties of the utterance from the phonological representation, BUT NOT

(3a). to infer the proper phonological representation of any speech event only from the physical properties of this event (→ bi-uniqueness)

Halle's argument against bi-uniqueness

- in Russian, voicing is distinctive for all obstruents except /ts/, /č/ and /x/
- /ts/, /č/ and /x/ get voiced before vd obstr
- all obstr are vless word-finally, unless before a vd obstr

[mok li] [mog bi]; [žeč li] [žedž bi]

- if a phon. repr. satisfies both (3) & (3a):

/mok li/ /mog bi/; [žeč li] [žeč bi]

(there is no vd phoneme ǰ!) & a rule voicing /ts/, /č/ and /x/ + a rule voicing all other obstruents (so obstruents split into two groups, and voicing split into two rules)

- if 3a dropped:

/mok li/ /mok bi/; [žeč li] [žeč bi] & a rule of voicing

Halle cont.

- thus, representation chosen for the benefit of the rule (one unitary regularity)
- centrality of rules in a phonological description
- change towards much more abstract representations
- language as a complex cognitive system (including rules and representations) rather than an inventory

antecedents (1)

- Chomsky's ideas were developed largely in isolation from the linguistic tradition
- Halle's ← clear antecedents in the Prague School via Jakobson:
  - distinctive features, which were used as notation necessary in
  - the evaluation of grammars (uniform notation makes it possible to compare alternative descriptions of the same facts) → evaluation measure
  - and in formulating linguistically significant generalizations (fewer features to characterize more general natural classes)

antecedents (2)

- concern for explanation in linguistics and search for universals
- from Am. structuralism:
- explicitness and formal statement
- assumptions about morphological structure
- elimination of redundancy ← Jakobson's information theory; the phonological system as a branching diagram for segments (a sequence of successive choices)

THE SOUND PATTERN OF ENGLISH

NOAM CHOMSKY

MORRIS HALLE

1968

Harper & Row, Publishers

New York, Evanston, and London

Chapter One. *Setting*.

1. Grammar

The goal of the descriptive study of a language is the construction of a grammar. We may think of a language as a set of sentences, each with an ideal phonetic form and an associated intrinsic semantic interpretation. The grammar of the language is the system of rules that specifies this sound-meaning correspondence.

The speaker produces a signal with a certain intended meaning; the hearer receives a signal and attempts to determine what was said and what was intended. The performance of the speaker or hearer is a complex matter that involves many factors. One fundamental factor involved in the speaker-hearer's performance is his knowledge of the grammar that determines an intrinsic connection of sound and meaning for each sentence. We refer to this knowledge—for the most part, obviously, unconscious knowledge—as the speaker- hearer's "competence." Competence, in this sense, is not to be confused with performance.

Performance, that is, what the speaker-hearer actually does, is based not only on his knowledge of the language, but on many other factors as well—factors such as memory restrictions, inattention, distraction, nonlinguistic knowledge and beliefs, and so on. We may, if we like, think of the study of competence as the study of the potential performance of an idealized speaker-hearer who is unaffected by such grammatically irrelevant factors.

We use the term "grammar" with a systematic ambiguity. On the one hand, the term refers to the explicit theory constructed by the linguist and proposed as a description of the speaker's competence. On the other hand, we use the term to refer to this competence itself. The former usage is familiar; the latter, though perhaps less familiar, is equally appropriate. The person who has acquired knowledge of a language has internalized a system of rules that determines sound-meaning connections for indefinitely many sentences.

2. Linguistic universals

General linguistics attempts to develop a theory of natural language as such, a system of hypotheses concerning the essential properties of any human language. These properties determine the class of possible natural languages and the class of potential grammars for some human language. The essential properties of natural language are often referred to as "linguistic universals." Certain apparent linguistic universals may be the result merely of historical accident. For example, if only inhabitants of Tasmania survive a future war,

it might be a property of all then existing languages that pitch is not used to differentiate lexical items. Accidental universals of this sort are of no importance for general linguistics, which attempts rather to characterize the range of possible human languages. The significant linguistic universals are those that must be assumed to be available to the child learning a language as an a priori, innate endowment. That there must be a rich system of a priori properties—of essential linguistic universals—is fairly obvious from the following empirical observations.

Every normal child acquires an extremely intricate and abstract grammar, the properties of which are much underdetermined by the available data. This takes place with great speed, under conditions that are far from ideal, and there is little significant variation among children who may differ greatly in intelligence and experience. The search for essential linguistic universals is, in effect, the study of the a priori faculté de langage that makes language acquisition possible under the given conditions of time and access to data.

Phonological Analysis

Underlying Representations, Surface Forms and Phonological Rules

Introduction to Phonological Rules and Derivations

- Phonological rules describe how the underlying form of a morpheme is transformed into its surface form during speech. These rules explain predictable sound changes that occur in specific environments.
- Phonological rules describe the changes that occur as a word moves from its underlying form to its surface form. They operate systematically across the language and help explain why sounds alternate in predictable ways.

Introduction to Phonological Rules and Derivations

- **Why Do We Need Phonological Rules?**

. **Economy of Representation:** We want to store only the unpredictable properties of sounds.

. **Predictability:** Many phonetic properties can be predicted from context.

. **Systematicity:** Language has regular patterns of sound change that phonological rules can capture.

Examples

- ***Electric*** **[ɪˈlektrɪk] vs.** ***Electricity*** **[ɪˈlektrɪsəti]**
  - The vowel in the second syllable changes due to stress patterns.
  - A phonological rule captures this systematic change.

Structure of Phonological Rules

- **A phonological rule consists of three parts:**

1. **Input/Target:** The segment undergoing change.
2. **Change:** The modification applied to the segment.
3. **Environment:** The context where the change occurs.

- **Rule Format:**
- **A → B / X ___ Y**
  - A = Underlying segment
  - B = Surface realization
  - X, Y = Context
- Example: English Plural Formation
- **/z/ → [s] / [-voice] ___**
  - The plural morpheme /z/ becomes [s] after voiceless sounds.
  - *Cats* [kæts], *Dogs* [dɒgz]

Derivation Example:

- **Example: English Plural Formation**
- **/z/ → [s] / [-voice] ___**
  - The plural morpheme /z/ becomes [s] after voiceless sounds.
  - *Cats* [kæts]

1. Underlying form: /kæt + z/
2. Rule applies: /z/ → [s] after voiceless [t].
3. Surface form: [kæts]

Derivation Example:

- Example: Nasal place assimilation
- In phrases like **in Paris** vs. **in London**:
- UR: /ɪn/
- SR:
- in Paris → **[ɪm ˈpærɪs]** (before bilabials, /n/ → [m])
- in London → **[ɪn ˈlʌndən]** (before alveolars, /n/ stays [n])
- Diagram of the Process:
- UR → Apply Phonological Rules → SR

What are underlying and surface representations?

- **Underlying Representation (UR)**: This is the abstract form of a word or morpheme stored in the speaker's mental lexicon. It contains only the essential phonological information — the distinctive features that don't change across different contexts.
- **Surface Representation (SR):** This is the actual pronunciation of the word when spoken. It results from applying phonological rules to the underlying form, adapting it to suit the phonetic context.
- Example: Take the English plural suffix:
- In cats → [kæts]
- In dogs → [dɔgz]
- In buses → [bʌsɪz]

Underlying vs. Surface Representations:

- **Underlying Representation (UR):**
- The mental, abstract form of a word or morpheme before any phonological rules apply. It reflects the basic structure and distinctive features of sounds. Stored in the mind of speakers.
- **Surface Representation (SR):**
- The actual pronunciation of a word after phonological rules have been applied. This is what we hear in real speech.

Underlying Representations (URs)

- Underlying representations are the abstract forms of morphemes before any phonological rules apply. They help simplify the mental lexicon by storing only the essential, unpredictable features.
- **Why Underlying Representations?**

1. **Capture Regularities:** Related words can share a single underlying form.
    - *Sign* [saɪn], *Signal* [sɪgnəl], *Signature* [sɪgnətʃər]
    - UR: /sign/; rules explain the different surface forms.
2. **Economy of Representation:** Predictable properties are filled in by redundancy rules.
3. **Predictability:** Certain features, like nasal consonants being voiced, don't need to be stored in the UR.

Diagram:

- UR: /sign/ → [saɪn] (Final -gn → [n] and vowel change)
- → [sɪgnəl] (No final -gn, no vowel change)

Surface Representations (SRs)

- **Surface representations are the actual forms we hear and pronounce after phonological rules have applied.**
- Example:
  - UR: /sign/
  - Rules:
    1. Word-final /gn/ → [n]
    2. Vowel change /i/ → [ai] in final position
  - SR: [saɪn]

Rule Ordering and Interaction

- **When multiple rules apply, their order affects the output.**
- Example: Aspiration and Flapping in English

1. Aspiration: Voiceless stops become aspirated at the beginning of stressed syllables.
2. Flapping: Intervocalic /t/ becomes a flap [ɾ] between two vowels.

- Word: *Butter*:

1. **UR: /bʌtər/**
2. Aspiration: No effect.
3. Flapping: /t/ → [ɾ] between vowels.
4. **SR: [bʌɾər]**

Exercises

- **1. Identify the phonological rule in these words:**
  - *Cats* [kæts], *Dogs* [dɒgz], *Horses* [hɔrsɪz]
  - What rule explains the variation in the plural endings?
- **2. Derive the surface forms:**
  - UR: /bʌtər/ (butter) → Apply rules → SR: ?
  - UR: /sɪgn/ (sign) → Apply rules → SR: ?
- **Answers:**

1. Rule: /z/ → [s] after voiceless sounds, [z] after voiced sounds, [ɪz] after sibilants.
2. Butter: /bʌtər/ → [bʌɾər], Sign: /sɪgn/ → [saɪn]

The Necessity of Underlying Representations in Phonology

1. **Predictability and Redundancy:** Many phonetic features are predictable based on context or inherent properties of sounds. By having two levels of representation, phonologists can capture only the unique features of a morpheme in its underlying form, while redundancy rules fill in the predictable features. Without this dual-level model, handling redundancy would be inadequate.
2. **Concrete Phonology is Illusory:** Even so-called "concrete" phonetic representations involve interpretation. Phonetic data is filtered through theoretical frameworks, and phonetic transcriptions inherently require subjective judgment. Therefore, the idea of a purely concrete, single-level representation identical to surface forms is unrealistic.
3. **Capturing Generalizations:** Recognizing only surface forms fails to reveal the non-arbitrary, phonologically conditioned relationships between allomorphs of a morpheme. For example, the different past tense endings in English (-t, -d, -id) follow voice assimilation rules, contrasting with irregular forms like *went*. Underlying representations allow these patterns to be derived from a single base form, highlighting systematic processes.

Why do we need underlying representations and phonological rules?

- They simplify the grammar by reducing redundancy. Instead of memorizing multiple forms for every word, you store one abstract form and apply rules to derive the correct surface forms.
- They reveal systematic patterns across words. For instance, the /gn/ sequence in sign disappears at the word's end but stays intact in signal.
- They explain why seemingly different pronunciations are related, like electric → electricity, where the vowel changes due to stress shifts.

Exercise 1: Write a phonological rule.

- In the following data, write a rule to explain the change:
- intolerant → [ɪnˈtɒlərənt]
- impossible → [ɪmˈpɒsɪbl̩]
- incorrect → [ɪŋˈkɒrɛkt]
- Question: What rule explains the change in the nasal consonant before different sounds?

Exercise 2: Apply the rule.

- Use the rule you wrote in Exercise 1 to predict the pronunciation of the prefix in- in these words:
- incomplete
- infrequent
- incredible

Answer to Exercise 1: Write a phonological rule.

- In the following data, write a rule to explain the change:
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- Question: What rule explains the change in the nasal consonant before different sounds?
- Nasal Place Assimilation Rule:
- n→n/_[t, d, s, z] ($before$ alveolar$s$)
- n→m/_[p, b, m](before bilabials)
- n→ŋ/_[k, g] ($before\ velars$)

Answer to Exercise 2: Apply the rule.

- Use the rule you wrote in Exercise 1 to predict the pronunciation of the prefix in- in these words:
- incomplete → [ɪŋkəmˈpliːt]
- infrequent → [ɪnˈfriːkwənt]
- incredible → [ɪŋˈkrɛdɪbl̩]
- Explanation:
- In incomplete, the following consonant /k/ triggers nasal place assimilation, changing /n/ → [ŋ].
- In infrequent, the following consonant /f/ does not trigger assimilation, so /n/ stays [n].
- In incredible, the following consonant /k/ triggers nasal place assimilation, changing /n/ → [ŋ].

American Structuralism

Contributions of the Bloomfieldian School to Phonological Theory

Introduction to the Bloomfieldian School

- Founded on the work of Leonard Bloomfield (1887–1949)
- Dominant in American linguistics (1930s–1950s)
- Emphasized empirical, behaviorist, and structuralist methods

Core Principles

- Language as a structured system of observable data
- Avoidance of psychological or mentalistic explanations
- Focus on distribution and surface forms

Phoneme Theory

- Phoneme: smallest contrastive unit of sound
- Identified through minimal pairs
- Allophones: context-based realizations of phonemes
- Emphasis on phonemic (broad) transcription

Mechanical and Taxonomic Analysis

- Objective discovery procedures:
  - Collect utterances
  - Segment into phonetic units
  - Analyze distribution
- Phonology as a catalog of phonemes and their allophones

Surface-Oriented Analysis

- Rejection of abstract underlying forms
- Allophonic variation explained by surface phonetic environments
- No derivational rules or transformations

Anti-Mentalism

- Behaviorist influence: all analysis based on observable data
- Speaker intuition and mental representation excluded
- Psychological neutrality in analysis

Fieldwork and Documentation

- Influenced practical analysis of unwritten languages
- Standardized phonemic principles in orthography development
- Extensive use in indigenous language documentation

Linear View of Phonology

- Sounds analyzed as linear sequences
- No hierarchical or suprasegmental features
- Precursor to later non-linear models (autosegmental, metrical)

Comparative Perspective

Feature	Bloomfieldian Approach	Generative Phonology
Focus	Surface forms, distribution	Underlying forms, rules
Phoneme Concept	Distribution-based	Rule-governed abstraction
Mental Representation	Avoided	Central
Rule Formalism	Minimal	Extensive

Legacy and Limitations Legacy:

- Systematic phonemic analysis
- Foundation for field linguistics
- Framework for future phonological theories

- **Limitations:**
  - No abstraction or rule-based analysis
  - Ignores cognitive aspects of language
  - Cannot explain morphophonemics or productivity

Key Figures and Texts

- Leonard Bloomfield: *Language* (1933)
- Charles Hockett: *A Course in Modern Linguistics* (1958)
- Zellig Harris, Kenneth Pike

Further Reading:

- Stephen R. Anderson (1985). *Phonology in the Twentieth Century*
- Bruce Hayes (2009). *Introductory Phonology*

Summary

- Bloomfieldian phonology = empirical, structural, descriptive
- Focus on observable patterns and sound distribution
- Important precursor to generative and non-linear models

Discussion Questions

1. How does the Bloomfieldian concept of the phoneme differ from that in generative phonology?
2. In what ways did the Bloomfieldian emphasis on surface forms help or hinder phonological analysis?
3. How might Bloomfieldian methods still be useful today in language documentation?