

GENtrifying OT: Evicting Impossible Candidates

Christian Uffmann
Philipps-Universität Marburg
uffmann@staff.uni-marburg.de

OT Today

- Many addenda, many classes of constraints
- still many problems
- system overgenerates

→ How can we streamline the architecture?

What is in GEN?

- Little has been said about what GEN exactly does.
- GEN is pretty much still a black box.
- Possibility of filters on GEN?

Against filters on GEN



The explanations for universals should be sought in factorial typology under a particular theory of CON and not in GEN or other "universal" aspects of OT.

The Source of Universals



By deriving universals and typology from constraint interaction, we ensure that there are connections between the universal properties of language and between-language variation, since both follow from the properties of constraint ranking. [...] Hardwiring universals into GEN is inevitably a matter of brute-force stipulation, with no hope of explanation or connection to other matters – it is the end of discussion rather than the beginning.

The Source of Universals

- Filters on GEN are superfluous if universals can also be obtained from constraint rankings.
- Moreover, such filters would violate Freedom of Analysis.

But:

- Is it true that there are no restrictions at all on GEN?
- Are there universals which do not follow from constraint rankings and typological variation?
- How could such absolute universals be reconciled with the notion of constraint violability?

Restrictions on GEN



[The] freedom is limited only by primitive structural principles essential in every language, perhaps restricting GEN to a specific alphabet of distinctive features.

Excursus: What is a Phonological Theory?

Every phonological theory needs

- a theory of **representations**
(what is the structure of phonological units?)
- a theory of **operations**
(how do input representations map onto output representations?)

Phonological Theory: The Components

Representations

- What are the phonological units?
- In which relations do these units stand?

Operations

- How can these units be manipulated from input to output?

For Example SPE

Representations

- Words are linear strings of segments
- Segments contain unordered bundles of distinctive (binary) features

Operations

- Rules (feature changing or feature filling)

Further Developments

Representations

- Autosegmental representations
- Feature Geometry
- Prosodic structure (syllables, feet, metrical grids ...)
- Underspecification theory
- In LP: bracket erasure

Operations

- e.g. Lexical Phonology: level ordering, the cycle
- e.g. Autosegmental Phonology: linking and delinking

And in OT?

Representations

?

Operations

?

Both representations and operations are outside candidate evaluation and constraint ranking but relevant to GEN: What are possible candidates?

Restrictions on GEN: Take 2

GEN is not a tabula rasa. It needs statements about

- representational primitives and their structure
- the kinds of operations that can be performed on an input to yield a licit candidate.

Operations in GEN



[GEN] constructs candidate output forms, [...] and it specifies a relation between the candidate output forms and the input. GEN is [...] input dependent.

Operations in GEN

GEN needs to specify how a candidate set is generated,

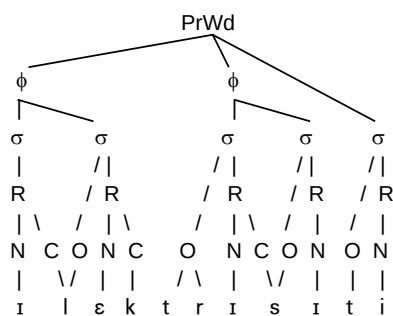
- traditionally by freely applying operations to the input (in Containment, but also in Candidate Chains),
- or by establishing a set of correspondence relations between the input and an infinite number of output forms.

Problem: Correspondence Theory as is overgenerates and predicts all types of unattested behaviour (van Oostendorp 2005).

Representations in GEN

- What is the structure of representations in OT?
- What are the "primitive structural principles" McCarthy alludes to?
- There is little or no discussion of what types of representations to assume.
- A tacitly shared belief perhaps: Representations should be as simple as possible. The job done by representations in other theories can be done by constraint interaction in OT.
- What is a simple representation? How simple are representations in OT really?

Prosodic Structure: OK in OT

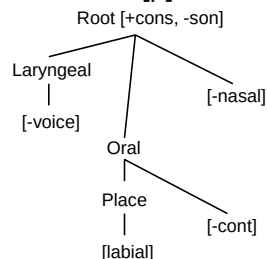


Segment Structure: How in OT?

[p]

[+consonantal
-sonorant
-continuant
-voice
-strident
-nasal
labial]

[p]



Segment Structure: How in OT?

- Although complex representation are retained in suprasegmental phonology (and in syntax!), they are shunned in segmental phonology.
- Many researchers explicitly speak out against elaborate autosegmental representations, e.g. Bakovic (1999), McCarthy (2002), Padgett (1995, 2002), Ní Chiosáin & Padgett (2001).
- Classic Correspondence Theory itself treats features not as autosegments.

Feature Faithfulness

IDENT(F) Correspondent segments have identical values for the feature F.
If $x \text{ } \mathcal{R} \text{ } y$ and x is $[\gamma F]$, then y is $[\gamma F]$.

- evaluates segments as feature bearers, not features,
- thus implicitly assumes that segments and features stand in a bijective relationship,
- treats all features as binary.

The Complexity of Representations

- What is the reason for reducing representational complexity in one specific domain?
- Is a return to SPE-type segment structure warranted?
- Or can more complex representations lift a burden from CON?
- Or should certain universals be outside constraint interaction at all?

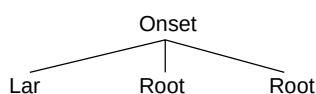
Test Case: Laryngeal Specifications

Kehrein (2002), Kehrein & Golston (2004):

- Syllable constituents (onsets, nuclei, codas) never bear more than one contrastive laryngeal specification ([ks, gz], *[kz, gs])
- Where and how this specification is realised in the cluster is a matter of phonetic phasing, not of segmental specification (/pr[+spread glottis]/ = [p^hr, pr, ...])
- No conflicting or contrasting laryngeal specifications within an onset, a nucleus, or a coda

Test Case: Laryngeal Specifications

Kehrein and Golston's solution:
Laryngeal specifications are not a property of the root node but of syllable constituents, a representational solution



Laryngeal Restrictions in OT

- are traditionally expressed by the AGREE family of constraints.
- Problem: How can a class of violable constraints express a universal prohibition?
- More generally, constraint interaction can only account for parametric, typological universals.
- Universal prohibitions which are not part of some crosslinguistic variation cannot be modeled as constraint interaction.

A Modest Proposal

- Universal restrictions that are not explicable as parametric variation are captured in the system of representations.
- GEN only produces candidates that are well-formed representationally.
- So, candidates with more than one laryngeal specification are not generated and do not enter competition in EVAL.
- For a hypothetical input /kzo/, GEN computes {[gzo], [kso] ...}, *[kzo]

Consequences

- Research on representations, which has virtually ceased with the advent of OT (except in non-OT circles) must be taken up again.
- Universal restrictions need to be identified, as well as
- sources of parametric variation.

Basic Insights of Autosegmentalism

- Features do not stand in a bijective relationship with segments.
- They can act independently of segments, and then may extend over a span larger than a single segment (most importantly tones but other features as well).
- Tier segregation can explain locality effects (Odden 1994: Locality Theory)

A research programme

A comprehensive re-evaluation of advances in autosegmental phonology and feature geometry:

- Which are hard universals that can be taken over?
- Where are the sources of variation, and how can they be expressed in terms of constraint interaction?
- Possible universals:
tier independence and locality effects, feature classes, segmental and prosodic hierarchies
- Variation: partial class behaviour and non-uniformity effects, class combinations (e.g. the issue of laterality and coronality; Yip 2005)

Locality and Tier Adjacency

In autosegmental phonology, locality is defined over tier adjacency: Two features can interact if they are adjacent on their respective tier.

- Explains interactions that are segmentally non-local
- and restricts these interactions.
- Odden (1994): Interaction is parametrically constrained – it is
 - root-adjacent,
 - syllable-adjacent or
 - tier-adjacent (unbounded)

Locality and Voicing

Voicing assimilation often proceeds locally,

e.g. Yiddish:
/bak+bejn/ [bagbejn] 'cheekbone'

But it can also occur long-distance,

e.g. Kera:
/tereŋ+ga/ [tereŋka] 'old (fem.)'

Locality Effects in OT

These constraints on interaction can be captured by the constraint *SKIP (Uffmann 2004, 2005).

*SKIP No material should intervene between interacting segments

*SKIP (Seg)

*SKIP (Syll)

Locality in Standard OT

Loss of autosegmental representations means that locality effects must be captured differently.

- Padgett (1995, 2002): Feature classes explain why certain groups of features tend to interact together. However, there are no tiers.
- Spreading thus is strictly local.
- In vowel harmony, intervening consonants participate in this harmony.
- Ní Chiosáin & Padgett (2001): Locality Theory

Locality Theory

- All spreading is local. Seemingly transparent segments nevertheless participate.
- Bottleneck effect: prohibits propagation of consonantal features on vowels, thus rules out consonant harmony.
- Also needed: Dispersion Theory to explain why participating intervening material never is contrastive.

The Bottleneck Effect

is too strong. While consonantal features cannot propagate through vowels, they may still choose vowels as a target in spreading:

- Lowering in Maltese before pharyngeals (Hume 1996)
- Backing/lowering in West Circassian before gutturals (Smeets 1984)
- Fronting in Moroccan Arabic before coronals (Hume 1996)
- Raising/fronting in !Xóǀ between coronals (Traill 1985)
- Labial attraction in Tulu, Cakchiquel (Campbell 1984) and Warlpiri (McCarthy 2004).

Strict Locality

cannot explain long-distance interaction:

- voicing assimilation in Kera (Ebert 1979)
- unbounded spreading of [constricted glottis] in Saanish (Vaux in prep.)
- sibilant/anterior harmony in Berber (Vaux in prep.)
- Karaim backness harmony (Nevins & Vaux 2003)
- Transparent segments (e.g. vowel harmony)
- final H tone lowering in Arusa (Odden 1994)
- Can strict locality deal with basic tonology at all?

Long-Distance Correspondence

Rose & Walker (2001): Long-distance interaction is not spreading but correspondence

- Why can only some features (for which long-distance interaction is attested) participate?
- Predicts that intervening features may not block the process.
- Diagnostic: spreading is between dissimilar segments (e.g. nasal harmony affecting all kinds of segments), correspondence between similar ones. Where does this put vowel harmony, for example?

What is "spreading" anyway?

Common assumption: assimilation is correspondence (Bakovic 2000, Krämer 2001), established by AGREE constraints.

- renders Rose & Walker's account problematic
- How about evidence that segments which share a feature specification literally share the same feature because this feature acts as a unit?

H Tone Interaction in Namwanga

Two processes resulting from a prohibition against adjacent H tones (Bickmore 2000):

- fusion (if the two H are underlyingly adjacent)
- downstep (if they are not underlyingly adjacent)

interacting with spreading rules (preprefix H doubling and stem spreading to penult)

/ú – ku- léet –a/ [úkú'lééta]

H Tone Interaction in Namwanga

Autosegmentally:

H H

 ukuleeta

As correspondence:

H HHH

 ukuleeta

Downstep applies automatically. How can downstep be calculated under a correspondence-based approach? (Comparative Markedness as a solution?)

More on AGREE

Besides formalising assimilation as correspondence, agreement constraints have other quirks:

- They explicitly state that some process apply while all other processes (deletion, epenthesis, metathesis ...) are an epiphenomenon of interaction between a markedness constraint and a faithfulness constraint prohibiting the process.
- Agreement actually comes at some computational cost.

To Dis AGREE

- Autosegments allow for a different conception of assimilation:
- Assimilation removes autosegments from the surface, minimising the number of feature specifications.
- The trigger is thus some *[F] constraint
- Constraints against autosegment deletion or multiple linkage interact with *[F]:
 - *[F] >> DEP(F) assimilation
 - DEP(F) >> *[F] faithful preservation of F

Locality: A Summary

- Autosegmental phonology provides a ready analysis for types of local and non-local interactions, which can be transferred to OT.
- Models of strictly local segment interaction run into many problems, in contrast.
- Autosegments also provide an elegant analysis of segment interaction, obviating the need for special agreement constraints and the problems generated when assimilation is viewed as correspondence.
- Much is won in terms of lifting a burden from CON when autosegmental representations are taken seriously.

Consequences

If autosegmental representations are part of the phonological system, it follows that CON should be sensitive to them:

- constraints against spreading, types of linkage, etc.
- Ideally, such constraints should be relevant not only subsegmentally but in other parts of the prosodic hierarchy as well.

Constraints on Representations

*MULTIPLE

Nodes are dominated by one node exclusively (no multiple associations, e.g. feature spreading, also ambisyllabicity?)

*SKIP

No material should intervene between interacting segments (see above)

*LINK(X,Y)

Features should not be dominated by two different mother nodes (Hume's 1996 Mother Node Attraction Principle, penalises place feature sharing between C-Place and V-Place nodes)

Constraints on Representations

PARSE(X)

Material is parsed into the next-highest level of representation

- PARSE(F) Features are parsed into class nodes (No floating autosegments)
- PARSE(Seg) Segments are parsed into syllables (No extrasyllabicity)
- PARSE(σ) Syllables are parsed into feet (No extrametricality)

Arguments against Autosegments?

- McCarthy (2003) argues not against autosegmental representations but against the rule apparatus that traditionally came with them. Representations and operations can be used independently, however.
- Other criticism basically falls into two types: "I don't need it for my analysis" or serious misunderstanding (most surprisingly perhaps in Ní Chiosáin & Padgett 2001).

And Freedom of Analysis?

is not jeopardised:

- GEN can generate whatever it likes as long as the candidates are well-formed w.r.t. hard-wired constraints on possible and impossible representations (no line crossing, tier adjacency in interaction, geometry)
- Every theory of GEN contains these constraints or filters, only that the theory of "structural principles" is spelled out more directly and that these structural principles are richer.

Summary

It is not true that all linguistic universals can be derived from factorial typologies:

- Factorial typologies can predict gaps (e.g. AB, ABC, *BC)
- They cannot predict universal restrictions (e.g. *D)
- Such restrictions can be stated in a richer theory of representations.
- With respect to possible and impossible processes they might be stated in a more constrained theory of operations.
- Possible and impossible representations and operations have to be stated in GEN. They thus prohibit the generation of candidates which are universally impossible.
- This is not against the spirit of GEN, since everybody must make some stipulation w.r.t. GEN (but these stipulations often remain implicit).