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**STRESS IN MEHWEB:  
A LEXICALLY FILLED  
OPTIMALITY THEORY  
APPROACH**

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**STRESS IN MEHWEB:  
A LEXICALLY FILLED OPTIMALITY THEORY APPROACH**<sup>2,3</sup>

There are two different ways to deal with exceptions in Optimality Theory (OT): Co-phonology and Indexed Constraints. Several works compare the two approaches claiming that the Co-phonology approach is more formally parsimonious than Indexed Constraint approach. This paper presents an analysis of the stress system in Mehweb (Dargwa, Nakh Daghestanian) using a modification of the Indexed Constraint approach, which I call “Lexically Filled OT”. I argue that this approach is more parsimonious than both Co-phonology and Indexed Constraints.

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## 1. Introduction

This paper presents an analysis of the stress system in Mehweb, a Dargwa language spoken in the Republic of Dagestan, Russia. All data for this research were collected during my fieldwork in the village of Mehweb in 2014. The first part of the paper is empirical, followed by a formal analysis. I introduce “Lexically Filled Optimality Theory” (LFOT) which is a modification of the Indexed Constraint approach to exceptions in Optimality Theory (OT) ((Benua 1997a, b), (Alderete 1999, 2000), (Itô and Mester 1999), (Pater 2000), (Pater 2004)).

The presentation consists of five sections. Section 2 provides a sketch of Mehweb and the relevant parts of its morphology. Section 3 discusses the distribution of Mehweb stress patterns and describes some exceptions to it. Section 4 presents analyses in three different frameworks: standard rule-based model, Metrical Phonology and OT. Finally, Section 5 provides concluding remarks.

## 2. Background information

Mehweb is an isolated one-village language of the Dargwa (or Dargic) group of the Nakh-Daghestanian language family. Several centuries ago Mehweb speakers reportedly moved away from the Dargwa-speaking area (Khajdakov 1985) and settled among Avar (Andal dialect (Mikhailov 1959, 176)) and Lak villages. Mehweb is spoken by about 700 people who mainly live in the village Mehweb (Gunibsky district, Republic of Dagestan, Russia). School education is in Russian. There are also ‘mother tongue lessons’, but these are conducted in Avar, not in the children’s native language.

Like other Nakh-Daghestanian languages, Mehweb has a rich system of nominal spatial cases and a complex verbal morphology, which is shown in Table 1.

Table 1 Morphological structure of the Mehweb verbs and nouns

nominal wordform				verbal wordform						
0	1	2	3	-3	-2	-1	0	1	2	3
R[ABS.SG]	-CASE			PREF-	NEG-	CL-	R	-CAUS	-TAM	-PERSON
	-OBL	-CASE								
	-PL[ABS]		-LOC	-OR	R					
		-CASE								
		-LOC	-OR							

An example Mehweb noun and verb are shown in ((1)-(2)).

(1) uq'laha-li-tæe-r

window-OBL-SUPER-ESS[N.SG]

0 1 2 3

‘on the window’

(2) ar-ħa-b-ik-aq-i-ra

PREF-NEG-N-become:PFV-CAUS-AOR-1/2

-3 -2 -1 0 1 2 3

‘I/you didn’t drop’

There are no strong syllable structure constraints applied to Mehweb nominal stems. Roots can be one-, two-, three-, four- or five-syllable, though the most common are one- or two-syllable roots. Table 2 shows the proportion of one-, two-, three-, four- and five-syllable noun stems, based on a dictionary which includes over 500 noun entries.

Table 2 Distribution of one-, two-, three-, four- and five-syllable noun stems

σ	σσ	σσσ	σσσσ	σσσσσ	Total
132	284	65	22	1	504
26%	56%	13%	4%	1%	100%

Most verbal roots are monosyllabic and have the structure [CL-]VC(C) or LVC(C) (L – liquids). Two-syllable stems are rare. There are four irregular verb stems which, in some wordforms, only consist of one consonant or are zero morphs.

(3) k-ib come:PFV-AOR 'came'	(4) ib say:PFV.AOR 'said'	(5) g-ub see:PFV-AOR 'saw'	(6) g-ib give:PFV-AOR 'gave'
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There are several subgroups within the Dargwa branch: the northern lects have no geminate and labialized consonants and have fixed stress on the second syllable. Other lects have geminates, labialized consonants and some morphologically governed stress rules (Abdulayev 1954, pp. 23-71). Most features of Mehweb indicate an affinity with the northern subgroup; the Mehweb consonant system, however, contains numerous labialized consonants, just as the neighbouring dialects of Avar and Lak ((Mikailov 1959), (Khaydakov 1966, 116)).

### 3.1 Stress in Mehweb

Most often, the stress is on the second syllable (Magomedov 1982, p. 10), but there are some exceptions and minimal pairs.

(7a) dek' <u>a</u> <sup>4</sup> hill[ABS] 'hill'	(7b) d- <u>ek</u> '-a PL-choose:PFV-IMP 'choose (between them)!'	(8a) du <u>ze</u> night[ABS] 'night'	(8b) d- <u>uʒ</u> -e N-drink:IPFV-IMP 'drink (it)!'
--	--	--	---

Nearly all nouns, adjectives and numerals have the stress on the second syllable. During derivational processes, initially monosyllabic words move the stress to the second syllable (if it is available), as shown in (10-11, 13-15).

(9a) uq' <u>laha</u> window[ABS] 'window'	(9b) uq' <u>laha</u> -jni window-ERG 'window'	(9c) uq' <u>laha</u> -li-tʂe-r window-OBL-SUPER-ESS[N.SG] 'on the window'
(10a) b <u>etʂ</u> ' head[ABS] 'head'	(10b) b <u>etʂ</u> '-la window-OBL.GEN '(e.g. part). of a window'	(10c) bu <u>tʂ</u> '-re window-PL[ABS] 'windows'

<sup>4</sup> To avoid problems with syllabification, which have not yet been explored, I will underline and boldface the nucleus of the stressed syllable.

- |                                      |   |   |  |
|--------------------------------------|---|---|--|
| (11a) <b>hu</b><br>you[ABS]<br>'you' | (11b) <b>hu-ni</b><br>you-ERG<br>'you'      | (12a) <b>nu<u>fa</u></b><br>we[ABS]<br>'we'     | (12b) <b>nu<u>fa</u>-jni</b><br>we-ERG<br>'we' |
| (13) <b>ca</b><br>one[CARD]<br>'one' | (14) <b>ka-l</b><br>twenty-CARD<br>'twenty' | (15) <b>ka-nu</b><br>twenty-LNK<br>'twenty one' | <b>ca-ra-l</b><br>one-LNK-CARD                 |

There are numerous Arabic borrowings and proper names, which are stressed elsewhere:

- |   |  |  |  |
|---|--|--|--|
| (16) <b>amanat</b><br>assignment[ABS]<br>'assignment' | (17) <b>paraq'at</b><br>calm[ABS]<br>'calm'        | (18) <b>sadaqa</b><br>alms[ABS]<br>'alms'  | (19) <b>tabi'at</b><br>temper[ABS]<br>'temper' |
| (20) <b>ʔaq'lu</b><br>wit[ABS]<br>'wit'               | (21) <b>masala</b><br>for.example<br>'for example' | (22) <b>maʔna</b><br>sense[ABS]<br>'sense' |  |

The only form that goes against this generalization is the vocative. A special vocative form only exists for two-syllable human stems, mostly used when the addressee is far away but also when addressing somebody is near. Below, these forms are treated as a special stress pattern. A special study is however necessary to find out whether this kind of acoustic salience should be treated as stress or a special vocative intonation.

- |   |  |   |  |
|---|--|---|--|
| (23a) <b>ada<u>j</u></b><br>father[ABS]<br>'father'     | (23b) <b>a<u>da</u>j</b><br>father[VOC]<br>'father!'     | (24a) <b>ur<u>fi</u></b><br>brother[ABS]<br>'brother' | (24b) <b>u<u>r</u>fi</b><br>brother[VOC]<br>'brother!' |
| (25a) <b>uzi<u>q</u>'ari</b><br>cousin[ABS]<br>'cousin' | (25b) <b>uzi<u>q</u>'ari</b><br>cousin[VOC]<br>'cousin!' |   |  |

Most verbal wordforms are disyllabic and have the stress on the second syllable.

- |  |   |  |
|--|---|--|
| (26) <b>w-ak'-<u>ib</u></b><br>M-come:PFV-AOR<br>'he came'               | (27) <b>w-ak'-<u>ifa</u></b><br>M-come:PFV-1/2.FUT<br>'I will come'   | (28) <b>w-ak'-<u>as</u></b><br>M-come:PFV-FUT<br>'he will come'  |
| (29) <b>w-ak'-<u>i</u>-ra</b><br>M-come:PFV-AOR-1/2<br>'I came'          | (30) <b>lut<u>ʕ</u>'-<u>an</u></b><br>read:IPFV-PRS<br>'he reads'     | (31) <b>lut<u>ʕ</u>'-<u>as</u></b><br>read:IPFV-1PRS<br>'I read' |
| (32) <b>lut<u>ʕ</u>'-<u>ifa</u></b><br>read:IPFV-1/2FUT<br>'I will read' | (33) <b>lut<u>ʕ</u>'-<u>es</u></b><br>read:IPFV-FUT<br>'he will read' |  |

The optative marker is never stressed.

- |   |   |
|---|---|
| <p>(34a) <u>l</u>uɬɛ'-ab<br/>read:IPFV-OPT<br/>'if only he would read'</p>              | <p>(34b) mu-l<u>u</u>ɬɛ'-ab<br/>NEGVOL-read:IPFV-OPT<br/>'if only he wouldn't read'</p>             |
| <p>(35a) <u>u</u>rts-ab<br/>fly:IPFV-OPT<br/>'if only he would fly'</p>                 | <p>(35b) m-<u>u</u>rts-ab<br/>NEGVOL-fly:IPFV-OPT<br/>'if only he wouldn't fly'</p>                 |
| <p>(36a) <u>i</u>rk'<sup>w</sup>-ab<br/>dress:IPFV-OPT<br/>'if only he would dress'</p> | <p>(36b) m-<u>i</u>rk'<sup>w</sup>-ab<br/>NEGVOL-dress:IPFV-OPT<br/>'if only he wouldn't dress'</p> |

Imperative forms are special. They never have the stress in the final position of the phonological (or morphological) word—in imperatives, the stem is stressed. Plural forms, however, where the imperative is suffixed with the plural-of-addressee marker *-na*, have the common second stressed pattern.

- |  |   |
|--|---|
| <p>(37a) <u>a</u>rts-e<br/>fly:PFV-IMP<br/>'fly!'</p>    | <p>(37b) arts-<u>e</u>-na<br/>fly:PFV-IMP-PL<br/>'fly! (to a group of people)'</p>    |
| <p>(38a) <u>b</u>elɬɛ-a<br/>read:PFV-IMP<br/>'read!'</p> | <p>(38b) belɬɛ-<u>a</u>-na<br/>read:PFV-IMP-PL<br/>'read! (to a group of people)'</p> |

Verbal prefixes influence the stress position, but the stress domain is restricted to the verbal stem. As shown in Table 1, in Mehweb only one preverb slot is possible<sup>5</sup>, so that any two-syllable domain before a verbal stem consists of a verbal prefix and the negation marker, as in (39b). Comparing (39b) with (39a) and (40b) with (40a) shows that the stress, although moving leftwards when new syllables are added to the left of the verbal stem, may not leave the verbal stem:

- |   |   |
|---|---|
| <p>(39a) ar-b-<u>i</u>k-ib<br/>PREF-N-become:PFV-AOR<br/>'he fell'</p>  | <p>(39b) ar-<u>h</u>a-b-<u>i</u>k-ib<br/>PREF-NEG-N-become:PFV-AOR<br/>'he didn't fall'</p> |
| <p>(40a) b-<u>i</u>k-<u>i</u>b<br/>N-become:PFV-AOR<br/>'he became'</p> | <p>(40b) <u>h</u>a-b-<u>i</u>k-ib<br/>NEG-N-become:PFV-AOR<br/>'he didn't become'</p>       |

<sup>5</sup> In many Dargwa languages a stem can be preceded by two preverbs, e.g. in Akusha, Kubachi, Icari, Khuduts and others. If a verb has two preverbs, the first (position -4) is always an orientation preverb, the second a direction preverb (position -3).

There are several two-syllable verbal stems, but they all fall within the scope of the main Mehweb stress rule: the stress always falls on the second syllable of the wordform, including those wordforms where monosyllabic verbs have special stress patterns, i.e. imperatives and optatives.

- |  |  |
|--|--|
| (41a) b-aʔ <u>a</u> q-ib<br>N-beat:PFV-AOR<br>'he beat'  | (41b) b-aʔ <u>a</u> q-a<br>N-beat:PFV-IMP<br>'beat!'                                 |
| (41c) b-aʔ <u>a</u> q-a-na<br>N-beat:PFV-IMP-PL<br>'beat! (to a group of people)'                        | (41d) ɸa-b- <u>a</u> ʔaq-ib<br>NEG-N-beat:PFV-AOR<br>'he didn't beat'                |
| (42a) d-usʔ <u>a</u> ʔ-un<br>F-fall.asleep:PFV-AOR<br>'he fell asleep'                                   | (42b) d-usʔ <u>a</u> ʔ <sup>w</sup> -e<br>F-fall.asleep:PFV-IMP<br>'sleep!'          |
| (43c) d-usʔ <u>a</u> ʔ <sup>w</sup> -e-na<br>N-fall.asleep:PFV-IMP-PL<br>'sleep! (to a group of people)' | (43d) ɸa-d- <u>u</u> sʔaʔ-un<br>NEG-N-fall.asleep:PFV-AOR<br>'he didn't fell asleep' |

In a small group of irregular verbs, the stems of some perfective wordforms only consist of a single consonant (or are zero morphs). When such forms are disyllabic, the dominant stress pattern is violated in the same forms as above (imperatives, see (58)-(63)) as well as in some additional wordforms (see (64)-(72)). In some forms the stress is on the second syllable (see (52)-(57)).

- |   |   |   |  |
|---|---|---|--|
| (44) g- <u>i</u> b<br>give:PFV-AOR<br>'gave'                  | (45) g- <u>u</u> b<br>see:PFV-AOR<br>'saw'                                | (46) <u>i</u> b<br>say:PFV.AOR<br>'said'                | (47) k- <u>i</u> b<br>come:PFV-AOR<br>'came' |
| (48) g- <u>a</u> b<br>give:PFV-OPT<br>'if only he would give' | (49) g <sup>w</sup> - <u>a</u> b<br>see:PFV-OPT<br>'if only he would see' |   |  |
| (50) <u>a</u> b<br>say:PFV.OPT<br>'if only he would say'      | (51) k- <u>a</u> b<br>come:PFV-OPT<br>'if only he would come'             |   |  |
| (52) g- <u>i</u> ʔa<br>give:PFV-1/2FUT<br>'I will give'       | (53) <u>i</u> ʔa<br>say:PFV.1/2FUT<br>'I will say'                        | (54) k- <u>i</u> ʔa<br>come:PFV-1/2FUT<br>'I will come' |  |
| (55) g- <u>i</u> ra<br>give:PFV-1.AOR<br>'I gave'             | (56) <u>i</u> ra<br>say:PFV.1.AOR<br>'I said'                             | (57) k- <u>i</u> ra<br>come:PFV-1.AOR<br>'I came'       |  |

- |  |  |  |
|--|--|--|
| (58) <b>ag-a</b><br>give:PFV-IMP<br>'give!'                              | (59) <b>bet'-a</b><br>say:PFV-IMP<br>'say!'                              | (60) <b>k-a</b><br>come:PFV-IMP<br>'come!'                 |
| (61) <b>ag-a-na</b><br>give:PFV-IMP-PL<br>'give!' (to a group of people) | (62) <b>bet'-a-na</b><br>say:PFV-IMP-PL<br>'say!' (to a group of people) |  |
| (63) <b>k-a-na</b><br>come:PFV-IMP-PL<br>'come!' (to a group of people)  |  |  |
| (64) <b>g-ala</b><br>give:PFV-APPREH<br>'beware of giving'               | (65) <b>g<sup>w</sup>-ala</b><br>see:PFV-APPREH<br>'beware of looking'   | (66) <b>k-ala</b><br>come:PFV-APPREH<br>'beware of coming' |
| (67) <b>g-ak'a</b><br>give:PFV-COND<br>'if he gives'                     | (68) <b>g<sup>w</sup>-ak'a</b><br>see:PFV-COND<br>'if he sees'           | (69) <b>k-ak'a</b><br>come:PFV-COND<br>'if he comes'       |
| (70) <b>g-ari</b><br>give:PFV-NMLZ<br>'(his) giving'                     | (71) <b>g<sup>w</sup>-ari</b><br>see:PFV-NMLZ<br>'(his) seeing'          | (72) <b>k-ari</b><br>come:PFV-NMLZ<br>'(his) coming'       |

Irregular verbs show that there are two groups of verbal endings. The endings in the first group are transparent for stress rule: relative forms have stress on the second syllable ((45)-(50)). Other forms restrict the stress position to the first syllable of the ending ((64)-(69)). This group has the same behaviour, when verb stem is monosyllabic ((73)-(74)). Only the nominalization marker behaves differently in the regular and irregular form. It seems that it repels stress when combined with an irregular verb (compare (64)-(66) with (73), (67)-(69) with (74) and (70)-(72) with (75)).

- |  |   |   |
|--|---|---|
| (73) <b>arc-ala</b><br>fly:PFV-APPREH<br>'don't fly' | (74) <b>arc-ak'a</b><br>fly:PFV-COND<br>'if he fly' | (75) <b>arc-ri</b><br>fly:PFV-NMLZ<br>'that he fly' |
|--|---|---|

In Mehweb, secondary stress behaves identically in all groups of words and wordforms: it falls on every second syllable to the right of the syllable bearing the primary stress.

In other Dargwa languages various syllables can be stressed, but there is a strong tendency (a) to stress the second closed syllable of a noun (Ashti, Icari, Khuduc, Qaytagh, Qunqi, Shiri, Tanti) and (b) to have the stress on the verbal root. These lects also have morphemes that are always stressed: the plural marker on nouns, the marker of verbal noun (masdar) and some others.



#### 4. Formalization

Phonological theory offers a range of models which focus on different properties of the empirical data or provide alternative solutions for the same facts. Below, I use various models to account for the data shown above. For convenience, I repeat the relevant generalizations:

1. most forms have the stress on the second syllable;
2. monosyllabic words are stressed;
3. secondary stress falls on every second syllable to the right from the main stress.
4. in Arab and Russian borrowings stress is unpredictable but remains fixed through the whole paradigm;
5. some morphemes (prefixes, OPT, IMP[SG]) repel stress, so that the respective forms may be stress-initial
6. the nominalization morpheme repels stress when combined with irregular verbs;
7. conditional and apprehensive markers can have only first syllable stressed;
8. some disyllabic nouns have initial stress in vocatives.

##### 4.1 Standard rule-based analysis

Classical Lexical Morphophonology theories distinguish stress-neutral (weak) morphemes and stress-attracting (strong) morphemes. If there is one and only one strong morpheme, then it is stressed; otherwise special rules apply. Some rules deal with the linear position of the strong morphemes (e.g. the final strong morpheme is stressed, as in Abkhaz [Spruit 1948]), other rules deal with hierarchies (e.g. in Lithuanian: root >> affixes [Dogil 1999]; cf. also [Zaliznyak 1967] on Russian).

Table 3. Illustration of the Lithuanian morpheme hierarchy

		root	
		weak	strong
affix	weak	dīen-ą day-ACC.SG	pīev-ą meadow-ACC.SG
	strong	dien-oms day-DAT.PL	pīev-oms meadow-DAT.PL

In systems like that, some rules describe the domain of stress assignment while additional, subsequent rules indicate which syllable is stressed if the strong morpheme is polysyllabic. Systems with Fixed Stress Location and with Weight-Sensitive Stress can be described in the same way if we assume that the domain of stress assignment is the prosodic word and all morphemes are of the same class.

In Mehweb, the main pattern is similar: OPT and IMP[SG], and some other markers (and even more in irregular verb paradigms) repel stress. So I postulate two groups of morphemes in Mehweb: standard markers (strong) and markers which repel stress (weak). To describe conditional and apprehensive markers I divide them into two morphemes: a-la (APPREH.ST-APPREH) and a-k'a (COND.ST-COND). APPREH and COND are weak morphemes. The following rules describe Mehweb stress pattern (as in generative phonology, the rules are ordered):

(76) Some lexemes (borrowings) are stored in the lexicon with the stressed syllable, so that the stress rules (77)-(80) do not apply to them.

(77) The stress domains in nominal and verbal wordforms are darkened (see Table 4). Weak morphemes (OPT, IMP[SG], prefixes) are not stressed.

Table 4. Stress domain in Mehweb wordforms

noun wordform				verb wordform						
stress domain				stress domain					strong	
0	1	2	3	-3	-2	-1	0	1	2	3
R[ABS.SG]	-CASE			PREF-	NEG-	CL-	R	-CAUS	-SUFF	-SUFF
	-OBL	-CASE								
	-PL[ABS]	-LOC	-OR			R				
		-CASE								
	-LOC	-OR								

(78) Primary stress is on the second syllable of the stress domain. If the stress on the second syllable is prohibited or impossible, then stress is initial.

(79) In the vocative, two-syllable wordforms are stress initial.

(80) Secondary stress falls on the every second syllable to the right of the main stress.

Some examples of the rule application are shown in (81):

(81)	amanat	w-ak'-as	lutɕ'-ab	adaj
rule (76)	aman <u>at</u>	–	–	–
rule (77)	–	w-ak'- <u>as</u>	lutɕ'- <u>ab</u>	ad <u>aj</u>
rule (78)	–	w-ak'- <u>as</u>	lutɕ'- <u>ab</u>	–
rule (79)	–	–	–	<u>adaj</u>
	assignment[ABS]	M-come:PFV-FUT	read:IPFV-OPT	father[ABS]
	assignment	'he will come'	'if only he would read'	'father'

#### 4.2 Metrical Phonology analysis

In Metrical Phonology ((Lieberman 1975), (Lieberman, Prince 1977), (Hayes 1981), (Hayes 1985), (van der Hulst 1999)) accentual patterns of different languages are explained by parameters of a foot structure and a phonological word structure. Since (Hayes 1981) feet, which constitute a layer between segments and the phonological word, are supposed to be strictly disyllabic. There are three parameters which account for all systems with fixed stress location:

- 1) foot structure: left-headed or right-headed;
- 2) word structure: left-headed or right-headed;
- 3) direction of the feet assignment: from left to right or from right to left.

Table 5. Typology of stress patterns in Metrical Phonology, based on (van der Hulst 1999)

		left-headed word	right-headed word
from left to right	left-headed foot	(x ...) (x .)(x .) ... σ σ σ σ ...	
	right-headed foot	(x ...) (. x)(. x) ... σ σ σ σ ...	
from right to left	left-headed foot		(... x) ... (x .)(x .) ...σ σ σ σ
	right-headed foot		(... x) ... (. x)(. x) ...σ σ σ σ

In Metrical Phonology, Mehweb can be analysed as a language with the foot structure assigned to the stress domain from left to right, with left-headed phonological word and with right-headed feet. Vocative forms are made by a stress readjustment rule:

(82) right-headed foot → left-headed foot / #[  ]<sub>voc</sub>#

This analysis, however, does not account for the fact that verbal prefixes cannot bear stress. As shown in examples ((39)-(40)), prefixes repel stress, but the foot consists of a prefix and a root. In 4.1 above, I accounted for this by rule (77) which blocks stress assignment to a prefix. But in Metrical Phonology all stress patterns should be explained by foot structure itself. Examples ((39)-(40)) are repeated here, with foot structure shown by brackets as required by the model; cf. ((83)-(84)):

(83a) (ar-b-ik)<sup>6</sup>-ib  
 PREF-N-become:PFV-AOR  
 ‘he fell’

(83b) ar-(ħa-b-ik)-ib  
 PREF-NEG-N-become:PFV-AOR  
 ‘he didn’t fall’

(84a) (b-ik-ib)  
 N-become:PFV-AOR  
 ‘he became’

(84b) (ħa-b-ik)-ib  
 NEG-N-become:PFV-AOR  
 ‘he didn’t become’

There is no way to define stress domain with right-headed feet. Any such rule will yield ill-formed wordforms:

<sup>6</sup> Feet scope here does not show syllable boundaries since syllabification in Mehweb has not yet been explored. Instead, it reflects morphological structure of the word.

Table 6. Ill-formed wordforms, which appear as a result of bad stress domain assignment

stress domain			⇒	(83b) *(arḥa)bikib
PREF	NEG	ROOT		
stress domain			⇒	(83a) *ar(bikib)
PREF	NEG	ROOT		

To avoid ill-formedness it is necessary to apply a stress readjustment rule:

(85) right-headed foot → left-headed foot / ...]PREF[\_]

The following are the Metrical Phonology rules for Mehweb:

(86) Some lexemes (borrowings) are stored in the lexicon with the assigned foot structure, so that the stress rules (87)-(92) do not apply to them;

(87) The following stress domains are assumed for Mehweb (prefixes and negation marker are not included, cf. (Table 4.)):

Table 7. Stress domains in Mehweb wordforms

noun wordform				verb wordform						
stress domain				stress domain				strong		
0	1	2	3	-3	-2	-1	0	1	2	3
R[ABS.SG]	-CASE			PREF-	NEG-	CL-	R	-CAUS	-SUFF	-SUFF
	-OBL	-CASE								
	-PL[ABS]	-LOC	-OR			R				
		-CASE								

(88) for every phonological word, feet are assigned from left to right within the stress domain;

(89) the foot is right-headed;

(90) the word is left-headed;

(91) a right-headed foot → a left-headed foot / #[\_]VOC#;

(92) a right-headed foot → a left-headed foot / ...]PREF[\_].

Some derivations are shown in (92):

(93)	amanat	w-ak'-as	adaj	arbikib
rule (86)	a(manat)	-	-	-
rule (87)-(90)	-	(w-ak'-as)	(adaj)	ar(bikib)
rule (91)	-	-	(adaj)	-
rule (92)	-	-	-	ar(bikib)
	assignment[ABS]	M-come:PFV-FUT	father[ABS]	PREF-N-become:PFV-AOR
	assignment	'he will come'	'father'	'he fell'

### 4.3 Optimality Theory

Within the framework of OT (McCarthy, Prince 1993b, 1995), (Prince, Smolensky 1993/2002)), the stress patterns are usually described within the Metrical Phonology model. Mehweb patterns of primary and secondary stress can be described as four constraints (cf. McGarrity 2003):

(93) RHTYPE=I: Feet have final prominence;

(94) FTBIN: Feet are binary;


(95) PARSE- $\sigma$ : Syllables are parsed by feet;

This constraint assigns one violation to each syllable that is not assigned to any foot;

(96) ALIGNFT-L: Align (Ft, L, PrWd, L), that is, align the left edge of every foot with the left edge of some prosodic word. It is only fully satisfied when a single foot is in the leftmost position of the prosodic word; any other foot will necessarily incur a violation of this constraint since more than one foot cannot stand at the left edge;

This is how stress rules look with the constraints ranking RHTYPE=I >> FTBIN >> PARSE- $\sigma$  >> ALIGNFT-L:

Table 8. Common Mehweb stress pattern in standard OT

/uq'laha-jni/ (7b)	RHTYPE=I	FTBIN	PARSE- $\sigma$	ALIGNFT-L
a.  (uq'lá)(hajni)				*
b. (uq'lá)(hàjni)	*!			*
c. (uq'lá)(hà)ni		*!	*	*
d. (uq'lá)hajni			*!*	

Prince and Smolensky put forward a hypothesis that OT constraints are universally present in grammars of all languages. It is further claimed that the lexicon is not the source of language specific material but is the result of the ranking of these violable universal constraints (Prince, Smolensky 1993). There are two different ways to deal with exceptions: Co-phonology and Indexed Constraints ((Inkelas, Zoll 2007), (Syed Jaafar 2012)). The Co-phonological approach ((Orgun 1996), (Antilla 1997), (Kiparsky 2000)), also called “Stratal OT”, holds that different phonological subsystems may co-exist in one language with the different constraint rankings. This is employed to describe different morphological subsystems, lexical classes and so on. In the Indexed Constraints approach ((Benua 1997a, b), (Alderete 1999, 2000), (Itô and Mester 1999), (Pater 2000), (Pater 2004)) a single constraint ranking is used, but it is supplemented with higher-ranked language specific constraints. As mentioned in Inkelas and Zoll (2007), for the same data, the Indexed Constraints approach permits more analyses than the Co-phonological approach. Another argument in favour of Co-phonology, as pointed out in Antilla (1997), is that the Indexed Constraints approach cannot explain cases of free variation.

On the other hand, the argument against Co-phonology is that when it is used to describe different rankings during the derivation, it seems to become similar to the rule-based approach (as in Rubach 1997). Both approaches are closely connected with the lexicon, so another possibility is just to give up the idea of the richness of the base ((Prince and Smolensky 1993/2004: 205, 225), (McCarthy 2008: 88-89)) which prohibits storing any information in lexicon, so that the input, which serves as the base for the generator of all possible outputs, is claimed to be poor.

My suggestion is to use a lexically filled version of the OT, in which some phonological information can be fed to the input. Faithfulness constraints which make phonological features of the output identical to the phonological features of the input should be higher-ranked. Below I show how Mehweb data is analysed under this approach. This idea is not really new: there are several works on stress, which actually used data with some lexical information (see Revithiadou (2006) on Greek or Komen (2007) on Chechen).

Another innovation in my analysis concerns Metrical Phonology in OT. Although Metrical Phonology is widely used in OT, works on stress transform into a search of how to correctly assign foot structure. In most languages, there is no evidence for foot structure except for secondary stress. It is widely presumed that it is a universal tool to describe patterns of primary stress. My suggestion is that while there are main stress rules and secondary stress rules, only secondary stress rules are based on foot structure.

Within LFOT we can explain the behaviour of the APPREH and COND morphemes without splitting them into two morphemes as in (4.1) and (4.2). They are stored in the lexicon with the prominent first syllable (-ak'a and -ala) and are not weak.

Mehweb patterns of primary and secondary stress are described within LFOT in (97)-(105).

(97) The following stress domains are assumed for Mehweb (cf. Tables 4 and 7).

Table 9. Stress domains in Mehweb wordforms

noun wordform				verb wordform						
stress domain				1 PREF		stress domain			strong	
0	1	2	3	-3	-2	-1	0	1	weak	3
R[ABS.SG]	-CASE			PREF-	NEG-	CL-	R	-CAUS		
	-OBL	-CASE								
	-PL[ABS]	- LOC	-OR			R				
		-CASE								
	- LOC	- OR								

In this scheme only one prefix or negation marker is included in the stress domain:

Table 10. Stress domains in Mehweb within the prefix zone

-3	-2	...
	NEG-	
PREF-		
PREF-	NEG-	

(98) **LEXICON**: in vocative forms and forms with some prefixes first syllable is prominent; in Arabic and Russian borrowings and apprehensive and conditional morphemes stress is stored in Lexicon;

(99) **MAX-STR-IO**: A syllable that bears lexical stress in the input, should be stressed in the output.

(101) **STRDOM**: stress is in the stress domain;

(102) **FTBIN**: Feet are binary;

(103) **RHTYPE=I**: Feet have final prominence;


(104) PARSE- $\sigma$ -LtoR: Syllables are parsed by feet left to right; this constraint assigns one violation per each syllable not parsed by a foot and one additional violation for each syllable in the stress domain before a foot not parsed by a foot. That means that to the structure ... $\sigma(\sigma\sigma)$ ... PARSE- $\sigma$ -LtoR assigns two violation marks, but to the structure ... $\sigma(\sigma\sigma)$ ... or ...  $(\sigma\sigma)\sigma$ ... only one.

(105) ALIGNSTRESS: in all outputs the prominent syllable of the foot should be stressed

The constraints are ranked as follows:


MAX-STR-IO >> STRDOM >> RHTYPE=I >> ALIGNSTRESS >> FTBIN >> PARSE- $\sigma$ -LtoR

Table 11. Common Mehweb stress pattern within Lexically filled OT

/uq'laha-jni/ <sup>7</sup> (7b)	MAX-STR-IO	STRDOM	RHTYPE=I	ALIGNSTRESS	FTBIN	PARSE- $\sigma$ -LtoR
a.  (uq'lá)(hajni)						
b. (úq')(lahà)jni					*!	*
c. (uq'lá)(hàjni)			*!			
d. uq'(láha)(jni)			*!		*	*
e. (uq'lá)(hà)ni					*!	*
f. (uq'lá)hajni						*!*
g. uq'lahajni				*!		****

The underlying form in Tableau 11 is /uq'laha-jni/, which is fully in the stress domain, so wherever the stress is, any of candidates cannot violate the STRDOM-constraint. Since there is no lexically stressed syllable, the MAX-STR-IO cannot be violated too. Candidates (c) and (d) violate RHTYPE=I, which requires all feet to have final prominence. The footless, and then stressless, candidate (g) violates ALIGNSTRESS and PARSE- $\sigma$ -LtoR. Candidates (b) and (e) violate FTBIN. Since candidate (f) has two unparsed by the foot syllables, it does not satisfy the PARSE- $\sigma$ -LtoR, so it makes the candidate with the secondary stress optimal.

Table 12. Arabic borrowing within Lexically filled OT

/paraq'át/ (15)	MAX-STR-IO	STRDOM	RHTYPE=I	ALIGNSTRESS	FTBIN	PARSE- $\sigma$ -LtoR
a.  pa(raq'át)						*
b. pa(ráq'at)	*!		*			*
c. para(q'át)					*!	**
c. pa(rá)(q'át)	*!				**	**
d. pa(rá)q'at	*!				*	**
e. (pará)(q'át)	*!	*			*	
f. (pará)q'at	*!	*				*
g. paraq'at				*!		****
h. (pá)(raq'át)	*!	*			*	

The underlying form in Tableau 12 is /paraq'át/, which has a lexically stressed syllable, so any candidate with a non-stressed final syllable violates MAX-STR-IO ((b), (d), (e), (f) and (h)). Only the last two syllables can be parsed by a foot or its part, otherwise STRDOM is violated. So the last candidates are in some case standard: the footless, and then stressless, candidate (g) violates the ALIGNSTRESS and PARSE- $\sigma$ -LtoR. Candidate (b) has a monosyllabic foot, so it violates FTBIN.

<sup>7</sup> Stress Domain is coloured.

Table 13. Mehweb imperative form within LFOT

/arts-e/ (32a)	MAX-STR-IO	STRDOM	RHTYPE=I	ALIGNSTRESS	FTBIN	PARSE- $\sigma$ -LtoR
a. (ártse)		*!	*			
b. (ár)(tsè)					**!	
c. $\mathcal{F}$ (ár)tse					*	*
d. ar(tsé)		*!			*	*
e. (artsé)		*!				
f. artse				*!		**

The underlying form in Tableau 13, /arts-e/, has no lexically stressed syllable, so MAX-STR-IO cannot be violated by any candidate. But the stress domain is monosyllabic in this form, so only those forms satisfying STRDOM have a monosyllabic foot within the stress domain (candidates (b), (c) and (f)). The candidate (f) is footless and stressless, so it violates ALIGNSTRESS and PARSE- $\sigma$ -LtoR. If PARSE- $\sigma$ -LtoR was ranked higher than FTBIN and RHTYPE=I, then candidate (b) with the secondary stress would be optimal. Since secondary stress does not appear in such cases the ranking is FTBIN>>PARSE- $\sigma$ -LtoR.

Table 14. Mehweb monosyllabic word within LFOT

/betéʔ/ (8a)	MAX-STR-IO	STRDOM	RHTYPE=I	ALIGNSTRESS	FTBIN	PARSE- $\sigma$ -LtoR
a. $\mathcal{F}$ (béteʔ)					*!	
b. betéʔ				*!		*

Since the syllable cannot be stressed—not being parsed by a foot—the candidate (b) in Tableau (14) has no stress and violates ALIGNSTRESS. This constraint is ranked higher than FTBIN, otherwise candidate (b) would be optimal.

Table 15. Mehweb verb form with prefixes within LFOT


/ar-ḥa-b-ik-ib/ (34b)	MAX-STR-IO	STRDOM	RHTYPE=I	ALIGNSTRESS	FTBIN	PARSE- $\sigma$ -LtoR
a. (arḥá)(bikìb)		*!				
b. (arḥá)(bì)kib		*!			*	*
c. (arḥá)bikib		*!				**
d. ar(ḥabí)(kìb)					*!	*
e. $\mathcal{F}$ ar(ḥabí)kib						**
f. arḥa(bikífb)						***!
g. arḥabi(kífb)					*!	***
h. arḥabikib				*!		****

The underlying form in Tableau (15) is /ar-ḥa-b-ik-ib/, which has no lexically stressed syllable, so MAX-STR-IO is not violated by any candidate. As shown in Table 10, the prefix is not included in the stress domain, so all forms where first syllable parsed by a foot or its part violate STRDOM ((a), (b) and (c)). The candidate (h) is footless and stressless, violating ALIGNSTRESS and PARSE- $\sigma$ -LtoR. If PARSE- $\sigma$ -LtoR was ranked higher than the FTBIN, then candidate (d) with the secondary stress would be optimal. Since secondary stress does not appear in such cases the ranking is FTBIN>>PARSE- $\sigma$ -LtoR, so (g) and (d) violate FTBIN. A note about candidate (f): As mentioned in (104), PARSE- $\sigma$ -LtoR assigns two



violation marks to the syllables before a foot within the stress domain which are unparsed by a foot (the structure ... $\sigma(\sigma\sigma)$ ...). So candidate (f) has an additional violation mark and is not optimal.

Table 16. Mehweb irregular verb form with conditional morpheme within Lexically filled OT

/g <sup>w</sup> -ák'a/ (61)	MAX-STR-IO	STRDOM	RHTYPE=I	ALIGNSTRESS	FTBIN	PARSE- $\sigma$ -LtoR
a. (g <sup>w</sup> á-k'a)			*!			
b. (g <sup>w</sup> a-k'á)	*!					
c.  (g <sup>w</sup> á)-k'a					*	*
d. (g <sup>w</sup> á)- (k'à)					**!	
e. g <sup>w</sup> a-(k'á)	*!				*	*
f. g <sup>w</sup> a-k'a	*!			*		**

The underlying form in Tableau (16) is /g<sup>w</sup>-ák'a/, has a lexically stressed syllable, so any candidate with a non-stressed initial syllable violates MAX-STR-IO ((b), (e) and (f)). There is no way to violate STRDOM here. Candidate (a) has a trochaic foot, so it violates RHTYPE=I. And again if PARSE- $\sigma$ -LtoR was ranked higher than FTBIN and RHTYPE=I, then candidate (d) with the secondary stress would be optimal. Since the secondary stress does not appear in such cases the ranking is FTBIN>>PARSE- $\sigma$ -LtoR and the candidate (d) loses.

LFOT is a modification of the Indexed Constraints approach. It is better than previous Indexed Constraints approaches since it does not introduce language specific constraints on the presumably universal set (as put forward by Prince and Smolensky). It allows us to keep one constraint ranking and not to re-rank constraints at every stage of derivation. In other words, we can combine LFOT and Co-phonology or Indexed Constraints. The advantage of the LFOT is the decrease in the number of exceptions.

## 5. Conclusions

It has been shown that in Mehweb the main stress by default falls on the second syllable. Various classes of exceptions are explained using a set of seven constraints in what I introduced as LFOT, a modification of the Indexed Constraints approach. Note that in other studies that compared the Co-phonology approach and the Indexed Constraint approach ((Inkelas, Zoll 2007), (Syed Jaafar 2012)), Co-phonology was preferred over Indexed Constraints. The empirical data discussed above shows how a small modification of the Indexed Constraint approach wins over Co-phonology and maintains the descriptive power of the Standard OT.

### List of abbreviations

ABS – absolute; ACC – accusative; AOR – aorist; APPREH – apprehensive; C – consonants; CARD – numeral marker; CASE – core case markers; CAUS – causative; CL – class agreement markers; COND – conditional; DAT – dative; ERG – ergative; ESS – essive; FUT – future; GEN – genitive; IMP – imperative; IPFV – imperfective stem; L – liquids; LNK – numeral linker; LOC – localization; M – masculine; N – neuter; NEG – negation; NMLZ – nominalizer; OBL – oblique; OPT – optative; OR – orientation; PFV – perfective stem; PL – plural; PREF – prefix; R – root; SG – singular; SUPER – localization on goal; TAM – TAM markers; V – vowels; VOC – vocative;  $\sigma$  – syllable.

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