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Phonology: An Appraisal of the Field in 2007

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THE FRAMING OF LABORATORY PHONOLOGY AND THEORETICAL PHONOLOGY AND THE INFLUENCE OF EARLY GENERATIVE THEORY*

Introduction

1a. What is phonology? Particularly in its relationship to phonetics and laboratory phonology

b. Effects of a polarized discourse on advancing our understanding of sound systems

c. The ways in which assumptions in early generative theory have defined and delineated the fields of phonology and phonetics

d. Generative grammar as excellent *approximation* of adult grammar

I What is phonology? (as it relates to phonetics and laboratory phonology)

2. What is phonology?

- Hyman (1971, p. 2): "Phonology has been defined as the study of sound systems, that is, the study of how speech sounds *structure* and *function* in language."
- facets of phonology: inventories, phonotactics, allophony, morphophonology
- relationship to closely allied domains of phonetics, the lexicon, morphology

3. Why is the question of what phonology is pressing right now?

4. Almost 40 years since the publication of Chomsky and Halle's (1968) seminal work, *The Sound Pattern of English* (SPE), there remains a polemic surrounding the definition of phonology and its relationship to phonetics, morphology and the lexicon.

* Some of the points discussed here were also discussed in a paper entitled "Laboratory Phonology: Past successes and current questions, challenges, and goals" presented at LabPhon 10, Paris, June 2006. Thanks to members of that audience for insightful comments and discussion.

- Moment of relative flux: Optimality Theory (OT) is accepted as the dominant paradigm by many, while others have rejected it. No consensus view of the alternative has yet coalesced, although a number of researchers assume modified versions of OT and others assume that exemplar theory and connectionism are part or all of the answer.
- The discourse surrounding these alternatives tends to be very polarized.

5. Phonology as rules and representations

Anderson (1985, p. 1) frames his discussion of 20th Century phonology as follows: "Our intent is to study this history in relation to a particular issue: the balance between *rules* and *representations* as components of a theory of sound structure."

and concludes (p. 350) "We hope that this book has demonstrated that neither a theory of rules nor a theory of representations constitutes a theory of phonology by itself."

In Anderson's characterization, SPE is a theory that privileges rules over representations and Autosegmental Phonology privileges representations over rules.

6. OT as a theory of "rules" (processes)

- under-attention to the nature of representation
- richness of the base
- carryover earlier assumptions about representations
- Many important questions about representation that were under discussion in the late 80-early 90's have languished.

7. To reach a balance, need to refocus our attention on representations

8. Types of representations:

- lexical
- phonological
- phonetic

9. SPE

- Underlying representations = both the phonological and lexical form
- Surface form – output of the phonology, translation of binary values to scalar values = phonetic transcription
- important ingredients:

– grammar as modular

– phonology as categorical; phonetics as gradient/continuous

– phonology as language-specific; phonetics as universal

10. Evolution of views on phonology vs. phonetics since that time

11. Laboratory Phonology (LabPhon)

- LabPhon is an approach to investigating human sounds systems, taking as its foundational premise that this will be achieved more successfully through integrated methodologies.

Introduction to LabPhon I volume (Beckman and Kingston 1990, p. 3):

> Therefore, we ask: how can we use the physical models and experimental paradigms of phonetics to construct more viable surface phonological representations? Conversely, what can we learn about underlying phonetic representations and processes from the formal cognitive models and computational paradigms of phonology? Determining the relationship between the phonological component and the phonetic component demands a *hybrid methodology*.

- LabPhon is not a "theory" as such.

NB: LabPhon is not the inception of this sort of integrated, hybrid approach to investigating phonology and phonetics. A number of phoneticians and admittedly fewer phonologists were doing this sort of work. LabPhon was a codification and naming of this approach.

12. At the outset, the central goals of LabPhon included framing issues in terms of a richer way of investigating phonology and reconciling phonological and phonetic approaches to the investigation of human sound systems.

- LabPhon was seen as an enhancement or complement to theoretical phonology, framed within the modular framework that grew out of SPE, embedded

with a number of operational assumptions, including a sharp division between phonology and phonetics:

> . . . how should the task of explaining speech patterns be divided between the models of grammatical function that are encoded in phonological representations and the model of physical or sensory function that are encoded in phonetic representations?" (Beckman and Kingston 1990, p. 1)

13. Over time, LabPhon has evolved to be seen by many as an alternative to theoretical phonology. Why?

14. The emphasis on experimental data highlighted the ways that relying on impressionistic data is inadequate.

- LabPhon has played a critical role in showing that only with greater attention to fine detail in our empirical studies will we be able to develop adequate models.
- It has also encouraged the idea that we need to strengthen our base of empirical knowledge, through experimental work as well as fieldwork supporting cross-language documentation.

15. LabPhon has broadened the view of the questions that define phonology

- enriched awareness of variation
- a better understanding of sociolinguistic variation
- effects of variation in diachronic change

→ breaking down the division between language competence and language performance

- increased orientation toward psycholinguistics
- highlighted the role of stochastic generalization in the organization and knowledge of sound systems

16. The success of LabPhon is that those issues which at first were defined in the effort to bridge phonology and phonetics are now understood more broadly, as truly interdisciplinary questions, bridging linguistics with psychology, computer science, etc., defining the relationship between the cognitive and physical aspects of human speech as a question of cognitive science.

17. How has LabPhon fared vis-à-vis the original goal of bridging the gap between more theoretical and more empirical approaches to the study of sounds and speech?

18. The results of LabPhon, with attention to a wide range of evidence, have led to a shift of certain assumptions that at times puts LabPohn at odds with current theoretical phonology.

- the dichotomies defined in SPE are an oversimplification
- rethinking of what is language-specific and language-universal
- division between what is categorical and what is gradient is less clear
- movement away from strict modularity, with a richer understanding of levels of representation

19. Degree of granularity and whether sharp divisions can be drawn

- Is there is a psychological reality to the sorts of detail encoded in both underlying and surface representations?
- Minimally these are useful tools, but do they correspond to psychologically real levels of representation?

20. The nature of lexical representations:

- Do they consist of sparse abstract representations along the lines generally assumed within generative phonology?
- Or do they consist of much finer-grained details, as usually assumed within both connectionist and exemplar views of lexical representation?
- The framing of this debate suggests that either one end point or the other is correct.
- Much empirical work supports the conclusion reached by Pierrehumbert (2003), Beckman (2003), and others that both fine-grained and course-grained information are part of lexical representations. At the coarse-grained end are abstractions that I believe look a lot like what we traditionally assumed to be a phonemic or underlying representation.
- Need to avoid reductionist thinking:

Pierrehumbert (2003, p. 178) frames the relationship between more abstract and more fine-grained information as follows: "In viable theories of

phonetics/phonology, there is a ladder of abstraction, each level having its own representational apparatus. Thus, the theory as a whole must delineate both the available representation at each level and the principles relating one level to another."

- As phonologists, we need to take seriously the evidence of the effects of fine-grained details on phonology. Yet on the other side, this doesn't mean that there isn't true abstraction. It is important to realize that just because abstract knowledge may be built out of fine-grained details, it does not mean that the abstractions do not exist.

II Types of models and problems with polarization

21. Arguments are typically framed in either/or terms. Either this model --in wholesale terms--is *right* or that model is *right*.

- Our discourse has led to an amplification of differences that goes beyond intellectual usefulness. In highlighting the differences, we also lose sight of how much of a shared agenda we have in our investigation of the nature of human language.

22. To reach a deeper understanding of the questions before us, the next major challenge is to develop better-integrated theories to account for the richer empirical body of knowledge we have been acquiring.

- move away from a polarized discourse about the *right* theory
- new insight can be gained through a more synthetic and collaborative mindset
- how we frame both assumptions and models and how this framing affect our investigations

III Assumptions and their implications

23. Set of assumptions stemming from early generative theory

- Since many of us are trained in approaches growing out of generative theory, or approaches which directly critique generative approaches, it is useful to think about how the foundational assumptions of early generative theory have shaped our theories and our approaches to linguistic investigation.

NB: In this broad sense, I understand Optimality Theory to be a theory of generative phonology.

24. Interwoven assumptions, e.g. Chomsky (1965) *Aspects of the Theory of Syntax*

- the definition of the *ideal speaker/hearer* within a *homogeneous speech community*
- the *separation of competence and performance*
- the importance of *modularity* and the *avoidance of redundancy*
- the nature and source of *language universals*, and the implications for the nature of the task of *language acquisition.*
- These assumptions were originally largely defined and framed in terms of syntax, but also strongly influenced phonology—either directly or indirectly.

25. Middle ground: in large measure these assumptions are *approximately* correct, but not in the literal sense in which they are often interpreted.

- Purpose that these assumptions have served
- Unpacking and rethinking these assumptions will help us move away from a polarized discourse and come to understand the ways in which these assumptions are useful and the ways in which they are not.
- With careful articulation of our assumptions, we may well find more agreement and less disagreement within linguistics and with closely allied fields.

26. Early generative linguistics as an approach to the study of language rejecting American Structuralist approaches to the study of language, particularly with regard to the influences of behaviorist approaches to psychology.

- The motivation for assuming a specific endowment for language, as well as assumptions about universals and their linkage to language acquisition arose from substantive and methodological gaps between linguistics and cognitive psychology in the late 50s and early 60s.
- What were in a sense working assumptions have been taken as some to be foundational beliefs of the theory.
- These assumptions need to be reevaluated in light of what we have learned not only in linguistics, but also in the psychology and neurobiology of language over the past 40 or so years.

27. Language universals and their implications for acquisition

> A theory of linguistic structure that aims for explanatory adequacy incorporates an account of linguistic universals, and it attributes tacit knowledge of these universals to the child. . . .
>
> Language learning would be impossible unless this were the case. . . .
>
> What are the initial assumptions concerning the nature of language that the child brings to language learning, and how detailed and specific is the innate schema (the general definition of "grammar") that gradually becomes more explicit and differentiated as the child learns the language? (Chomsky 1965, p. 27)

28. Many would agree that the nature of phonological universals and the acquisition of phonology are two of the central questions that face the field of phonology.

- However, the equation of the task of the linguist and the task of the child learning the language limits our investigation of both issues.
- How we learn ≠ what we know

Vihman and Velleman (2000) point out that neither a model of "phonology all the way down" which models early acquisition in terms of adult categories and rules or constraints, nor a "phonetics all the way up" approach which assumes that "phonology" emerges gradually out of the phonetics offers an adequate account of the acquisition of a phonological system.

- Both language acquisition and linguistic universals need to be investigated and understood in their own right. Only then can we understand how they are interrelated.

29. Feature theory as universal

- The term *universal* is used in many different ways.
- To think about the ways in which the set of possible speech sounds is *universal* and to think about the ways that there is or could be a *universal feature theory* we need to understand in each particular case what is meant by the term *universal*.

• In the broadest sense, as linguists, we strive to develop a *universal theory*, in that we aim to delineate the properties of possible human language.

–what is a possible human speech sound

–what are the representations of the set of possible speech sounds and the categories defined by them?

• These goals predate generative linguistics, as seen, for example, in the long-standing interest in and accepted need for an international phonetic alphabet.

30. What *are* we endowed with that enables us to build up a system of phonological contrasts so successfully and so quickly?

• Why is it that the possible categories of contrasts across languages are quite limited and the systems show such surprising similarities across languages?

• How do we explain evidence suggesting both language-independent and language-specific dimensions of language acquisition?

31. A partial answer comes from constraints imposed by the psycho-acoustics of the human ear and the nature of the human vocal track. But as stated by Fromkin (1977, p. 370), these are necessary but not sufficient constraints.

32. Generative theory accounts for the definition of possible speech sounds, as well as an explanation of "natural classes" and "markedness" by positing a small vocabulary of elements or parameters that we are endowed with, defined to be a universal set of distinctive features.

> The total set of features is identical with the set of phonetic properties that can in principle be controlled in speech; they represent the phonetic capabilities of man, and we would assume, are therefore the same for all languages. (Chomsky and Halle, 1968, pp 294-295.)

• These phonetically defined properties are understood together to define the inventories and patterns in phonology. Much attention has been paid to delineating the proper set, in terms of observed natural classes and in terms of phonetic correlates.

33. There is far from a consensus on how much of the definition of the sound system comes from the physical world vs. how much is intrinsic to the nature of the linguistic system.

• There is disagreement about whether the physical factors directly define the

nature of the phonological system or whether their effects are indirect, mediated by the grammar.

- It has been argued that certain principles, such as *symmetry* (Hayes 1997) and *economy* (Clements 2003) are intrinsic to the phonological system.

- These questions remain as central issues within phonetics, phonology and LabPhon.

34. The point is that unless we move away from a literal interpretation of feature theory as universal: "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." (Chomsky and Halle 1968, p. 4), we will not make progress on understanding the nature of the linguistic endowment, since the literal interpretation predetermines the answers.

IV Generative grammars as excellent *approximations* of adult grammars

35. Successes of generative models

- Generative models have proven to be excellent *approximations* of adult grammars. This is a non-trivial result when we consider the complexity of linguistic systems across the languages of the world.

36. Definition of possible speech sounds

- Maddieson (1984) *Patterns of Sounds* identifies roughly 800 sounds occurring in a representative sample of 317 languages. These are quite well characterized in categories definable by distinctive feature theory. From this simple characterization, we have learned a lot about the typology of the sounds of the languages of the world.

- Pierrehumbert et al. (2000) among others, rightly point out a problem: These categories are only definable in a roughly equivalent way. The categories are language-specific in the sense that "there are no languages in which the implementation of analogous phonemes is exactly the same." (Pierrehumbert et al. 2000, p. 285).

37. The categories show more variation across languages and are fuzzier than predicted by either the SPE distinctive feature set or the IPA chart. These formalizations do not capture these differences.

- The evidence supports the view that experience contributes to the construction of adult categories.
- In some technical sense then, distinctive feature theory is *wrong*. But does this mean that we should throw it out? No.
- As we come to understand why formal systems are only approximately right, it becomes an interesting question why they do as well as they do. As we come to better understand how categories are acquired, we will come to better understand why categories are somewhat fuzzy.

38. If we frame our discussion in terms of *right* and *wrong*, then we miss the opportunity to understand what is *almost right* about these models.

- We need to understand their limitations, while also understanding the insight they offer. It may be that feature theory is right at a particular level of granularity or it might be, as suggested by Pierrehumbert et al. (2000), that feature categories capture the end state, but not how the system is formed.
- The crux of the problem is that formal models are good models of adult grammar, but they are less successful as models of language acquisition, language change, and sociolinguistic variation. In some sense, adult grammars must be built out of these elements.

39. Why a model that captures an approximation of adult grammar might be on the right track.

- For communication to be successful, all we need is for individual grammars to approximate the individual grammars of those we are communicating with.

V Conclusions

40. As we strive to understand the nature of phonology, we need

- a balanced theory, one which attends to the nature of representations
- integrated models, moving away from a polarized discourse
- unpacking and rethinking assumptions

41. Because the very nature of language is so complex, an adequate model will be complex and we are most likely to properly characterize it through synthetic approaches.

- The model needs to enable us to accurately model adult grammar, not as

epiphenomena, but as a system of knowledge, while also modeling acquisition, language use, and language change. And it needs to give us insight into the ways in which the adult grammar grows out of these.

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