On the borderline of reduplication: gemination and other consonant doubling in Arabic morphology[1]

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1. Introduction

Gemination and reduplication in Arabic morphology have been classified both as essentially the same thing and as two different procedures. While morphological gemination is a comparably uncontroversial term in linguistic literature, reduplication, its definition and delimitation from other repetition and doubling phenomena is still a matter of some debate. One such delimitation problem concerns the differentiation between reduplication and recursive structures in syntax, another problem of delimitation arises at the other end of the continuum, between morphology and phonology, involving the doubling of bare segments or the "tiny bits", as dubbed by Inkelas (cf. Inkelas, this volume).

This paper is concerned with the latter, drawing on data from Arabic verbal morphology. It is assumed that in Arabic, and in Semitic in general, bare consonants can be doubled to achieve some change in meaning. The Arabic verbs investigated here exhibit the doubling of one or two consonants, like *ʃarʃaħ* ($C_1VC_2C_1VC_3$) or *bərgəg* ($C_1VC_2C_3VC_3$) and *laflif* ($C_1VC_2C_1VC_2$), or the most frequent type of doubling, the doubling of C_2, which results in gemination, like in *kassar* or *fakkar* ($C_1VC_2C_2VC_3$).

Trying to decide whether this phenomenon should be viewed as reduplication or not will inevitably lead us to some basic issues that have been dealt with in the recent linguistic debate.

(i)   Is reduplication of bare segments only a phonological process or does it bring about semantic change?

(ii)   Does reduplication necessarily obey prosodic requirements following the assumptions of Prosodic Morphology (McCarthy and Prince 1986; Marantz 1982) or can the doubling of bare segments be counted as an instance of reduplication?

(iii)   Is gemination and other segmental doubling in Arabic to be considered as reduplication or spreading (McCarthy 1981, 1982)?

(iv)   Is the strong grammaticalization hypothesis that predicts a grammaticalization path along the following line: full reduplication > partial reduplication > [...] > gemination (Niepokuj 1997: 63) correct?

The functional question (i) does not seem to be very problematic: reduplication as a grammatical phenomenon is commonly held to involve a change in meaning, thereby excluding phenomena such as the well-known reduplicative constructions that occur in babbling, consonant harmony and long consonants as in Italian 'raddoppiamento sintattico'. The formal problems (ii, iii), however, seem to be far from being settled. As far as question (iv) is concerned, the Arabic data will provide further evidence against the strong grammaticalization hypothesis.

2.   Preliminaries

2.1.   The mechanism of Semitic morphology

In Arab grammatical tradition Arabic morphology has always been described as a system of *roots* (dʒiðr) and *patterns* (wazn) which are filled out by the intercalation of vowels to the consonantal root skeleton. This model was established systematically in modern linguistics with John McCarthy's dissertation (1979), which was the starting point of a prosodic theory of non-concatenative morphology (McCarthy 1981). This view has been challenged in recent linguistic work, which attempts an analysis without roots and patterns, or only without roots, e.g., Bat-El (1994) for Modern Hebrew and Ratcliffe (1998 and prior work) for Arabic. This is not the place to discuss this issue. The necessity of assuming word-based derivation in many cases of Arabic word formation, like in the formation of the "broken" plural (Ratcliffe 1998) does not, in my opinion, obliterate the traditional analysis of Arabic morphology as a *root-pattern-system* but rather enriches it.[2] I believe the root exists as an, admittedly abstract, lexical morpheme that provides the basic consonantal skeleton for derivational processes which are considered to be an interplay of the root, vocalic melodies and certain prosodic patterns. Sometimes they also involve other morphological processes like doubling or affixation. The template is viewed as a kind of

constraint on the other morphological operations (cf. also Ratcliffe 1998: 42-50).

Arabic roots are mostly triliteral (henceforth cited between "°°"), and the most common simplex verb contains only three consonants with interspersed vowels, and exhibits a pattern CVCVC or *katab* (following the Arab tradition of using an existing root to illustrate the pattern). This pattern conveys the basic verbal meaning of the root. All other verbal classes are derived by augmentation, either with a morphological affix or by the doubling of consonants. This system in principle holds true for Classical Arabic (CA) as well as Modern Standard Arabic (MSA) and for the Neo-Arabic varieties spoken today. The derived forms add something to the basic meaning of the root, or alter it in some way, and thus constitute semantic verbal classes.

2.2. Gemination and reduplication in former studies

In 1862 August Friedrich Pott formally divided *doubling* into two subprocedures, *gemination* and *reduplication*. Gemination, contrary to the meaning of the modern term, is viewed as *total doubling* ("Wiederholung im Ganzen") and reduplication as *partial doubling* ("verkürzte und nur zum Theil, also bloß andeutungsweise vollzogene Wiederholung", p. 16). Reduplication is further divided into a) *strengthening* of bare segments ("bloße Steigerung von Einzel-Lauten", p. 16) and b) *reduplication proper* ("eig[entliche] Reduplikation", p.18). This last distinction is obviously based on the shape of the reduplicant. In case bare segments are strengthened, the reduplicant does not project a syllable of its own. Pott explicitly cites vocalic lengthening as "vowel strengthening" and the gemination of the second radical in Semitic languages as "consonant strengthening" (p.17). If it is only one segment that is doubled, in cases of reduplication proper, the result is always a syllable in its own right. When initial consonants are strengthened, they are said to have an accompanying vowel as in Sanskrit perfect formation (p.18).

Considering that Pott's survey subsumes all different kinds of repetition phenomena under the heading "Doppelung", whether they are grammatical or extra-grammatical, it comes as no surprise that he should include every kind of formal doubling as well. But also Edith Moravcsik (1978: 309), in her seminal article on reduplication, explicitly counts Syrian Arabic gemination of C_2 as an instance of reduplication. Consonantal and vocalic dou-

bling is also viewed as a kind of reduplication in more recent surveys on reduplication (Rubino, this volume). The opposite view has been expressed, for instance, by Wiltshire and Marantz (2000). They exclude gemination in Semitic from reduplication (p. 558) and group it together with consonant mutation phenomena (p. 567), but do not bring forth any arguments to sustain their claim.

While specialists on Arabic or Semitic languages mostly put all doubling phenomena of Arabic together under the heading of reduplication (or doubling) like Ibrahim (1982), the history of generative treatments is one of keeping things apart (in the framework of autosegmental and metrical phonology), but recently also of aiming at a unified treatment within Correspondence Theory (Imouzaz 2002). The arguments put forward are mostly purely formal and theory-internal and to the greater part neglect the semantic dimension. In these accounts, gemination has been viewed variously as multiple association of root segments in the framework of autosegmental phonology (McCarthy 1979, 1981) and within the theory of metrical phonology (Angoujard 1988), or as the addition of a mora within Prosodic Morphology (McCarthy 1992), while other doubling has been attributed variously to (long distance) consonant spreading or reduplication (Broselow and McCarthy 1983), depending on the adjacency of the segments. More recently, with the advent of Optimality Theory, a different approach has been put forward and the distinction between long distance consonant spreading and reduplication has been challenged (Gafos 1995, 1998; Rose 2000). OT-analyses of different languages have come to treat all kinds of bare consonant repetition as being essentially the same, like Hendricks (1999) and Imouzaz (2002).

2.3. Reduplication as a morphological operation

Reduplication in Semitic is not a process that adds material to the base in a purely concatenative manner; it rather obeys the requirements of template satisfaction. This is the main reason why such doubling phenomena have often been analyzed as the spreading of phonetic information.

In line with the approach to Arabic morphology as outlined above, I argue in the following section that bare consonant doubling in Arabic is a morphological means of word formation. In morphological terms, reduplication is the repetition of all or part of a morphological entity (root, affix, stem). If the consonantal root is considered as a genuine morphological

entity, there is no problem in classifying the repetition of part of that root as reduplication.

If we have a look at the literature on reduplication, we however observe a certain reluctance to classify consonant doubling as such. I assume that the reason for this reluctance lies in what we expect prototypical reduplication to look like. Prototypical reduplication is supposed to be highly iconic (full reduplication) and morphotactically transparent. Full reduplication is easier to perceive, to memorize and evaluate, but even adjacent reduplicated syllables are easily recognized as being the same - much less so, if only singleton segments are doubled. So it seems to be a matter of the phonological make-up, the prosodic structure and of adjacency, whether we easily perceive certain structures as reduplicated.

In phonological terms, reduplicated structures should preferably project syllables on their own with the segments showing the same sequence in the reduplicant as in the base. Such a preference is paralleled by the extra-linguistic principles of poetry, *Alliteration* and *Rhyme*, as suggested by Yip (1999). Both, the linguistic and poetic principles can be further deduced from general natural principles of rhythmicity and gestalt preferences (cf. Dressler 1996). Semiotically, adjacency facilitates indexicality (Dressler 1996), hence alliteration only counts when the phonemes are at a sufficiently close distance (Dressler 1990). Thus, prototypical reduplication is supposed to be adjacent. This takes us back to Pott's classification of the reduplication phenomena, which divides reduplication into "proper" reduplication and the "strengthening" of segments. I therefore assume reduplication that abides by the principle of alliteration and rhyme (e.g., syllable reduplication) to be more natural than reduplication of bare segments. I will return to this point in section 4 after I have discussed the Arabic data.

3.   The Data

3.1. Form and meaning of Arabic CVCCVC-verbs

The data presented here will exclusively be tokens of the second disyllabic pattern (CVCCVC), mostly from Neo-Arabic vernaculars, but also from Classical (CA) and Modern Standard Arabic (MSA) which is the modern

continuation of the Classical variety, especially as far as morphology is concerned.[3]

Arabic verbs of the CVCCVC-pattern can have the following abstract segmental shapes:

katkat (with a reduplicated root or syllable)
katkab (with a doubled C_1)
kattab (with a doubled (i.e., geminated) C_2)
katbab (with a doubled C_3)
$C_1C_2C_3C_4$

With regard to semantics, the verb forms can be said to derive from an existing form, be it a simplex verb – as it is in most cases – or a noun. But not every augmented pattern can synchronically be traced back to a simplex form, augmented lexical forms do not seem to be dependent on the prior existence of simplex ones. As mentioned above, I assume that formally the derivational process utilizes the root, and pairs it with a certain pattern to arrive at the desired lexical form.

3.1.1. Patterns with gemination

Stem II of the verb is derived by the doubling of the second consonant, which is commonly called 'gemination' in Arabic philology, and is thus the Arabic realization of a common Semitic D(oubling)-stem. Wright ([1896] 1974/I: 31) describes the original meaning of the *kattab*-pattern in CA as intensive or "extensive", thus translating the old Arab grammarians' categorization of *muba:laɣa* 'exaggeration' and *takTi:r* 'augmentation, multiplication' which means that an action is being carried out for a longer period of time (continuous) or repeatedly (iterative, frequentative) or by a number of people or in a number of places (distributive). In a tentative account of the functions of the *kattab*-stem, Greenberg (1991) noted that the Semitic "Intensive" might better be analyzed as expressing verbal plurality (cf. Dressler 1968, Cusic 1981).

Table (1) gives some examples of the different intensive/pluractional meanings of the *kattab*-form:

(1)

root	verbform	gloß	language
°frq°	faraq	to separate	CA/MSA
°frq °+ GEM	farraq	to disperse	CA/MSA
°ɖrb°	ɖarab	to beat	CA/MSA
°ɖrb°+ GEM	ɖarrab	to beat violently	CA/MSA
°ksr°	kasar	to break	CA/MSA
°ksr° + GEM	kassar	to break into pieces	CA/MSA
°bky°	baka:	to weep	CA/MSA
°bky°+ GEM	bakka:	to weep much	CA
°brk°	barak(a[4] l-dʒamalu)	(the camel) kneeled down	CA
°brk°	barrak(a n-naʕamu)	(the whole drove of camels) kneeled down	CA

As the above table shows, the pluractional function of the *kattab*-pattern seems to have been partly lost over time. The dictionary of Hans Wehr (1977) on Modern Standard Arabic (MSA) gives for *bakka:* (°bky°+GEM) and *barraka* (°brk°+GEM) only the translations 'to make cry' and 'to make (the camel) kneel', respectively. This leads us to a second function of the *kattab*-pattern, viz. the causative/factitive function, which is the dominating function in Neo-Arabic and MSA. A third, very common function, again as well in MSA as in Neo-Arabic varieties, is the denominative function which also extends to loan words. In Neo-Arabic and in MSA the causative and denominative functions can be said to be fairly productive, the pluractional/intensive meaning is still maintained by a considerable number of verbs. These functions have already developed in CA (Wright [1896] 1974/I: 31). But the extensive use of this pattern in Neo-Arabic has been furthered by the loss of stem IV (*ʔaktab*) of CA for factitive or causative signification, and its merger with stem I, with the second form taking over its function in many cases.

3.1.2. Patterns with full reduplication

Traditional Arabic grammars like Wright ([1896] 1974) subsume the remaining CVCCVC-verbs under the heading *quadriliteral*, not differentiat-

ing the nature of the consonants. From a semantic point of view, this seems useful. Moreover, these verbs are also structurally related. Thus a quadriliteral verb may just as well consist of four as of three or two different consonants, with one or two of them being doubled.

The most common of these is the *katkat*-pattern, a pattern with full reduplication of a biconsonantal (in some cases pseudo-) root, which results in the surface representation of two identical or nearly identical syllables. Words with that pattern can be found in all varieties and are often of onomatopoetic origin. Despite their extra-grammatical formation, these also fit into the overall derivational system, and the root can be extracted and made the basis for the derivation of nominal forms, like *zalzal* 'trembling (earth)' – *zilza:l* 'earthquake' (CA/MSA), *waswas* 'whisper' – *waswa:s* 'whisperer (devil)' (CA/MSA), *taʔtaʔ* 'lisp' – *taʔtaʔa* 'lisping' (Egyptian Arabic, henceforth EA). The origin of many of the biradical roots is not at all clear, and they do not seem to have common Semitic ancestors. This is why Moscati et al. (1980: 130) regard all quadriliteral forms in Semitic as innovations.

Procházka (1995) gives a survey of the semantic properties of the reduplicated biradical roots and roughly divides them into onomatopoetic words that express acoustic phenomena like different voices and sounds, movements and other things that shall be neglected here. Even if many of these words are of onomatopoetic origin, words for different voices like snoring, rattling etc. and movements like shivering, shaking, swinging to and fro etc. share one common feature, namely the plurality of the action or iterativity of the event.[5]

It has often been observed that Neo-Arabic varieties exhibit a strong tendency towards the use of quadriliteral verbs. While the doubling of C_2 (gemination) is found all throughout Semitic (Kienast 2001: 227, Lipiński 2001: 390), the reduplication of biradicals is a feature of West Semitic (Brockelmann 1908: 520) and is especially common in Ethio-Semitic languages (Höfner 1951: 103, Unseth 2003: 268). Lipiński (2001: 414) mentions their frequent occurrence in Libyco-Berber.

A preliminary investigation of Hinds and Badawi' dictionary of Egyptian Arabic (1986) clearly shows that, apart from obviously onomatopoetic words which do not show a corresponding simplex form, fully reduplicated verbs only arise if the root is composed of only two different consonants, thus I assume them to be derived from these roots, which are interpreted as bi-consonantal.

There is no biconsonantal reduplication within triliteral verbs, as in that case relevant phonological material would have to be dropped to fit the CVCCVC template, which serves as a constraint to the morphological operation of reduplication.

It seems that the younger *katkat*-verbs cover the same semantic range as the older *kattab* forms, i.e., from different kinds of pluractional and intensive significations to causativization (transitivization) and even intransitivization. Sometimes *kattab*- and *katkat*-forms are both attested, (mostly) with a differentiation in meaning, sometimes only one of the two forms can be found. There seems to be a tendency for the fully reduplicated forms to move towards stronger pluractionality in the sense of event-internal repetition, i.e., that one event at one occasion consists of repeated phases, like *bite* and *nibble*.

Table (2) shows some examples from EA (examples from Moroccan Arabic (MA) are marked as such), which do not give an exhaustive overview of all different kinds of meanings these words, can take on:

(2)

root	simplex	geminated	reduplicated
°lff°	laff 'wrap, wind, twist, coil'	laffif 'wrap, wind, twist, coil repeatedly'	laflif 'wrap up'
°lmm°	lamm 'collect, gather'	_____	lamlim 'gather up, gather together'
°ʃmm°	ʃamm 'smell'	ʃammim 'make, let smell'	ʃamʃim 'sniff'
	ʃəmm (MA) 'id.'	ʃəmməm (MA) 'id.'	ʃəmʃəm (MA) 'id.'
°mss°	mass 'suck'	_____	masmas 'chew, suck on'
°bss°	bass 'look'	_____	basbas 'ogle, make eyes, leer'
°dʃʃ°	daʃʃ 'mash, pound'	daʃʃiʃ 'mash or pound lightly'	daʃdiʃ 'reduce to fragments, smash, shatter'
°dʔʔ°	daʔʔ 'pound, hammer, nail etc.'	daʔʔaʔ 'go into detail, be meticulous, scrutinize'	daʔdaʔ 'crush, grind by pounding, etc.'

3.1.3. Patterns with doubled C_1 or C_3 and $C_1VC_2C_3VC_4$

According to Brockelmann (1908: 517), final doubling which results in the *katbab*-pattern in Arabic CVCCVC-forms is used in all Semitic languages to form iteratives. Three of the now mostly obsolete forms of Old Arabic (=CA) (stem IX, XI, XIV) are built according to that principle. Brockelmann does not mention the occurrence of CVCCVC-disyllables of that type in Old Arabic, but only gives examples from Maghrebinian (Neo-Arabic) varieties (Brockelmann 1908: 518; cf. also Kienast 2001: 236).

A fair number of Neo-Arabic verbs show a doubled C_1 after C_2, which results in *katkab*. If doubling of C_1 were adjacent, the resulting pattern should be **kaktab* which is not attested, obeying a general prohibition of $C_1=C_2$ in Arabic roots (Greenberg 1950). It has variously been suggested that such forms are the result of dissimilation of the first part of a totally reduplicated form, such as in *tòartòaba < tòabtòaba* 'he gurgled' (Lipiński 2001: 414). This pattern is especially common in the Levantine varieties (cf. Cowell 1964: 110f.).

One of the striking features of the above mentioned patterns, and likewise the pattern with four different Cs, is the fact that C_2 is significantly often represented by a sonorous consonant (r,l,n or a semivowel) which splits an original doubled C_2 or deconstructs a fully reduplicated form, with the sonorant mostly occupying the coda position of the first syllable: *farqaʕ < faqqaʕ* 'explode' (Brockelmann 1908: 510) or the already mentioned *tòartòab < tòabtòab* 'he gurgled'. Examples of such forms are legion, not only in the CVCCVC-pattern; the now obsolete XIIth stem was also probably built according to the same principle: *ʔxðawðar<*ʔxðarðar* 'to be green' (Brockelmann 1908: 519).

Furthermore, there are many different forms that obviously have undergone additional processes, such as metathesis, root contamination or insertion of a specific consonant.[6] Given the many different surface forms of quadriliterals, it does not seem to be possible to always trace them back to existing base forms, not to mention to one specific existing origin. Taking into account the considerable force of analogy in Arabic morphology (cf. Brockelmann 1927; Ratcliffe 2001), I assume that analogical formation is behind many of these new forms in Neo-Arabic. The frequent occurrence of certain consonants in C_2-position seems to have led to the development of submorphemes, just like in English *glitter, glow, glare, glimmer, flitter, flow, flare, flimmer* which consist of an element /fl-/ or /gl-/ with stable semantic content and possibly some formative, like –er for iteration (Plank

1981: 220). The following examples from EA all display a sequence °brtòC° and signify a repeated action with derogative connotation *bartòaS* 'to wear (shoes) until out of shape, to act clumsily; *bartòaʔ* 'to gallop about, round and prance about (of donkeys)'; *bartòal* 'to bribe' *bartòam* or *bartòan* 'to speak gibberish, to mutter crossly, grumble'. Analogical formations, however, can eventually lead to the emergence of new rules. I will turn to that point in section 4.

   In order to be able to establish a semantic system of the different patterns, a diligent study of all CVCCVC-verbs in Neo-Arabic is called for. In general, these quadriliterals seem to signify pluractionality, and additionally often exhibit a clearly derogative connotation, but they also function as causatives (transitives). The denominative use of this pattern is very common and goes back to CA, especially to derive verbs from nouns (mostly loanwords) with more than three consonants. Imouzaz (2002: chapter 5) claims for MA that the *katkab* pattern conveys derogative meaning, while the *katbab* template is used for intensification ('zêle'), the *katkat*-form for repetition and the geminated pattern signifies causatives. I suspect however, that these claims are too strong, even for MA, for EA they definitely do not hold in that strong sense.

   Moreover, as these verbs cannot always be traced back to a simplex triliteral form, there is often no semantic relationship to any root that could be proposed. The various formations treated in this section are illustrated in table (3). Simplex forms are cited where they occur.

(3)

simplex	**quadriliteral**	**Pattern**
ʃarah 'explain'	ʃarʃah 'criticize severely' (LA)	Katkab
?	dardiʃ 'chat' (EA)	Katkab
baraq (CA) 'shine (eye)'	barbaʔ 'to stare' (EA), cf. also barraʔ, same meaning)	Katkab
baraq (CA) 'shine (eye)'	bərgəg 'to have one's eye on' (MA)	Katbab
ʃaʕal (CA, MSA, EA) 'light, kindle'	ʃaʕlil 'kindle, cause to flare up' (EA)	Katbab
daɣʃa (EA) n. 'dusk'	daɣʃiʃ (EA) 'blur, bedim; become dim, blurred' (cf. daɣɣaʃ, same meaning)	Katbab

simplex	quadriliteral	Pattern
ʔalab 'invert, turn over' (?)	ʃaʔlib 'overturn, flip over'	no doubling
labax (EA) 'confuse, perplex' xabatò, xabbatò 'strike, hit, knock (+ GEM: repeatedly)'	laxbatòòò and xalbatò (EA) 'confuse, muddle, make a mess'	no doubling
xamaʃ, xammaʃ (CA, MSA) 'scratch'	xarbiʃ (EA) (<xarmaʃ) 'scratch, scribble'	no doubling

As the above examples show, the same meaning can be expressed by differently formed disyllables, cf. e.g., the EA-triplet *marmaɣ, mardaɣ, marraɣ* 'to roll in dirt', augmentations of the CA/MSA verb *maraɣ* 'to roll sthg. in dirt, to muddy', with no differentiation in meaning. Other examples like (4) from EA suggest that the different strategies are applied to achieve different shades of meanings, though this cannot be said to happen systematically:

(4)

verb	Gloß
fatt	'crumble bread' (not in EA, but in MSA)
fattit	'crumble, break into small pieces'
fatfit	'crumble, break into tiny pieces'
farfit	'crumble, break into tiny pieces'

4. The relationship between the different doubling phenomena in Arabic CVCCVC verbs

From a semantic perspective, there is a clear relationship between the simplex and the doubled forms in these verbs. The semantic range covered by all doubled forms is typical for reduplication in the languages of the world, i.e. pluractionality, intensity and perhaps even causativization,[7] following the principle of iconicity that 'more of the same form signifies more of the same meaning.' The only clearly non-iconic function is the denominative one.

From a diachronic and cross-Semitic perspective, doubling of C2, i.e., gemination, is clearly the older operation, signifying intensity or verbal

plurality in Semitic. Doubling of C2 is attested all over the Semitic area with roughly the same signification and goes back to Proto-Semitic (cf. Brockelmann 1908: 508ff., Lipiński 2001: 390, and others).

Brockelmann (1908: 508ff.), who considers doubling of C_2 as the basic means of forming the intensive, views the other forms of the CVCCVC-pattern as variations of the geminated form in Semitic:

> ... Durch Verdoppelung des 2. Radikals entsteht der *Intensivstamm* ... Seitenbildungen des Intensivstammes sind in allen semitischen Sprachen außerordentlich häufig, sie liefern namentlich in den jüngeren Dialekten das Hauptkontingent der Verbalbildung. (p. 508, p. 510)

Compared to gemination, the other doubling phenomena are much less common and are generally considered as innovations. While final doubling is attested throughout Semitic, initial doubling does not seem to be a genuine morphological operation in Semitic. In fact, the historically younger patterns of Neo-Arabic were probably originally derived from fuller reduplication (cf. below). Cowell (1964:253ff.) subsumes the different segmental shapes of the CVCCVC-pattern in Syrian Arabic under the heading *augmentatives*, which may be further divided into *frequentatives* and *intensives*.

Biconsonantal reduplications are also widely attested in Semitic languages (cf. Unseth 2003), but, as has been noted above, do not exhibit common Semitic forms, and are therefore probably a more recent development.

Considering the evolving semantic change of the *kattab*-form, from the originally dominating function of intensification and denotation of pluractionality (cf. table 1), to a nowadays more pervasive causative/factitive and denominative use, one could cautiously venture the hypothesis that this development has paved, and still is paving the way for the other doubled forms to take over (cf. MA: ʃəmməm 'make/let smell' and ʃəmʃəm 'sniff').

In the Ethiopian Semitic languages, syllable reduplication has become more productive, especially as the geminated forms have become fossilized and do not constitute derivational, but only lexical classes. A great number of biconsonantal reduplications, which are also accommodated to certain templates, occur in these languages (Unseth 2003), but such patterns can be significantly longer than in Arabic. The reduplicated forms, commonly called "frequentative", denote different pluractional meanings; sometimes different types of reduplication are used to denote different shades of meaning. In Tigré a triple set of reduplications of the same syllable is attested

which conveys three grades of attenuation (Rose, to appear). The *pilpēl* pattern of Modern Hebrew can be compared to the Arabic *katkat* and is also related formally and semantically to *piʕel,* the Hebrew counterpart of the Arabic *kattab*-form (cf. McCarthy 1981: 408)

From a formal perspective, in Arabic a single consonant as well as a whole syllable can appear as doubled. All verb forms obey template satisfaction and are thus restricted to a disyllabic pattern of two syllables, which exhibits a prosodic augmentation of the corresponding simplex pattern. In that sense, this view does not contradict the proposal of moraic augmentation put forward by McCarthy (1992). I do not think that the different kinds of affixation and other morphological operations obliterate the principle of root-and-pattern morphology. I rather assume that the addition of a mora affects the template, adding material on a separate "timing tier" which then serves as a kind of a well-formedness condition to the different possible segmental formations (cf. Ratcliffe 1998: 31f.).

Doubling, like the intercalation of vowels and affixation, should therefore be viewed as a morphological operation in its own right (in the sense of Sapir 1921), which can be combined with another morphological process like affixation or composition to arrive at the actual output forms. These strategies would be typical for concatenative languages, whereas a non-concatenative language like Arabic typically superimposes a prosodic template on the different kinds of morphological operations.

The pattern itself is assumed to exist independently from the possible derivational base, as these base forms can differ in shape (the simplex verbal pattern or a noun pattern exhibiting many possible templates) and may even carry part of the functional load.

Thus, roots with three different consonants double only a single consonant, whereas roots with only two consonants may double only one (as in *kattab* verbs, yielding *kattat*) or both of them (as in *katkat* verbs). Synchronically, all three consonants can appear as doubled, but diachronically only doubling of C_2 and C_3 is attested, whereas the repetition of the 1st radical after the second one probably resulted originally from the dissimilation of a totally reduplicated biconsonantal root (cf. 3.1.3.).

Doubling of C_2 inevitably results in gemination. Given the restrictions of the template shape, there is no way to achieve fuller reduplication when C_2 is doubled: *kataba > *katataba* would not only exceed the limits of the template, it would also be prone to syncope, like in the formation of stem IX in CA (°ħmr°) *ʔiħmarara > ʔiħmarra* or even the formation of stem I from a root °mrr° *marara > marra.*[8] One possible argument against view-

ing the geminate as an instance of doubling is the fact that it cannot be split in the inflectional paradigm, as in the following CA-verb forms:

(5)

	root	3.sg.m.: +a	1.sg.: +tu
(i)	°mrr° (stem I)	marra	marartu
(ii)	°ħmr° (stem IX,+RED(C$_3$))	ʔiħmarra	ʔiħmarartu
(iii)	°ktb° (stem II, RED (C$_2$))	kattaba	kattabtu

The reason why the geminate is not split in (iii), is its position between two vowels, whereas in examples (i) and (ii), forming a geminate would yield an illicit consonant cluster as it is followed by a consonant: *marrtu, *ʔiħmarrtu.[9] Geminated words structurally behave like all other CVCCVC-forms. The decisive argument for viewing geminates as doubled, and not lengthened consonants, is the fact that their first segment can be replaced by another segment (cf. below).

In the fully reduplicated forms the root consists of only two different consonants, both of which are doubled. This amounts to repeating the whole syllable /C$_1$VC$_2$/.[10] Thus the reduplicative structure is improved, as the outcome is no longer a singleton consonant, but a whole syllable, on the assumption that prosodic reduplication is better than the doubling of bare segments.

While full reduplication as well as final and initial consonant doubling are definitely not productive (yet) and are sometimes not derived from an existing root, it seems justified to assume that new reduplication rules have come into being. Many of the CVCCVC verbs show a sonorant, very frequently /r/ or the semivowel /w/, which is the typical default consonant in Arabic word formation, in the position of C$_2$. The scenario for the development of a new reduplication rule might thus be as follows:

Degemination and the deconstruction of a fuller reduplicated form have produced novel forms with apparently doubled C$_1$ or C$_3$ which might be illustrated by the following examples from MA and EA, which both have an ancestor in CA *fatt, fattat* 'to crumble bread'.

*fəttət > fərtət   'to crumble bread, to disperse' (MA)
 fatfit > farfit 'to crumble bread' (EA)

These forms now serve as the basis for analogical formations that aim at replicating the novel pattern. Note that not every surface form exhibiting a doubled consonant can be derived in this way. Such forms might thus be

considered as analogical formations, especially when they cannot be traced back to any original root. There are dozens of verbs, like EA *dardiʃ, farfiʃ, dandiʃ* etc. and MA *bərgəg, ʕəntət, zəntɔ̀ətɔ̀, guʒəʒ* etc. that might have been partly formed by analogy.[11] Following Ratcliffe's (2001) proposal that analogy involves the creation of a rule on the basis of surface patterns, I assume that these analogical formations in turn lead to a rule that is applied to triliteral roots, to derive verbs like *lahlib* 'to cause a burning sensation' from *lahab* 'flame'. Contrary to initial doubling, final doubling, of course, has a history in Semitic, in CA in the formation of the IXth and XIth and XIVth stem, but the CVCCVC-forms of that type only appear in Neo-Arabic, esp. in the Maghrebinian varieties. From the examination of such forms in Arabic, it becomes clear that the only productive reduplication rules in CVCCVC-verbs in Neo-Arabic are gemination and perhaps full reduplication of biconsonantal roots, the other two kinds of reduplication still having a marginal status in the grammar.

In order to evaluate the different kinds of reduplication in Arabic verb forms, we should consider the principles of reduplication that have been assumed in section 2.3 and are replicated here for convenience. If we assume that the formal procedure of reduplication originates in the repetition of phonological material as in babbling for example, which may be utilized to denote grammatical categories or notions, the best type of reduplication seems to be one that doubles whole structures as they are. This means that full reduplication is better than partial reduplication and reduplication of prosodic units with the minimal size of a syllable is better than the doubling of bare segments. Within the realm of segmental doubling, the reduplicant, in this case the copy of the segment, should be in the same syllabic position as in the base, i.e. it should alliterate or rhyme with the segment of the base.

Under this assumption, Arabic verb forms can be graded on a scale from "best" to "worst" type of reduplication:

$$katkat > katkab > katbab > kattab$$

The segments in the *katkat*-form alliterate and rhyme; the output shows two identical syllables. In *katkab* the two syllables have the same onset-C, so at least alliteration is realized, whereas in the last two forms the copied consonants neither alliterate, nor do they rhyme. The problem with geminates is that they are articulated and also perceived as one gesture, which makes the doubling more opaque and also makes them prone to degemination.

It has been observed that reduplicative constructions may be subject to phonetic erosion. Thus, full reduplication may develop into partial reduplication and syllable reduplication may eventually result in gemination after the syncope of a vowel, as for example in Trukese (Goodenough 1963). This is what the strong grammaticalization hypothesis of reduplication predicts. As has been shown, the case of Arabic does not sustain this hypothesis, as geminates do not originate in fuller forms of reduplication, but on the contrary, the geminated forms are definitely older than the other reduplicated forms. In addition to the frequently observed deterioration or loss of reduplication, there are cases attested cross-linguistically where reduplicated structures are improved (cf. Hurch and Mattes, to appear). Of course, these are not very common and the main process is the one of deconstruction.

In Arabic CVCCVC verbs, both processes, a) deconstruction and b) structural improvement are attested:

a) full reduplication > partial reduplication
   partial reduplication > zero-reduplication
b) partial reduplication > full reduplication

Examples for (a) have been cited above in 3.1.3, such as the emergence of a sonorant in the coda of the first syllable of fully reduplicated forms like kabkab > karkab, thereby giving rise to the novel type of initial reduplication and the reduction of geminated triliterals as in faqqaʕ > farqaʕ, which is an example for the complete loss of reduplication and the emergence of novel quadriliteral forms. Examples for b) are all instances of fully reduplicated biconsonantal roots that are an innovation, compared to the older forms with doubled C2 as in fattit > fatfit or laffif > laflif (cf. 3.1.2, table 2). I do not assume, though, that these novel forms are directly derived from the geminated pattern, but rather that they replace it.

5. Formal analysis

Having established the semantic, diachronic and structural relationship of all different CVCCVC forms, some kind of formal analysis seems to be called for. Formalizing linguistic rules is always a highly hypothetical and tentative thing to do, as the history of modern linguistics amply shows. But, on the other hand, it may lead us to gain deeper insight into the actual pro-

cedures that go on in our minds in the process of linguistic production, as well as into the mechanisms of language change. The major problem is that the wish to make the model work will often make the data obey a certain system, instead of finding a system that explains the data.

Among other issues, linguistic debates of the past decade have centered around the (prosodic) shape of the reduplicant and its base. Starting with Marantz (1982), reduplicants have been defined phonologically as segmental strings, or later in prosodic terms as exemplifying a certain prosodic shape (McCarthy and Prince 1986 et seq.). Clearly, the case of Arabic provides no evidence for the latter assumption. Gafos (1995) proposes to analyze consonant reduplication as "a-templatic" reduplication, i.e. not satisfying a prespecified prosodic template, relying on data from the Austronesian language Temiar, the formation of Hebrew denominative verbs and Arabic root formation. He also proposes that the distinction between templatic and a-templatic reduplication is due to the difference between concatenative and non-concatenative morphology.

Broselow and McCarthy (1983) analyzed reduplication in Arabic *katkab* and *katkat* forms as essentially the same process of infixation to a prespecified C-slot. However, they did not address *katbab*-reduplication and gemination in the *kattab*-pattern is explicitly excluded (p. 76). In McCarthy (1981, 1982) the geminate was ascribed to the addition of a segment and the spreading of phonetic information, and in McCarthy (1992) this approach was refined and the augmentation of the template was ascribed to the addition of a mora within the theory of prosodic circumscription.

As I have tried to show in the previous section, the different kinds of doubling in the disyllabic Arabic verb should rather be viewed as related and thus the mechanism of their derivation should also be subject to a unified treatment.

As outlined above, I assume the CVCCVC pattern to be an augmentation of the prosodic shape, which is achieved by the addition of a mora to the simplex verbal pattern CVCVC (LL),[12] thereby yielding a sequence (HL). The actual segmental shape of the pattern is then arrived at by copying a consonant: C_1, C_2 or C_3. The locus of the reduplicant is the onset of the second syllable. The most recent development in generative treatments of reduplication has distinguished between prosodic and morphological bases of reduplication. As reduplication in verb formation is a morphological operation, it seems only natural that it should take as its base a morphological entity, such as the root. There is cross-Semitic evidence (Unseth 2003) as well as evidence from syntactic reduplication in Arabic (Maas,

this volume) that it is the root consonants that are doubled, and, as the data show, every consonant can in principle be doubled. The linguistic output, however, is subject to prosodic constraints. As McCarthy (1982) already noted, Arabic *katkab*-reduplication is paralleled in Temiar. In fact, the following Temiar examples, often cited in the literature, are the mirror image of the Arabic verbs.[13]

(6)
Temiar:

	triconsonantal root	**biconsonantal root**
perfective	s.lɔg	kɔ̄w
continuative	s**g**.lɔg	**kw**.kɔ̄w

Arabic:

	triconsonantal root	**biconsonantal root**
perfective	faraħ	laff
pluractional (perf.)	far**f**aħ	laf**lif**

In Broselow and McCarthy's (1983) analysis the difference between the Arabic and the Temiar examples lies in the "direction of association of the phonemic melody copy with the infix" (p. 38). Within Optimality Theory, Gafos (1995, 1998) translates the analysis of the Temiar data to prefixation or alignment to a stressed syllable or the prosodic head of the prosodic word. The parallelism between the Temiar and the Arabic examples is definitely striking. Thus, we could also venture to analyze reduplication in the Arabic forms in terms of "suffixation" or of "alignment to the right" of the stressed syllable which is the head of the foot, as Arabic disyllabic verbs have trochaic stress. As we want to include all kinds of doubling in the CVCCVC pattern of Arabic verbs into our analysis, this clearly demands that 1) copying must take place from left to right **or** from right to left; as the target is in infixal position, this option is not to be excluded a priori.

(7)

root	**simplex**	**CVCCVC**	**direction of copying**
°frħ°	faraħ	far**f**aħ	left-to-right
°k-s-r°	kasar	kas**s**ar	left-to-right
°ʃ-m-l°	ʃamal	ʃam**l**al	right-to-left

2) The base to which the reduplicant is aligned and the input for copying are different, the former being a prosodic constituent, viz. a stressed syllable, the latter a morphological one, viz. the root. Again, I take this to be in line with the assumption that reduplication is a morphological procedure that copies part of a morphological entity, but that its output is subject to prosodic and other phonological requirements or constraints.

There are other principles that govern the outcome of reduplication, whether they are strict requirements which cannot be violated, or just preferences, like the aforementioned alliteration and rhyme that can be violated. I will not dwell on these however, as they are not the subject of this paper.

Whatever the correct analysis may be, the major insight from the parallelism with the Temiar facts seems to be the difference in the role of the prosodic template within morphology, as already pointed out by Gafos. While in concatenative morphology it is the shape of the reduplicative "affix" that is prosodically determined, in non-concatenative morphology it is the prosodic shape of the whole structure that is fixed. Consequently, in Temiar as in Arabic, whether one or two consonants are doubled depends on the number of root consonants, because the requirement that must be met in the first place is the shape of the disyllabic template.

6. Conclusion

In this article I have tried to establish the relationship of different consonant doubling phenomena, including gemination, in Arabic verbal morphology. Furthermore, I have provided some new data of Arabic CVCCVC-verbs that show the emergence of a pattern of full reduplication, not just for a lexical class of onomatopoetics as in Old Arabic, but also as a derivational class, which seems to exist beside the ancient stem II (D-stem) and is even partly replacing it.

If the proposed analysis is right, this will answer the questions asked in the introductory paragraph of this paper:
(i) Is reduplication of bare segments only a phonological operation or does it bring about semantic change and (ii) does reduplication necessarily obey prosodic requirements or can the doubling of bare segments be counted an instance of reduplication?

The analysis of the data has shown that the doubling of consonants in Arabic is clearly a morphological issue, which changes the derivational class and the semantics of the verb. Considering the structure of the root, which

only consists of consonants, it seems only natural that bare consonants are doubled. Moreover, if we compare doubling with affixation, we find that an affix in Arabic typically has the size of just one segment, e.g., two derivational affixes in Arabic verb formation are °t° and °n°.

Furthermore, the doubling of bare segments is a legitimate form of morphological reduplication, connected to the morphological type of Semitic, in which the consonantal root is the basic lexical morpheme.

Segmental doubling, though, is a rather bad instance of reduplication as far as constructional iconicity is concerned, as it is harder to perceive and process than fuller reduplications that abide by the extra-grammatical principle of alliteration and rhyme.

(iii) Is gemination in Arabic to be considered as reduplication or spreading?

It has been shown that the geminate clearly is an instance of two identical consonants. Thus gemination in Arabic verbs should be viewed as reduplication. On the other hand, as has happened in some Semitic languages, gemination can easily become fossilized and lose its morphological function. As geminated consonants are phonetically one, it is only natural that with time they should develop into singleton consonants like in Hebrew and thus become prone to consonant mutation phenomena. What started out as morphological doubling can become consonant mutation, following the grammaticalization path of phonetic and semantic erosion.

(iv) Is the strong grammaticalization hypothesis (Niepokuj 1997: 63) that predicts a grammaticalization path along the following line: full reduplication > partial reduplication > [...] > gemination correct?

The case of Semitic provides clear evidence against a strong grammaticalization hypothesis, as it becomes evident that partial reduplication does not necessarily belong to a later stage of earlier fuller or total reduplication. It rather seems that different reduplications can coexist to convey different meanings (cf. also Haugen, this volume, Hurch and Mattes, to appear). On the contrary, as in the cases of the Ethiopian Semitic languages, Modern Arabic and Hebrew show that fuller reduplication may develop in a later stage of the language. Gemination as consonantal doubling in Arabic word formation has to be viewed as a basic derivational process as it definitely is not the outcome of a phonological truncation process like vowel deletion and is therefore not the endpoint of grammaticalization.

Notes

1. I am greatly indebted to Robert Ratcliffe for his valuable comments and constructive criticism on a prior version of this paper. Special thanks to Bernhard Hurch for reading the manuscript and many helpful comments and to Veronika Mattes for discussions.
   The examples in the text come from the following Arabic varieties: Classical Arabic (abbreviated as CA), Modern Standard Arabic (MSA), Egyptian Arabic (EA), Levantine Arabic (LA) and Moroccan Arabic (MA).
2. For a similar view cf. Rose (2003), who also gives a short introduction into the debate. Evidence for the root and the template comes from language games (McCarthy 1982) and from psycholinguistic experiments.
3. The sources of the data are Cowell (1964) for LA, Imouzaz (2002) and my Moroccan informant (Casablanca) for MA and Hinds and Badawi (1986) and my Egyptian informants for EA.
4. The /a/ denotes the inflectional ending of the 3.m.sg. which has been lost in Neo-Arabic and is also dropped in pausal form. It has to be stated here because the verb is embedded in a whole sentence.
5. Scanning the dictionaries of Wahrmund, Lane, Freytag and Blàchere, Procházka found 417 reduplicated roots (p. 43).
6. For reasons of space I will not go into details here. The interested reader is referred to Brockelmann 1908, Kienast 2001, Lipiński 2001 where further references are cited.
7. Robert Ratcliffe (personal communication) has suggested that causatives involve an increase in arguments, thus this construction might also be viewed as iconic.
8. The bulk of linguistic studies on reduplication/consonant spreading in Arabic (starting with McCarthy 1986) is concerned with the formation of the basic stem from a biconsonantal root (the so-called geminated roots of traditional grammar). Despite the structural relationship between these forms and verbs with final doubling, I have not included them in my argumentation, as I consider this subject to be a matter of diachronic root formation and not of synchronic morphological derivation; there is no difference in meaning between a root °mr° and °mrr°, the expansion of the root is rather a matter of achieving the ideal triconsonantal root.
9. In Neo-Arabic varieties the geminates in these forms have become fossilized: *marr* 'he passed' and *marre:t* 'I passed', *iḥmarre:t* 'I got red'. Stem IX is not

a derivational class but a lexical one with only a few tokens. In MA where consonant clusters are more freely allowed, the forms with final reduplication show a geminate in some inflections: *bərgəg + u* (3.pl.) > *bərggu* 'they had an eye on'.

10. Unseth (2003: 268) cites some word forms from Ethio-Semitic languages like Tigre *gälbä > ʔägläbläba* and Geʕez *rämsäsä > ʔärmäsmäsä* that provide evidence for the view that it is essentially the consonants that are reduplicated.

11. *ʕəntət* for example, may go back to *ʕatt* 'to reiterate questions, blame s.o.' as the base for a derivation: °ʕtt°: **ʕəttət > ʕəntət* 'se rebeller.'

12. Note that a heavy final syllable (CV: or CVC) is prosodically light due to its peripheral position and thus does not receive stress resulting in a trochaic stress pattern for such word forms (cf. El Zarka 1999).

13. Reduplicants are printed bold-face and a dot signifies a syllable boundary.

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