# Topics in Optimality Theory: Class 4

**TETU, GTH, and BC**

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Warren 245 - "vocat aestus in umbram"

(0) **Chain Shift** leftover. Scale notion allows natural Faithfulness formulations other than binary. Not just α= G(α) for a grammar G; but α is *k-close to* G(α).

{• [• (♦) •] • } •

Portrayed is a set of neighborhoods enclosing ♦ on the scale. These form an inclusion hierarchy. We can define, then, degrees of, types of, Faithfulness to any point ♦ on the scale — which of these nested neighborhoods it stays within. (Cf. Gnanadesikan 1997 (ROA) on "Adjacent")

Let the smallest nontrivial interval including ♦ be the "Local Neighborhood of ♦"

‣Nbɛzi F/LN(ht) >> Likeness-to-[i] >>F(ht) - a Paninian stringency system

**Remark**:: Need theory of how distinct phonetic properties generate scales (Foley? Clements on V ht.)

Cf. Finnish tt ↦ t , t ↦ d (structural properties: loss of mora, gain of voicing!)

**Remark**:: Smolensky's suggestion reported in Kirchner 1996. Use: F(V-feat) and F(V-feat)**&** F(V-feat). Addresses problem of *what may conjoin* — measures distance by featural disparity within a coherent class (cf. Padgett). Locality issue remains — this applies to same segment, never to disparate segments.

(1) **Today's Goals.** We continue with the question introduced in class 1: under what conditions can various indpendently possible maps be superimposed in the same grammatical hierarchy?

▲Material and Arguments drawn from **joint work with John McCarthy** (1993, 1994, 1995, in press).

(2) **Thematic Issue**. We examine *two* **B**ase ⇌ **R**eduplicant Maps, both turning on B-R identity.

a. **Template Defining**: how much of **B** does **R** take when not all? (and what does R do with it?).

b. **Overapplicational**. Phonology expected only in **B** is transferred to **R** , and vice versa.

We show that these two can be *crucially incompatible*.

(3) What is Reduplication? The Basic Model (McCarthy & Prince 1993, 1995)

Input: /$Af_{RED}$ , Stem/

↑↓ ⟨*I=O*⟩

Output: R ⇄ B

⟨*R=B*⟩

(4) **Key elements of Correspondence** constraint system. ($S_1$, $S_2$)

**Faithfulness**, via correspondence, atomizes the monolithic demand $S_1 = S_2$.

‣MAX: ∀x ∃y segment x ∈ $S_1$ ⇒ y=corr(x) ∈ $S_2$. "No Deletion from $S_1$ to $S_2$."

‣DEP: ∀x ∃y segment x ∈ $S_2$ ⇒ y=corr(x) ∈ $S_1$. "No Epenthesis from $S_1$ to $S_2$"

‣Ident(Feat): feature *f* holds of seg. x ∈ $S_1$ ⇔ feature *f* holds of corr(x) ∈ $S_2$.

NB: need to distinguish → and ↔ versions of IDENT ≈ MAX vs. DEP for privative features.

•We have MAX-**IO** and MAX-**BR**, IDENT-**IO** and IDENT-**BR**, etc.

(5) **The Emergence of The Unmarked:** F/IO>>M>>F/BR (McCarthy & Prince 1993b)

Gloss: **F/IO>>M** means no general solution to M, no relevant process, M violated in lg. at large.

But! **M >> F/BR** means that (the anti-markedness constr.) M *is* satisfied in the reduplicant — a non-identity map, breaching F, is compelled.

(6) Example. Reduplicant must be open syllable, although closed syllables are allowed in lg.

MAX-IO>>NOCODA "Don't delete to avoid a closed syllable."

NOCODA>>MAX-BR "Have incomplete copying to avoid a closed syllable"

| /RED+takder/ | MAX-IO | NOCODA | MAX-BR |
|---|---|---|---|
| ☞ TA - tak.der. | | ** | **** (kder) |
| TAK- tak.der. | | *** ! | *** (der) |
| TA - ta.de. | **! (...k...r) | | |

(7) **TETU** yields template-like restrictions through constraint enforcement. (Cf. Steriade 1988). Let us use our resources maximally:

Hypothesis. *All* templatic restrictions follow from TETU: there are no templates.

(8) **GTH**. Given that each morpheme must specify its own category (Root, Affix, — Stem, etc.) and/or the category of the item it attaches to, and/or the category of the result of the combination; and given that these *morphological* categories have typical *phonological* realizations, we come to the **Generalized Template Hypothesis**:

**The Reduplicant is the Canonical Structural Realization of its morphological class.**

The "Canonical Structural Realization" (Grimshaw's term) is attained through TETU.

(9) For background and further kinds of evidence of the correctness of this stance, see at least Downing (1994, 1995ab, 1996), Itô & Mester (1992), McCarthy & Prince (op.cit.), Futagi (1997).

(10) **Crude map of morphological collocation types:**

Quasi-Independent: stem

Compounding: [ stem stem ]$_{stem}$

Dependent:

External Affix: [ — stem ]$_{stem}$ ▸*or maybe* [ ... ]$_{stem}$′ , a step up the X-bar ladder

Internal Affix: [ — root ]$_{stem}$ •*thus, here,* stem = root′ , X-bar-wise

(11) Two Basic Phono-Morpho Interface Constraints:

ALIGN (**Stem**, L/R; **PrWd**, L/R) Every L/R Stem-edge should coincide with the L/R edge of PrWd

(12) Some assumptions about the Prosodic Hierarchy.

a.GEN: every Prosodic Word contain a Foot.

b.CON: PARSE-σ, which demands that every σ belong to an F

FTBIN, which demands that every foot be binary on moras or syllables.

(13) External Affixation. What is its basic *canonical structural realization* ?

(14) English External Prefixes.

| | | |
|---|---|---|
| rē - build | contrast *internal* rěform ~ rèformation/ rē′search, | rē′cess |
| dē - Nazify | | děfine ~ dèfinition/ dē′fect ~ děfective |
| prē- built | | prěscribe / prē′ fix |
| prō -capitalist | | prŏceed ~ prŏcession / prō′noun ~ prŏnominal |
| mis- t$^{h}$ype | | mĭstake (Aronoff) |
| un- realized | | (cf. /in-/ intemperate/illegal/irresponsible) |
| non- linguistic | | |

See Aronoff for discussion of the semantic, phonological, and combinational differences between the two.

(15) English external prefixes are stressed, unreduceable, semantically transparent, productive and (minimally) bimoraic: they have a high degree of prosodic independence. (The internal ones, even when near homophonous, contrast in each of these properties: e.g. their stress is contexually determined.) How could this follow from their morphological classification?

(16) Morpho → Phono Interface: Say both Align constraints (2) are met. Then we have the Ph-structure
[ rē [ (build)$_{F}$ ]$_{PrWd}$ ]$_{PrWd}$.

(17) Now assume that PARSE-σ is satisfied in these affixal domains, and FtBin everywhere.
- Then, we **must** have [ (rē) [ (build)$_{F}$ ]$_{PrWd}$ ]$_{PrWd}$.

(18) **Conclusion.** Affixes like external rē- *must be (at least) bimoraic*, given the imposed structure and the constraints imposed on it.

(19)Partial grammar: DEP-μ/Stem FTBIN ALIGN-L (Stem, Prwd) ALIGN-R (Stem, PrWd)

PARSE-σ

DEP-μ/Af-Ext.

(Note: if ExtAf+Stem → Stem′,then we write instead Max/Stem′, with an inclusion hierarchy Stem ⊆ Stem′ and we generalize Alignment accordingly: Align (Stem$^{k}$, PrWd) — align Stem and all its projections.)

Interpretation: Violation of Dep-μ ("Don't lengthen") is forced in External Affixes, if necessary to satisfy PARSE-σ and FTBIN. So potential /re/ ↦ rē . But no such map for the internals, e.g. [ rĕ (fórm) ].
- Note that FTBIN (if it sets an *upper* 2 unit bound, as well as a lower bound) forces violation of PARSE-σ generally — what would be an example?

(20) **Reduplicative 'Template' Effect**: the heavy syllable prefix "$\sigma_{\mu\mu}$ -" Ex.: Ilokano Progressive and Plural (McCarthy & Prince 1986; Hayes & Abad 1989).

| | |
|---|---|
| trab- trabaho | 'be working' |
| da: -daʔit | 'be sewing' |
| dad -daʔit | |
| na: -nars | 'nurses' |
| tra: -trak | 'trucks' |

(21) Applying the same kind of grammar as in (3), we have

Morphology: PROG, PL : — Stem

Grammar: MAX/IO FTBIN Align-L (Stem, Prwd) Align-R (Stem, PrWd)

PARSE-σ

MAX/BR

Interpretation. MAX/IO >> PARSE-σ (F>>M, map-blocking) "Don't delete to get perfect footing."
PARSE-σ >> MAX/BR (M>>F, map-making) "Undercopy B-to-R for foot's sake"

(22) Why should the affix then be **mono**syllabic? We have so far demanded only that it be Foot-parsed. Bruce Tesar suggests that Foot-internal alignment constraints may be responsible:

ALIGN (F,L; Hd(F), L) , ALIGN (F, R; Hd(F), R).

Only a monosyllabic foot, with its head at both left and right edges, can satisfy both!

(23) What happens if the Foot Head constraints have more general force — as ranked over MAX/IO?

- The language allows only monosyllables! Like Chinese, etc.

(24) So the operative hierarchy must contain at least

FTBIN MAX/IO Align-L (Stem, Prwd) Align-R (Stem, PrWd)

PARSE-σ Ft-Hd-L, Ft-Hd-R

MAX/BR

(25) Illustrative Tableau. Only candidates satisfying FtBin & Stem~PrWd Alignment considered.

| /PROG+trabaho | Max-IO | PARSE-σ | Ft-Hd-L, Ft-Hd-R | MAX/BR |
|---|---|---|---|---|
| a. ☞[ (trab) - [tra (baho)]] | | * | * | *** |
| b. [ (tra:) - [tra (baho) ]] | | * | * | **** ! |
| c. [ tră - [tra (baho) ]] | | * * ! | * | **** |
| d. [ (trab) - [ (trab) ]] | * ! ** | ✓ | ✓ | ✓ |

(26) **Conclusion**: With MAX-BR subordinated to phonological constraints, incomplete copying is recruited to obtain better satisfaction of the superordinate constraints. This is TETU: and gives the "Heavy Syllable Template" here.

(27) **Phonology of BRI.** What if **F/BR** is dominant over some structural constraint M that is respected in the lg. at large? Then it can happen that the reduplicant shows unusual phonology — violation of M — *merely to look like the base*. And vice-versa! — the base can show unusual phonology to look like the reduplicant.

(28) **An illuminating case**. Southern Paiute. /w/ shows up initially; between vowels you get /ŋ$^{w}$/

**w**aʔaŋi  tï˙′– **ŋ$^{w}$**aʔaŋi  ‘to shout/to give a good shout’

(29) But in Reduplication, the Base imitates the Reduplicant --

a. ***Differing Context in R and B***: BR identity => B back-copies R

| | | |
|---|---|---|
| **w**ïn˙nai– | **w**ï – **w**ï′n’nai– | ‘to throw/several throw down’ |
| | ***ŋ$^{w}$**ï – **ŋ$^{w}$**ï′n’nai– | *(R copies B to excess) |
| | ***w**ï – **ŋ$^{w}$**ï′n’nai– | *(normal phonology; bad BR-Faith) |

b. ***Same V–V Context in R and B***. BR identity + normal phonology

**w**i̯nɪ–  ya– **ŋ$^{w}$**ɪ′–**ŋ$^{w}$**i̯nɪx̯aˁ  ‘to stand/while standing and holding’

(30) **Analysis of background phonology.**

Logic of Complementary Distribution: distinguishes a *default* from a special case. The problem is how to keep the nondefault out of circulation.

- In SPE type phono, the default is the lexical value /α/, with */β/ and α → β / E.
- ▸ In Unspec Th., the lexical value is ambig between the two: /A/ and */α/, */β/
  and we have  A → β / E  ,  A → α everywhere else, filling in the def. feature.
- ♦ In theories w/o lexicon-specfic restrictions, we have
  α ↦ β / E and elsewhere β ↦ α  (the latter dumping β from the inventory)

(31) Ergo, we must settle on the *default* (a notion that is more general than the implementations). Suppose it is ***w***, as seems natural (perhaps presence of **ŋ$^{w}$** presupposes presence of **w**).

We conclude that  ***ŋ$^{w}$** >> ***w**

(32) We must superimpose these maps:  **w** ↦ **ŋ$^{w}$**  intervocalically, losing the default value there.
**ŋ$^{w}$** ↦ **w**  elsewhere, dumping the *non*default.

(33) The map **ŋ$^{w}$** ↦ **w** .By the discussion in Class 3 of what it takes to get a map going (Handout 3,. (40)), we know that there must be *some* constraint against **ŋ$^{w}$** that dominates *every* M constraint against w and every F constraint against the mapping **ŋ$^{w}$** ↦ **w**

So, at least:  ***ŋ$^{w}$** >> ***w**, IDENT-IO(nas)

(34) For **w** ↦ **ŋ$^{w}$** intervocalically, it must be that some constraint against intervocalic w dominates every M constraints against (intervocalic) **ŋ$^{w}$** and every F constraint against the mapping **ŋ$^{w}$** ↦ **w**. So,

So, at least: *VwV >> ***ŋ$^{w}$** , IDENT-IO(nas).

(35) Putting these together, we have (at least): *VwV >> ***ŋ$^{w}$** >> ***w** , IDENT-IO(nas)

(36) Suppose we now add IDENT-BR(*f*) , the set of all BR-feature identity constraints. It is unviolated — the Reduplicant is featurally identical to the section of the Base that it copies — so it can be top-ranked:

(37) With undominated IDENT-BR(*f*), there are two serious candidates:

| | | |
|---|---|---|
| **w**ïn˙nai– | **w**ï – **w**ï′n’nai– | ‘to throw/several throw down’ |
| | ***ŋ$^{w}$**ï – **ŋ$^{w}$**ï′n’nai– | |

▪ But surely the second will win! — because it violates undominated *VwV.

(38) We need to rule out **[ ŋ$^{w}$**. So CON must supply ***[ ŋ$^{w}$**. (NB. if **ŋ$^{w}$** were the default, we'd need this for the basic phonology). McCarthy & Prince 1994 et seq. argue that such a constraint exists independently.

(39) Final Grammar. IDENT-BR($f$), ***[ ŋ$^{w}$** >>*VwV >> ***ŋ$^{w}$** >> ***w** , IDENT-IO(nas)
Observe that this grammar selects the correct candidate:

☞ **w**ï – **w**ï′n'nai–
* **ŋ$^{w}$**ï – **ŋ$^{w}$**ï′n'nai–

The second candidate violates the highest ranked ***[ ŋ$^{w}$** ; the first only violates *VwV, now demoted.

(40) **Interpretation**: Crucially, the BASE assumes unusual phonology to achieve reduplicative identity. Thus, the ranking pattern F/BR >> M >> F/IO can yield not just "over-application" but **back-copying** from the reduplicant to the base, violating F/IO !

(41) **CRISIS!?** The P. Hamilton/R. Kager Conundrum: **Templatic Conditions are never back-copied.**

/RED + takder/ =/=> *ta-ta **!!**
/RED + wakari/ =/=> *waka-waka !! (Diyari)
/RED + sawatik/ =/=> *sa:-s**a:**watik !! (Nahuatl: 'someone hoarse')

(42) But, *if there are templates*, or indeed affix-specific constraints, this is easily accomplished.

(43) "RED =$\sigma_{\mu\mu}$", Max-**BR** >>MAX-**IO** in Ψ-Ilokano

| /RED+tʲilparku/ | "RED =$\sigma_{\mu\mu}$" | MAX-BR | MAX-IO |
|---|---|---|---|
| a. ☞ trab - trab | | | *** |
| b. trab - trabaho | | *** ! | |
| c. trabaho - trabaho | * ! | | |

(44) Unreduplicated forms receive a fully faithful analysis in Ψ-Ilokano

| /trabaho/ | "RED=MINWD" | MAX-BR | MAX-IO |
|---|---|---|---|
| a. trab | | | *** ! |
| b. ☞ trabaho | | | |

(45) **But if Templatic conditions come always from TETU, with constraints of general applicability, this is impossible.**

(46) As above, the descriptive outcome "RED is $\sigma_{\mu\mu}$" comes from this:

FAITH/**IO** >> PROSOD >> FAITH/**BR**

Clearly, with FAITH/**IO** dominant, there can be no truncation of the Base to meet PROSOD or to accommodate the Reduplicant.

(47) Suppose we try to fit PROSOD through the Back-Copy Ranking (40) .

a .The key element of the ranking is PROSOD >> FAITH/**IO**
b. But now, everything in the language conforms to PROSOD !

(48) E. Keer: For this to fly, TETU must work by indexing Faithfulness-constraints to morphological domains, **not** Markedness constraints. Suppose to the contrary that F was general and M indexed.

| | |
|---|---|
| PROSOD/R >> GENERAL-FAITH | "PROSOD is enforced in R" |
| GENERAL-FAITH >> PROSOD/ALL | "Elsewhere not so" |

| | | |
|---|---|---|
| But: | PROSOD/R, **FAITH-BR** >> GENERAL-FAITH | "As above, but B=R" |
| | GENERAL-FAITH >> PROSOD/ALL | |

■ Here FAITH-BR will cause violation of GENERAL-FAITH to achieve B=R by truncating B.

(49) Conclusion: **No emergent property of the reduplicant can every be back-copied**.

Assumptions: No M constraints refer only to affixes or parochially affixal structures.
Only F is indexed to morphology.

**Corollary**: if we are to preserve the FAITH/BR theory of reduplication & reduplicative identity, all "templatic conditions" must be emergent.

(50) **Summary of Topics**

| **Property** | **Key Assumptions** | **Issues & Directions** |
|---|---|---|
| S/W process pairs | -logic of >> | Constraint conjunction re-packages constraints, & limits the range of the property |
| Stringency/ deactivation | -logic of >> | Dangerous interaction with multiple violations, which reduces stringency on elements to *conflict* on forms, with poss. of many less-marked viols. overcoming fewer more-mkd. |
| Harmonic completeness | -logic of >><br>-care in formal typology of M AND F constraints | Inclusion hierarchies allow Anti-Pan. rankings which preserve HC, but need empirical exemplification |
| Chain Shift Criterion | -logic of >><br>-M/F OT | Provable need for F constraint against long-distance move requires development of F theory; scale th. |
| GTH, TETU | -logic of >><br>-Index F by domain, but not M. | Only "attractor" configurations of v. low prosodic markedness suffer TETU, but much more richness is formally available |
| BC result | -logic of >><br>-generality of formulation of relevant structural constrs. | -successful construction of the required morph-phonology interface |

(51) **Conclusion**. Three main goals.

a. To direct attention away from the worm's-eye view of hustling candidates through hierarchies, and toward a perspective on what more general, element-to-element *maps* are performed by the grammar.

b. And to investigate the properties of these maps, particularly the question of which related maps can be superimposed in the same grammar.

c. Having found that the simple theory has properties of great interest, and to guide theoretical development with an eye toward preserving those properties in the large.

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