Let us return, briefly to the discussion of the problem that non-conditioned phonetic variation poses for full feature specification and bi-uniqueness.

Rotokas

This language has two sets of consonants - one group is fairly consistent in articulation, airflow and acoustic characteristics, while the other shows a wide range of variation along some phonetic dimensions, but not others. The question is how to best characterize these consonants using phonetic labels and what the phonological feature specification and segment-internal representations might look like for these consonants.

			Group A			Group B		
			p	t	k	b~β~ʋ~m~mb	d~ɾ~ɹ~n~l	g~ɣ~ŋ
Artic.	Degree of general constriction	Max	✓	✓	✓			
		<Max						
		<Min						
		Min						
	Degree of laryneal constriction	Max						
		<Max				(✓)	(✓)	(✓)
		<Min						
		Min						
	Place of constriction/ expansion	Lar				(✓)	(✓)	(✓)
		Lab	✓			✓		
		Cor		✓			✓	
		Vel			✓			✓
	Velum	Lowered						
Aero.	Oral airflow	Yes						
		No	✓	✓	✓			
	Laryngeal airflow	Yes				✓	✓	✓
		No	✓	✓	✓			
	Nasal airflow	Yes						
		No	✓	✓	✓			
Acous.	Silence	Yes	✓	✓	✓			
		No				✓	✓	✓
	Noise	Yes						
		No						
	F1	High						
		Low	✓	✓	✓	✓	✓	✓
	F2	High		✓	✓		✓	✓
		Low	✓	✓	(✓u)	✓	✓	(✓u)
	Nasal F							

Legend: (✓) means that I do not know if this is present or consistent across variations. (✓u) means that the velar constriction has a lower F2 in back/round vowel environments. Shading means that the row associated with this phonetic characteristic does not distinguish between the two groups of sounds ("voiceless" versus "voiced"). The lack of shading in the place of constriction/expansion rows means that these are distinguishing within the two groups of sounds.

Group A is characterized by maximum constriction, no airflow and silence. There is a lack of laryngeal airflow, but we do not know if this is due to aerodynamics or articulation. These differ in terms of place of constriction and corresponding acoustics (F2/spectral differences).

Group B has consistent laryngeal airflow and a corresponding lack of silence. Note, however, that there is no consistent constriction across tokens. These also differ in terms of place of constriction and corresponding acoustics (F2/spectral differences).

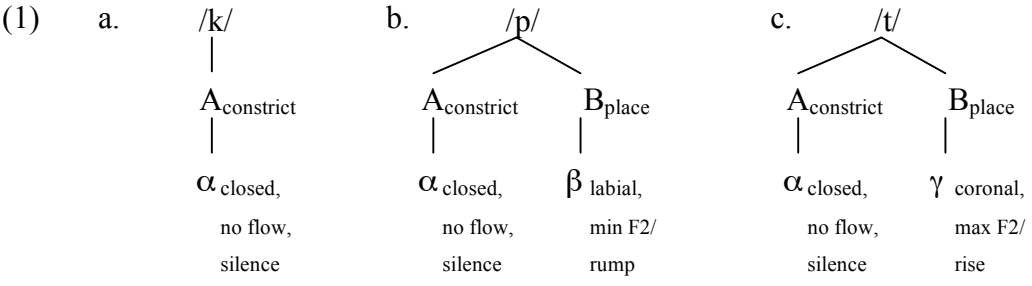
All other phonetic characteristics are either irrelevant because they are present or absent in both sets, or they are not relevant for a single set (e.g. B) because of the unconditioned range of variation involving that characteristic.

Given the consistent closure gesture for A, I would hypothesize that this set has a common feature α, which maps to maximum constriction, complete lack of airflow and silence in this language.

Given the need to distinguish within A and the inconsistent spectral properties across vowel contexts associated with a velar constriction, I hypothesize that /p/ has feature β, /t/ has feature γ and /k/ has no phonological feature. β maps to a labial constriction and corresponding consistent low F2/"rump", while γ maps to a coronal constriction and corresponding consistent high F2/"rise". The phonetic dorsal constriction and corresponding inconsistent F2 target for /k/ are a language-particular strategy for realizing the stop closure.

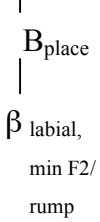
If we assume that humans are good at forming classes of related characteristics/labels based on distributional and functional similarities, then we might represent these three segments as in (1).

(1)

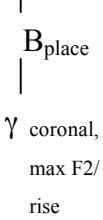


If we assume the strong hypothesis regarding structural markedness (recall that we get this for free in OT) in which more complex structures should imply minimally different less complex structures, then (1b) and (1c) should imply the presence of segments composed of just β and just γ (if we assume that the root nodes and class nodes are necessary for independent reasons). In Rotokas, we have two perfect candidates - the segments corresponding to [b~β~ʊ~m~mb] and [d~ɾ~ɹ~n~l]! These have a consistent place of articulation, but not a consistent constriction. For ease of exposition, I will represent these phonological place-only segments with /b/ and /d/.

(2) a. /b/

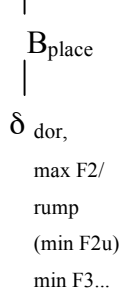


b. /d/



This leaves just one segment left to represent - that corresponding to [g~ɣ~ŋ] for which I will use the symbol /g/. Assuming a relationhip between structural complexity and economy, there are two likely hypotheses. First, this segment could be composed of only a place feature (with necessary root node and class node). This makes the phonetics quite transparent because it does have a dorsal constriction and it makes a within group similarly transparent as well since all "constrictionless" segments have just place, as shown in (2) and (3). However, it adds one more feature to the system that is used for only one segment (not an economical use of a feature in the sense of Clements' recent work), and it misses a within group similarity because the two "dorsal" segments are now completely unrelated - one is placeless and the other has place - compare (1a) and (3).

(3) a. /g/

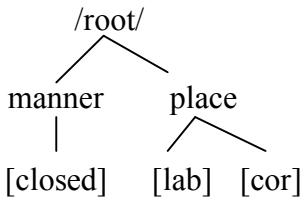


Another hypothesis is that /g/ is simply an empty root node in this language. This captures the default dorsal articulation similar to that in (1a) and captures the lack of consistent constriction-related characteristics. This hypothesis is more economical and captures the facts, but allows for empty root nodes - is this good or bad?

Note that given the indeterminacy of how to capture some segments using features (including what phonetic characteristics are necessary or not), it may be possible that different speakers have different interpretations of the same phonetic facts. That is, they have a set of phonological features (labels) mapping to either the same or slightly different phonetics (still consistent with the empirical facts). This would parallel different speakers' use of semantic features and feature relationships when organizing concepts, and it might make for a natural connection to how/why dialects diverge from one another over time, i.e. historical change.

Without evidence to the contrary, I might assume the fully-specified consonant-related structure in (4) and the individual segment representations in (5). Note that I am using mnemonic labels that should not imply an innately pre-specified connection between the class nodes and features and particular phonetic properties.

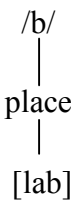
(4)


/root/
manner
place
[closed]
[lab]
[cor]

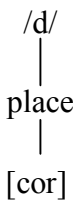
(5)

a. /g/

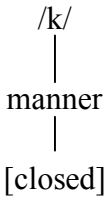
b.


/b/
place
[lab]

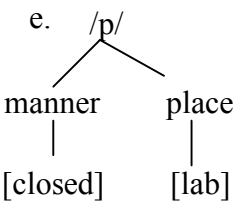
c.


/d/
place
[cor]

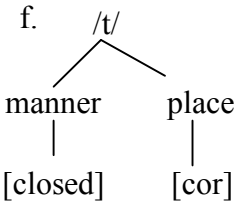
d.


/k/
manner
[closed]

e.


/p/
manner
place
[closed]
[lab]

f.


/t/
manner
place
[closed]
[cor]