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this handout and some of the references quoted at
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CONSTRAINTS AND REPRESENTATIONS: (HOW) LABOUR IS DIVIDED

(1) purpose
   a. suggest that constraint interaction is but a piece of phonology: there are other pieces such as representations that are not slaves of constraints, but equal-righted.
   Cf., among others, Oostendorp & van de Weijer (2005).
   b. the arbitral award of representations is ABSOLUTE – it is entirely independent of constraints: it neither is their product, nor their object of evaluation.
   c. in other words, rebalance computation (constraints) and structure (representation) in grammar: OT has eliminated the latter (sic). No science of a natural object can do without one or the other.
   See Anderson (1985)
   d. suggest that many oddities that OT has to struggle with are due to the absence of a constraint-independent arbitral award:
   - overgeneration
   - inflation of constraints
   - secondary theories such as Sympathy, targeted constraints etc.
   e. against the backdrop of Rosenthall's (2006) analysis of Classical Arabic weak verbs, suggest means of drawing the red line between phenomena that are due to constraint interaction, and phenomena that are controlled by representations.

(2) overgeneration is genetically encoded in OT
(Scheer 2003, Scheer 2004:§305)

factors that contribute to overgeneration:
   a. Richness of the base
   b. no restriction on the formulation of constraints - anything prose can do will do
   c. GEN is unmarshalled
   d. Freedom of Analysis: it does not matter how you get the "correct" result as long as you get it (sounds like SPE)
   e. secondary theories: sympathy, targeted constraints, constraint conjunction etc. add an incalculable number of additional systems.

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   f. monsters are taken seriously by OT
   nothing is ungrammatical per se
   in OT, there is no assessment of (a)grammaticality in absence of competition, i.e. of comparison to other candidates. Hence a computational effort is needed in order to exclude items with 26-times branching Codas. And a constraint ranking can be imagined where these monsters are optimal.
   ==> minimal representations with a constraint-independent arbitral award do away with this UFO-phonology.
   ==> representations assess an item per se, i.e. independently of competition with others; they cut away all monsters once and forever.
   g. computation is king
      1. grammaticality is determined exclusively by constraint interaction
      2. no other arbitral award contributes
      3. Hence representations are mere decoration: they are the slave of computation
         - they are created by constraint interaction (they "emerge")
         - their intrinsic arbitral award can always be outranked by some constraint
         - typical example: Richness of the base prohibits the presence of syllable structure in the lexicon, which makes it useless: it cannot be used as an explanation for segmental processes anymore.
         A typical example is Wilson's (2001) treatment of CC clusters: in C1C2, it is always C1 that is lost. The explanation that every phonologist thinks of - it's the Coda - cannot be used (and is not even mentioned by Wilson).
   e. Factorial Typology has long been advertised as a trump of OT: does it make you happy to be able to derive 20 dialects by reranking when 2000 additional UFO-systems are generated in the mean time?

(3) overgeneration is a relatively recent focus in OT, where it is called the too-many-solutions-problem: Steriade (2001) et passim
[it was pinpointed from inside and outside OT since 1993]
   a. that OT has an overgeneration problem has been voiced from outside and inside OT since 1993.
   b. back to where we started
   given SPE, the main purpose of phonology in the 70s and 80s was to curtail overgeneration: rules can describe anything and its reverse.
   The answer of the 80s were (autosegmental) representations. [and also Lexical Phonology, i.e. the attempt at curtailing morpho-phonology]
   c. OT has eliminated representations from phonology (in the above sense): they are demoted to a ghost-ship of the 80s, slaves of constraints.
   ==> hence the armor against overgeneration has been thrown over board.
   d. there are calls for constraining OT, and for implementing other pieces aside from constraint ranking:
   work by Marc van Oostendorp, Bruce Morén, Christian Uffmann, Laura Downing, Freedom of Analysis conference (Tromsø) and volume.

e. OT and constraint interaction is but ONE piece of grammar. It needs to be inserted into a "universe of discourse".
Missing pieces
1. GEN
==> there is no theory of what a possible phonological object is
2. not any statement in prose can be a constraint
outlandish constraints: LAZY, NOSTRUCTURE etc.
==> there is no theory of constraints (only of constraint interaction)
(phonological alphabets: Oostendorp & Weijer 2005)
3. No Freedom of Analysis
the way a result is achieved matters
==> there is no evaluation measure, an old post-SPE problem (e.g. Kiparsky 1974).
4. Richness of the base
==> means that there is no theory of the lexicon
and that syllable structure is useless
5. representations
==> there is no theory of representations
hence OT loses energy struggling with UFOs and monsters

1. Semitic preliminaries

1.1. Morphology: distribution of vocalic melody in stems

(4)	melody	a-u	a-i	i-a	u-u
pf act	A – Vlex	k A t A b -a	Dar**A**b-a	lab**I**s-a	kab**U**r-a
pf pass	U – I	k U t I b -a			
ipf act	ø – apoph(Vlex)	ya- k ø t U b -u	ya-Dr**I**b-u	ya-lb**A**s-u	ya-kb**U**r-u
ipf pass	ø - A	yu- k ø t A b -u			

1.2. Vlex and apophony

(5) the lexical information of a root contains
a. the three consonants (for a sound root) carry the lexical meaning
√ktb "write"
b. a vowel that appears in V2 (between C2 and C3)
- Vlex, a class marker much like IE thematic vowels
- Vlex cannot be predicted
e.g.
√ktb=a katAb-a
√Drb=a DarAb-a
√lbs=i labIs-a
√kbr=u kabUr-a
c. Vlex is subject to apophony (Ablaut): cf. the patterns under (4).

pf	ipf	
a	u	√ktb=a-u
a	i	√Drb=a-i
i	a	√lbs=i-a
u	u	√kbr=u-u

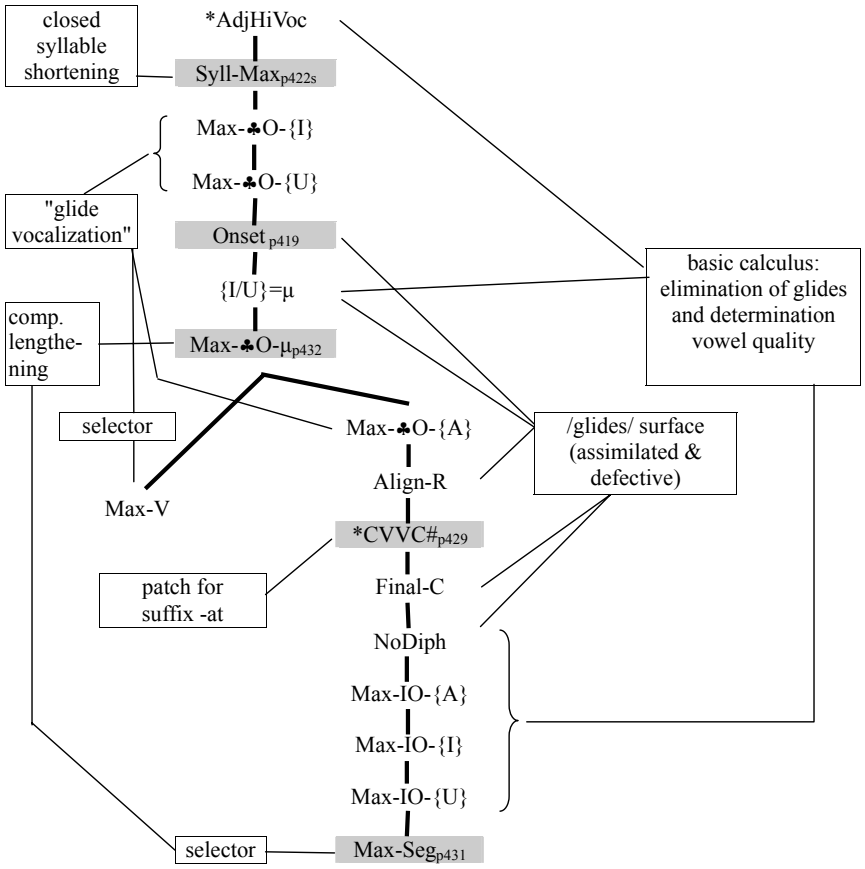
1.3. Weak verbs

(6) Sound vs. Weak verbs
a. "normal", "healthy" verbs have 3 consonants
b. weak verbs are one or two consonants short (in some of their forms)
c. two types of weak verbs
1. deaf verbs: CCxCx
C2 and C3 are identical
madad-a
2. verbs with glides
throughout conjugation, glides are sometimes absent
- glide in C1: assimilated wajad-a
- glide in C2: hollow sayar-a
- glide in C3: defective ramay-a
d. how do we know which verb has which glide?
1. in some forms of the verbal paradigm, the glide surfaces
2. nominal forms of the same root such as the masdar always show the glide.

2. Rosenthall's (2006) analysis of glide distribution in Classical Arabic weak verbs

2.1. General overview

(7) Rosenthall's (2006:427) constraint ranking (broadest explicit tree given)
[grey-shaded: constraints used but not mentioned p427. Their ranking is approximative according to the local information given upon their intervention]
[leaving aside a significant number of details and secondary analyses]



2.2. Elimination of the glide

(8) glide elimination
a. Rosenthall uses unitary primes I, A, U: high vowels and glides are the same melodic object (high vocoids); their realisation as a glide or a vowel depends on their being moraic or not.
b. the glide of underlying forms is ALWAYS eliminated.
c. due to **{I/U}=μ**
"vocalic elements {I} and {U} are moraic"
==> no I,U in Onsets.

2.3. Calculus of vowel quality

(9) general picture: analysis according to suffix shape
a. possible suffixes:
1. -V
2. -C
3. -VV

	-V	-VV	-C
defective	**HERE**	another time	below
hollow	**HERE**	**HERE**	below

(10) vowel quality of /VgV/ sequences
b. is the result of a calculus on the 3 input Elements
c. defective: e.g. /ramay-a/ needs to resolve /aya/.
d. hollow: e.g. /xawif-a/ needs to resolve /awi/
instruments:
1. Max-Feature
Max-A >> Max-I >> Max-U
2. [*AdjHiVoc "No adjacent high vocoids" (vocoid = vowels & glides)]

(11) empirical situation for /V-g-V/ sequences
defective: /CVC**Vg-V**/
hollow: /C**Vg**VC-V/ - WATCH OUT: only V-initial suffixes here
[grey-shaded cells: morphology does not provide the relevant input]

	/V1-Glide-V2/		surface	defective CCg			hollow CgC		
				/ /	[ ]	cat.gr.	/ /	[ ]	cat.gr.
V1=a	V2=a	awa	aa	danaw-a	danaa		qawal-a	qaal-a	
		aya	aa	ramay-a	ramaa		sayar-a	saar-a	
	V2=u	awu	aa	yu-dnaw-u	yu-dnaa		Tawul-a	Taal-a	
		ayu	aa	yu-rDay-u	yu-rDaa				
	V2=i	awi	aa				xawif-a	xaaf-a	
		ayi	aa				hayib-a	haab-a	
V1=u	V2=a	uwa	uwa	saruw-a	saruw-a				
		uya							
	V2=u	uwu	uu	ya-dnuw-u	ya-dnuu				
		uyu							
	V2=i	uwi	ii				quwil-a	qiil-a	
		uyi	ii				suyir-a	siir-a	
V1=i	V2=a	iwa							
		iya	iya	nasiy-a	nasiy-a				
	V2=u	iwu							
		iyu	ii	ya-rmiy-u	ya-rmii				
	V2=i	iwi							
		iyi							

(12) how it works
a. there are three vocalic ingredients, of which two or three may be identical:
1 ingredient: uwu
2 ingredients: awa, aya, uyi etc.
3 ingredients: awi
b. the faithful candidate with the glide is always eliminated by high-ranking I/U=μ
c. deletion of V2 (in hollow stems) is failed by high-ranking NoDiph
d. example: 3-ingredient /awi/

awi (e.g. xawif-a)		I/U=μ	NoDiph	Max-A	Max-I	Max-U
	xawif-a	*!				
	xawf-a		*!			
→	xaaf-a				*	*
	xuuf-a			*!	*	
	xiif-a			*!		*

e. this ranking successfully derives all attested patterns[1]
1. as long as there is A among the ingredients, it will win. TRUE
2. if A is absent, either there is no competition (1 ingredient), or I wins (I meets U). TRUE

[1] It is not clear to us why Rosenthall uses *AdjHiVoc in order to eliminate the faithful parse of /duʕiw-na/ (his tableau (14) on page 415). This is the same diphthong situation as under (12)d (Rosenthall's (10) page 413), where NoDiph is fatal to the diphthong candidate.

f. except for the two cases where the glide survives:
- /uwa/ → uwa
- /iya/ → iya
Rosenthall's answer: the glide we see is NOT the underlying glide. Rather, it is the result of spreading from V1 (Rosenthall calls this a homorganic glide and distinguishes it from its underlying cousins as i̯). Hence
- /uwa/ → uu̯a
- /iya/ → ii̯a

(13) supplement: two questions that Rosenthall does not discuss
a. why are homorganic glides produced, rather than the usual long vowel?
[Rosenthall does not discuss this question]
- /saruw-a/ → saruw-a instead of *saraa
- /nasiy-a/ → nasiy-a instead of *nasaa
==> the homorganic glide candidate only violates Max-U or Max-I

uwa (e.g. saruwa)		I/U=μ	NoDiph	Max-A	Max-I	Max-U
	saruw-a	*!				
→	saruu̯a					*
	saruu			*!		*
	saraa					**!

b. why are homorganic glide candidates not successful all through?
They only occur in two cases:
/uwa/ → uwa
/iya/ → iya
1. V1 & V2=i,u produces a fatal violation of undominated *AdjHiVoc:
- /uwu/ → uu̯u
/uwi/ → uu̯i
- /iyu/ → ii̯u
/iyi/ → ii̯i
2. V1=a
/awi/ → aa̯i
etc.
obvious reason:
- there is no candidate corresponding to this description since "a̯" does not exist
- A cannot be copied into an Onset
- could be implemented as a high ranking constraint against "A-glides"
- GEN could also be unable to generate this kind of monster

(14) [a > i > u] is the traditional hierarchy and analysis
Rosenthall (2006:416) is explicit on the fact that the Max-Feature account is but an OTed version of the traditional analysis found for example in
- Bohas (1982)
- Angoujard (1990)

2.4. Underlying glides that surface

(15) the presence of glides on the surface is due to independent high-ranking constraints:

a. there are two instances where /glides/ surface

1. assimilated verbs: always in the pf
   /wajad-a/ → wajad-a
2. defective verbs: before -C suffixes
   /ramay-ta/ → ramay-ta
   recall the general picture:

	-V	-VV	-C
defective	done	another time	**HERE**
hollow	done	done	below

b. high-ranking Onset is responsible for stem-initial glides

c. high-ranking Final-C is responsible for stem-final glides

d. general explanation "stem edges want to have consonants" (p.419).
However, this single causality is two distinct agents in Rosenthall's analysis.

e. example Final-C (p.419)

ramay-ta		Final-C	NoDiph	Max-A	Max-I	Max-U
→	ramay-ta		*			
	rama-ta	*!			*	
	rami-ta	*!		*		

(16) an additional patch is needed in order to fight back short candidates that stem from multiple deletion: Align-R.

a. /duʕiw-a/ → duʕiya
the multiple deletion (/i/ and /w/) candidate: duʕ-aa
should win because it satisfies Final-C and NoDiph

b. multiple deletion is excluded by Align-R >> Final-C ("right edge of stem must coincide with a syllable boundary): duʕ-aa fatally violates Align-R

c. /ramay-a/ → ramaa
according to Rosenthall's table (25) (p.420), ramaa satisfies Final-C.
Whether ramaa violates Final-C or not depends on the interpretation of -aa.
Rosenthall is explicit on the status on the fusion of two distinct underlying /a/s (pp.422,431): the surface [aa] represents both input /a/s. Hence the correct structure for ramaa is rama-a.
==> rama-a violates Final-C
Problem 1

2.5. Special difficulty: "glide vocalization"

(17) glide vocalization occurs in hollow verbs with -C suffixes

	-V	-VV	-C
defective	2.3	another time	2.4
hollow	2.3	2.3	**HERE**

(18) empirical situation

		a-i, y sayar-C	i-a, w xawif-C	i-a, y hayib-C	a-u, w lawam-C	u-u, w Tawul-C	
pf act	A – Vlex	i	i	i	u	u	treated by R.
pf pass	U – I	u	u	u	i	--	not treated by R.
ipf act	ø – Vlex	i	a	a	u	u	not treated by R.
ipf pass	ø - A	a	a	a	a	--	not treated by R.

that is, pf act:		glide	vowel
a.	/sayar-tu/ → sir-tu	y	i
	/xawif-tu/ → xif-tu	w	i
	/hayib-tu/ → hib-tu	y	i
b.	/lawam-tu/ → lum-tu	w	u
	/Tawul-tu/ → Tul-tu	w	u

(19) Rosenthall calls this pattern glide vocalization all through the article

a. that is, the underlying glide surfaces, but in a vocalic coat.

b. this is incorrect: xawif-a has a w, but produces an i.

c. worse: sometimes an [a] surfaces, which cannot be the vocalic form of a glide.
Rosenthall does not talk about
- pf pass
- ipf act
- ipf pass

d. his mechanism gets all the data right, but the direction of his analysis is wrong.

e. rather than from the glide, the vowel is predictable from Vlex:

Vlex	
a-i, i-a	i
a-u, u-u	u

(20) Rosenthall's analysis

a. the regular ranking fails: /lawam-ta/ → lum-tu

lawam-tu		I/U=μ	Max-A	Max-I	Max-U	
	lum-tu		**!			
☛	lam-tu		*		*	
	lawam-tu	*!				

b. a different ranking of Max-Feature is needed, which applies only to the paradigm at hand.
Solution: Sympathy

c. selector constraint: Max-V "every input vowel has an output vowel"

d. selection of the sympathetic candidate
SyllMax (no 3-mora (superheavy) syllables) is needed in order to get the sympathetic candidate that is needed for the analysis.

lawam-tu		SyllMax	I/U=μ	Max-V		
	lum-tu			**		
	lam-tu			*		
♣	lawam-tu		*	✓		
	laam-ta	*!		✓		

e. the parallel Sympathy ranking is ♣I >> ♣U >> ♣A

lawam-tu		SyllMax	Max-♣O-I	Max-♣O-U	I/U=μ	Max-♣O-A	Max-V
→	lum-tu					**	**
	lam-tu			*!		*	*
♣	lawam-tu				*!		✓
	laam-ta	*!					✓

f. since only i and u surface, a-candidats are always failed.

g. what about the many cases where a indeed is attested (and which, recall, Rosenthall does not discuss). For example
ipf act (ø-Vlex) 2f pl: /tu-xøwaf-na/ → tu-xaf-na
- the attested form incurs a violation of Max-♣O-U since the /w/ is deleted.
- the u-candidate tu-xuf-na incurs a lower-ranked Max-♣O-A violation.
- hence ☛ tu-xuf-na should be optimal.
==> problem 2

(21) this system, made for "glide vocalization", also correctly accounts for the case where the surface vowel has got nothing to do with the underlying glide:

a.

xawif-tu		*AdjHiVoc	Max-♣O-I	Max-♣O-U	I/U=μ	Max-♣O-A	Max-V
♣	xawif-tu	*!					✓
	xaf-tu		*!	*			*
→	xif-tu			*		*	*
	xuf-tu		*!			*	**

2.6. The system fails on the suffix -at (and -ataa)

(22) two suffixes cannot be done with the system developed

a. - pf 3f sg -at
- pf 3f du -ataa

b. - they share the fact of being -VC
- they are the only suffixes of this shape

c. Rosenthall proposes a patch for -at, but gives up on -ataa

d. solution for -at:
latent constraint ranking
that is, a ranking between two constraints that otherwise do not conflict.

e. here between I/U=μ and the hitherto unknown *CVVC#
*CVVC# militates against word-final super-heavy syllables.

f. hence the patch for -at is based on the fact that -at is consonant-final:
/ramay-at/ → ramat
ramaat, the toughest concurrent, is failed by *CVVC#
- therefore ramat wins
- therefore -ataa cannot be accounted for: it is not C-final.

g. distinct treatments for -at and -ataa miss the obvious generalization:
- they are the only suffixes that the system cannot account for
- they are the only -VC suffixes
==> problem 3

2.7. Vowel length I: why long vowels cannot exist in closed syllables

(23) closed syllable shortening

a. surface-true observation: closed syllable shortening
VV / __CV
vs.
V / C{C,#}

b. implementation in OT: SyllMax
- SyllMax militates against trimoraic syllables (superheavy syllables)
- it is high-ranked and hence eliminates VVC-C candidates.

2.8. Vowel length II: why short vowels lengthen in open syllables

(24) Rosenthall follows the traditional analysis: compensatory lengthening

a. when a moraic segment is deleted, the preceding vowel spreads on its mora
1. deletion of a coda-glide: /raDiw-ta/ → radii-ta
donc /iw/ → ii
2. deletion of a vowel: /xawif-a/ → xaaf-a
donc /ai/ → aa

b. the standard way in OT to do compensatory lengthening is Sympathy
1. the otherwise irrelevant (low-ranking) selector constraint Max-Seg makes sure that the sympathetic candidate is always identical to the input.
2. a parallel ♣-constraint ranking can then make reference to the input without caring for regular constraints.
Max-♣O-μ ensures that no mora can be lost.

2.9. Summary Rosenthall

(25) labour done by constraints

	labour	constraints	section
a.	glide deletion	{I/U}=μ	2.2
b.	vowel quality of /VgV/ sequences	Max-A >> Max-I >> Max-U *AdjHiVoc	2.3
c.	glides surface:		2.4
	1. assimilated: w-	Onset	
	2. defective: …Vg-C	Final-C	
	3. fighting back multiple deletion	Align-R	
d.	glide vocalization i.e. hollow -C: xif-ta	Sympathy ♣I >> ♣U >> ♣A selector: Max-V	2.5
e.	-at	*CVVC#	2.6
f.	*VV in closed syllables	SyllMax	2.7
g.	open syllable lengthening	compensatory lengthening Sympathy: Max-♣O-μ selector: Max-Seg	2.8

(26) summary problems

a. analysis-internal problem
Final-C and the interpretation of -aa
/ramay-a/ → ramaa should violate Final-C, but according to Rosenthall does not.

b. empirical problems
1. glide vocalization paradigm (hollow -C xif-ta):
what about attested forms with -a- (e.g. /tu-xøwaf-na/ → tu-xaf-na)?
These occur in the ipf paradigm, which Rosenthall does not mention.
2. -at and -ataa misbehave for the same reason: -VC. But Rosenthall does not offer a unified explanation: the edge-based solution for -at does not work for -ataa.
A generalization is missed.

(27) conceptual problem

Classical Arabic is analyzed without reference to the template and Template Satisfaction

At no point in Rosenthall's analysis does the template play any role, or is even mentioned.

3. Alternative: a biliteral and templatic analysis

3.1. Weak verbs are biliterals

(28) bilitarism: a theory-independent issue
literature in favour of biliteralism (diachronically even for sound verbs): Bohas (1997, 2000), Bohas & Chekayri (1991,1993), Chekayri (1994 et 1999).

a. Rosenthall takes for granted the traditional view (held by both Arabic grammarians and the modern literature) according to which
1. weak verbs (i.e. showing a glide) are triliterals
2. - glides are underlyingly present (/xwf/, /rmy/ = /ktb/)
- they delete in certain circumstances.

b. biliteral alternative
- glides are underlyingly absent (/xøf/, /rmø/ vs. /ktb/).
- they are inserted in certain circumstances.

c. the biliteral analysis supposes that
1. the nature of the glide (w or y) can be predicted for each verb.
2. the context for insertion throughout the paradigms can be predicted.

d. Chekayri & Scheer (1996) have shown that the nature of the glide indeed is predictable: it is a function of Vlex (=V2) - an apophonic function (cf. below).

e. hence the perspective is the reverse of traditional approaches: we are not looking for the contexts in which glides are deleted, but for those where they are inserted. And we are looking for a reason why they are inserted.
==> Template Satisfaction.

(29) argument 1: predictability
the lexicon contains only unpredictable information. If the nature of the glide can be predicted, it must not be recorded in the lexicon.

(30) argument 2: verbs with stable glides
there is a significant number of verbs with glides that behave exactly like sound triliterals, i.e. where the glide NEVER deletes. These verbs are not discussed by Rosenthall.

a. overview (statistics based on a count in Chekayri (1999, 2001, 2006)

	glide stable			glide unstable		
	pf	ipf	nb	pf	ipf	Nb
assimilated	wafur-a	ya-wfur-u	116	wajad-a	ya-jid-u	262
hollow	mayil-a	ya-myal-u	51	zaal-a	ya-ziil-u	497
defective	—	—	—	ramaa	ya-rmii	493

b. "minimal pairs"
stable vs. unstable glides are sometimes a matter of
a. free variation

	glide stable		glide unstable		
	pf	ipf	pf	ipf	
assimilated	wajab-a	ya-wjub-u	wajab-a	ya-jib-u	to be necessary
hollow	ᶜaaSa	ya-ᶜaaS-u	ᶜawiS-a	ya-ᶜwaS-u	to be difficult to comprehend

b. semantic differentiation (from a common source)

	glide stable		glide unstable		
	pf	ipf	pf	ipf	
assimilated	1.waSaf-a	ya-wSuf-u	2.waSaf-a	ya-Sif-u	1. to credit s.o. with 2. to describe
hollow	1.fawih-a	ya-fwah-u	2.faah-a	ya-fuuh-u	1. to be broad mouthed 2. to pronounce, say

c. analysis only possible in a biliteral perspective
   1. verbs with stable glides behave like sound triliterals - they ARE triliterals
   2. verbs with unstable glides are biliterals
   3. ==> /wjz/ vs. /øjd/

d. triliteral analyses cannot account for verbs with stable glides otherwise than
   - by diacritics
   - "exceptions"

e. the whole tradition (Arabic & Western alike) is based on the division of roots into sound vs. weak
   1. "weak" means that a consonant is missing.
   2. ==> it follows that verbs with three stable consonants must be sound
   3. despite this fact, the tradition considers "weak" ANY verb with a glide, not just the subset with an unstable glide.

(31) argument 3: there are no assimilated verbs with y-

a. if glides are lexically present, their distribution should be free, just as the distribution of other consonants.

b. this is indeed the case for defective and hollow verbs:

	nb verbs with w	nb verbs with y
hollow	342	246
defective	310	217

(hollow and defective CWY: 32, Bayyuumii et al. 1989)

c. by contrast, only w- occurs in assimilated verbs (378 verbs).
There are 22 verbs with y- (Bayyuumii et al. (1989)), but the glide in these cases is always stable. Hence all assimilated verbs with y- are triliterals.
==> there are no assimilated biliterals with y-.

d. while this is accidental on a triliteral approach, it follows in a biliteral prespective:
in C1 V1 C2 V2 C3-
- glides in C2 and C3 are the apophonic product of V2
- glides in C1 are the apophonic product of V1
V2-created glides vary because V2 (=Vlex) varies.
V1-created glides do not vary because V1 is invariable (the active morpheme: A).

3.2. Apophony

(32) apophonic theory

a. vowels (vocalic primes) are not an amorphous set of items. Rather, they are universally ordered on an "apophonic path":

Apophonic Path
ø ==> I ==> A ==> U ==> U

b. this path may be used by languages in order to mark (to derive) grammatical oppositions, for example
   - sg - pl
   - pf - ipf
   - present - preterite - past participle
   - etc.

c. apophonic theory has been introduced by
Guerssel & Lowenstamm (1996,ms)
it has been applied and developed by, among others,
   - Ge'ez: Ségéral (1995, 1996)
   - Semitic: Ségéral (2000)
   - German Ablaut: Ségéral & Scheer (1998)
   - Berber, Beja: Bendjaballah (1998,1999)
   - Spanish: Boyé (2000)
   - Somali: Barillot (2002)

(33) Ablaut in Classical Arabic:
Guerssel & Lowenstamm (1996)

a. patterns found in measure I

pf	ipf		
a	i	Darab-a	ya-Drib-u
a	a	katab-a	ya-ktub-u
i	a	labis-a	ya-lbas-u
u	u	kabur-a	ya-kbur-u

b. real A: kataba
fake A: Daraba
   - the fake A in fact is a zero, which is clothed by V1

c. hence the alternations are applicative:
the ipf is derived from the pf by moving one step on the apophonic path.

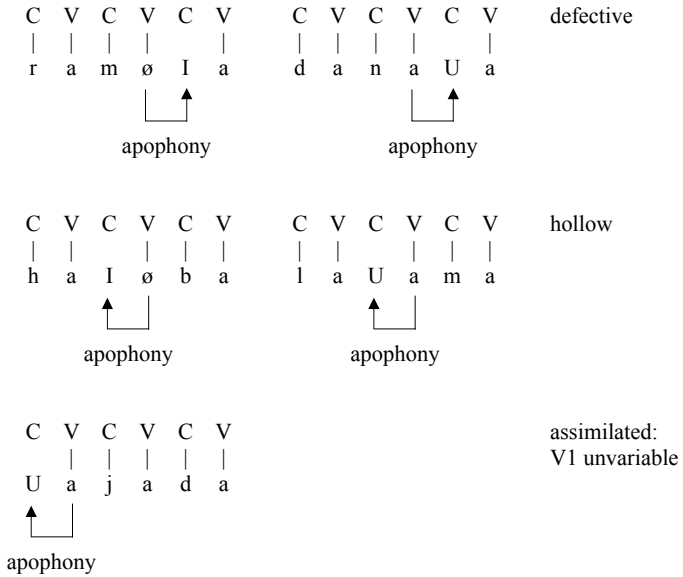
(34) predictablity of glides in Classical Arabic:
Chekayri & Scheer (1996)

a. observation (100% true):
the glide in hollow and defective verbs (glide in C2, C3) is identical with V2 **in the imperfective**.

b. hence
- y occurs in verbs with fake A (i.e. ipf=i)
- w occurs in verbs with real A (i.e. ipf=u)

pf	ipf	glide	ex. defective		sound	
a	i	y	ramay-a	ya-rmiy-u	Darab-a	ya-Drib-u
a	a	w	danaw-a	ya-dnuw-u	katab-a	ya-ktub-u
i	a	y	Sadiy-a	ya-Say-u	labis-a	ya-lbas-u
u	u	w	saruw-a	ya-sruw-u	kabur-a	ya-kbur-u

c. ==> just as ipf V2, the glide is the apophonic product of Vlex.



d. A cannot be accommodated in Onsets.
In case A is the output of apophony, y always appears (by default).
Sadiy-a - /ya-Sday-u/

3.3. Biliteral analysis I: Template satisfaction and 3 ordered salvaging strategies

(35) Chekayri & Scheer (2003,2004,2005):
analysis of defective and hollow verbs based on

a. one single motor: Template Satisfaction
1. fill in a missing C position
2. anti-hiatus, but this is just a specific case of Template Satisfaction

b. illegal (= non-occurrent) sequences
1. any hiatus
2. *uwC, *iyC
3. *uy, *iw
4. *Vyu, *Vyi, *Vyuu, *Vyii
5. *Vwu, *Vwi, *Vwuu, *Vwii

} *AdjHiVoc

c. procedural hierarchy of 3 strategies
1. try to simply concatenate the lexical ingredients.
If the result is legal, END. If not, continue.
2. apophonic glide creation
If the result is legal, END. If not, continue.
3. make a long vowel by spreading

(36) problem

a. illegal sequences are taken to be surface-true in Classical Arabic

b. this is true for some of them ((35)b1-3), but not for others (35)b4-5).

c. some "illegal" sequences are indeed non-occurrent in verbs, but appear in nominal forms
1. [awi] is found e.g. in adjectives such as *rawiyya* “deliberation, reflection”
2. [awii] is found in hollow adjectives such as *Tawiil* "tall"
3. [uyuu] is found in plural forms of hollow nouns such as sg *sayf*, pl suyuuf "sword"
4. hapax with [awu]: *Tawul* "be tall"

d. Rosenthall will have the same problem - he does not talk about non-verbal forms.

(37) general attitude

a. all analyses will have to somehow rely on the non-occurrence of the sequences at hand.

b. the illegal character of these sequences must somehow be recorded in the grammar: they are language-specific to Classical Arabic, in other languages they may well occur.
The recording of parametric properties of languages is
1. traditionally done as parameters on/off, or as statements in prose
2. done as violable constraints in OT, which may have a different ranking in other languages

c. the same is true for the hierarchy A >> I >> U, which needs to be somehow recorded anyway, and has always been in the traditional literature.

d. ==> this is the place for constraints and constraint interaction:
- typological properties of a language
- parametric properties of a language

(38) strategy: implementation of the 3-step strategy into a parallel constraint-based environment
step 1: try to concatenate
a. concatenation
1. works only with identical vowels: /rama-a/ → ramaa
2. non-identical vowels, i.e. a hiatus, is always illegal: /raDi-a/ → *raDia
b. translation into constraints
1. Max-VV:
two adjacent vowels (at the melodic level) in the input are also adjacent in the output (at the melodic level)
2. *Hiatus
c. the two constraints are crucially ordered so to make sure that only identical vowels survive:
*Hiatus >> Max-VV

(39) step 2: try to save the structure by apophonic glide creation
a. translation into constraints:
Apoph
do apophony, i.e. create an apophonic glide!
b. crucially ranked below step-1-constraints
*Hiatus >> Max-VV >> Apoph

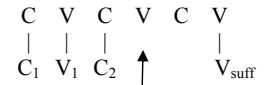
(40) step 3: try to save the structure by making a long vowel through spreading
a. no specific constraint needed: long-vowel candidates will always lose against
- candidates with a legal concatenation
- candidates with an apophonic glide
b. however, we need to determine which vowel spreads, and this is done in the traditional way which was translated into OT by Rosenthall:
Max-A >> Max-I >> Max-U
plus
*AdjHiVoc
c. the selection of the "right" long vowel is only done when all other strategies have failed. Hence
*Hiatus >> Max-VV >> Apoph >>
*AdjHiVoc >> Max-A >> Max-I >> Max-U

3.4. Biliteral analysis II: how it works

(41) representational & melodic situation in a biliteral perspective

a. defective verbs

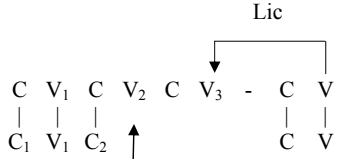
1. V-initial suffix



pf act Vlex
pf pass I
ipf act Vlex
ipf pass A

input: /V_2V_{suff}/
result: VgV, VV
context 1
table (42)

2. C-initial suffix

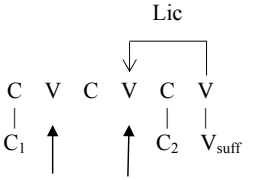


pf act Vlex
pf pass I
ipf act Vlex
ipf pass A

input: /V_2C_{suff}/
result: VgV, VV
context 2
table (47)

b. hollow verbs

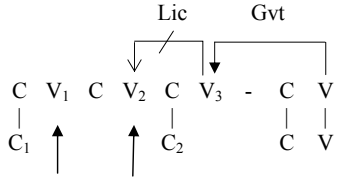
1. V-initial suffix



pf act A Vlex
pf pass U I
ipf act ø Vlex
ipf pass ø A

input: /V_1V_2/-V
result: VV
context 1
table (42)

2. C-initial suffix



pf act A Vlex
pf pass U I
ipf act ø Vlex
ipf pass ø A

input: /V_1V_2/-C
result: V
context 3
table (51)

CONTEXT 1

(42) empirical situation
1. defective /V_2V_{suff}/ → VgV, VV
2. hollow /V_1V_2/-V → VV

		surface	defective CCg			hollow CgC		
V1	V2		/ /	[ ]	cat.gr.	/ /	[ ]	cat.gr.
a	a	aa	dana-a	danaa		qaal-a	qaal-a	
	u	aa	yu-dna-u	yu-dnaa		Taul-a	Taal-a	
	i	aa				xaif-a	xaaf-a	
u	a	uwa	saru-a	saruw-a				
	u	uu	ya-dnu-u	ya-dnuu				
	i	ii				quil-a	qiil-a	
i	a	iya	nasi-a	nasiy-a				
	u	ii	ya-rmi-u	ya-rmii				
	i							
ø	a	aa				ya-xøaf-u	ya-xaaf-u	ipf
	u	uu				ya-løum-u	ya-luum-u	ipf
	i	ii				ya-søir-u	ya-siir-u	ipf

(43) preliminaries
a. the input for Vlex = ø is always /a/ since this is the object that appears in the representation of sound verbs (through filling-in from active A in V1: Dar**a**b-a):
rm=ø ==> /rama-V/
b. zero is a vowel like any other (it appears as zero in sound verbs: ya-k**ø**tub-u):
/øa/ → aa incurs a violation of Max-VV
c. apophonic glide creation is done on the grounds of the lexical information:
Vlex = ø ==> I
Vlex = a ==> U
==> /rama-tu/ → rama**y**-tu

(44) tables

a.
/aa/	*Hiatus	Max-VV	Apoph	*AdjHiVoc	Max-A	Max-I	Max-U
awa		*!					
→ aa			*				

b.
/uu/	*Hiatus	Max-VV	Apoph	*AdjHiVoc	Max-A	Max-I	Max-U
uwu		*!		*			
→ uu			*				

c.
/øa/ (/øi/, /øu/)	*Hiatus	Max-VV	Apoph	*AdjHiVoc	Max-A	Max-I	Max-U
øwa		*!		*			
aa		*!	*				
→ øa			*				

d.
/au/ (/ai/)	*Hiatus	Max-VV	Apoph	*AdjHiVoc	Max-A	Max-I	Max-U
awu		*!		*			
au	*!		*				
→ aa		*	*				*
uu		*	*		*!		

e.
/ui/ (/iu/)	*Hiatus	Max-VV	Apoph	*AdjHiVoc	Max-A	Max-I	Max-U
uwi		*!		**			
ui	*!		*				
→ ii		*	*				*
uu		*	*			*!	

f.
/ua/ (/ia/)	*Hiatus	Max-VV	Apoph	*AdjHiVoc	Max-A	Max-I	Max-U
→ uwa		*		*			
ua	*!		*				
aa		*	*!				*
uu		*	*!		*		

(45) where candidates come from
a. the lexicon defines the input
==> no Richness of the Base
b. the set of phonological processes that are active in the language defines the set of candidates:
1. apophony is present, hence candidates with an apophonized input occur
2. long vowels from spreading exist, hence long vowel candidates occur
3. eventually, a piece of melody can be linked to different constituents. This produces as many candidates as there are linkings.
==> "GEN" is the phonology of the language adapted to the relevant representation.

(46) Template Satisfaction
a. constraints care only for melody = melodic competition.
b. representations do not care for melody. They care for being well-formed.
==> Template Satisfaction is a matter of representations, not of constraints.
c. the winner that is returned from the constraint chamber may produce an ill-formed representation:
1. ramaa is the winner of /rama-a/: simple concatenation
2. it violates Template Satisfaction: C_3 remains orphan

CONTEXT 2

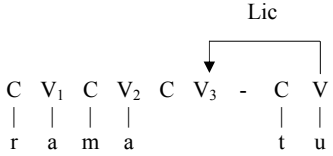
(47) empirical situation
defective: /V_2C_{suff}/ → VgV, VV

/ /		surface	example		
V2			/ /	[ ]	cat.gr.
ø	C	ayC	ramay-tu	ramay-tu	1st sing perf.
a	C	awC	danaw-tu	danaw-tu	1st sing perf.
i	C	iiC	raDii-tu	raDii-tu	1st sing perf.
u	C	uuC	saruu-tu	saruu-tu	1st sing perf.

(48) preliminaries

a. /V_2-C/ has got NO zero:
V3 is really empty, the lexicon has not provided anything.
==> /V_2-C/ → VV does NOT incur a violation of Max-VV, wich is irrelevant.

b. unlike, recall, in hollow ipf /øV/ where morphology provides a zero melody.



(49) Tables

a.

/aC/ (/øC/)	*Hiatus	Max-VV	Apoph	*AdjHiVoc	Max-A	Max-I	Max-U
→ awC							
aaC			*!				
aC			*!				

b.

uC (/iC/)	*Hiatus	Max-VV	Apoph	*AdjHiVoc	Max-A	Max-I	Max-U
→ uwC				*			
uuC			*!				
uC			*!				

(50) [uwC] vs. [uu]
both readings are attested
(al-anbaarii 1961, ibn al-Haajib 1982, siibawayhi 1988)

CONTEXT 3

(51) empirical situation
hollow: / V_1V_2C-C/ → V
==> Rosenthall's "glide vocalization"

a. overview

	melody	suffix –C ø-i √sr	i-a √xf	a-u √lm	u-u √Tl
pf act	A - Vlex	i	i	u	u
pf pass	U - I	u	u	i	--
ipf act	ø - Vlex	i	a	u	u
ipf pass	ø - A	a	a	a	--

b. melodic situation (logical possibilities)

	/ / V1	/ / V2	surface	example / /	[ ]	cat.gr.
pf act	a	ø	i	sayar-tu	sir-tu	1st sing pf.
		i	i	xawif-tu	xif-tu	1st sing pf.
		a	u	qawal-tu	qul-tu	1st sing pf.
		u	u	Tawul-tu	Tul-tu	1st sing pf.
pf pass	u	i	u	quwil-a	qüül-a	3d sing pf.
		i	i	suyir-a	siir-a	3d sing pf.
ipf	ø	i	i	ya-syir-u	ya-siiru	3d sing ipf.
		a	a	yarDay-u	ya-rDaa	3d sing ipf.
		u	u	ya-Twul-u	ya-Tuul-u	3d sing ipf.

(52) grey-shaded part of the tables: hopeless situation

a. with exactly identical melodic ingredients, the melodic output is radically different when the vowel is
1. long: well-behaving (V-initial suffix)
2. short: ill-behaving (C-initial suffix)

b. the vowel that surfaces has got nothing to do with competition among the ingredients.

c. it is a function of V2: the apophonic glide in a vocalic coat:
Vlex = ø ==> i
Vlex = a ==> u

d. pf pass:
identical ingredients produce different results

e. išmaam
"a flavour of U"
attested readings: [i], [u], [y] (front rounded vowel, sic)
for pf pass Vlex = ø,i
but not for Vlex = a - no išmaam, only [i] attested.

(53) sympathy?
- a. this is where Rosenthall recurs to Sympathy:
  the parallel ♣-ranking allows for installing a different Max-Feature hierarchy, wich will correctly resolve the
  pf act
  paradigm: ♣I >> ♣U >> ♣A
- b. that this is the wrong way to go is shown by the fact that even Sympathy cannot solve the pf passive paradigm.
  ==> which Rosenthall does not mention.
- c. we give up on the grey-shaded cells
  ==> no solution is better than a sympathetic solution.

4. Assimilated verbs: w-

(54) assimilated verbs
- a. /wajad-a/ → wajad-a
  ipf ya-jud-u
- b. the representation allows only for two condidates:
  1. the faithful candidate /ajad-a/ → ajad-a
  2. the apophonic candidate /ajad-a/ → wajad-a

C	V_1	C	V_2	C	V_3
	|	|	|	|	|
	a	j	u	d	a

(55) table

/a/	*Hiatus	Max-VV	Apoph	*AdjHiVoc	Max-A	Max-I	Max-U
a			*!				
→ wa							

5. -at, -ataa

(56) Chekayri & Scheer's (2003) story for the misbehaving -at, -ataa
- a. recall the problem: a short instead of the expected long vowel
  /rama-at/ → ram**a**t not the expected ram**aa**t
  /rama-ataa/ → ram**a**taa not the expected ram**aa**taa
- b. -at, -ataa are the only suffixes of the shape -VC.
- c. there is
  -CV (with all possible vowels: -ta, -tu, -ti)
  -V
  but no -C
- d. the -a of -at, -ataa is fake:
  these suffixes are the missing -C: /-C/
- e. the short vowel then follows.
- f. there is more to this, but no time here.

6. Comparison

(57) comparison I: labour done by which device?
- Rosenthall's triliteral constraint-only analysis
- our biliteral divided-labour analysis

	labour	Rosenthall	here
a.	concatenation >> apophonic glide >> VV	—	*Hiatus >> Max-VV >> Apoph
b.	vowel quality calculus	Max-A >> Max-I >> Max-U *AdjHiVoc	same
c.	glide deletion	{I/U}=μ	—
d.	glides surface:		
	1. assimilated: w-	Onset	—
	2. context 2: Vg-C	Final-C	—
	3. fighting back multiple deletion	Align-R	—
	4. homorganic glides	unclear	—
e.	*VV in closed syllables	SyllMax	representation
f.	open syllable lengthening	compensatory lengthening Sympathy: Max-♣O-μ selector: Max-Seg	representation
g.	-at	*CVVC#	different underlying form
h.	glide vocalization	Sympathy ♣I >> ♣U >> ♣A selector: Max-V	?

(58) comparison II: conceptual

	Rosenthall	here
a. driving force behind what we see	constraints	Template Satisfaction
b. candidates exist because of	GEN	1. representations 2. phonological processes of the language

(59) comparison II: empirical
- a. Rosenthall considers only 1/4th of the difficult hollow -C paradigm:
  1. pf act - yes
  2. pf pass - no
  3. ipf act - no
  4. ipf pass - no
- b. his Sympathy-based account of glide vocalization fails on the paradigms that he does not talk about:
  forms with -a-: e.g. /tu-xøwaf-na/ → tu-xaf-na.
- c. witness of the fact that something else is going on: išmaam (front rounded vowels).
- d. he cannot account for stable glides in assimilated verbs (and does not talk about stable glides in hollow verbs)
  ==> consequence of triliteralism

7. Conclusion

(60) conclusion
  a. structure and process
    1. a constraint-only grammar gets us into the trouble described: excessive overgeneration etc.
    2. a representation-only grammar needs to make statements regarding parametric choices anyway.

    ==> we need both - but where exactly the red line runs is an open question.
  b. constraint-independent representations
    1. cut down overgeneration
    2. rein in GEN
       the set of candidates is the result of the variation that the language-specific phonology produces over the lexical and the representational input.
  c. division of labour in the Arabic case:
    - melody is toughed out by constraints (below the skeleton)
    - syllabic matters are controlled by representations (at and above the skeleton)

    ==> looks like the reverse of McMahon's (2003,2007) picture.
  d. Arabic:
    1. weak verbs are verbs with an instable glide, not just with any glide.
    2. triliteral analyses of weak verbs are on the wrong track.
    3. no solution is better than a sympathetic solution.

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