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# Contrastive Feature Typologies of Arabic Consonant Reflexes

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**Abstract:** Attempts to classify spoken Arabic dialects based on distinct reflexes of consonant phonemes are known to employ a mixture of parameters, which often conflate linguistic and non-linguistic facts. This article advances an alternative, theory-informed perspective of segmental typology, one that takes phonological properties as the object of investigation. Under this approach, various classificatory systems are legitimate; and I utilize a typological scheme within the framework of feature geometry. A minimalist model designed to account for segment-internal representations produces neat typologies of the Arabic consonants that vary across dialects, namely *qāf, ǧīm, kāf, ḍād,* the interdentals, the rhotic, and the pharyngeals. Cognates for each of these are analyzed in a typology based on a few monovalent contrastive features. A key benefit of the proposed typologies is that the featural compositions of the various cognates give grounds for their behavior, in terms of contrasts and phonological activity, and potentially in diachronic processes as well. At a more general level, property-based typology is a promising line of research that helps us understand and categorize purely linguistic facts across languages or language varieties.

**Keywords:** phonological typology; feature geometry; contrastivity; Arabic dialects; consonant reflexes



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## 1. Introduction

Modern Arabic vernaculars have relatively large, but varying, consonant inventories. Because of that, they have been typologized according to differences in the reflexes of their consonant phonemes—differences which suggest common origins or long-term contact (Watson 2011a, p. 862). The resulting dialect categories often coincide with various divisions: geographical (eastern–western), lifestyle (sedentary–Bedouin), ethno-religious, social (based on status, age, gender), as well as stylistic and historical. However, using such mixed classificatory devices has always been problematic. Not only do the various factors cross-classify the dialects, but, with persistent exceptions, they exhibit internal inconsistency as well (see Palva 2006 for a discussion of some of these challenges). Moreover, the outcome is largely descriptive. Works that have explored Arabic consonant variation from this perspective include Cantineau (1960), Fischer and Jastrow (1980), Holes (1995), and Kaye and Rosenhouse (1997).

While classifying languages or dialects according to the type of sounds they contain is a recognized approach to phonological typology, it has been criticized for proposing oversimplified groupings with no explanatory value for synchronic or diachronic facts (Kiparsky 2008; Dresher et al. 2018). A more theory-oriented, 'property-driven' outlook to typology, advanced by Hyman (2007, 2018), has the individual phonological traits, not language varieties as such, as the primary objects of comparison. In this approach, typology and theory must go hand in hand, and since modern phonological theory is multifaceted and pluralistic in nature, we must admit that any meaningful typology builds on a specific theoretical framework (Kiparsky 2018). This, in turn, means that there will always be several viable options to formulate a typology; hence, there is no such thing as a one-size-fits-all classification system. Within Arabic, theoretically motivated typologies of syllabification phenomena (e.g., Broselow 1992; Kiparsky 2003; Farwaneh 2009) and

of stress placement (e.g., Kiparsky 2000; Watson 2011b) have been more successful than segmental studies.

This article embraces the latter line of research, by which the typologies of Arabic consonants are couched within a theory of representation. So, rather than considering only the existing phoneme reflexes in one inventory as opposed to another, I explore phoneme classes in terms of which of their constituent features are active in the phonology. Representational typologies will be formulated in a minimalist and highly abstract model of feature geometry, which optimizes the use of a minimum number of contrast-relevant features. This model, I argue, affords one possible concrete scheme to correlate the consonant reflexes without resorting to the problematic, long-established categories. It also explains and predicts phonological behavior in a systematic and unambiguous way. I will demonstrate that the typological and traditional classifications can coexist, but only to relate the structural generalizations to what we already know. Apart from that, the two are methodologically incompatible.

The remainder of the paper is organized as follows. Section 2 introduces the theoretical model employed in the analysis. Section 3 develops the typologies of the varying Arabic consonantal phonemes, sketching the geographical distribution of each reflex and justifying its component features in accordance with phonological facts. Sections 3.1–3.7 treat the consonant prototypes *qāf, ǧīm, kāf, ḍād–ḏ̣ā*, interdentals, rhotic, and pharyngeals (in that order). Section 4 discusses various implications of this type of analysis, both for the study of Arabic dialects and for phonological typology in general.

## 2. A Model for Feature-Based Typology

Typology in general is the classificatory study of languages according to their structural features; and by convention, phonological typology will group them according to the number and type of the phonemes they contain. This traditional view is challenged by Hyman (2007, 2018) who claims that typology is not about classifying languages but rather about characterizing linguistic properties across the linguistic spectrum. When this becomes the primary object of comparison, we move into what he calls property-driven typology. Under this view, the phonologist studying typology should not be interested in how phonological properties are distributed according to extra-linguistic factors. How to analyze the system of variation has been more of a priority for phonology than the 'where' question of traditional dialectology (Hyman 2018, pp. 14–15).

By focusing on the 'how', I will adopt a line of research that places dialect typologies within theories of phonological representation. Of course, features are the atoms of such representation. They are typically regarded as segment properties and as cross-classifying dimensions that characterize natural or phonologically active classes of segments. Moreover, there is solid evidence that features are arranged in some hierarchical structure, typically under higher-order categories known as 'class nodes', such as Place, Manner, and Laryngeal. This understanding of features constitutes the premise for most models of feature geometry (e.g., Clements 1985; Sagey 1986; McCarthy 1988, inter alia). The property-driven analysis of typology in this paper is feature geometric in nature.

Any feature-based theory of typology is potentially undermined by the different assumptions about the nature of the hierarchy or the very set of phonological features upon which it is based (Gordon 2016, p. 71). This should not be a problem, however, if we acknowledge that "there are no theory-neutral grammars, and consequently no theory-neutral typology" (Kiparsky 2018, p. 54). There is no contradiction, Kiparsky argues, that typological generalizations are the product of linguistic theory while they themselves are theory-dependent. The criterion to generate an informed theory-specific typology is thus to ensure that categories are founded on "independently justified linguistically significant representations" (Kiparsky 2018, p. 55). This is a fundamental principle of the framework I am going to employ here.

My analysis of Arabic consonant reflexes is couched in the Parallel Structures Model of feature geometry (PSM; Morén 2003, 2006, inter alia). The PSM is a minimalist framework

in which consonants and vowels have parallel structures and identical, broadly defined features for place and manner articulations. It integrates insights from various other proposals, in particular Unified Place Theory (Clements 1991; Clements and Hume 1996), Element Theory (Harris and Lindsey 1995), and Dependency Phonology (Anderson and Ewen 1987). Features in the PSM are monovalent and exclusively distinctive, i.e., present only if they are necessary to maintain phoneme contrasts and/or are active in the phonology (cf. Clements 2001). In this sense, a PSM analysis is also congruent with the Contrastivist Hypothesis (Hall 2007; Dresher 2009).

How a terminal feature is interpreted in the PSM hinges on its association to a superordinate class node in the hierarchy. As diagrammed in Figure 1, each place or manner feature can be represented under two separate nodes/tiers, with the V-node being dependent on the C-node. This symmetry aims to establish a unified machinery that captures consonant–vowel interactions as well as acoustic/articulatory parallelisms in natural language. To explain their asymmetries, consonants can have both C- and V-features, while vowels can only have the latter. Another architectural mechanism of the model is building segmentally complex structures from simpler ones, which, together with the dependency principle, allows for a high degree of economy in the feature system.

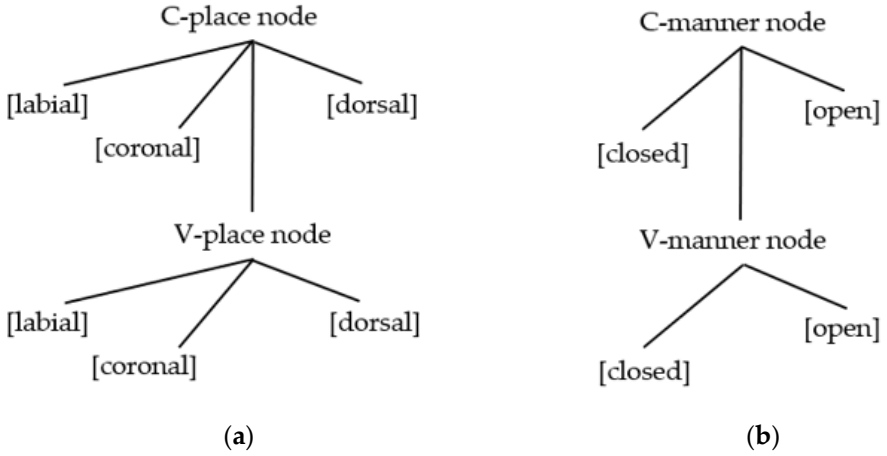


**Figure 1.** Basic PSM geometry. (**a**) Place tier; (**b**) Manner tier.

The Place and Manner tiers in the PSM deserve some attention. Under the Place tier (a), we use the articulator-based features [labial], [coronal], and [dorsal] under the C-place node and its daughter V-node (cf. Clements 1991). Simple consonants have one place feature; complex consonants have multiple features on the same place node; and consonants with secondary articulation have features on both C-place and V-place nodes (Morén 2003, pp. 199, 233). Similarly, under the Manner tier (b), we make use of the loosely defined features [open] and [closed], which can be attached to a C-manner or a V-manner node in arrangements that reflect the relative sonority of segments (Morén 2003, pp. 222–23). As for a Laryngeal tier, it should suffice here to use the feature [voice] to differentiate voiced from voiceless obstruents (see Morén 2003, p. 230).[1]

Specifying the above features to a particular segment depends on finding positive evidence in the relevant variety. When varieties are closely related, phonological activity will show major parallels. This, in addition to the universal phonetic properties of speech sounds, means that a given segment will have the same composition across varieties of the same language, unless there is proof to the contrary. Because of this, a contrast-based model like the PSM is a valid tool in drawing typologies, as I will demonstrate in the next section.

## 3. The Typologies of Arabic Consonant Reflexes

The present study provides feature-based typologies of **q*, **ǧ*, **k*, **ḍ*–**d̲*, **θ*–**ð*, **r*, and **ḥ*–**ʕ*, which display variation across Arabic dialects. Reflexes of these consonants can be differentiated representationally along the dimensions of place and manner of articulation,

in addition to voicing. As mentioned above, I will draw feature geometric generalizations of these reflexes based on the contrast and phonological activity they exhibit. The facts and data denoting their behavior appear in various studies on individual Arabic dialects as well as in cross-dialectal surveys, as the references indicate.

Before embarking on the analysis, a few remarks are in order. First, when discussing segmental composition in the PSM, it is crucial to separate underlying from surface levels. Our concern here is the major reflexes that have a contrastive phonemic status, i.e., not predictable allophones nor marginal phonemes that exist only in free variation. Although these types of sounds will not be analyzed representationally, they will be mentioned and clearly labeled for what they are, so that confusions are avoided. It is still, however, a challenge to decide which variant, in case of multiple allophones, should be treated as the basic phoneme, and whether sounds confined to loanwords should be included in the phoneme inventory (cf. Gordon 2016, p. 43). There is also the issue of how to deal with several reflexes of one consonant cooccurring in the same dialect.

The answer to the above questions will vary depending on the available evidence in each case: the nature of the environment in which the variants occur, the existence of minimal pairs, the extent and stability of the borrowings, etc. We will see, for example, that /k/ and /dʒ/ are the basic phonemes in dialects that exhibit [k]–[tʃ] and [dʒ]–[j] alternations, simply because the [tʃ] and [j] allophones are restricted to front vowel contexts, while the other two occur elsewhere. We will also learn that many, but not all, of the dialects with /ɡ/ and /ʔ/ reflexes of **q* have retained a /q/ phoneme in both stable and more recent loans from Standard Arabic (SA), sometimes leading to minimal pairs or morphological doublets. And even aside from direct borrowing, the diglossic coexistence of dialects with SA often leads to the reintroduction of SA phonemes into their inventories.

In the coming subsections, I will examine reflexes for each of the consonant prototypes listed above, describing their geographical distribution, but more importantly their phonological behavior: the phonemes they contrast with and the processes they participate in. This behavior serves as the basis for assigning their PSM feature-geometric structures, which are the building blocks of the new representational typologies I propose in this work.

### *3.1. The Qāf Typology*

Cantineau (1960, p. 68) states that "the pronunciation of *qāf* is of utmost importance" in the classification of Arabic dialects. Four major reflexes, /q ʔ k ɡ/, are often named in the literature. A widely accepted generalization is that dialects with the voiceless cognates /q ʔ k/ are spoken by sedentary people, while those with the voiced /ɡ/ are spoken by Bedouin or Bedouin-descended populations (Watson 2011a, p. 859). However, this principle is not without exceptions; for instance, both in North Africa and the Levant we encounter urban dialects with /ɡ/, and in reality, every geographical region has a distinct pattern of variation (see Bahloul 2007). Let us briefly examine each of these four reflexes, in pursuit of a representational typology of **q*. For a thorough overview of geographical distributions, see Cantineau (1960, pp. 68–71), Kaye and Rosenhouse (1997, pp. 270–73), Bahloul (2007), and Edzard (2009).

Looking first at the voiceless uvular /q/ reflex, it is most notably attested in the sedentary dialects of Syria and the Maghreb, as well as *qəltu* Mesopotamian and parts of Oman and Yemen (Fischer and Jastrow 1980, p. 52). Some examples are [trawwaq] 'he had breakfast' (Latakia, Syria), [bqa] 'he stayed' (Morocco), and [qaṣˤiːʁ] 'short' (Mosul, Iraq). Based on phonological activity in these dialects, /q/ can be treated as a member of the natural class of primary dorsal segments. It often patterns with velar stops in triggering nasal place assimilation (NPA) toward a back nasal, as in /manqal/ > [maɴqal] 'brazier', and totally assimilates adjacent velar/uvular fricatives in *qəltu* dialects, as in /ʔaqʁaʕ/ > [ʔaqqaʕ] 'bald' (Youssef 2019, p. 26).

With no trace of phonological activity that discriminates velars and uvulars, I infer that there is a single natural class of C-place [dorsal] consonants. Of these, uvular /q/ is most suitable for a mannerless segment, i.e., with a bare place feature, since it patterns with

both stops and fricatives. Phonetically, [dorsal] is a fitting feature since /q/'s posterior articulation is known to cause lowering or backing of all immediately adjacent vowels (cf. Al-Ani 1970, pp. 32–33).

By far the most common reflex of **q* is the voiced velar stop /ɡ/, which is characteristic of Bedouin dialects (Watson 2002, p. 17). This reflex covers eastern/central Arabian Peninsula and southern Iraq, but also significant pockets in North Africa, Upper Egypt, Sudan, the Levant, and southern Peninsula (Bahloul 2007). As implicated above, /ɡ/ belongs to the class of C-place [dorsal] consonants, as it triggers NPA, e.g., /ji-ngar/ > [jiŋgar] 'he pecks' (Muslim Baghdadi; Youssef 2013, p. 67); it also partakes in the labialization of /i/ to [u] in certain Iraqi and Levantine dialects (see e.g., Haddad 1984 and Youssef 2015). Further, if we assume that a C-manner [closed] feature indicates a stop constriction in the PSM, then /ɡ/ is specified for this feature as well as [voice], so that it is distinguished from /q/ and /k/.

The second most widespread reflex is the glottal stop /ʔ/, mainly attested in urban centers of the Levant and Lower Egypt, and sporadically in some Maghrebi city dialects (Holes 1995; Bahloul 2007), but also in rural areas especially in Lebanon (Fischer and Jastrow 1980, p. 52); examples: [ʔaːdˤi] 'judge' (Cairo); [ʔil-ʔuds] 'Jerusalem' (Beirut); and [rifʔaːt] 'friends' (Damascus). Given that all other stop consonants show contrastive evidence for a place feature, we are left with /ʔ/, the Arabic epenthetic consonant, to assign a single C-manner [closed] feature. From an articulatory standpoint /ʔ/ is simply a stop formed with complete closure between the vocal folds.

A voiceless velar stop cognate, /k/ (sometimes appearing as emphatic /kˤ/), is generally marked as ruralite; and Edzard (2009) notes that it surfaces in those dialects which have affricated the original *kāf* (see Section 3.3 below). It is typical of central Levantine villages, but also in areas of North Africa (Watson 2011a, p. 862). We find, for example, [kalb] 'heart'; [kaːl] 'he said'; and [karji] 'village' (rural Palestinian). Representationally, /k/ is the voiceless counterpart of /ɡ/, and it participates in the same processes: NPA (producing a velar nasal) and labialization (Herzallah 1990). We infer, then, that it is specified for the features C-place [dorsal] and C-manner [closed].

There also exists a number of conditioned variants, which are not included in the analysis because they appear to be the more restricted subsidiary allophones of one of the main reflexes above. For instance, certain eastern Arabian nomadic dialects affricate their /ɡ/ to [dʒ] and further to [dz], but only in front vowel contexts (Johnstone 1967). Alternations such as [ɡaːl] 'he said' vs. [tˤariːdʒ] 'road' (southern Iraqi) and [tˤariːdz] (Šammari, central Saudi) led Holes (1995, p. 60) to classify the /ɡ/ group into three subtypes of Bedouin dialects.

Another marginal variant is the voiced uvular fricative [ɣ], which appears to be in free variation with [q] in parts of southern Iraq and the Arabian Gulf, e.g., [ɣada]~[qada] 'lunch' and [qitˤaːr]~[ɣatˤaːr] 'train' (Fischer and Jastrow 1980; see also Al-Nassir 1993, p. 40). Moreover, many dialects with one of the major reflexes /ʔ k ɡ/ preserve /q/ in a number of borrowed words from SA, sometimes giving way to semi-contrasts like [wɔrˤgaː] 'tree leaf'–[worqa] 'sheet of paper' (Moroccan Bedouin; Cantineau 1960, p. 70).

Table 1 offers a restatement of the *qāf* typology in Arabic, with a rough geographical distribution of the four major cognates. Using this feature typology, we can simply refer to dialects with a **q* reflex that has all or a subset of the features named. The specifications both reflect and explain each segment's synchronic phonological behavior. And although not the focal point here, historical shifts from one reflex to the other could also be motivated through feature loss or gain.

**Table 1.** Representational typology of the major **q* phoneme reflexes.

| | C-place [dorsal] | C-manner [closed] | ... [voice] | Geographical Distribution |
|---|---|---|---|---|
| /q/ | ✓ | | | Various sedentary: North Africa, Mesopotamian *qəltu* ... |
| /ʔ/ | | ✓ | | Urban Egyptian and Levantine and sporadic Maghrebi |
| /k/ | ✓ | ✓ | | Ruralite Levantine dialects |
| /g/ | ✓ | ✓ | ✓ | Bedouin(-origin) dialects |

### 3.2. The Ǧīm Typology

Another famously varying consonant is *ǧīm*, with the three major reflex phonemes /dʒ ʒ g/. The first two are the most widespread pronunciations, and, broadly speaking, /dʒ/ is characteristic of Bedouin dialects, while /g/ and /ʒ/ are sedentary. Exceptionally, however, /ʒ/ is the predominant reflex in North Africa, irrespective of the sedentary–nomadic split (Cantineau 1960, p. 59). Below I discuss each of the **ǧ* cognates separately. Detailed geographical typologies are provided in Cantineau (1960, pp. 58–60), Fischer and Jastrow (1980, p. 51), Holes (1995, pp. 61–62), and Zaborski (2007).

The voiced palatoalveolar affricate /dʒ/ is standard "in the majority of eastern Bedouin dialects, in rural dialects of the Levant and Mesopotamia, in the majority of dialects in central Yemen, and in some sedentary dialects in Algeria" (Watson 2011a, p. 863).[2] Phonologically, /dʒ/ is the voiced counterpart of /tʃ/ in dialects that have developed the latter phoneme through borrowings and historical affrication (Fischer and Jastrow 1980), with minimal pairs like (Baghdadi) [tʃanna] 'daughter-in-law'–[dʒanna] 'paradise' and [furatʃ] 'brushes'–[furadʒ] 'he dispelled'; hence, it has [voice].

Two different phonological processes provide evidence that /dʒ/ is coronal. One is that it typically participates in the assimilation of the definite article (L-ass), as one of the 'sun letters', e.g., /l-dʒiba:l/ > [dʒ-dʒiba:l] 'the mountains' (though not in SA). The other is that it tends to assimilate partially to a following coronal obstruent in onset clusters, producing a fricative [ʒ], with possible devoicing to [ʃ], e.g., /dʒtima:ʕ/ > [ʃtima:ʕ] 'meeting' (Iraqi; Youssef 2013, p. 69). Because /dʒ/ is a blocker of emphasis spread (ES) in many dialects, /dʒ/'s coronality is interpreted as a secondary feature, i.e., V-place [coronal], in conflict with the secondary emphatic feature (cf. Davis 1995). Lastly, since affricates behave phonologically as stops, we specify /dʒ/ for C-manner [closed] as well.

The second most frequent reflex is the voiced palatoalveolar fricative /ʒ/, attested in the urban dialects of the Levant (exceptions include Aleppo and most of Jordan, which have /dʒ/) and most urban and non-urban Maghrebi dialects (Zaborski 2007). It is the voiced equivalent of /ʃ/, as seen in the minimal pair [ʒa:j] 'coming'–[ʃa:j] 'tea'. It is always a trigger of L-ass, e.g., [ʒ-ʒami:l] 'the pretty' (Lebanese), hence coronal, but it also patterns with the ES blockers (see above), hence V-place [coronal].

As discussed above, /ʒ/ results from the assimilation of /dʒ/ to a coronal obstruent. Since /dʒ/ has both V-place [coronal] and [voice], the only way to distinguish it from /ʒ/ is constriction. Parallel to the stops, we may hypothesize that a C-manner [open] feature marks fricative constriction for /ʒ/ and all other consonants with a similar manner of articulation. Mustafawi (2017, p. 15) argues that "the best alternative for /dʒ/ while keeping most of its distinctive features would be /ʒ/".

A voiced velar stop /g/ is found in Cairo, in rural central and northeastern Delta, and in all urban centers of northern Egypt down to Bani Swēf, but also in various Bedouin dialects of central Arabia and in some Yemenite and Omani dialects (cf. Watson 2002, p. 16; Zaborski 2007, p. 494). The /g/ reflex is often thought to be "the most salient feature of Egyptian speech across the Arab-speaking world" (Holes 1995, p. 61). Phonologically, /g/ has a stop constriction; it contrasts with voiceless /k/, e.g., [gu:ʕ] 'hunger'–[ku:ʕ] 'elbow'; and it triggers NPA, e.g., /fiŋga:l/ > [fiŋga:l] 'coffee cup' (Cairene; Youssef 2013, p. 35).

We may conclude, then, that /ɡ/ has the following contrastive features: C-place [dorsal], C-manner [closed], and [voice].

As I have noted for *qāf*, there are a few conditioned and marginal variants of *ǧīm*, which, although excluded from the featural analysis, are worth mentioning here. Perhaps the most well known is a palatal approximant [j], found mainly in Bedouin dialects of the Gulf and lower Iraq, which is partly in free variation with [dʒ] and partly lexically conditioned (Zaborski 2007). Despite the variability, e.g., [jarjuːr]~[dʒardʒuːr] 'shark' or [ʕajiːn]~[ʕadʒiːn] 'dough' (Baḥraini), [j] is considered a marker of Gulf speech (Holes 1995, p. 62). Other notable variants include an alveolar stop [d] in some Upper Egyptian dialects in front of liquids and nasals (Behnstedt and Woidich 1985), two affricates: palatoalveolar [tʃ] in Palmyra and alveolar [ts] in the oasis of Suḫne (Syria), and a fricative [z] in some Jewish dialects of the Maghreb (cf. Fischer and Jastrow 1980).

Table 2 summarizes and restates the *ǧīm* typology in terms of five contrastive features, which are assigned based on synchronic phonological activity. We now realize that urban Egyptian dialects, which have a glottal stop reflex of **q* and a /ɡ/ reflex of **ǧ*, have exploited the features C-place [dorsal] and C-manner [closed] to differentiate segments in their inventories. Historically, claims that the Proto-Semitic origin of **ǧ* is indeed a velar plosive /ɡ/ (see e.g., Roman 1981) can be also explained by a place of articulation shift from C-place [dorsal] to V-place [coronal] in /dʒ/, while keeping all other features intact.

**Table 2.** Representational typology of **ǧ* phoneme reflexes.

| | **C-place [dorsal]** | **V-place [coronal]** | **C-manner [closed]** | **C-manner [open]** | **. . . [voice]** | **Geographical Distribution** |
|---|---|---|---|---|---|---|
| /dʒ/ | | ✓ | ✓ | | ✓ | Bedouin(-origin) dialects |
| /ɡ/ | ✓ | | ✓ | | ✓ | Lower Egyptian and sporadic Peninsular |
| /ʒ/ | | ✓ | | ✓ | ✓ | Urban Levantine and most of Morocco |

### *3.3. The Kāf Typology*

This consonant exhibits conditioned and unconditioned variation in modern Arabic dialects. The former type—which concerns us here—affects the **k* regardless of neighboring sounds and is due to advancement of /k/'s place of articulation, which makes it prone to affrication and spirantization (Cantineau 1960, p. 66), resulting in /tʃ/. Conditioned alternations produce a [tʃ] or a [ts] allophone of /k/ in the vicinity of front vowels, and [k] elsewhere. As before, we concentrate on phonemic reflexes for our phonological analysis, namely /k/ and /tʃ/, but will also mention the allophonic pattern for the purpose of comparison. Elaborate surveys can be found in Cantineau (1960, pp. 66–67), Johnstone (1967), and Kaye and Rosenhouse (1997, pp. 273–74).

On the one hand, most Arabic varieties from east to west have preserved a velar stop /k/ as the only reflex available. In the east, this is generally viewed as an urban feature, while in Egypt and westwards, the lifestyle factor is insignificant as there is little to no variation observed (Palva 2006, p. 606). Among the dialects with a /ɡ/ phoneme, either as a reflex of **q* or **ǧ*, /k/ is its voiceless cognate; thus, it has no voicing specification. The contrastive features for /k/ have already been discussed in Section 3.1: a velar point of articulation corresponds to C-place [dorsal], and a stop constriction corresponds to C-manner [closed].

In various ruralite dialects of the Levant, a voiceless palatoalveolar affricate cognate, /tʃ/, is attested, irrespective of the phonological environment (Watson 2011a, p. 873). More specifically, this is the case in central Palestine, a few Syrian villages, and two regions of Algeria, as well as among the Shiites of Baḥrain (Fischer and Jastrow 1980, pp. 51–52). Moreover, several Bedouin dialects seem to have regularized affricate /tʃ/

within roots; and although there often remains few [k]–[tʃ] alternations, one can safely pose two phonemes, /k/ and /tʃ/, in contrast. In Muslim Baghdadi (Youssef 2014), for instance, we encounter minimal pairs like [tʃuwa] 'he scorched'–[kuwa] 'he ironed' and [baːtʃir] 'tomorrow'–[baːkir] 'virgin'. And in some rural Jordanian elderly speech (Cantineau 1960), extensions of [tʃ] to non-front vowel contexts occur as a result of analogy, e.g., [diːtʃ] 'rooster' > [djuːtʃ] 'pl'.

More widespread are the conditioned alternations where either [tʃ] or [ts] occurs in front vowel contexts in complementary distribution with [k], with no morphological repairs, and are thus regarded as allophones of the /k/ phoneme (cf. Holes 1995, p. 60). The [tʃ] variant is attested in the Bedouin north Arabian and related dialects of Jordan and Iraq (Fischer and Jastrow 1980), with alternating examples like [ritʃib] 'he mounted'–[jirkab] 'he mounts'.[3] The [ts] variant is predominant in central Najdi, among the ʿAnaiza and Šammar tribes (Cantineau 1960, p. 67), e.g., [tsaff] 'palm of the hand'–[kfuːf] 'pl.'.

Let us now discuss the featural composition of the phonemic /tʃ/ reflex, drawing mainly on Youssef (2014). First, note that all /tʃ/-dialects have a /dʒ/ cognate of *ǧ, the two forming a phoneme pair that differ in terms of voicing (see above); so in other respects, they should have comparable phonological status. On the one hand, /tʃ/ is necessarily coronal because it triggers L-ass, as in [tʃ-tʃaːkuːtʃ] 'the hammer'. On the other, affricates are stops phonologically, so /tʃ/ is also assigned C-manner [closed].

The proposed feature composition may also reflect the historical development of affricate /tʃ/ in the relevant dialects. If we treat affrication as a shift from velar to coronal that was once motivated by adjacent high vowels /i iː/ or palatal /j/, and if these triggers are specified for V-place [coronal], being blockers of ES, then the output of the assimilation process, namely /tʃ/, must also have the latter feature, while C-manner [closed] remains unchanged (cf. Watson and Dickins 1999). A concise representational typology of *kāf* is given in Table 3.

**Table 3.** Representational typology of **k* phoneme reflexes.

| | C-place [dorsal] | V-place [coronal] | C-manner [closed] | Geographical Distribution |
|---|---|---|---|---|
| /k/ | ✓ | | ✓ | Most Mashriqi and Maghrebi dialects |
| /tʃ/ | | ✓ | ✓ | -Various ruralite Levantine dialects<br>-Some Bedouin dialects: vs. /k/ |

### *3.4. The Interdental Typology*

Here we will be dealing only with the plain interdentals *t̲ā* and *d̲āl*; emphatic *d̲̣ā* will be discussed in the next section. A general principle is that Old Arabic /θ ð/ are preserved in Bedouin-type dialects and merged with the corresponding alveolar stops /t d/, and less frequently with alveolar /s z/ or labiodental /f v/ fricatives, in sedentary speech (Cantineau 1960, p. 44). However, this dichotomy encounters numerous exceptions. For example, all dialects in Morocco seem to have shifted to stops (ibid.), while a few city dialects (e.g., Tunis, Mosul, Mardin) have retained the interdentals (Fischer and Jastrow 1980, p. 50). Below, I will individually examine the three pairs of reflexes; for a full overview, see Cantineau (1960, pp. 44–45), Fischer and Jastrow (1980, p. 50), and Mustafawi (2017, pp. 14–15).

What we may call 'the preservation dialects' constitute all "Bedouin dialects, dialects of Bedouin origin, the rural sedentary dialects of central Palestine/Jordan, Tunisia and Mesopotamia, and [ . . . ] all but the western coastal city dialects of the Peninsula" (Watson 2011a, p. 863): an assortment of dialects, if one assumes traditional dichotomies. In all of these, both /θ/ and /ð/ participate in L-ass, e.g., [θ-θoːb] 'the shirt' and [ð-ðahab] 'the gold', hence C-place [coronal]. Considering that /θ ð/ are non-sibilants, with relatively

weak turbulence, we may propose that they are devoid of manner features (and thus featurally distinct from the sibilants /s z/). Furthermore, the two consonants contrast in voicing, which means that /ð/ is marked for additional [voice].

The majority of urban dialects, as well as many neighboring rural areas, have the dental/alveolar stop cognates /t d/ (Fischer and Jastrow 1980). This vast isogloss covers all of Morocco, all sedentary dialects of Egypt, Hijazi Arabic, and the rest of the Levant (Mustafawi 2017, p. 14). Concerning their featural content, there is good indication that /t d/ are C-place [coronal]. In Cairene (Youssef 2013), for instance, they trigger L-ass, e.g., [ʔit-tiʔiːl] 'the heavy', [ʔid-deːl] 'the tail'; and they regressively assimilate to labial and velar stops across word boundaries, e.g., /baʕat kitaːb/ > [baʕak kitaːb] 'he sent a book', /nafad bi-gildu/ > [nafab bi-gildu] 'he saved his skin'. As stops, they are also specified for C-manner [closed], and /d/ has yet another [voice] feature.

In various northern Mesopotamian dialects, as well as in the Arabic of Afghanistan and Uzbekistan, the development is toward the alveolar sibilants /s z/ (Jastrow 1978), as in [saːse] 'three', [ʔaxaz] 'he took' (Āzəx, Anatolian). These sibilants also tend to replace /θ ð/ in borrowings from SA in the urban dialects of Egypt and the Levant (Mustafawi 2017), e.g., [jisbit] 'he proves', [ʔizaːʕa] 'broadcasting' (Aleppo). The /s z/ pair partakes in L-ass, voicing assimilation, and often sibilant assimilation. We can therefore specify them for C-place [coronal], being alveolars, and C-manner [open], being fricatives; with an extra [voice] feature for /z/.

Another known pair of cognates are the labiodental fricatives /f v/, attested in Siirt (southeastern Anatolia), e.g., in [faːfe] 'three' and [vahab] 'gold' (Jastrow 1978, pp. 34–39), in some nomadic dialects of the Tell Atlas Mountains, and in Palmyra (Cantineau 1960, p. 45). In the Shiite dialect of Baḥrain, only a /f/ reflex of *$\theta$ is attested (Mustafawi 2017, p. 15). The /f v/ reflexes form a voiceless-voiced pair; and I further assign them C-place [labial], as they would be expected to trigger NPA, and C-manner [open], which characterizes fricatives.

A crucial point to notice is that in all but the preservation dialects, the change is that of merger with an already existing phoneme—a fact simply built into the feature typology in Table 4. We can also make sense of Cantineau's (1960, p. 44) observation that the sedentary dialects which pronounce *$q$ as /q/ have retained the interdentals. It appears that such dialects have a preference for reflexes with no manner features. Historically, in addition, the cross-linguistically common sound changes /θ ð/ > /t d/ or /s z/ are effortlessly explained as insertion of manner features.

**Table 4.** Representational typology of *$\theta$–*$\delta$ phoneme reflexes[4].

| | C-place [labial] | C-place [coronal] | C-manner [closed] | C-manner [open] | … [voice] | Geographical Distribution |
|---|---|---|---|---|---|---|
| /θ ð/ | | ✓ | | | (✓) | Bedouin(-origin) and few rural dialects |
| /t d/ | | ✓ | ✓ | | (✓) | Sedentary dialects and all of Morocco |
| /s z/ | | ✓ | | ✓ | (✓) | Peripheral and northern Mesopotamian |
| /f v/ | ✓ | | | ✓ | (✓) | Sporadic: Siirt, Tell Atlas, Palmyra … |

### *3.5. The Ḍād–Ḏāʾ Typology*

Next are the emphatic consonants denoted by the Arabic letters *ḍād* and *ḏāʾ*, which in the modern dialects either appear as two distinct phonemes, respectively alveolar stop /dˤ/ and fricative /zˤ/, or merge into a single interdental fricative /ðˤ/. The former is characteristic of sedentary dialects and the latter of nomadic dialects. Historically, these

two sets of dialects have restructured the asymmetrical Old Arabic system in different ways (Holes 1995), as we will see below. Both historical and synchronic surveys are provided in Holes (1995, pp. 57–59), Versteegh (2006), and recently Hamdan and Al-Hawamdeh (2020).

We start with dialects maintaining a contrast between /dˤ/ and /zˤ/. These coincide unmistakably with city dialects that have neutralized the interdental fricatives /θ ð/, merging them with the corresponding alveolar stops /t d/ (Holes 1995, p. 58). These dialects are said to have a dyadic (binary) system, with voiceless–voiced series for both plain and emphatic consonants, i.e., /t d/, /tˤ dˤ/, /s z/, /sˤ zˤ/ (Bellem 2014).[5] Representationally, /dˤ zˤ/ are emphatic consonants that trigger long-distance ES, e.g., in [tạ-xfịdˤ-ạːt] 'discounts' or [ʕạzˤạmạ] 'greatness' (Cairene; Watson 2002, p. 273).

Emphatics are distinguished from their plain counterparts by an additional non-primary back articulation (Davis 1995, p. 472). Youssef (2006, 2013) posits V-place [dorsal] to characterize this natural class. This way, [dorsal] alone, on separate tiers, is used to account for velar/uvular and emphatic consonants, which is clearly more economical than introducing an additional [pharyngeal] (McCarthy 1994), [guttural] (Watson 2002), or any other feature proposed specifically for Arabic or Semitic. It is worth mentioning that McCarthy (1994) has also suggested [dorsal] as a redundant feature for emphatics.

The emphatics generally have C-place [coronal] as their primary articulation; /dˤ zˤ/ do trigger L-ass, e.g., [ʔịdˤ-dˤạjʕa] 'the village', [ʔịzˤ-zˤạriːf] 'the pleasant' (Damascene). Further, /dˤ zˤ/ are specified for [voice], as they contrast with voiceless /tˤ sˤ/ in the dyadic system. In terms of manner of articulation, /dˤ/ is a stop, with C-manner [closed], and /zˤ/ is a fricative, with C-manner [open].

The other group of dialects, where /dˤ/ had fallen together with /ðˤ/, are mainly Bedouin or have a Bedouin origin, such as *gilit* Mesopotamian, Yemenite, and Peninsular—essentially dialects that have retained the plain interdentals (cf. Embarki 2008, p. 592).[6] This merger has engendered confusion in defining minimal pairs that used to contrast /dˤ/–/ðˤ/, e.g., [fạːjịðˤ] 'overflowing/ usury' and [ðˤụfạr] 'he plaited/ overcame' (Baghdadi; Youssef 2013, p. 131). These dialects are said to have reduced the asymmetry of the system by developing triadic series, with two three-member sets of voiceless–voiced–emphatic cognates: alveolar plosives /t d tˤ/ and interdental fricatives /θ ð ðˤ/ (Holes 1995, p. 58; see also Bellem 2014). The featural makeup of /ðˤ/ should now be easy to deduce: C-place [coronal], as a trigger of L-ass, V-place [dorsal], as a trigger of ES, and [voice]. And just like the plain interdentals (cf. Table 4) it need not be specified for C-manner.

It is probable that *ḍād* was historically a voiced lateral/lateralized interdental fricative emphatic (cf. Corriente 1978). A remnant of this is apparently the pronunciation of **ḍ̲* as emphatic lateral /lˤ/ in a few dialects of southern Arabia, such as the Saudi Tihāma (Al-Azraqi 2010) and the Yemeni dialect of Daṯīna (Landberg 1905–1913, cited in Versteegh 2006). I will not pursue an analysis of this marginal reflex here, although my presumption is that it is featurally identical to /ðˤ/. Table 5 recapitulates the featural composition of the three major phonemes discussed above: the contrastive /dˤ zˤ/ and their merged reflex /ðˤ/.

**Table 5.** Representational typology of **ḍ̲*–**ḍ* phoneme reflexes.

| | C-place [coronal] | V-place [dorsal] | C-manner [closed] | C-manner [open] | . . . [voice] | Geographical Distribution |
|---|---|---|---|---|---|---|
| /dˤ/ < **ḍ̲* | ✓ | ✓ | ✓ | | ✓ | Sedentary dialects: vs. /zˤ/ |
| /zˤ/ < **ḍ̲* | ✓ | ✓ | | ✓ | ✓ | Same as above: vs. /dˤ/ |
| /ðˤ/ | ✓ | ✓ | | | ✓ | Bedouin(-origin) dialects |

### *3.6. The Rhotic Typology*

Most Arabic dialects have a rhotic phoneme /r/, corresponding to the letter *rāʾ*, which is typically realized as a voiced alveolar tap or trill (Younes 1994; Watson 2002). However, two groups of dialects have introduced a phonemic split whereby a new emphatic /rˤ/ or uvular fricative /ʁ/ contrasts with a plain /r/ phoneme. A third group has only an emphatic /rˤ/ reflex, a fourth has a plain /R/ with a double place of articulation, and a fifth has just a plain /r/. The first four types are thoroughly examined in Youssef (2019, forthcoming); below I provide a synopsis.

Type-I dialects have established two distinct phonemes in contrast, a plain /r/ vs. an emphatic /rˤ/, and are therefore dubbed 'the split-*r* dialects'. They mainly comprise the Arabic dialects of Africa, which include the Maghrebi and Egyptian families, and a few peripheral dialects in sub-Saharan Africa (but also in Anatolia). Minimal pairs are abundant, e.g., [rˤaːjɟb] 'curdled'–[raːjib] 'collapsed' (Moroccan), [ʔaʀˤbaʕ] 'a Wednesday'–[ʔarbaʕ] 'he guzzled' (Egyptian), and [kaʀˤa] 'he was seen'–[kara] 'he rented' (Mardin). Additionally, [rˤ] and [r] exist partly in the same environments, suggesting that they have parallel distribution.[7]

The phonemes /r rˤ/ trigger L-ass, e.g., [əʀˤ-rˤaːʒəl] 'the man', [ər-razwar] 'the shaver' (Moroccan); hence, they are C-place [coronal]. They also trigger coronal sonorant assimilation (CSA), whereby /n l/ assimilate regressively to a following /r rˤ/ across word and morpheme boundaries, e.g., /min riglu/ > [mir riglu] 'from his leg' (Cairene). The inference is that /r rˤ/ are sonorants, for which we may assign a composite of C-manner [open] and V-manner [closed] (see Morén 2006, p. 1210), denoting that sonorants are continuants (open) and vowel-like (sonorous). Finally, emphatic /rˤ/ in this group is a trigger of ES, with the same bidirectional, long-range spreading of pharyngealization as other primary emphatics, e.g., [ʕaʀˤabjjj-aːt-ak] 'your cars' (Cairene). We thus assign it a secondary V-place [dorsal] feature in addition.

Type-II dialects have a single, emphatic /rˤ/ phoneme, and incorporate the Levantine dialects spoken in Syria, Lebanon, Palestine, and Jordan. The phoneme has emphatic [rˤ] and plain [r] allophones in complementary distribution, and there is no sign of a phonemic split. Distributional evidence that the phoneme is /rˤ/ and not /r/ includes the fact that it does not trigger vowel raising (*imāla*), e.g., [dʒoːrˤa] 'hole' rather than *[dʒoːri] (rural Palestinian; see Younes 1994 for details). Furthermore, /rˤ/ patterns with other emphatics in inducing ES, although it partially differs in its more limited domain and vulnerability to undergo de-emphasis (Younes 1993; Davis 1995); and it participates in L-ass, as well. Therefore, it has C-place [coronal] and V-place [dorsal]. It is a sonorant, as it triggers CSA, e.g., /leːl rˤaːjig/ > [leːrˤ rˤaːjig] 'a calm night' (Jordanian), so we add C-manner [open] and V-manner [closed].

Type-III dialects have one /R/ phoneme, which is underlyingly non-emphatic, yet arguably both coronal and dorsal. They belong to the Peninsular and Mesopotamian *gilit* groups. Here, the /R/ phoneme has fully predictable plain and emphatic realizations; the emphatic allophone causes backing of adjacent low vowels only (Al-Ani 1970, p. 33), which implies low-level coarticulation rather than ES. As expected, /R/ obligatorily triggers L-ass, e.g., [R-Riːħa] 'the smell' (Muslim Baghdadi; Erwin 2004); besides, a process of labialization in these dialects shows that /R/ behaves more like velar/uvular than emphatic triggers (cf. Youssef 2015). We infer that /R/ is specified for two primary places of articulation, C-place [coronal] plus [dorsal], but no secondary articulation. In addition, it patterns with the coronal sonorants in CSA; therefore, it also gets the usual manner features for sonorants.

The remarkable type-IV group exhibits two distinct phonemes, an alveolar sonorant /r/ and a uvular fricative /ʁ/, and comprises primarily the Mesopotamian *qəltu* dialects, spoken in various cities in Iraq. In those dialects, the uvular /ʁ/ reflex of **r* coincides and merges with etymological *ġayn*, whereas /r/ is found principally in loanwords (Blanc 1964; Jastrow 1978). Distributional evidence for two phonemes includes minimal pairs, e.g., [rakkib] 'he let climb'–[ʁakkib] 'he assembled' (Mosul), [farraq] 'he distinguished'–[faʁʁaq] 'he separated' (Jewish Baghdadi).

Further phonological processes of assimilation, vocalization, and dissimilation take place to resolve some unusual contacts between uvular /ʁ/ (from **r*) and the back consonants /q x ʁ/. If these processes are motivated by an OCP violation, we can propose that /ʁ/ is specified for C-place [dorsal]. Since /ʁ/ also behaves as a fricative and contrasts with voiceless /x/, we can assign additional C-manner [open] and [voice] features. As for the /r/ phoneme, it triggers both L-ass and CSA, so I propose C-place [coronal] together with the two (sonorant) manner features. It does not trigger emphasis spread, though.

We may also add a fifth group for dialects with just a plain /r/ reflex, which contains several Yemeni and Peninsular dialects, as well as peripheral dialects that have lost all emphatic versus plain contrasts in their inventories, e.g., Maltese, Cypriot, Uzbekistani, Juba, and Ki-Nubi. In San ʿāni, for instance, the allophone [rˤ] is only found in proximity of an emphatic obstruent; elsewhere, it is realized as a plain [r], even in words such as [raːs] 'head' and [ħarr] 'hot' (Watson 2002, p. 16). For this group, the /r/ is representationally similar to the /r/ of types I and IV above.

The rhotic typology provides an interesting case where it is hard to rely on surface forms at the expense of actual phonological behavior. This behavior is disclosed in the feature representations of the various reflexes, summarized in Table 6. Variability is due to the general elusive nature of rhotics (see Wiese 2001) and in Arabic, additionally due to the involvement of the notorious emphatic–plain distinction (Youssef, forthcoming). This latter point also relates to the so-called marginal emphatics, with a list consisting of [lˤ nˤ mˤ fˤ bˤ xˤ kˤ] (Davis 2009), but since these are often attested in restricted environments, next to other emphatics or to a low vowel, they are arguably not part of the phonemic inventory of most dialects (Youssef 2013, p. 102). If, however, they show contrastive behavior in a dialect, they can be analyzed as having a V-place [dorsal] feature.

**Table 6.** Representational typology of **r* phoneme reflexes.

| | C-place [coronal] | C-place [dorsal] | V-place [dorsal] | C-manner [open] | V-manner [closed] | … [voice] | Geographical Distribution |
|---|---|---|---|---|---|---|---|
| /r/ | ✓ | | | ✓ | ✓ | | -Peripheral and some Gulf<br>-Maghrebi and Egyptian: vs. /rˤ/<br>-Mesopotamian *qəltu*: vs. /ʁ/ |
| /R/ | ✓ | ✓ | | ✓ | ✓ | | Mesopotamian *gilit* and most Peninsular dialects |
| /rˤ/ | ✓ | | ✓ | ✓ | ✓ | | -Most Levantine dialects<br>-Maghrebi and Egyptian (vs. /r/) |
| /ʁ/ | | ✓ | | ✓ | | ✓ | Mesopotamian *qəltu* (vs. /r/) |

### *3.7. The Pharyngeal Typology*

The voiceless and voiced pharyngeals /ħ ʕ/ have largely been preserved in the modern dialects; however, a weakening of one or both phonemes can be observed in a few outskirts of the Arabic sprachbund (Watson 2002, p. 18). According to Fischer and Jastrow (1980, p. 52), Chadian and Nigerian Arabic have reduced old /ħ ʕ/ to laryngeal /h ʔ/, whereas Tihāma (Yemen) and Šīgo-Sason (Anatolia) dialects have only turned /ʕ/ into /ʔ/.

For /ħ ʕ/, there is no phonological evidence to support a C-place [dor] specification (nor any other place feature). I propose the double C-manner features [closed] and [open], a specification that ties phonetically with the considerable variation in the production of pharyngeals, which have been described as having fricative, approximant, or stop gestures (see McCarthy 1994; Shosted et al. 2017).

In Section 3.1, we assigned a single C-manner [closed] feature to the glottal stop /ʔ/, which surfaced as a reflex of **q* in certain other dialects. For the natural class of fricatives, I proposed C-manner [open]. Now, let us posit that /h/ is the (placeless)

segment composed entirely of that feature, considering its tendency to delete in word-final position in modern dialects. Table 7 summarizes the feature representation of these consonants and illustrates that the sound changes /ʕ/ > /ʔ/ and /ħ/ > /h/ involve a simple feature deletion mechanism.

**Table 7.** Representational typology of *ħ–*ʕ phoneme reflexes.

| | C-manner [closed] | C-manner [open] | . . . [voice] | Geographical Distribution |
|---|---|---|---|---|
| /ħ ʕ/ | ✓ | ✓ | (✓) | All except a few peripheral dialects |
| /h/ < *ħ | | ✓ | | Peripheral dialects: Chadian, Nigerian . . . |
| /ʔ/ < *ʕ | ✓ | | | Same as /h/; plus a few extra |

## 4. Discussion and Conclusions

An important characteristic of the property-driven approach is that it refrains from classifying languages, or for that matter dialects, into types. The latter methodology leads to three false implications, elaborated in Hyman (2018, pp. 10–12), which I will consider in relation to the typologies of Arabic consonant reflexes.

The first is that the resulting categories appear to be mutually exclusive. A good illustration of this is the customary classification of Arabic dialects based on reflexes of **k* into /k/ vs. /tʃ/ type dialects. As we saw in Section 3.3, the pure /tʃ/ dialects are relatively few, and many more dialects in fact contrast /tʃ/ and /k/ phonemes. Additionally, with increasing pressure to normalize educated speech toward SA, this phonemic split is expanding or even disappearing in favor of /k/. A division of this sort, therefore, appears simplistic.

A second argument is that the outcomes of such studies pretend to offer unique taxonomies, as if "something has been accomplished" (Hyman 2018, p. 11), while in fact multiple categorizations are often possible. Take the case of stop /t d/ vs. fricative /s z/ reflexes of the interdentals in Section 3.4. One typologist may classify, say, the sedentary dialects of Egypt in the /t d/ group (e.g., Fischer and Jastrow 1980) when considering well-established lexical items; another may classify them as /s z/-type dialects (e.g., Embarki 2008) given their rendering of recent SA borrowings into fricatives, never stops.

Another example is the Mesopotamian *qəltu* dialects in the **r* typology, which are classified under a separate category as a result of their unique /ʁ/ reflex. However, synchrony alone dictates that they should be part of the 'plain r' group since they have a single rhotic phoneme /r/ in loanwords, and since the fricative /ʁ/ reflex of **r* has totally merged with an existing phoneme, the etymological *ġayn*. Rarely are the facts so uncomplicated that we can place a dialect in one or the other category. What really matters in the current approach is that the two categories are structurally delineated so that the phonological behavior of those reflexes can be explained, regardless of which dialect falls under which type.

The final argument advanced by Hyman is that the typological labels are often imprecise and invariably run into exceptions. Let us take, for example, the labels proposed by Youssef (2019) for the **r* typology. The so-called 'split-*r* dialects' represent a type that contrasts plain /r/ and emphatic /rˤ/, but the label may equally apply to the 'uvular-*r* dialects', which also happen to split the etymological *r* into two phonemes, /ʁ/ and /r/. The third type, labeled 'plain-*r* dialects', have a non-emphatic rhotic phoneme which is either doubly marked for C-place [coronal] and [dorsal], /R/, or just [coronal], namely /r/. That is why it is more accurate to divide them into two discrete groups, as I have done

in Section 3.6. Another case of inaccurate labeling is the designation of a 'type' with an approximant reflex of *ǧ, i.e., /j/ (cf. Watson 2011a, p. 863), even though [j] is typically a conditioned variant of the /dʒ/ phoneme in such dialects (Section 3.2). We must admit, of course, that labels are useful descriptive tools that help us conceptualize the object of our research; the important thing is that they should not be perceived as explanatory typological devices instead. They are not themselves manifestations of actual phenomena.

So, if typology is not about finding types, what should its goal be? By discarding types and embracing the property-driven view, we were indeed able to make valuable predictions, both empirical (for Arabic) and theoretical. Let us review them one by one.

First, as Hyman (2007, p. 265) states, this approach makes no clear distinction between phonological typology and phonological theory; and in doing so, it affords a range of theoretically informed schemes to typologize and explain variation. The current study appealed to the formal apparatus of phonological representation to account for variation in Arabic consonant phonemes. Here, the raw material of the typological analysis is not the phoneme reflexes per se, but how these reflexes are differentiated by the feature hierarchy (cf. Dresher et al. 2018). This contrastive-feature typology then has explanatory power in that the featural makeup of the various reflexes will correlate with their distinct phonological patterning across varieties of Arabic.

Secondly, the feature typology was generated by a specific model of feature geometry, the PSM. By utilizing a handful of features, which are only operative when distinctive (contrastive and/or active), the PSM provides a minimalist device to account for phonological alternations across languages and dialects. I have illustrated that the PSM is not only sufficient to capture complex typological correlations, but also that the correlations are made transparent by the architectural properties of the model. Crucially, feature economy is maximized and phoneme distribution is accounted for.

A relevant case here is that (the mostly Bedouin) dialects with a /ɡ/ reflex of *q (Section 3.1) are more likely to have a /dʒ/ reflex of *ǧ (Section 3.2). By activating C-place [dorsal] for /ɡ/ and V-place [coronal] for /dʒ/, other features being equal, those dialects make maximal use of the few available distinctive features to express their phoneme inventories (cf. Clements 2003). At the same time, they escape creating a common reflex for the two historical consonants, which would result in a merger (mergers happen typically when the phoneme contrasts have a low functional load, which is not the case here).

Thirdly, although exclusively synchronic in essence, the PSM analysis also sheds light on processes of sound change and phonologization, by offering linguistic explanations for how such processes might have taken place. According to Kiparsky (2008), structural properties (including features), rather than systems of opposition, should form the basis for language change. Typological generalizations then simply follow from recurrent patterns of change. As such, historical changes can provide explanations for closely related dialects, but how is this achieved?

We know, for instance, that partial sound change can eventually lead to a phonemic split. This occurs for several of the consonants under scrutiny where multiple reflexes cooccur in a given group of dialects, e.g., /ɡ/ and /q/ reflexes of *q (Section 3.1), /k/ and /tʃ/ reflexes of *k (Section 3.3), and /ʁ/ and /r/ reflexes of *r (Section 3.6). When there is a single systematic reflex, we have an indication that the change is complete. Additionally, since the reflexes are characterized by minimal feature distinctions, we can often register that phonological change involves the addition or deletion of a few features. Finally, conditioned phonetic variants—as I have pointed out for *q, *ǧ, and *k—can provide clues for the process of phonologization. For a principally diachronic perspective of variation in a range of Arabic consonants, readers may consult Embarki (2008, 2014).

In conclusion, contrastive-feature taxonomies provide an interesting insight into the relations that exist between varieties of the same language, both synchronically and diachronically (cf. Dresher et al. 2018). Having demonstrated that the PSM is well suited to capturing variation in the consonants of genealogically related Arabic dialects, we can also claim, following Kiparsky (2018), that typological generalizations are inevitably theory

dependent. The variety of available theoretical solutions should open up new avenues for dialect categorization, independent of traditional classificatory systems that conflate multiple extra-linguistic factors.

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## Notes

1 A reviewer has pointed out that the picture of laryngeal distinctions is more intricate. Within the PSM, Morén (2003) proposed the features [closed], [open], and [lax] for the Laryngeal tier; and recently Watson and Heselwood (2016) have advocated Laryngeal [open/closed] to analyze languages (e.g., Mehri) or dialects (e.g., San ʿāni Arabic) in which [voice] does not play an active role in the phonology. With this in mind, I acknowledge that the use of [voice] in this paper is a simplification to help streamline the typological analysis, given that the active laryngeal features may vary across Arabic dialects.

2 The likely older, palatal plosive pronunciation [ɟ] can be found sporadically in the Arabian Peninsula and in Upper Egypt and Sudan (Fischer and Jastrow 1980, p. 51).

3 In addition, all dialects with unconditioned and conditioned [tʃ] use this variant consistently in the second person feminine suffix. In certain dialects of Oman and Yemen, [tʃ] is found only in this pronoun, with other /k/'s remaining intact (see Watson 1992). In northern Yemeni highlands, the form has [ʃ] instead (as in *kaškaša*).

4 Parenthesized [voice] features in this table, as well as in Table 7, belong exclusively to the second member of the consonant pair to the left, here /ð d z v/.

5 Bellem (2014) mentions Sunni Baḥraini as an exception, being dyadic while retaining the interdentals /θ ð/.

6 In some Maghrebi dialects, the merge to /ðˤ/ is inconsistent; one finds voiceless /tˤ/ in free variation with /dˤ/ in certain instances: [tˤrˤạb]~[dˤrˤạb] 'he struck'; [mọːtˤạˤ]~[mọːdˤạˤ] 'place' (Djidjelli; Fischer and Jastrow 1980, p. 50).

7 Note that, unlike the obstruent emphatics, /rˤ/ tends to lose its emphatic feature—and surface as plain [r]—next to front vowels. This distribution, known as /rˤ/ de-emphasis, leads to root-internal allomorphy between emphatic [rˤ] and plain [r]. Youssef (2019) analyzes de-emphasis as contextual neutralization (Kenstowicz and Kisseberth 1979, p. 211), whereby the underlying /r/–/rˤ/ contrast is merged in front vowel contexts but maintained elsewhere.

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