Issues in Feature Theory

Introduction // Universal features?

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Roadmap

- A brief recap from last week
- The phonetics / phonology problem
- Are features universal?
- In favour of universal features and thge implications of universal features: a reading of Hale, Kissock & Reiss (2006) with a side order of Hale & Reiss (2008), ch.2.
- Some initial discussion

Recap: the function of features

- **Classificatory / phonological:** Features identify sets of segments with the same phonological behaviour (e.g. participation in alternations)
- **Descriptive / phonetic:** Features define the articulatory properties of the segment. They provide an interface to phonetics.
- **Contrastive:** Features denote possible / attested contrasts.
- Question: How well do the three functions align, especially the phonological and phonetic ones? Are phonological classes always phonetically natural?
- And: are features universal?

Mismatches

- We encountered a few possible wrinkles in analyses in the first week.
- Phonetics/phonology mismatches have been noticed before (see e.g. Anderson 1981).
  - One option: complicate the phonology to capture phonetically non-uniform classes of segments.
  - Other option: allow some leeway in the phonetic definition of features.
- Can phonological criteria also play a role in feature assignment?

Phonological criteria

- ‘Mixed’ view of the feature: usually grounded in phonetics, but we can make allowances to account for phonological behaviour.
- How does this work in practice? And how can we make allowances without removing the basis for the phonetic definition of features?
- Recall: features are interpreted in phonetics. How does the phonetics ‘know’ that for some segments (feature combinations) this interpretation is to be altered or suspended?
- And if we allow it for one feature, why not for all?

Emergent features?

- View expressed in Mielke (2008): Features are ‘emergent’ (not universal), based only on phonological principles.
- Complete rejection of phonetic/descriptive function of the feature. Features are only indices of phonological classhood.
- Consequence: No role for features at the interface. Then how does ‘translation’ work? Mielke keeps the question open but suggests Exemplar Theory as a possible way out.
- (**Exemplar Theory**: idea that words are stored as wholes, in multiple instances. Production = reproduction of stored form.)
- We will look at this idea in greater detail on Friday (probably).

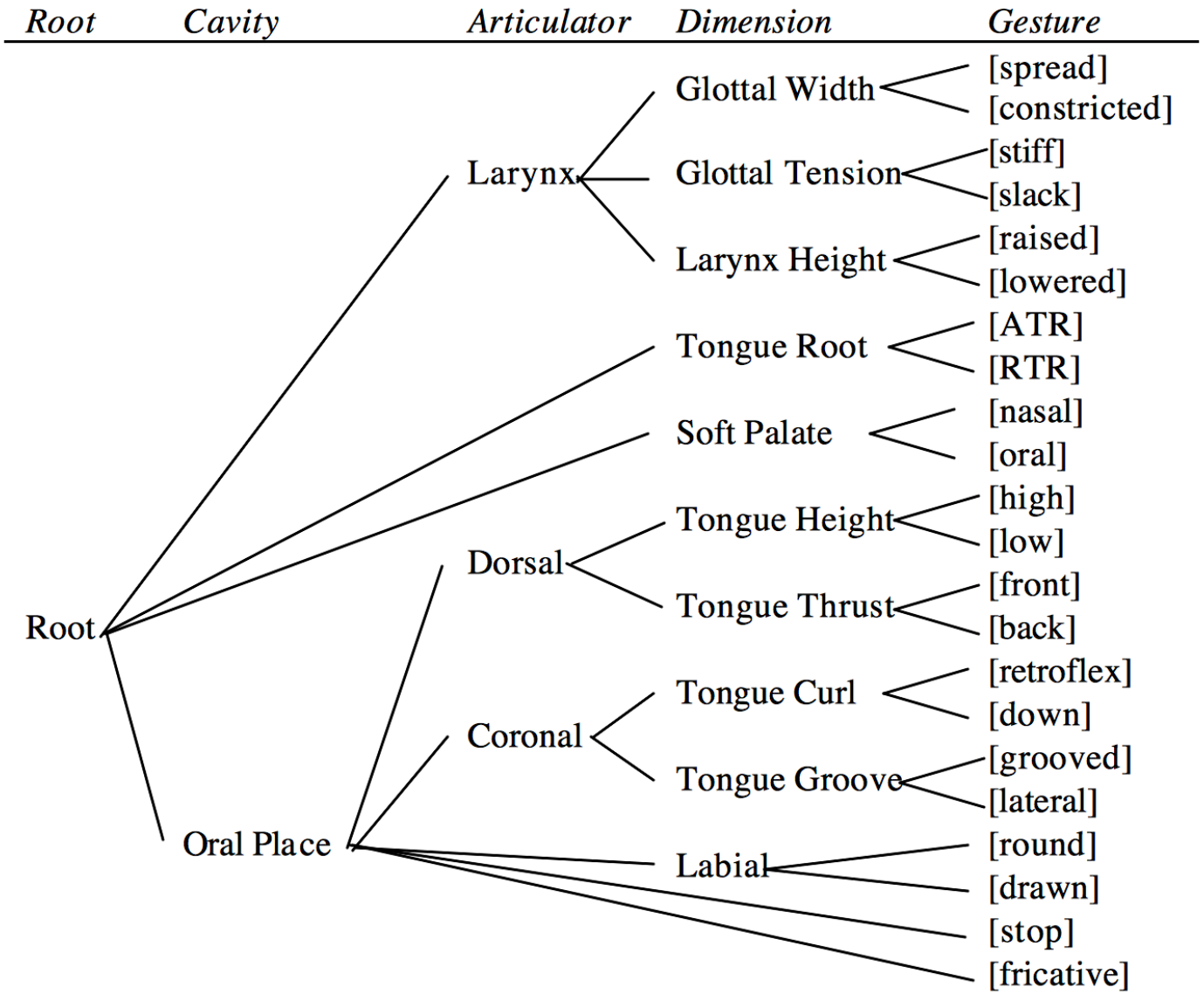
Are features universal?

- A second point of contention: Is the set of features universal, or are there language-specific feature sets?
- Chomsky / Halle: They are. Idea of ‘universal phonetics’.
- All humans are genetically pre-wired with the same set of features; the phonetic realisation of these features is also uniform.
- Observed mismatches (if predicted) thus have to be dealt with in the phonology.
- A number of theories of features have since endorsed this view.
- The view is explicitly motivated and defended in today’s paper (Hale, Kissock and Reiss 2006).

Universal features

- Idea supported by quite a few feature theories.
- Seen on Friday: Articulator Theory model of Feature Geometry and other work by Halle.
- Halle is explicit: models of feature organisation should model the vocal tract anatomy closely.
- The model probably taking this furthest: Dimension Theory (Avery & Idsardi 2001). At the terminal level, features are directly paired with antagonistic movements of one specific muscle.

Avery & Idsardi (2001)



Degrees of “universal”

1. There is one universal set of features with universal and precise phonetic correlates.
2. There is one universal set of features corresponding to major phonetic sets of properties, which allow for some fiddling.
3. UG provides a feature template linked to major articulatory dimensions. Languages are free to develop it further.
4. UG provides features and a template for hierarchical structure. How they map onto phonetics is language-specific and learned. No two languages or varieties have the same set of features, but they all have features.

- Which one is it? (Hint: I’ll go for 4.)

An alternative view

- Some ideas to be followed here:
- There is no deterministic mapping between features and phonetic properties.
- Features map on bundles of phonetic properties, however.
- This bundling is language-specific.
- Mismatches between phonetics and phonology can often be addressed by bringing in the contrastive function of features.
- Segments are underspecified for non-contrastive properties, and this allows for controlled phonetic variation.
- Features still have an interface function, though, but it's less direct.

The plan

- Monday: reviewing the case for universal features (Hale, Kissock & Reiss 2006, Hale & Reiss 2008).
- Tuesday: reviewing the phonetic evidence (Ladefoged 1980, Kingston & Diehl 1994).
- Wednesday: extending this to phonological alternations; looking at phonetics-phonology mismatches and feature mappings.
- Thursday: looking at phonetic and phonological variation and change with a case study from Southern England.
- Friday: reviewing the case for abstract features (Mielke 2008) with a case study from Evenki.

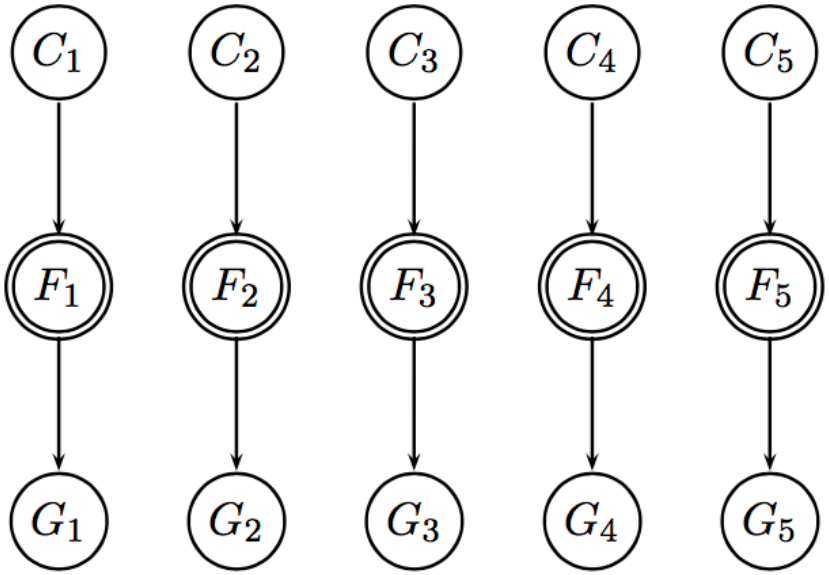
Hale, Kissock & Reiss (2006)

- Mark Hale, Madelyn Kissock, and Charles Reiss (2006). Microvariation, variation, and the features of universal grammar. *Lingua*.
- Supplemented with points from §2 of Hale & Reiss (2008): The subset principle in phonology.
- This lays out the most detailed theory of universal features I am aware of.
- We'll look at their ideas, with a first critical discussion.
- These ideas will form the background against which I will try ton develop a different theory, and against which we will evaluate other papers that we are reading.

The architecture of phonology

- Phonology: mapping from UR to SR. Here: features.
  = phonological computation
- A second type of mapping, between dissimilar representations.
  = transduction, required by strict modularity
- Phonology needs two sets of transducers, to articulation and from perception.
- Transducers are innate and invariant (no tweaking!).
- Therefore, features are universal. Their innateness also follows from learnability (see below …).
- “Only a change in features will produce any significant change in acoustic space” (6).

Features and transducers



every feature corresponds to exactly one acoustic cue and one articulatory gesture.

Some consequences

- Invariance means that there are almost no phonetic differences between languages (for those that do exist, wait …).
- Features and transducers are innate and can't be tampered with.
- By transitivity, there should also be a strict one-to-one mapping between articulatory gestures and acoustic cues. What do you think?
- Hale & Reiss in general: against 'substance abuse' in phonology (e.g. OT constraints that have a phonetic grounding of some sort).
- HKR claim that their features are 'substance-free' and purely symbolic, just happen to be transduced. Plus, two different types of transduction require substance-freedom.

Excursus: The Subset Principle

- In the other paper Hale & Reiss argue why a set of innate features is absolutely necessary, invoking the subset principle.
- Main points come from learnability and language acquisition.
- The set of innate features is large. Hale & Reiss argue against the view that children might build feature representations bit by bit, as proposed in the session on underspecification.
- A more detailed discussion of this paper: in Dave's class.
  Now: the basics, to understand their argument.

For innateness

- The primitives have to be innate because without them learning would be impossible — we would only pervceive noise.
- Hence, “UG consists of the elements of linguistic representation which cannot be derived from anything else.”
- We need a priori knowledge of categories. In phonology: features.
- “Children must ‘know’ ...the set of phonological features used in all the languages of the world.” Evidence: categorical perception at birth, lost between 6 and 10 months of age.
- Claim: Babies start out with highly specified representations and then remove what is redundant in their language.

The subset principle in learning

- Core point for Hale & Reiss: there is no negative evidence in language acquisition.
- If you start with few categories, what evidence would tell you that you need more? Everything is classifiable. Broad generalisations cannot be corrected.
- “Without access to a difference in representation, the phonetic difference between the two vowels cannot be evaluated.”
- Thus, children will start out overly fussy with super-specified representations.
- How will they ever reduce the number of distinct representations? Lexicon Optimisation.

Lexicon Optimisation

- Effect of super-precise representations in absence of contrasts: lots of synonyms.
- Example: only 3 vowels. /i/ could be realised as [i, ɪ, e …]
- Lexicon Optimisation removes gratuitous synonymy.
- If [pit, pɪt, pet] all mean the same, simplify the representation.
- There is no underspecification, only overspecification, which is curtailed by Lexicon Optimisation.
- Then why don't children talk overly precisely? Hale & Reiss: That's just performance. Infants still have to work on articulatory precision; their phonology actually is adult-like.

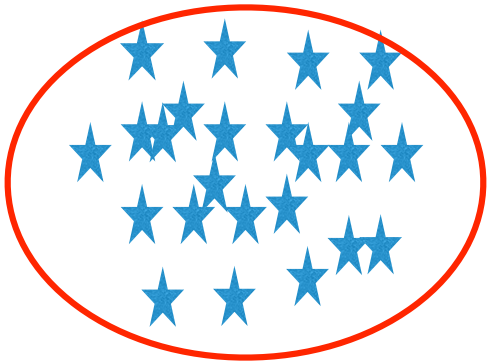
The importance of features

- Corollary / important initial assumption:
  All perceptual differences are based on features. Newborn babies start out with the full set of features that determines completely what linguistic differences in the speech signal they can perceive.
- Features are not learned!
- Alternative hypothesis: children start out with perceptual maps which are fine-tuned early, then are mapped onto features later.
- Rejected because
  - adds an additional level of representation: more complex
  - makes child language special (assumption: adults don't have these maps)
  - obviates need for phonology if we can store perceptual maps anyway.

Variation and microvariation

- Phonological variation: anything covered by phonology, that is, feature changes
- Microvariation: phonetic variation below this level.
- Although we will see that some instances of seeming microvariation are reanalysed as featurally driven.
- 4 types of microvariation of which the first 3 are uninteresting to the phonologist.

Type A



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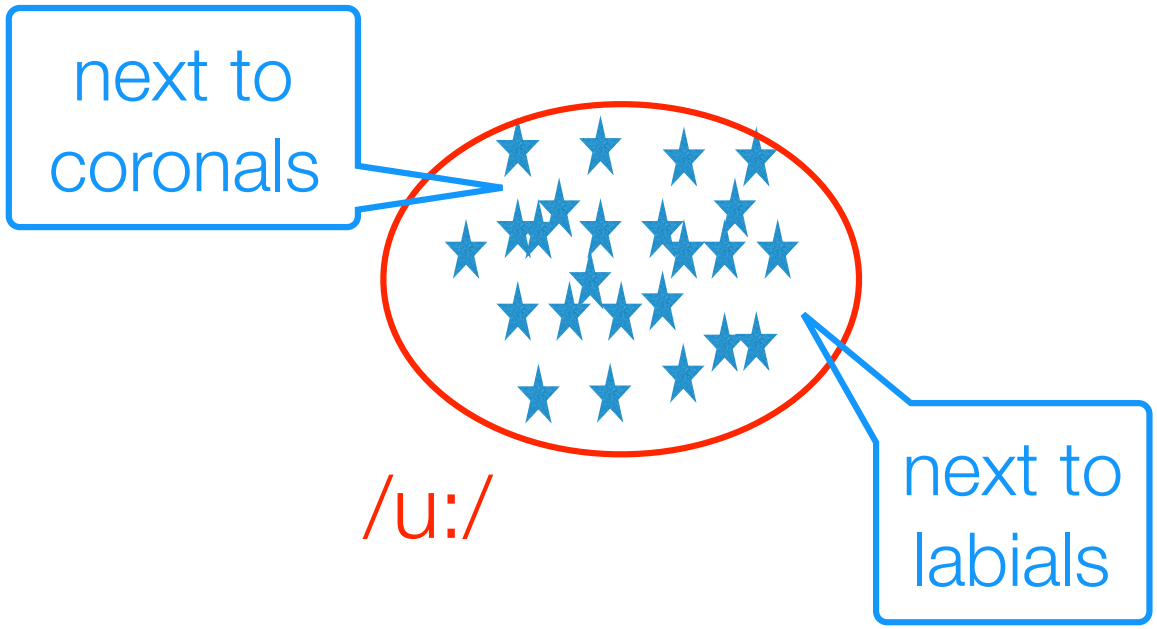
Random within-speaker variation

Type B

- Also random variation but between speakers. No two vocal tracts are alike.
- For example, women have a higher F0 because of a shorter vocal tract, resulting also in higher F1/F2 and a larger vowel space compared to men.
- Question: Are transducers really invariant? The acoustic transducers need to ‘normalise’ the incoming signal to map it onto a feature.
- Strand (1999): some male /s/ sound like female /ʃ/. Same acoustic signal classified differently depending on whether listeners think the speaker is male or female.
- Do we (or HKR) have a problem here?

Type C



Contextual within-speaker variation

Type D

- Type A-C are uninteresting as they involve automatic properties of transduction. D is linguistically relevant and has 3 flavours.
- D1: phonetic underspecification causing variation
- D2: non-equivalent phonetic spaces.
  - For example, smaller phonetic spaces if more contrasts
  - For example, ‘same’ vowel has somewhat different phonetics
- D3: non-equivalent phonetic spaces (size-wise) without a difference in contrast

Phonetic underspecification

- Covered last week: Surface variation of a segment that lacks an articulatory target on some dimension(s)
- Examples: backness variation in Russian /x/ (Keating 1988) or lack of oral features for /h/
- Striking example of Marshallese: 4 vowel contrasts (differentiated by height) — backness/rounding fuily predictable from flanking consonants which can be labialised, palatalised or velarised.
- Gradience of phenomenon shows that this is phonetic.
- Transducers lack target for segment, interpolate between flanking segments.

Marshallese vowels

Non-equivalent vowel spaces

- e.g. 7-vowel systems typically have more precise targets than 3-vowel systems
- HKR: follows from underspecification via Lexicon Optimisation. 3-vowel systems may be unspecified for features needed for 7-vowel system, can induce variation.
- Phonologically same but phonetically somewhat different?
  - HKR mention Danish vs. Japanese /e/, which may, however, not be different at all.
  - Anyway, any difference in actual vowel targets should be down to different feature specs (you can't fiddle with the transducers!).
  - For an example, let's look at Danish vs English. 4-way contrast /i e ɛ æ/

Danish vs English

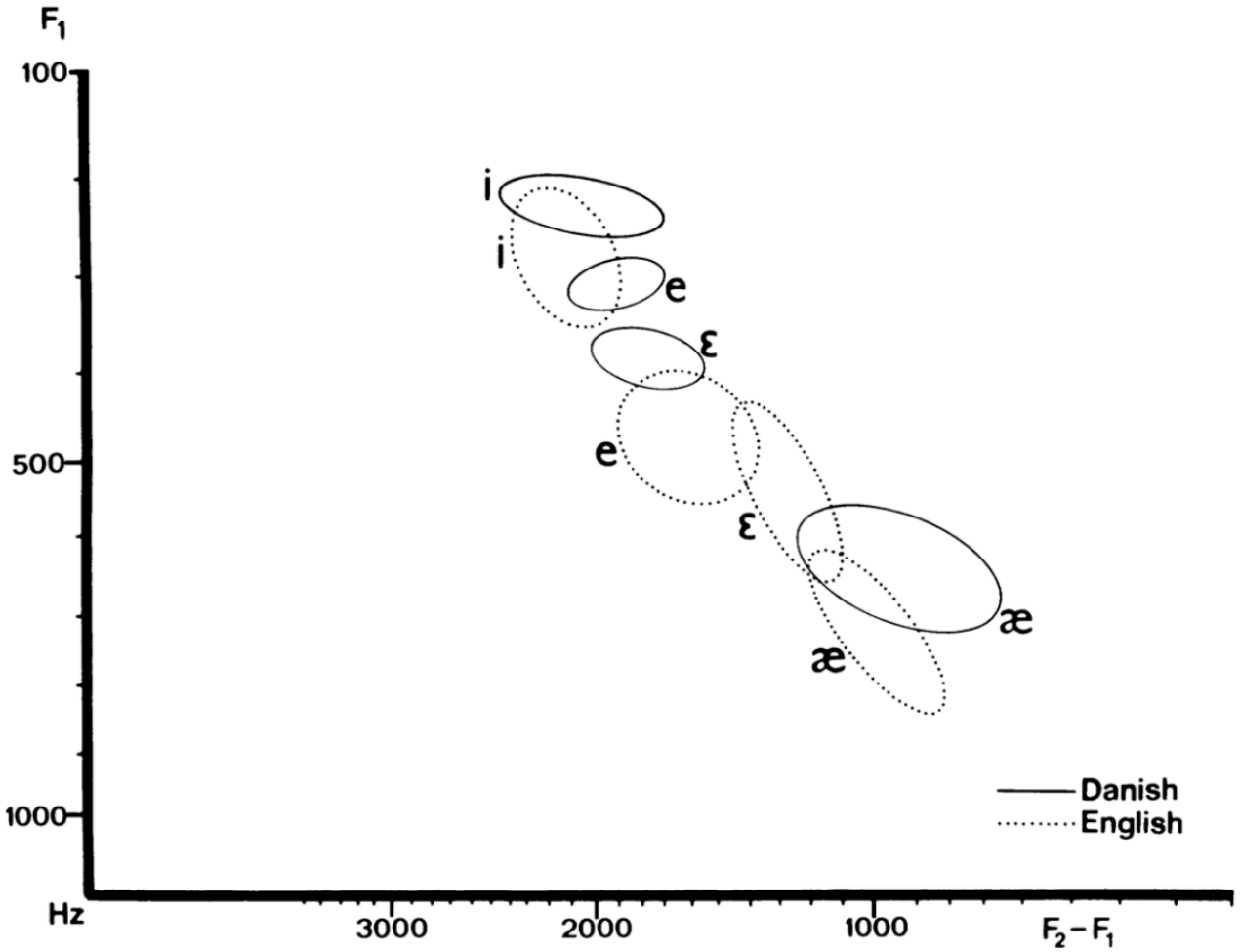


FIGURE 8.

Same inventory, different spaces

- Cases where the vowel space is not filled.
- e.g. Amis: Only 3 vowels but precise articulation as [i u a], none of the variation observed e.g. in Arabic.
- Again, this is down to feature specs. Amis never underspecifies but keeps overspecified vowels.
- Children grow up with highly specified inputs, never need to optimise their lexicon by removing synonyms.

Against a learning account

- Can feature mappings be learned? HKR argue against the view held by Kingston & Diehl (1994) that mappings only seem automatic because they are “thoroughly overlearned”. Their points:
  - If there is no innate connection between feature and transducer, how does a learner know what feature to choose? Different learners = different pairings. [Is this a problem???]
  - We would need an infinite number of features to learn anything because any phonetic difference might map onto some feature. [This assumes that of course features are perceptual primitives.]
  - Why could there be categorical perception? How could small differences ever be classified as the same?
- We’ll read Kingston & Diehl tomorrow.

Evidence from acquisition

- Infants are born with categorical perception. Ability to discriminate non-native contrasts is lost by the age of 10-12 months.
- HKR see this as evidence of features and underspecification (via lexicon optimisation) at work.
  - [Comment: Hang on. These kids don't have a lexicon yet. Loss of discriminatory abilities is completed before the first word is learned.]
- Conversely there is evidence from L2 acquisition: Learners can acquire new phoneme contrasts. Means the features are still there and can be reactivated.
  - [Comment: This seems to be a bit more complex. For example, some L2 sounds may initially not be parsed as speech sounds at all. We might get back to that.]

It’s all in the features

- Every phonetically observable difference between two languages must be phonological, i.e in the features, because of transducer invariance. True of space size as well as position of a segment.
- Learning doesn’t involve the creation of categories like features.
- Instead, representations are built based on the featural input that comes deterministically from the acoustic transducer.
- A consequence: the contrastive function of features is gone. According to HKR, the notion of contrast is structuralist in nature anyway and thus a no-no for any true generative linguist.

Some questions

- Is it really the case that all phonetic variation is random and uncontrolled, that any controlled variation must be in the phonology? Or can we fiddle with the transducers?
  - For a dissenting view, see Kingston & Diehl (1994) — tomorrow
- Is there a one-to-one mapping between articulatory gestures and features — and between articulatory gestures and phonetic cues?
  - For some complications, see e.g. Ladefoged (1980) — tomorrow.
- How does acquisition work? Are all possible distinctions innate, are features the representational primitives we need?
- Is it true of acquisition in general that children start out with overspecified representations, e.g. in morphology?

A programme (recap)

- We need to look at how deterministic the relationship between features and phonetic properties is (tomorrow).
- We need to look at some language data to see how this plays out in grammars. Idea: features and phonetic properties are not in one-to-one but many-to-many relationships (Wednesday).
- There is quite a bit of controlled phonetic variation, and we can distinguish between phonetic and phonological variation. Sociophonetic studies are a good playground for this (Thursday).
- Should we go the extra mile and ban all reference to phonetics from features (Mielke)? Some thoughts why we shouldn't (Friday.)