# Functions and categories in natural human language: A generative perspective

Elizabeth Cowper (University of Toronto) & Daniel Currie Hall (Saint Mary's University)

## 1. Universal Grammar

Generative linguistics begins with the observation that there is something in the human mind that makes it possible for us to acquire language (Chomsky 1955). Generative linguists refer to this biological endowment as **Universal Grammar** (UG).

Universal Grammar is…

- species-specific
- present in all more-or-less cognitively normal human beings
- reflected in structural similarities among natural languages

The observation raises some obvious and fruitful research questions:

- What is the content of UG, and how does it constrain the range of possible languages?
- What is the process by which a child combines UG and experience to acquire the grammar of a specific language?
- What linguistic universals should be attributed to UG, and which ones follow from other known properties of human perception, cognition, and anatomy?

### 1.1 What people have thought UG might be

Proposals as to the nature and structure of UG have changed considerably in their details over the years, though the main thrust has always been the same: to provide an account of Plato's problem: How does the learner get from the input to an adult grammar? (Chomsky 1988; see also Dresher 2003).

**The Universal Base Hypothesis (1960s):** Posited that the base component of the grammar, which generates deep structures, is universal, and that all variation arises from transformational rules.

This was shown to be vacuous (Peters & Ritchie 1969): the transformational component was powerful enough to derive *any* set of surface structures from *any* set of deep structures.

**Relational Grammar laws (1970s):** Focused on relations rather than constituent structure; attempted to capture cross-linguistic generalizations about kinds of alternations.

**X-bar theory (1980s):** Posited a single abstract structural schema for phrases of all categories, eliminating phrase structure rules in favour of projecting relations from lexical entries.

**Principles and parameters**: Originally saw UG as an underspecified grammar—some pieces are invariant (principles); others have two or more possible settings (parameters) that must be identified by the learner (left-headed or right-headed phrases, null subjects allowed or not, nominative–accusative or ergative–absolutive, etc.).

This was a descriptively promising approach, but the large number of parameters that ended up being posited make it evolutionarily implausible in this form.

**The Minimalist Program (1990s–)**: Shifts the focus to ask how *little* UG can possibly include. What are the inherent properties of language that cannot be derived from more general cognitive properties or other factors?

This approach is motivated in part by evidence that language emerged in a single evolutionary event, rather than through a series of incremental changes (Hauser et al. 2002), and that UG is therefore probably not richly detailed. It is also, of course, methodologically motivated: start with the minimal hypothesis, add complexity only as needed.

## 1.2 Looking for the minimum

So, what must a grammar have, minimally?

- **functions** – operations that build (and transform?) structure
- **categories** – types of primitive elements from which structure is built

Much work in the Minimalist Program has focused on operations, particularly the idea that there is a single structure-building operation **Merge** that combines two (simple or complex) objects into one (complex) object. Current work by many asks whether other operations must also be posited (Select, Agree, Copy, Move).

If there is no cross-linguistic variation in operations (unlike the diverse range of transformations proposed in the 1960s), then all variation must be in the elements operated on. Thus Borer's (1984) conjecture (adopted by Chomsky 1995 and Baker 2008) that 'parametric' variation arises from differences in formal features of elements of the functional lexicon.

We distinguish between the Encyclopedia and the Functional Lexicon (Marantz 1996, 1997).

- Encyclopedia: the inventory of meaningful roots in a language, which are characterized by Saussurean arbitrariness. E.g., $\sqrt{\text{DOG}}$, which belongs to the Encyclopedia of English, vs. $\sqrt{\text{CHIEN}}$, which belongs to the Encyclopedia of French.
- Functional Lexicon: the inventory of grammatically relevant elements in a language. E.g., PLURAL, PAST, DEFINITE. These are typically characterized as consisting of formal features with cross-linguistically similar or identical meaning. Differences in these features, and in the combinations in which they occur, have syntactic consequences—they may select and be selected for, etc.

On the phonological side, a similar distinction can be made between the arbitrary differences in the forms of lexical items (e.g., /dɑg/ vs. /ʃjɛ̃/) and systematic differences in the combinations of features that can occur (e.g., having nasalized vowels or not).

Our ideas about formal features have their origins in research that predates the generative framework: Saussure, the Prague Linguistic Circle, the Russian formalists.

Specifically, we assume (with just about everyone working on features), that features define categories by marking contrasts.

An early statement of this assumption:

> "Dans la langue, il n'y a que des différences" (Saussure 1916: 166).

Upshot: Grammatical **categories** are determined by the formal features of the elements of the functional lexicon. These formal features encode systematic **contrasts** relevant to the grammar of the language.

**Our question for today**: Fine, but where do the features themselves come from?

## 2. Does Universal Grammar mean universal features?

Does Universal Grammar provide the formal features that languages use? In other words, are human beings biologically endowed with the formal features themselves?

### 2.1 The strongest possible hypothesis

The strongest version of this hypothesis is that UG provides a single set of features, that are active in all languages. This would mean that the learner does not have to acquire features at all.

If this is correct, then we expect complete cross-linguistic consistency in grammatically relevant formal features, and in their interpretation. All languages should make the same grammatical distinctions, and mark them in essentially the same way (subject only to differences in pronunciation). Do they?

**No**. This prediction is demonstrably too strong.

#### In morphosyntax:

- Number systems (Corbett 2000) - anywhere from no number contrasts (Kawi) to 4 or even 5 distinct numbers (Lihir).

(1) Kawi (Javanese; Indonesia) pronoun paradigm (Becker & Oka 1974: 232)

| | CLOSE | DISTANT |
|---|---|---|
| SPEAKER | *aku* | *kami* |
| HEARER | *ka(N)u* | *kita* |
| OTHER | *ia* | *sira* |

Becker & Oka (1974: 232) write:

> In examining this paradigm in detail, one familiar with other Austronesian languages is struck by the fact that there are no plural pronouns. (There are also no grammatically plural nouns.)

(2) Lihir (Oceanic; PNG) pronoun paradigm (Corbett 2000: 25)

| | SINGULAR | DUAL | TRIAL | PAUCAL | PLURAL |
|---|---|---|---|---|---|
| 1ST EXCL. | *yo* | *gel* | *getol* | *gehet* | *ge* |
| 1ST INCL. | — | *kito* | *kitol* | *kitahet* | *giet* |
| 2ND | *wa* | *gol* | *gotol* | *gohet* | *go* |
| 3RD | *e* | *dul* | *dietol* | *diehet* | *die* |

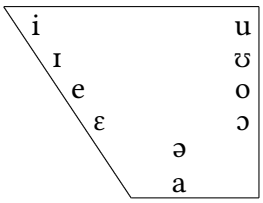
- In English, the modal auxiliaries used to be ordinary verbs, but became part of the inflectional system in late Middle English (Closs 1965; Lightfoot 1979; etc.). Cowper & Hall (2013) argue that this involved the addition of a feature [Modality] to the grammar of English that hadn't been present at the earlier stage.
- Infl systems (Ritter & Wiltschko 2009) can be based on temporal (English), locational (Halkomelem), or personal features (Blackfoot).
- Determiner/classifier systems differ significantly among languages (Ghomeshi et al. 2009).

**In phonology:**

- Signed vs. spoken languages. Either different modalities use different features (see, e.g., Sandler (1989) for signed language feature geometries), or else the content of features must be either widely variable or extremely abstract (Mielke 2008: §1.5.1).
- Even within the same modality, inventories differ. We might still say that features are universal, but universally active? Some features that are necessary for large inventories have no obvious specifications on segments in smaller inventories.

  For example, Standard Arabic distinguishes three phonemic vowel qualities /i a u/, with phonetic realizations varying as in Figure 1. Should we be forced to specify these vowels for all the features required by the vowel inventory of Degema (Edoid; Nigeria)?

(3) Phonemic vowel inventory of Degema (Pulleyblank 2011: 493)



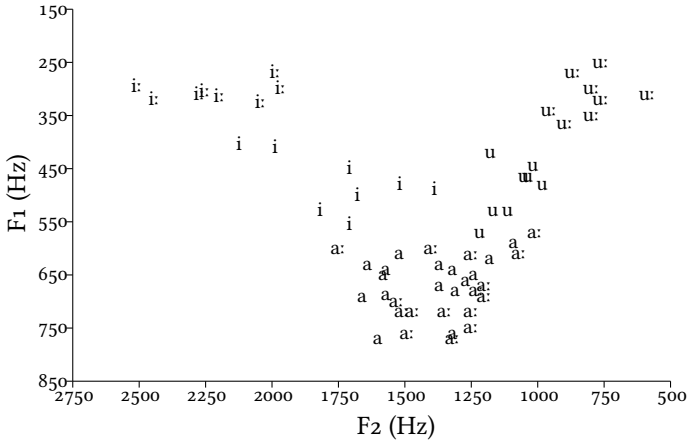



Figure 1: Variation in Standard Arabic vowels (Hall 2011: 22; data from Abou Haidar 1994)

## 2.2 A weaker version

Does Universal Grammar provide a set of features from which each language chooses a subset? This is similar to the position taken by Chomsky (2000).

If this is true, then we expect to find that languages can differ in how many grammatical distinctions they make, and which ones. But since all languages choose from the same set of features, we predict that if two languages make a given distinction, they should formalize it in the same way.

**This is either still too strong, or else so weak as to be vacuous:**

#### In morphosyntax:

- Richly articulated tense systems that distinguish degrees of temporal proximity don't show a consistent set of categories. For example, Comrie (1985: 98–99) describes Yandruwandha (Dieric; South Australia) and Araona (Tacana; Bolivia) as each having five distinct past tenses, but with different contrasts:

(4) Yandruwandha past tenses

| | | |
|---|---|---|
| a. | *-na* | 'very recent past' |
| b. | *-n̪ana* | 'within the last two days' |
| c. | *-n̪ukarra* | 'within the last few days' |
| d. | *-nga* | 'weeks or months ago' |
| e. | *-lapurra* | 'distant past' |

(5) Araona past tenses

| | | |
|---|---|---|
| a. | *-iqui* | 'same day' |
| b. | *-a* | 'one day to several weeks ago' |
| c. | *-asha* | 'several weeks or years ago' |
| d. | *-ana* | 'distant past' |
| e. | *-isa* | 'remote past' |

If UG contains all the features needed to mark all the tense contrasts attested in the world's languages, then it contains enough tense features to create a much more complex tense system than has ever been attested in any single language.

- Many languages have gender or noun class systems. Such classes often have some semantic basis (e.g., natural gender, animacy, culturally significant categories), but they can also be

arbitrary. Even so, they must be encoded in formal features to the extent that they are reflected in syntactic agreement.

| Class | Meanings |
|---|---|
| 1/2 | humans, other animates |
| 1a/2a | kinship terms, proper names |
| 3/4 | trees, plants, non-paired body parts, other inanimates |
| 5/6 | fruits, paired body parts, natural phenomena |
| 6 | liquid masses |
| 7/8 | manner |
| 9/10 | animals, inanimates |
| 11 | long thin objects, abstract nouns |
| 12/13 | diminutives |
| 14 | abstract nouns, mass nouns |
| 15 | infinitive |
| 16, 17, 18 | locatives (near, remote, inside) |
| 19 | diminutive |
| 20/22 | augmentative (diminutive) |
| 21 | augmentative pejorative |

Table 1: Proto-Bantu noun classes (Demuth 2000: 275)

**In phonology:**

- All vowel systems have height contrasts. But they have different numbers of contrasts, and the borders between heights are not always in the same place in the acoustic or articulatory space.

  As shown above, Standard Arabic has two distinct vowel heights, high and low. Degema has either three heights (cross-classifying with ATR/RTR) or six. What counts as 'high' in Arabic might be high or mid in Degema; what counts as 'low' in Arabic could be low or mid in Degema.

- The feature [continuant] appears in many proposals for a universal set of phonological features (e.g., Jakobson et al. [1951] 1969; Chomsky & Halle 1968; Clements & Hume 1995; Halle et al. 2000).

  Stops and affricates are [−continuant]; fricatives, glides, etc., are [+continuant]. But Mielke (2005; 2008: ch. 4) notes that nasals and laterals are 'ambivalent' as to continuancy, each sometimes patterning with [+continuant] segments and sometimes with [−continuant] segments.

  If all features are provided by UG, then we might have to say that there are multiple continuancy features, with suspiciously similar content, but with different cut-off points between the + and − values:

(6)

| | continuous central oral airflow | continuous oral airflow | continuous airflow |
|---|---|---|---|
| /d/ | − | − | − |
| /n/ | − | − | + |
| /l/ | − | + | + |
| /z/ | + | + | + |

At this point, the task of the learner in *selecting* features from a putative universal set doesn't look substantially easier than the task of *educing* features not given by UG. If universal features don't help us solve Plato's problem, there's no reason to posit them—especially if the number and granularity of the features are evolutionarily implausible.

So, what's universal about formal features? Exactly what, if anything, does Universal Grammar contribute?

We propose that UG determines, not the content of the formal features, but rather their structural properties; i.e., the way they function to encode systematic **contrasts** that the grammar pays attention to.

## 3. How do learners acquire formal features?

If formal features are not themselves biologically determined, the language learner must figure out what they are and how they work, based on whatever UG provides, the linguistic input they are exposed to, and any other relevant cognitive capacities.

How does the learner do this? What innate tools are they working with? And are any of these tools specific to language?

- "Features are not innate, but the ability to make generalisations over data and posit categories is" (Blaho 2008: 40).
- We hypothesize that learners are innately predisposed to look for contrast in the linguistic input (Trubetzkoy 1939, Jakobson 1949, Dresher 2009, among many others).
- We know that non-human (as well as human) animals have the capacity to assign categorial boundaries to perceptual phenomena (Kuhl 1987), so the categorization of sounds can't be an ability particular to human language.
- It has been argued (Goldstone et al. 1996) that categorical perception does not, in fact, require the postulation of an innate set of categories, as was originally suggested by Eimas et al. (1971); Eimas (1975).
- But there's more to the acquisition of linguistic contrast than categorical perception. The categorization of phenomena on one level has to be correlated with a categorization on another level.

- If learners already know how to categorize perceived phenomena, and if they are innately predisposed to correlate these categorizations so as to form linguistic contrasts, then why do they need a (very large) *a priori* set of possible contrasts to choose from? Why not simply make use of the tools they already have, and identify the features in whatever way makes sense?

- Blaho (2008), Mielke (2008), and Samuels (2011), among others, present arguments for acquired/emergent features. Hale & Reiss (2003: 225) claim that features must be innate, on the grounds that "ya gotta start with something!"; see Hall (2010) and Dresher (2014) for rebuttals. See also references in Hall & Mielke (2011) for further discussion.

- Finding contrast means identifying which of the many differences in the surface forms of utterances have grammatically relevant **correlates**.

Correlations? Between what and what?

- Sometimes, between a substantive phonetic or semantic property and a grammatical one:

  The presence or absence of vocal fold vibration signals the difference between one word and another: [faɪn] vs. [vaɪn]. Or, nominals with plural referents trigger a particular form of agreement on the verb: *The sheep is white* vs. *The sheep are white.*

- But not always. It is the correlation, rather than the substance, that is crucial. Sometimes the correlation is between a phonological pattern and a lexical distinction.

  – A learner acquiring Nupe must discover that, among the phones realized as [a], there is one that triggers palatalization of a preceding consonant, one that triggers labialization, and one that triggers neither (Hyman 1970). So, different phonological behaviours can mark lexical differences just as different phonetic forms can.

  (7)

  | PALATALIZING | | | LABIALIZING | |
  |---|---|---|---|---|
  | [ēgʲī] | 'child' | | [ēgʷw̃ū] | 'mud' |
  | [ēgʲē] | 'beer' | | [ēgʷó] | 'grass' |
  | [ēgʲà] | 'blood' | [ēgā] 'stranger' | [ēgʷā] | 'hand' |

  Hyman (1970) argues for an analysis with three contrasting underlying low vowel phonemes /ɛ a ɔ/, all of which surface as [a].[1]

  – Likewise, a learner acquiring Northern Alaskan Iñupiaq must discover that there is a 'strong' [i] that palatalizes following consonants, as in (8b) and a 'weak' [i] that does not, as in (8c) (Kaplan 1981; Compton & Dresher 2011).

  (8)

  | | | | | |
  |---|---|---|---|---|
  | a. | [iɣlu] | 'house' | [iɣlu-lu] | 'and a house' |
  | b. | [iki] | 'wound' | [iki-ʎu] | 'and a wound' |
  | c. | [ini] | 'place' | [ini-lu] | 'and a place' |

1. The alternatives would be positing underlying sequences that don't follow the usual phonotactics of the language, or positing whole contrasting series of palatalized and labialized consonants that neutralize everywhere except before /a/. See also Harms (1973) and Hyman (1973) for further discussion.

– Similarly, a learner acquiring French must learn that nouns belong to classes that have no clear and consistent semantic properties, but which determine the forms of determiners and adjectives in construction with them.

(9) Grammatical gender in French

| | | | | | |
|---|---|---|---|---|---|
| a. | *un homme* | 'a man' | e. | *une femme* | 'a woman' |
| b. | *le lit* | 'the bed' | f. | *la table* | 'the table' |
| c. | *le violon* | 'the violin' | g. | *la contrebasse* | 'the double bass' |
| d. | *le vocabulaire* | 'the vocabulary' | h. | *la syntaxe* | 'the syntax' |

**Interim Conclusion**:

- Features are the grammatical manifestation of systematic contrasts.
- Systematic contrasts are identified by the language learner based on correlated patterns.

## 4. A proposal and some new questions

REDUCTIŌ AD DISCRĪMEN (Cowper & Hall 2014b): *The ability to search for systematic contrast in the linguistic input, by correlating differences at various levels, is the only mechanism required to account for the abstract building blocks that make up those mental structures: the formal features of grammatical systems.*

- What formal similarities can we observe in feature systems, and what do they tell us about the UG mechanism that constructs them?
- If the features themselves are not supplied by UG, why is their substantive content so similar from one language to another?

### 4.1 Formal properties of feature systems

- **Binarity**: Most proposed feature systems make binary distinctions—using either equipollent features, with + and − values both active, or privative ones, with one marked value and one unmarked one (Trubetzkoy 1939). Though there have been proposals for multivalent features (e.g., Lindau 1978 suggests values of 0 to 4 for [high] and −1 to 1 for [expanded]), binary features have generally prevailed even in accounting for multiple contrasts along a single phonetic or semantic dimension.

  If features are universally binary (equipollent or privative), this could be due to UG or more general properties of human cognition.

- **Contrastive hierarchies**: Dresher (2009), making explicit an idea that has been implicitly adopted throughout much of the history of phonology, proposes that phonological features are assigned by successively dividing the phonemic inventory. A feature is assigned only if it serves to mark some contrast that has not already been represented; features with narrower scope in the contrastive hierarchy will be unspecified if higher features make them redundant.

(10) Successive Division Algorithm (Dresher 2009: 16)

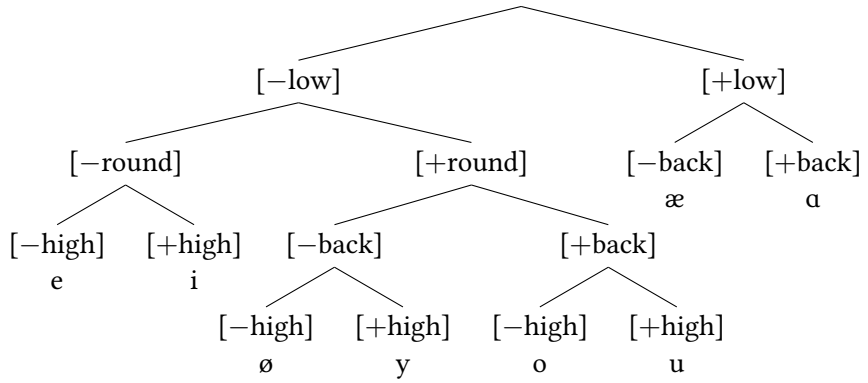
a. Begin with *no* feature specifications: assume all sounds are allophones of a single undifferentiated phoneme.

b. If the set is found to consist of more than one contrasting member, select a feature and divide the set into as many subsets as the feature allows for.

c. Repeat step (b) in each subset: keep dividing up the inventory into sets, applying successive features in turn, until every set has only one member.

For example, (11) shows a hierarchical assignment of features to Finnish vowels. Because /e/ and /i/ are already distinguished from all the back vowels by being specified as [−low, −round], the feature [−back] is not assigned to them—and so they do not participate in backness harmony (Jakobson et al. [1951] 1969: 41).

(11) Contrastive hierarchy for Finnish vowels (expanded from Hall 2011: 15)
[±low] ≫ [±round] ≫ [±back] ≫ [±high]:




The same kinds of scope relations can be observed in morphosyntactic feature systems, where they have more commonly been accounted for using feature geometries (Bonet 1991; Harley 1994; Harley & Ritter 2002a,b; Cowper 2005; Cowper & Hall 2009, 2012; etc.).

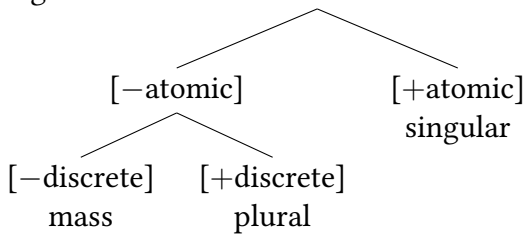
For example, consider the grammatical number systems of English and Mandarin (Cowper & Hall 2014a). In English, mass nominals sometimes pattern with plurals and sometimes with singulars, as shown in (12):

(12)

| SINGULAR | MASS | PLURAL |
|---|---|---|
| *a book* | (*sǒme*) *tea* | (*sǒme*) *books* |
| *this book* | *this tea* | *these books* |

Two features for number: [±atomic] and [±discrete]. In English, [±atomic] takes scope over [±discrete], and [±discrete] is contrastive only in the [−atomic] domain (anything that is atomic is necessarily discrete).

(13) English number contrasts




- Singular-only morphology (*a* or *an*) spells out [+atomic]; mass and plural nominals get [−atomic] morphology.
- Plural-only morphology (*-s, these/those,* plural agreement on verbs) spells out [+discrete]; mass and singular nominals get default singular morphology.

Languages that use the same features may assign them different contrastive scope. For example, Mandarin has different classifiers for mass and count nouns, but does not obligatorily mark plurality (Cheng & Sybesma 1998, 1999, 2005):[2]

(14) Number marking in Mandarin

a. Bare count nouns are unspecified for plurality:
*Hufei mai shu qu le.*
Hufei buy book go PARTICLE
'Hufei went to buy a book/books.'

b. Bare mass nouns are mass:
*Hufei he-wan-le tang.*
Hufei drink-finished-PRF soup
'Hufei finished the soup.'

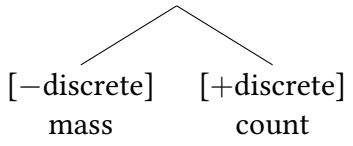
c. Count nouns require classifiers with numerals:
*san ben shu*
three $\text{CLF}_{\text{VOLUME}}$ book
'three books' (**shan shu*)

d. Mass nouns use a different set of classifiers:
*san wan tang*
three $\text{CLF}_{\text{BOWL}}$ soup
'three bowls of soup' (**san tang*)

So Mandarin groups singulars and plurals together as [+discrete], and doesn't use [±atomic] at all:

2. See Cowper & Hall (2014a: 78–79) for discussion of the optional plural marker *-men* in Mandarin.

(15) Mandarin number contrasts




So perhaps UG provides a generalized version of (10) as the method for acquiring features and building representations that combine them, both in phonology and in morphosyntax.

## 4.2 Substantive properties of feature systems

If features are not universal, why do the same features keep showing up in different languages?

Grammars must generate representations that are intelligible to the other systems with which they have interfaces (Chomsky 1995, 2005). In particular, semantic content must be interpretable by the conceptual–intentional system, and phonetic content by the articulatory–perceptual system.

#### Conceptual–Intentional interface requirements

- Illocutionary force is an essential part of the interpretation of propositions.
  Clause typing (Cheng 1991)
  → Features of the C system

- Propositions must be deictically anchored in order to be evaluated.
  Anchoring by person, location, or time (Ritter & Wiltschko 2009)
  Anchoring of moments or intervals (Cowper 2005)
  → Features of the Infl system

- Internal structure of events:
  Inner aspectual structure (Clarke 2013)
  Participants and roles: argument-introducing heads (Kratzer 1996; Pylkkänen 2008)
  → Features of the *v* system

- Predicates must take arguments of the appropriate semantic type:
  Internal structure of nominals (Ghomeshi et al. 2009)
  → Features of the D system; also D-like features of the C system

- Argument-predicate relations must be recoverable:
  Head-marking and Dependent-marking of agreement (Nichols 1986)
  → ($\varphi$)-marking of predicates, Case-marking of arguments

#### Articulatory-Perceptual interface requirements

- Properties of the human vocal tract and auditory system determine range of articulatory/acoustic properties that can ground phonological features of oral languages. (See in particular

Keyser & Stevens (2006) and Stevens & Keyser (2010) on phonetic discontinuities that correspond to phonological features.)

- Analogously for signed languages, properties of the human upper-body anatomy and the human visual system determine range of physical movements/positions that can ground phonological features of signed languages.
- The mechanisms by which contrast and correlations are identified may limit the possibility (or at least likelihood) of 'crazy' features *à la* Fudge (1967) or Mielke (2008).

## 5. Conclusions

- Grammars are complex; Universal Grammar, much less so.
- Diversity resides in lexical items, unity in the means by which they are acquired and combined.
- Simple mechanisms such as Merge produce complex syntactic structures through recursive application.
- Likewise, the recursive identification, correlation, and marking of contrasts produces complex paradigmatic systems of features.

## References

Abou Haidar, Laura. 1994. Norme linguistique et variabilité dialectale: Analyse formantique du système vocalique de la langue arabe. *Revue de Phonétique Appliquée* 110. 1–15.

Baker, Mark. 2008. *The syntax of agreement and concord*. Cambridge: Cambridge University Press.

Becker, A. L. & I Gusti Ngurah Oka. 1974. Person in Kawi: Exploration of an elementary semantic distinction. *Oceanic Linguistics* 13(1/2). 229–255.

Blaho, Sylvia. 2008. *The syntax of phonology: A radically substance-free approach*. Ph.D. thesis, Universitetet i Tromsø.

Bonet, Eulàlia. 1991. *Morphology after syntax: Pronominal clitics in Romance*. Ph.D. thesis, Massachusetts Institute of Technology.

Borer, Hagit. 1984. *Parametric syntax: Case studies in Semitic and Romance languages*, Studies in Generative Grammar. Dordrecht: Foris Publications.

Cheng, Lisa Lai-Shen. 1991. *On the typology of Wh-questions*. Ph.D. thesis, Massachusetts Institute of Technology, Cambridge, MA.

Cheng, Lisa Lai-Shen & Rint Sybesma. 1998. *yi-wan tang, yi-ge Tang*: Classifiers and massifiers. *Tsing-Hua Journal of Chinese Studies* 28(3). 385–412.

Cheng, Lisa Lai-Shen & Rint Sybesma. 1999. Bare and not-so-bare nouns and the structure of NP. *Linguistic Inquiry* 30(4). 509–542.

Cheng, Lisa Lai-Shen & Rint Sybesma. 2005. Classifiers in four varieties of Chinese. In Guglielmo Cinque & Richard S. Kayne (eds.), *Handbook of comparative syntax*, 259–292. Oxford: Oxford University Press.

Chomsky, Noam. 1955. *The logical structure of linguistic theory.* Ph.D. thesis, University of Pennsylvania.

Chomsky, Noam. 1988. *Language and problems of knowledge: The Managua lectures.* Cambridge, MA: MIT Press.

Chomsky, Noam. 1995. *The minimalist program.* Cambridge, MA: MIT Press.

Chomsky, Noam. 2000. Minimalist inquiries: The framework. In Roger Martin, David Michaels & Juan Uriagereka (eds.), *Step by step*, 89–155. Cambridge, MA: MIT Press.

Chomsky, Noam. 2005. Three factors in language design. *Linguistic Inquiry* 36(1). 1–22.

Chomsky, Noam & Morris Halle. 1968. *The sound pattern of English.* New York: Harper and Row.

Clarke, Sarah. 2013. *Aspectual scope and contrast in English and Japanese.* Ph.D. thesis, University of Toronto.

Clements, G. N. & Elizabeth Hume. 1995. The internal organization of speech sounds. In John Goldsmith (ed.), *The handbook of phonological theory*, 245–306. Oxford: Blackwell.

Closs, Elizabeth. 1965. Diachronic syntax and generative grammar. *Language* 41(3). 402–415.

Compton, Richard & B. Elan Dresher. 2011. Palatalization and "strong *i*" across Inuit dialects. *Canadian Journal of Linguistics* 56(2). 203–228.

Comrie, Bernard. 1985. *Tense.* Cambridge: Cambridge University Press.

Corbett, Greville G. 2000. *Number.* Cambridge: Cambridge University Press.

Cowper, Elizabeth. 2005. The geometry of interpretable features: Infl in English and Spanish. *Language* 81(1). 10–46.

Cowper, Elizabeth & Daniel Currie Hall. 2009. Argumenthood, pronouns, and nominal feature geometry. In Jila Ghomeshi, Ileana Paul & Martina Wiltschko (eds.), *Determiners: Universals and variation*, 97–120. Amsterdam: John Benjamins.

Cowper, Elizabeth & Daniel Currie Hall. 2012. Aspects of individuation. In Diane Massam (ed.), *Count and mass across languages*, 27–53. Oxford: Oxford University Press.

Cowper, Elizabeth & Daniel Currie Hall. 2013. A neoparametric approach to variation and change in English modals. Presented at GLOW 36, Lund University, April 2013. To appear in *Linguistic Variation.*

Cowper, Elizabeth & Daniel Currie Hall. 2014a. The features and exponence of nominal number. *Lingue e Linguaggio* 13(1). 63–82.

Cowper, Elizabeth & Daniel Currie Hall. 2014b. Reductiō ad discrīmen: Where features come from. *Nordlyd* 41(2). 145–164.

Demuth, Katherine. 2000. Bantu noun class systems: Loanword and acquisition evidence of semantic productivity. In Gunter Senft (ed.), *Systems of nominal classification*, 270–292. Cambridge: Cambridge University Press.

Dresher, B. Elan. 2003. Meno's paradox and the acquisition of grammar. In Stefan Ploch (ed.), *Living on the edge: 28 papers in honour of Jonathan Kaye*, vol. 62, Studies in Generative Grammar, 7–27. Berlin: Mouton de Gruyter.

Dresher, B. Elan. 2009. *The contrastive hierarchy in phonology*, vol. 121, Cambridge Studies in Linguistics. Cambridge: Cambridge University Press.

Dresher, B. Elan. 2014. The arch not the stones: Universal feature theory without universal features. *Nordlyd* 41(2). 165–181.

Eimas, Peter D. 1975. Speech perception in early infancy. In Leslie B. Cohen & Philip Salapatek (eds.), *Infant perception: From sensation to cognition*, 193–231. New York: Academic Press.

Eimas, Peter D., Einar R. Siqueland, Peter Jusczyk & James Vitorito. 1971. Speech perception in infants. *Science* 171(3698). 303–306.

Fudge, Erik C. 1967. The nature of phonological primes. *Journal of Linguistics* 3(1). 1–36.

Ghomeshi, Jila, Ileana Paul & Martina Wiltschko (eds.). 2009. *Determiners: Variation and universals*. Amsterdam: John Benjamins.

Goldstone, Robert L., Mark Steyvers & Kenneth Larimer. 1996. Categorical perception of novel dimensions. In *Proceedings of the eighteenth annual conference of the Cognitive Science Society*, 243–248. Hillsdale, N.J.: Lawrence Erlbaum Associates.

Hale, Mark & Charles Reiss. 2003. The subset principle in phonology: Why the *tabula* can't be *rasa*. *Journal of Linguistics* 39(2). 219–244.

Hall, Daniel Currie. 2010. The check-list: Halle's Condition 2 and the form and meaning of phonological features. Invited talk presented at the Sixth North American Phonology Conference (NAPhC 6), Concordia University, Montréal, May 2010.

Hall, Daniel Currie. 2011. Phonological contrast and its phonetic enhancement: Dispersedness without dispersion. *Phonology* 28(1). 1–54.

Hall, Daniel Currie & Jeff Mielke. 2011. Distinctive features. Annotated bibliography published in *Oxford Bibliographies Online* at `http://dx.doi.org/10.1093/OBO/9780199772810-0012`.

Halle, Morris, Bert Vaux & Andrew Wolfe. 2000. On feature spreading and the representation of place of articulation. *Linguistic Inquiry* 31(3). 387–444.

Harley, Heidi. 1994. Hug a tree: Deriving the morphosyntactic feature hierarchy. *MIT Working Papers in Linguistics* 21. 289–320.

Harley, Heidi & Elizabeth Ritter. 2002a. Person and number in pronouns: A feature-geometric analysis. *Language* 78(3). 482–526.

Harley, Heidi & Elizabeth Ritter. 2002b. Structuring the bundle: A universal morphosyntactic feature geometry. In Horst J. Simon & Heike Wiese (eds.), *Pronouns: Grammar and representation*, 23–39. Amsterdam: John Benjamins.

Harms, Robert T. 1973. How abstract is Nupe? *Language* 49(2). 439–446.

Hauser, Marc D., Noam Chomsky & W. Tecumseh Fitch. 2002. The faculty of language: What is it, who has it, and how did it evolve? *Science* 298. 1569–1579.

Hyman, Larry M. 1970. How concrete is phonology? *Language* 46(1). 58–76.

Hyman, Larry M. 1973. Nupe three years later. *Language* 49(2). 447–452.

Jakobson, Roman. 1949. On the identification of phonemic entities. *Travaux du Cercle linguistique de Copenhague* 5. 205–213.

Jakobson, Roman, C. Gunnar M. Fant & Morris Halle. [1951] 1969. *Preliminaries to speech analysis: The distinctive features and their correlates*. Cambridge, MA: MIT Press. 9th printing.

Kaplan, Lawrence D. 1981. *Phonological issues in North Alaskan Inupiaq*. Fairbanks: Native Language Center.

Keyser, Samuel Jay & Kenneth Noble Stevens. 2006. Enhancement and overlap in the speech chain. *Language* 82(1). 33–63.

Kratzer, Angelika. 1996. Severing the internal argument from its verb. In Johan Rooryck & Laurie Zaring (eds.), *Phrase structure and the lexicon*, 109–137. Dordrecht: Kluwer.

Kuhl, Patricia K. 1987. The special-mechanisms debate in speech perception: Nonhuman species and nonspeech signals. In Stevan Harnad (ed.), *Categorical perception: The groundwork of cognition*, 355–386. Cambridge: Cambridge University Press.

Lightfoot, David. 1979. *Principles of diachronic syntax*. Cambridge: Cambridge University Press.

Lindau, Mona. 1978. Vowel features. *Language* 54(3). 541–563.

Marantz, Alec. 1996. 'Cat' as a phrasal idiom: Consequences of late insertion in Distributed Morphology. Ms., MIT.

Marantz, Alec. 1997. No escape from syntax: Don't try morphological analysis in the privacy of your own lexicon. In A. Dimitriadis, L. Siegel, C. Surek-Clark & A. Williams (eds.), *Proceedings of the 21st annual Penn Linguistics Colloquium*, vol. 4 (U. Penn Working Papers in Linguistics 2), 201–225. University of Pennsylvania.

Mielke, Jeff. 2005. Ambivalence and ambiguity in laterals and nasals. *Phonology* 22(2). 169–203.

Mielke, Jeff. 2008. *The emergence of distinctive features*. Oxford: Oxford University Press.

Nichols, Johanna. 1986. Head-marking and dependent-marking grammar. *Language* 62(1). 56–119.

Peters, P. Stanley & Robert W. Ritchie. 1969. A note on the universal base hypothesis. *Journal of Linguistics* 5(1). 150–152.

Pulleyblank, Douglas. 2011. Vowel height. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell companion to phonology*, vol. 1, 491–518. Oxford: Wiley-Blackwell.

Pylkkänen, Liina. 2008. *Introducing arguments*. Cambridge, MA: MIT Press.

Ritter, Elizabeth & Martina Wiltschko. 2009. Varieties of INFL: Tense, location, and person. In Jeroen van Craenenbroeck (ed.), *Alternatives to cartography*, 153–202. Berlin: Walter de Gruyter.

Samuels, Bridget D. 2011. *Phonological architecture: A biolinguistic perspective*, vol. 2, Oxford Studies in Biolinguistics. Oxford: Oxford University Press.

Sandler, Wendy. 1989. *Phonological representation of the sign: Linearity and nonlinearity in American Sign Language*. Dordrecht: Foris.

Saussure, Ferdinand de. 1916. *Cours de linguistique générale*. Paris: Payot. Edited by Charles Bally and Albert Sechehaye.

Stevens, Kenneth Noble & Samuel Jay Keyser. 2010. Quantal theory, enhancement and overlap. *Journal of Phonetics* 38(1). 10–19.

Trubetzkoy, N. S. 1939. Grundzüge der Phonologie. *Travaux du Cercle Linguistique de Prague* 8.