Comments on LING5700 Discovery Procedure: September 20, 2023 Class

Acquisition of phonemes via acquisition of feature hierarchies

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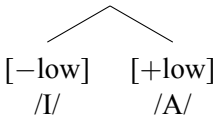
1. I really have only one main point, though it gives rise to several sub-points. In the discussion of the acquisition of phoneme contrasts, no mention was made of features. I think, following Jakobson (1941) and Jakobson & Halle (1956), that contrastive phonemes are acquired *via* the hierarchical acquisition of contrastive features. That is, rather than a learner seeing a contrast between /æ/ and /ɛ/ by finding minimal pairs (*bat* ∼ *bet, man* ∼ *men, bag* ∼ *beg*, etc.), we could say instead that a learner realizes that there is a contrast between a low vowel, which is assigned [+low], and a non-low vowel, which is assigned [−low]. Suppose that this contrast arises very early in the acquisition sequence: suppose, following Jakobson, that it is the first vowel contrast that learners make. In that case, the learner does not yet know how many further contrasts there may be within the [+low] and [−low] categories. At this point, the learner has only two vowel phonemes, as in (1), where /I/ and /A/ represent the two vowel phonemes recognized at this point.

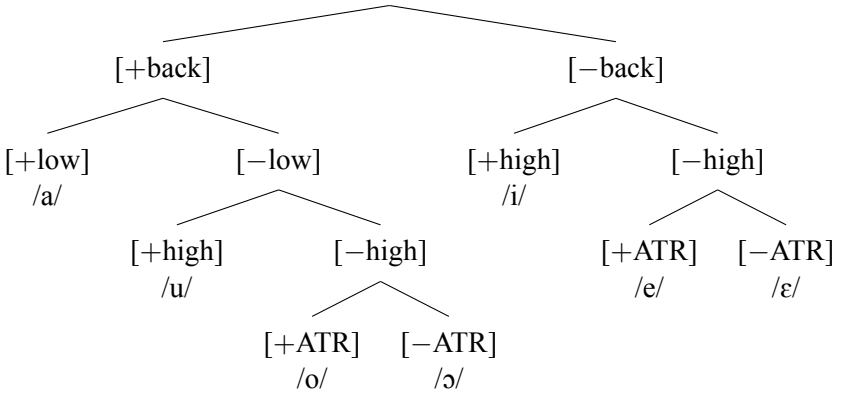
   (1) The first vowel feature contrast based on [low]



2. An advantage of using feature contrasts rather than segment contrasts is that learners have many more minimal pairs to support the contrast; since all low vowels are at this point allophones of /A/ and all non-low vowels are allophones of /I/, then any minimal pair between a low and a nonlow vowel counts (e.g., not just *bat* ∼ *bet*, etc., but also *bat* ∼ *beat, bat* ∼ *boot, far* ∼ *fear*, etc.). Later, learners discover more contrasts and elaborate the feature hierarchy along with the vowel inventory.

3. Bohn (2015) (see also Bohn 2017 and Bohn & Santos 2018, and Dresher 2020 for a brief summary) presents a Contrastive Hierarchy Theory (CHT) analysis of the acquisition of the Brazilian Portuguese (BP) vowel system by three children. Bohn proposes that the contrastive feature hierarchy of the vowel system of the Paulista dialect of BP is as in (2).

   (2) Brazilian Portuguese vowel feature hierarchy (Bohn 2015)



The hierarchy in (2) is based on phonological activity in this dialect. For example, there is a process of external sandhi which occurs when the first vowel is /a/, /o/ or /u/, suggesting that they all share a common feature, in this case [+back].

Bohn deduces the contrasts operative in the children's developing grammar by studying the substitutions they make in production and the vowel contrasts that they exhibit. The three children take different routes in acquiring the BP vowel system, as discussed below:

(a) Child L. seems to be a perfect Jakobsonian: the first vowel is [a], and the next one is [i], which is what Jakobson proposed as the first vowel contrast. But contrary to Jakobson, this is not a height contrast. It looks like one, but Bohn observes that substitution patterns suggest rather that is a [±back] contrast, which is the top BP feature (also contrary to Jakobson). L.'s initial feature tree is shown in (3a).

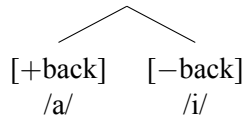
(b) Am.'s first contrast is between [a] and [e], not [i]; Bohn proposes that, as with L., this represents a backness contrast (3b).

(c) Both L. and Am. make a first contrast that reflects the highest BP feature, which is [back]. Are all Brazilian children this far-sighted? Apparently not! The third child, A., begins differently (3c). A.'s first contrast is between [a] and [o]. Substitution patterns suggest that this is not a backness or roundness contrast but a height contrast, based on [±low].

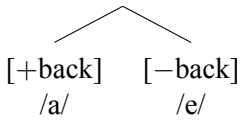
In the next stage, A. acquires contrastive /i, e, u/. A's tree can be expanded minimally to incorporate these new contrasts, which require adding [back] and [high] (4a). However, this is the wrong tree for BP, so at some point it has to be restructured as in (4b). The [ATR] contrast between /e∼ɛ/ and /o∼ɔ/ is the last to be acquired.

(3) Initial trees of children acquiring the Paulista BP vowel system

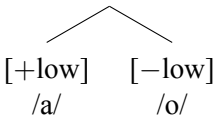
a. Child L.



b. Child Am.

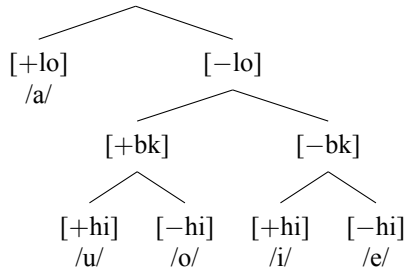


c. Child A.

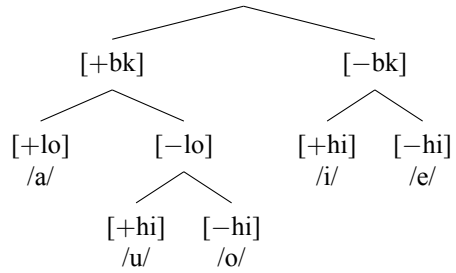


(4) Further development of A's feature hierarchy

a. Minimal revision of A's initial feature tree



b. Restructuring of A's feature tree



4. The acquisition pattern sketched above has some affinities with the learning procedure set out in ADP Research Group (2023). First, it assumes that learners find one feature at a time. As stated in ADP Research Group (2023: 12–13), 'The one-feature-at-a-time strategy in hypothesis formation has the

clear benefit of avoiding the exponential growth of hypothesis space via feature combinations. It is motivated by the study of learning and categorization: adults and children alike form intentional categories by attending to a single dimension of information ...'

Like the ADP model, we assume that if a learner's first feature contrast corresponds to the highest contrast in the system to be acquired, subsequent features can be added as daughter nodes to the tree. Otherwise, some revision of the tree may be required to promote a new feature to a higher position if the learner finds evidence that this is required. For example, in BP there is evidence that /a/ has a contrastive feature [+back]. This specification cannot be added to the tree in (3b) without reordering the feature hierarchy so that [back] is ordered ahead of [low], as shown by (4).

5. Contrastive Hierarchy Theory (see Dresher 2020, 2022 for quick overviews and references) suggests a new approach to phonological mergers, which were discussed in the Sept. 20 class in terms of functional load. Ko (2010, 2018) and Oxford (2012, 2015) independently proposed that mergers are most likely to involve segments that are *contrastive sisters* in the feature hierarchy tree. For example, Oxford (2012, 2015) shows how this hypothesis predicts distinct merger patterns in dialects of Algonquian (see Dresher, Harvey, & Oxford 2018 for a summary).

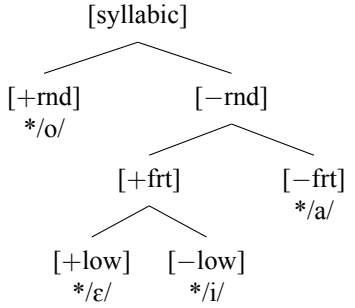
   Oxford reconstructs the Proto-Algonquian short vowel system as in (5a). This system was inherited by the Central Algonquian languages. In this hierarchy */ɛ/ and */i/ are contrastive sisters, i.e., minimally contrastive segments differing by only one feature, [±low]. In these languages, */ɛ/ regularly merges with */i/. Oxford cites examples in Fox, Shawnee, Miami-Illinois, Cree-Innu, Ojibwe, Woods Cree, Northern Plains Cree, and Blackfoot.

   On the eastern and western edges of the Algonquian area, */o/ became a high vowel and began to pattern together with */i/, which provoked a reorganization of the contrastive hierarchy. Oxford (2015) proposes that the height feature changed from [±low] to [±high]and came to outrank the place contrasts. Unlike in the previous hierarchy where */ɛ/ and */i/ were contrastive sisters, in the new hierarchy, shown in (5b), */ɛ/ and */a/ are contrastive sisters. In these languages, */ɛ/ merges with or shifts to */a/. Examples occur in Abenaki, Mahican, Mi'kmaq, Maliseet-Passamaquoddy, and Massachusett.

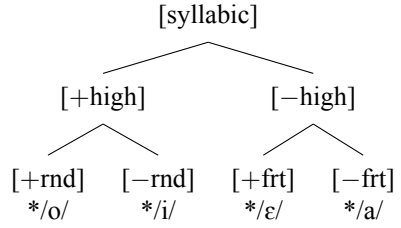
   Thus, the Eastern/Western contrast shift accounts for the distinct patterning of many phonological changes in the two branches of the Algonquian family.

   (5) Two feature hierarchies in Algonquian dialects (Oxford 2012, 2015)

   a. Proto-Algonquian and Central Algonquian



   b. Eastern and Western Algonquian



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