

# Feature geometry and cooccurrence restrictions\*

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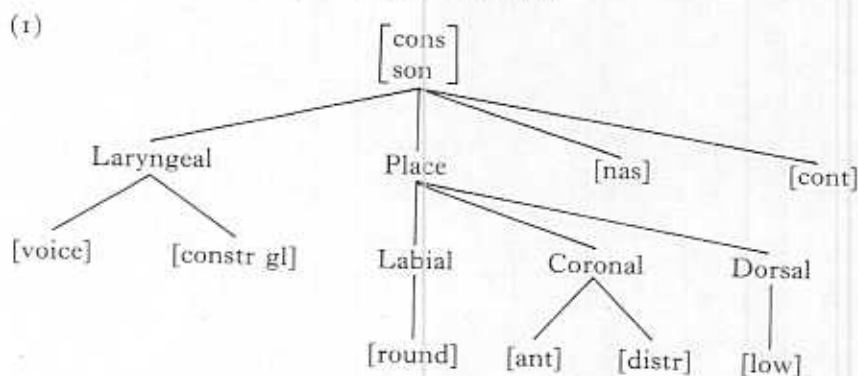
## 1 Introduction

Recent work by Clements (1985), Sagey (1986), Steriade (1987a) and others has shown clearly that distinctive features are hierarchically organised, and that the hierarchy includes a Place of Articulation constituent. Proposals differ, however, as to the organisation below this Place node. Clements (1985) suggests that there is a Secondary Place node dominating the vowel features, but that [anterior], [coronal] and [distributed] are directly dominated by the Place node itself. Sagey (1986) has argued that there are distinct Articulator nodes, Labial, Coronal and Dorsal, each of which dominates certain binary features, respectively [round]; [anterior] and [distributed]; and [high], [back] and [low]. Dorsal is thus present for both velar consonants and vowels. Steriade (1987a) modifies the Sagey model by adding a Velar node for velar consonants, distinct from the Dorsal node for vowels.

The purpose of this paper is to provide evidence in support of the Articulator node model of Sagey/Steriade, and to use this model to investigate the types of cooccurrence restrictions found in languages. Three kinds of evidence can be used to argue for a particular constituent structure for distinctive features: (i) constituents spread as units; (ii) constituents delete/detach as units; (iii) constituents are identified as units by rules which compute identity, such as the OCP (Leben 1973; McCarthy 1986b; Yip 1988). The evidence I shall produce here is of the third type. Many languages group consonants into 'identity classes', such that members of the same class may not cooccur in the same morpheme. In a hierarchical model, identity classes should be defined in terms of constituents, and in the Sagey model these constituents are the articulator nodes Labial, Coronal and Dorsal. These nodes are present or absent: [-Coronal] does not exist. I shall show that this model makes the right predictions about the kinds of identity classes found in languages, whereas a model using the binary features [anterior] and [coronal] (Chomsky & Halle 1968, henceforth *SPE*) does not.<sup>1</sup> McCarthy (1986a) was the first to use this kind of argument, for Semitic, and I follow his lead here.

The relevant aspects of the model I shall be arguing for are shown

below. I incorporate McCarthy's (1988) suggestion that the root node consists of the features [sonorant] and [consonantal], and that [nasal] and [continuant] are direct dependents of the root:



This is contrasted with any model in which [coronal] and [anterior] are sister binary features, defining the following natural classes in languages with labials, dentals, alveolars, retroflexes, coronals, velars and uvulars:

(2) Binary model		Articulator model
[+ant]	p t	-
[-ant]	t c k q	-
[+cor]	t t c	Coronal
[-cor]	p k q	-
[+ant, -cor]	p	Labial
[+ant, +cor]	t t	Coronal, [+ant]
[-ant, -cor]	k q	Dorsal (Velar)
[-ant, +cor]	t c	Coronal, [-ant]

In the binary model, any of these could form a mutually exclusive class in some language, but in fact the classes [+anterior], [-anterior] and [-coronal] do not occur. These are exactly the groups of sounds that are not natural classes in the Articulator model, and so their non-occurrence is predicted in that model. It is of course impossible to prove the non-existence of some phenomenon; all that can be done is to show that there is an abundance of examples of the type predicted by the Articulator model and, so far, an absence of any examples of the additional types predicted by the binary model.

I will discuss data from several languages, and for the most part discussion of each language will be organised into five sections dealing with the issues outlined in §§ 1.2-5 below. A few languages do not lend themselves to this organisation. In the course of outlining the issues I will summarise my theoretical assumptions.

### 1.1 Within but not

An articulator node blocking cooccurrence but not across articulator 'identity classes', such that two consonants cannot cooccur. Identity Dorsal cannot be defined without including a feature for velars. I know of no identity classes of this type.

I assume that there are cases and it appears to be a natural option of double

### 1.2 Total/partial node

Articulator nodes are terminal features in the identity role in the Semitic (see below) which form a single root. O c/, which form two roots to cooccur in roots in this regard; it appears also non-distinct

The facts here are radical underspecification of one value of a binary feature. See in particular the

### 1.3 Underlyingly

MSCs hold on underlying specific 1986a and Steriad Coronal can be used underlyingly to represent unaffected segment language may not be them. Suppose further

1.1 Within but not across articulator nodes

An articulator node model of feature structure predicts that MSCs blocking cooccurrence of homorganic consonants will be stated within but not across articulator nodes. A typical language might define three 'identity classes', one per articulator node, Labial, Coronal and Dorsal, such that two consonants dominated by the same articulator node cannot cooccur. Identity classes involving consonants from, say, Labial and Dorsal cannot be defined in this model, so the existence of such classes would constitute evidence against this model, and in favour of a model including a feature such as [-coronal] which grouped together labials and velars. I know of no language that has an MSC that makes reference to identity classes of the latter type.

I assume that the MSCs are OCP effects (McCarthy 1986b; Yip 1988), and it appears to be the case that they normally hold of all places of articulation, suggesting an OCP effect at the Place node level. Apparent cases involving only one Place node are artifacts of the language-particular option of double linking (e.g. Luo; see §6).

1.2 Total/partial Place of Articulation identity within Articulator node

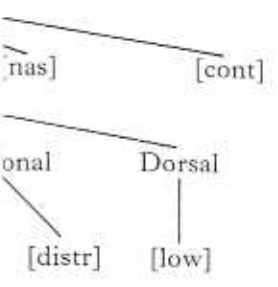
Articulator nodes are the grossest level of Place geometry, and various terminal features represent the finer distinctions. These subtleties play a role in the identity classes of some languages, but not all. For example in Semitic (see below) there are three voiceless coronal fricatives /θ s š/, which form a single identity class so that no two of them may cooccur in a single root. On the other hand Javanese has three coronal stops /t̪ t̪ c/, which form two identity classes {t̪, t̪} and {t̪, c}, with /t̪/ and /c/ free to cooccur in roots. The notion of non-distinctness will be introduced in this regard; it appears that the OCP may disallow not only identical, but also non-distinct sequences.

The facts here will force me to conclude that at least in some cases radical underspecification (Archangeli 1984) may be needed, since only one value of a binary feature may be specified, even when it is distinctive. See in particular the section on Javanese in this regard.

1.3 Underlyingly specified features and MSCs on identity

MSCs hold on underlying representations, and therefore have access to underlying specifications only. (This line of argument is due to McCarthy 1986a and Steriade 1987b.) The existence of an MSC involving, say, Coronal can be used as evidence for the presence of that feature in the underlying representation of the affected segments, and its absence in unaffected segments. For example, suppose that the coronal stops in some language may not cooccur, but the coronal nasal can occur with either of them. Suppose further that at other places of articulation the nasals may

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not cooccur with their homorganic stops. I conclude that in such a language the coronal nasal is not specified for Place, but coronal stops are, and the other nasals are. It would appear that sonorants may or may not be specified for Place, but obstruents always are: I know of no language in which /t/ does not participate in MSCs on coronals (but see Paradis & Prunet 1988 and Avery & Rice 1988 for a different view). The evidence will suggest that there is considerable variation in whether/which sonorants lack Place features; the liquids /l r/ are unspecified in Javanese, but specified in Semitic; the dental nasal is unspecified in Javanese, but the velar nasal is unspecified in Cambodian (see Trigo 1988 on the unspecified nature of the velar nasal in a variety of languages).

#### 1.4 Complete segment identity

In many of these languages there is a much-noted exception to the constraint on homorganic consonants. Totally identical consonants may cooccur, in apparent violation of the prohibition. In non-linear theories this has usually been attributed to the possibility of doubly linking a segmental root node to two consonant positions in the syllabic template, resulting in two consonants that share not just Place specifications, but all features. Javanese (Mester 1986) and Semitic (McCarthy 1986a) provide useful examples of this phenomenon.<sup>2</sup>

#### 1.5 Adjacency

The MSCs discussed below hold over strictly adjacent consonants (i.e. consonant clusters) (e.g. Cambodian), or over consonants adjacent in the root, but separated by a vowel on the surface (e.g. Javanese), or over consonants simply present in the same root, but optionally separated by another consonant or a vowel even underlyingly (Semitic). It is necessary to ask why string adjacency matters in some languages but not others, and I will argue below that at some level adjacency is always involved, and that apparent non-adjacent instances *always* involve separation of consonant and vowel melodies underlyingly, and a template which supplies the surface ordering.

McCarthy (1989a) has suggested that languages with severe restrictions on the canonical forms of roots from which C/V ordering is predictable must eliminate that ordering from the lexical entry, and thus separate vowels and consonants on to different planes. A consequence is that languages with predictable ordering may have restrictions on surface non-adjacent consonants, and this prediction is borne out in Javanese, Luo and Mayan. Cambodian, by contrast, has unpredictable linear ordering, and restrictions on truly adjacent consonants only. Semitic will require an elaboration of this approach.

## 2 Javanese<sup>3</sup>

Mester (1986) undertakes a detailed analysis of the syllabic structure of Javanese. He allows for language-specific variations in the syllable node model. I also deal with different readings of the model, which are given in (3):

(3)	Labial	Dental
	p	t̚
	b	d̚
	m	ŋ
	w	

The retroflexes are not included (Mester 1961: xxix). I follow Mester (1986: 107).

The great majority of Javanese roots are of the form C<sub>1</sub>VC<sub>2</sub>VC<sub>3</sub>VC<sub>4</sub>VC<sub>5</sub>VC<sub>6</sub>VC<sub>7</sub>VC<sub>8</sub>VC<sub>9</sub>VC<sub>10</sub>VC<sub>11</sub>VC<sub>12</sub>VC<sub>13</sub>VC<sub>14</sub>VC<sub>15</sub>VC<sub>16</sub>VC<sub>17</sub>VC<sub>18</sub>VC<sub>19</sub>VC<sub>20</sub>VC<sub>21</sub>VC<sub>22</sub>VC<sub>23</sub>VC<sub>24</sub>VC<sub>25</sub>VC<sub>26</sub>VC<sub>27</sub>VC<sub>28</sub>VC<sub>29</sub>VC<sub>30</sub>VC<sub>31</sub>VC<sub>32</sub>VC<sub>33</sub>VC<sub>34</sub>VC<sub>35</sub>VC<sub>36</sub>VC<sub>37</sub>VC<sub>38</sub>VC<sub>39</sub>VC<sub>40</sub>VC<sub>41</sub>VC<sub>42</sub>VC<sub>43</sub>VC<sub>44</sub>VC<sub>45</sub>VC<sub>46</sub>VC<sub>47</sub>VC<sub>48</sub>VC<sub>49</sub>VC<sub>50</sub>VC<sub>51</sub>VC<sub>52</sub>VC<sub>53</sub>VC<sub>54</sub>VC<sub>55</sub>VC<sub>56</sub>VC<sub>57</sub>VC<sub>58</sub>VC<sub>59</sub>VC<sub>60</sub>VC<sub>61</sub>VC<sub>62</sub>VC<sub>63</sub>VC<sub>64</sub>VC<sub>65</sub>VC<sub>66</sub>VC<sub>67</sub>VC<sub>68</sub>VC<sub>69</sub>VC<sub>70</sub>VC<sub>71</sub>VC<sub>72</sub>VC<sub>73</sub>VC<sub>74</sub>VC<sub>75</sub>VC<sub>76</sub>VC<sub>77</sub>VC<sub>78</sub>VC<sub>79</sub>VC<sub>80</sub>VC<sub>81</sub>VC<sub>82</sub>VC<sub>83</sub>VC<sub>84</sub>VC<sub>85</sub>VC<sub>86</sub>VC<sub>87</sub>VC<sub>88</sub>VC<sub>89</sub>VC<sub>90</sub>VC<sub>91</sub>VC<sub>92</sub>VC<sub>93</sub>VC<sub>94</sub>VC<sub>95</sub>VC<sub>96</sub>VC<sub>97</sub>VC<sub>98</sub>VC<sub>99</sub>VC<sub>100</sub>VC<sub>101</sub>VC<sub>102</sub>VC<sub>103</sub>VC<sub>104</sub>VC<sub>105</sub>VC<sub>106</sub>VC<sub>107</sub>VC<sub>108</sub>VC<sub>109</sub>VC<sub>110</sub>VC<sub>111</sub>VC<sub>112</sub>VC<sub>113</sub>VC<sub>114</sub>VC<sub>115</sub>VC<sub>116</sub>VC<sub>117</sub>VC<sub>118</sub>VC<sub>119</sub>VC<sub>120</sub>VC<sub>121</sub>VC<sub>122</sub>VC<sub>123</sub>VC<sub>124</sub>VC<sub>125</sub>VC<sub>126</sub>VC<sub>127</sub>VC<sub>128</sub>VC<sub>129</sub>VC<sub>130</sub>VC<sub>131</sub>VC<sub>132</sub>VC<sub>133</sub>VC<sub>134</sub>VC<sub>135</sub>VC<sub>136</sub>VC<sub>137</sub>VC<sub>138</sub>VC<sub>139</sub>VC<sub>140</sub>VC<sub>141</sub>VC<sub>142</sub>VC<sub>143</sub>VC<sub>144</sub>VC<sub>145</sub>VC<sub>146</sub>VC<sub>147</sub>VC<sub>148</sub>VC<sub>149</sub>VC<sub>150</sub>VC<sub>151</sub>VC<sub>152</sub>VC<sub>153</sub>VC<sub>154</sub>VC<sub>155</sub>VC<sub>156</sub>VC<sub>157</sub>VC<sub>158</sub>VC<sub>159</sub>VC<sub>160</sub>VC<sub>161</sub>VC<sub>162</sub>VC<sub>163</sub>VC<sub>164</sub>VC<sub>165</sub>VC<sub>166</sub>VC<sub>167</sub>VC<sub>168</sub>VC<sub>169</sub>VC<sub>170</sub>VC<sub>171</sub>VC<sub>172</sub>VC<sub>173</sub>VC<sub>174</sub>VC<sub>175</sub>VC<sub>176</sub>VC<sub>177</sub>VC<sub>178</sub>VC<sub>179</sub>VC<sub>180</sub>VC<sub>181</sub>VC<sub>182</sub>VC<sub>183</sub>VC<sub>184</sub>VC<sub>185</sub>VC<sub>186</sub>VC<sub>187</sub>VC<sub>188</sub>VC<sub>189</sub>VC<sub>190</sub>VC<sub>191</sub>VC<sub>192</sub>VC<sub>193</sub>VC<sub>194</sub>VC<sub>195</sub>VC<sub>196</sub>VC<sub>197</sub>VC<sub>198</sub>VC<sub>199</sub>VC<sub>200</sub>VC<sub>201</sub>VC<sub>202</sub>VC<sub>203</sub>VC<sub>204</sub>VC<sub>205</sub>VC<sub>206</sub>VC<sub>207</sub>VC<sub>208</sub>VC<sub>209</sub>VC<sub>210</sub>VC<sub>211</sub>VC<sub>212</sub>VC<sub>213</sub>VC<sub>214</sub>VC<sub>215</sub>VC<sub>216</sub>VC<sub>217</sub>VC<sub>218</sub>VC<sub>219</sub>VC<sub>220</sub>VC<sub>221</sub>VC<sub>222</sub>VC<sub>223</sub>VC<sub>224</sub>VC<sub>225</sub>VC<sub>226</sub>VC<sub>227</sub>VC<sub>228</sub>VC<sub>229</sub>VC<sub>230</sub>VC<sub>231</sub>VC<sub>232</sub>VC<sub>233</sub>VC<sub>234</sub>VC<sub>235</sub>VC<sub>236</sub>VC<sub>237</sub>VC<sub>238</sub>VC<sub>239</sub>VC<sub>240</sub>VC<sub>241</sub>VC<sub>242</sub>VC<sub>243</sub>VC<sub>244</sub>VC<sub>245</sub>VC<sub>246</sub>VC<sub>247</sub>VC<sub>248</sub>VC<sub>249</sub>VC<sub>250</sub>VC<sub>251</sub>VC<sub>252</sub>VC<sub>253</sub>VC<sub>254</sub>VC<sub>255</sub>VC<sub>256</sub>VC<sub>257</sub>VC<sub>258</sub>VC<sub>259</sub>VC<sub>260</sub>VC<sub>261</sub>VC<sub>262</sub>VC<sub>263</sub>VC<sub>264</sub>VC<sub>265</sub>VC<sub>266</sub>VC<sub>267</sub>VC<sub>268</sub>VC<sub>269</sub>VC<sub>270</sub>VC<sub>271</sub>VC<sub>272</sub>VC<sub>273</sub>VC<sub>274</sub>VC<sub>275</sub>VC<sub>276</sub>VC<sub>277</sub>VC<sub>278</sub>VC<sub>279</sub>VC<sub>280</sub>VC<sub>281</sub>VC<sub>282</sub>VC<sub>283</sub>VC<sub>284</sub>VC<sub>285</sub>VC<sub>286</sub>VC<sub>287</sub>VC<sub>288</sub>VC<sub>289</sub>VC<sub>290</sub>VC<sub>291</sub>VC<sub>292</sub>VC<sub>293</sub>VC<sub>294</sub>VC<sub>295</sub>VC<sub>296</sub>VC<sub>297</sub>VC<sub>298</sub>VC<sub>299</sub>VC<sub>300</sub>VC<sub>301</sub>VC<sub>302</sub>VC<sub>303</sub>VC<sub>304</sub>VC<sub>305</sub>VC<sub>306</sub>VC<sub>307</sub>VC<sub>308</sub>VC<sub>309</sub>VC<sub>310</sub>VC<sub>311</sub>VC<sub>312</sub>VC<sub>313</sub>VC<sub>314</sub>VC<sub>315</sub>VC<sub>316</sub>VC<sub>317</sub>VC<sub>318</sub>VC<sub>319</sub>VC<su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2 Javanese<sup>3</sup>

Mester (1986) undertakes a detailed analysis of the cooccurrence restrictions of Javanese. He makes use of hierarchical feature structures, but allows for language-specific variation in the dependency relations. I will attempt to analyse the facts of Javanese within an invariant articulator node model. I also depart from Mester empirically at certain points, based on different reading of some of the sources. The consonants of Javanese are given in (3):

(3)			Alveolar			
	Labial	Dental	Retroflex	Palatal	Velar	Glottal
	p	t̚	ʈ	c	k	ʔ
	b	d̚	ɖ	j	g	
				s		h
	m	ŋ		ɲ	ŋ	
			l			
			r			
	w			y		

The retroflexes /ʈ d/ are sometimes described as alveolar (Horne 1961: xxix). For arguments for treating /s/ as palatal, see Mester (1986: 107).

The great majority of native morphemes are CVCVC, and in these roots C<sub>1</sub> and C<sub>2</sub> show cooccurrence restrictions controlled by Place of Articulation.<sup>4</sup> Homorganic consonants are disallowed in these positions (but total identity is acceptable, and will be discussed below). The prohibition is not absolute, but statistically very significant, as Mester shows, using data from Uhlenbeck (1950a).

Javanese has the following classes of mutually exclusive consonants in the first two positions in CVCVC native roots:<sup>5</sup>

- (4) a. Labials p b m w  
 Dentals t̚ d̚  
 Retroflexes ʈ ɖ (r l)  
 Palatals c j ɲ s  
 Velars k g ŋ
- b. Dentals + retroflexes t̚ d̚ ʈ ɖ  
 Dentals + palatals t̚ d̚ c j ɲ s  
 Retroflexes + palatals are OK
- c. Dental /ŋ/ is neutral, as are /ʔ h/

In §§ 2.1-5 I deal in the same order with the issues raised in §§ 1.1-5 as they pertain to Javanese.

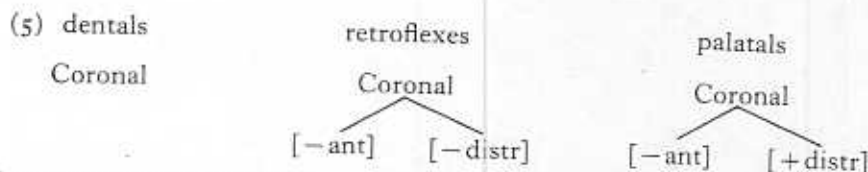
### 2.1 Within but not across articulator nodes

There are no identity classes in (4) which cut across articulator nodes. [-anterior] coronals and velars cooccur freely, for example: *cekap/cukop* 'enough, sufficient'. On the other hand, consonants which share an articulator node cannot cooccur at all (in the case of Labial and Dorsal), or some subset of them cannot cooccur (in the case of Coronal). Provided these subsets can be properly defined, this collection of facts is as predicted by the Articulator node model, but not the binary model. It can of course be stated in such a theory, but it is chance that [+coronal] is relevant, but [+anterior] and [-coronal] are not.

### 2.2 Total/partial place identity

We must explain why dentals cannot occur with either retroflexes or palatals, but why retroflexes and palatals can occur with each other.<sup>6</sup> Some notion of relative similarity or partial identity must be used to capture the intuition that dentals are the quintessential coronals of Javanese and thus cannot occur with any others, whereas the retroflexes and palatals are more different from each other than each is from the dentals, and thus can cooccur.

Given a system of underspecification, these facts can be captured by assuming that dentals are simply Coronal, with no specification for [anterior] or [distributed], but retroflexes and palatals are Coronal, [-anterior], and [-distributed]/[+distributed] respectively. This is shown in (5):



We may then say that Javanese requires the root consonants to have *distinct* Place nodes, and that total identity or non-distinctness is not acceptable. Dentals are not distinct from either retroflexes or palatals, since they have no specification for [distributed] or [anterior]. Since they are not distinct, they may not cooccur. Retroflexes and palatals, on the other hand, are distinct from each other, and thus may cooccur.

This proposal raises obvious issues for underspecification theory, and draws on two distinct variants. The use of [distributed] is in the spirit of Steriade (1987b), in which she distinguishes between D-values (distinctive values), which apparently have both values present underlyingly for the class of segments within which they are distinctive, and R-values (redundant values), which are missing underlyingly. [distributed] is distinctive in Javanese only within the class of [-anterior] coronals, and is thus absent elsewhere. On the other hand, the use made here of [anterior] is incompatible with Steriade's system: the distinctive value [-anterior] must be present, since it defines the D-class for [distributed], but the

distinctive value [+a] distinct from the [-a]. Archangeli's (1984) F present underlyingly, rule, here a complete leave this issue unre connection with Sem

### 2.3 Lack of Place fe

The nasals /m n ŋ/ Javanese, but /ŋ/ doe for Place features, and to be unmarked for assimilation in Javane Coronals, and by the velar nasal prefix /ŋ/

- (6) bakar mbak:  
 duḍuḍ nḍuḍi  
 wudjut mudju  
 lunguh ŋlung  
 rantap ŋrant:

I conclude that /l r/ a say that Coronal is r obstruents two coron: which neither velars : might plausibly sugg language.<sup>8</sup>

Finally, note that restrictions either, and specifications, includir case, see Steriade 198:

### 2.4 Complete segme

Consonants that are to and I follow Mester in Mester argues that rig first two consonants n image of Classical Ara that prefixing reduplic

- (7) peped 'to pus  
 totog 'to get  
 jujun 'attract

If this is so the roots a consonants at all.

distinctive value [+anterior] must be absent, since the dentals are non-distinct from the [-anterior] consonants. This use of [anterior] follows Archangeli's (1984) proposal, in which only one value of each feature is present underlyingly, and the missing value is supplied by redundancy rule, here a complement rule supplying the opposite value [+anterior]. I leave this issue unresolved at present, and will return to it below in connection with Semitic.

### 2.3 Lack of Place features

The nasals /m n ŋ/ participate in the cooccurrence restrictions in Javanese, but /ŋ/ does not. This suggests that the first three are specified for Place features, and that /ŋ/ is the unmarked nasal. In fact, /l r/ appear to be unmarked for Coronal as well. There is a rule of general Place assimilation in Javanese that is triggered by all obstruents, including the Coronals, and by the sonorant /w/, but not by /l r/. The rule affects the velar nasal prefix /ŋ/:<sup>7</sup>

- |     |        |             |                         |
|-----|--------|-------------|-------------------------|
| (6) | bakar  | mbakar      | 'roast' (ACTIVE)        |
|     | ḍuḍu   | nḍuḍu       | 'place'                 |
|     | wudjut | mudjut-ake  | 'shape' (CAUSATIVE)     |
|     | lunguh | ŋlunguh     | 'sir'                   |
|     | rantap | ŋrantap-ake | 'flake off' (CAUSATIVE) |

I conclude that /l r/ are unmarked for Place features. Note that we cannot say that Coronal is not marked for any consonants, since among the obstruents two coronals may not cooccur. If there were a language in which neither velars nor labials could cooccur, but coronals could, we might plausibly suggest that Coronal was the unmarked Place in that language.<sup>8</sup>

Finally, note that the laryngeals /ʔ h/ do not participate in the restrictions either, and this is as expected if they lack all supralaryngeal specifications, including a Place node (for arguments that this must be the case, see Steriade 1987c).

### 2.4 Complete segment identity

Consonants that are totally identical in all respects may cooccur in roots, and I follow Mester in assuming that this results from double association. Mester argues that right-to-left association accounts for the fact that the first two consonants may be identical, but not the last two (the mirror-image of Classical Arabic; see McCarthy 1981), but it seems more likely that prefixing reduplication is involved, since if  $C_1 = C_2$ ,  $V_1 = V_2$  also:

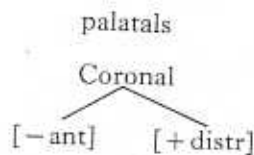
- |     |       |                                    |
|-----|-------|------------------------------------|
| (7) | pepeḍ | 'to push each other'               |
|     | ḷoḷog | 'to get knocked accidentally'      |
|     | jujuḷ | 'attracted by, madly in love with' |

If this is so the roots are monosyllabic, and do not contain two identical consonants at all.

across articulator nodes. For example: *cekap/cukop* (consonants which share an element of Labial and Dorsal, but not of Coronal). Provided the collection of facts is as simple as the binary model. It can be argued that [+coronal] is not a distinctive value.

with either retroflexes or coronals with each other.<sup>5</sup> Some might be used to capture the facts of Javanese and thus retroflexes and palatals are not distinct from the dentals, and thus can be captured by a feature like [-anterior].

with no specification for Place, palatals are Coronal, and retroflexes are [-anterior]. This is a possible analysis.



not all consonants to have a distinctive value. Non-distinctness is not a feature of retroflexes or palatals, but of [-anterior]. Since they are not distinct from the dentals and palatals, on the one hand, they may cooccur.

the specification theory, and the analysis of [-anterior] is in the spirit of the analysis of D-values (distinctive values) underlyingly for the retroflexes, and R-values (retroflexes). [-distributed] is distributed for [-anterior] coronals, and is not a distinctive value here of [-anterior] coronals, and is not a distinctive value [-anterior] coronals, and is not a distinctive value [-distributed], but the

## 2.5 Adjacency

It remains to explain the fact that all the above restrictions hold over non-adjacent consonants. Note first that the cooccurrence restraints are limited to canonical CVCVC native roots, and apparently to the first two consonants in those roots. Uhlenbeck notes that CVCVC roots have special properties, and that the majority of roots that lack these characteristics are loans, expressives, onomatopoeic or historically bimorphemic. The relevant properties are:

- (i) root vowels must match in height
- (ii) root consonants must not be homorganic
- (iii) roots must be bisyllabic, usually CVCVC

The canonical CVCVC shape of these native roots means that C/V ordering is predictable, and thus should be omitted from the lexical entry. Following McCarthy (1989a), this has as a consequence C/V segregation on to separate planes, and root consonants are thus adjacent on the C-plane. In the rest of the vocabulary C/V ordering is not predictable, and so must be encoded in the lexical entry, meaning C/V segregation does not hold. The three properties above would then follow from that separation, as would the lack of these properties in roots without that separation.<sup>9</sup> The non-local cooccurrence effects are hard to explain unless C/V segregation holds. Note that all places of articulation are involved in the cooccurrence restrictions, which must thus involve a rather general OCP filter \*Place Place. Since vowels have Place nodes, they would separate the consonants and block the filter, so it is necessary to assume that vowels and consonants occupy separate tiers in Javanese. There is additional evidence that supports this conclusion.

First, Kenstowicz (1985) has argued that certain vowel alternations that show across-the-board effects require C/V segregation.<sup>10</sup>

Second, in a few instances in Javanese, vowels are manipulated separately from consonants by the morphology, in a way typical of templatic languages like Semitic (McCarthy 1981). There are two levels of speech in Java, called Krama and Ngoko. Krama is more formal, and used with social superiors. Ngoko is less formal, and used with social inferiors. I follow here Uhlenbeck (1978: 278–299).

There are pairs of words for these two styles of speech. Some pairs are completely idiosyncratic, but others show one of several systematic relationships (see Uhlenbeck for details). Using the Ngoko word as a base, and deriving the Krama word, among the systematic options are changing the final syllable, changing the penultimate vowel, or both.

One common tendency is to front one vowel:

- |     |               |               |
|-----|---------------|---------------|
| (8) | kuwat/kiyat   | 'strong'      |
|     | rusaq/risaq   | 'broken'      |
|     | somah/semah   | 'spouse'      |
|     | takon/taken   | 'to inquire'  |
|     | məngko/məngke | 'immediately' |

Interestingly, if both v

- (9) dokoq/dekeq  
kongkon/kengk

Although Uhlenbeck i  
change when they are  
resulted from double a  
requires separation of  
would otherwise resul

(10)



To summarise, Java  
root consonants adjac  
consonants with non-  
are not specified for F  
nodes, and therefore I

## 3 Cambodian clu

Cambodian morphem  
there are systematic ge  
There are four places  
(\* denotes a non-occu

- (11)
- |   |   |   |   |
|---|---|---|---|
|   | b | p | m |
| p | * | * | * |
| m | * | * |   |
| t |   |   |   |
| c |   |   |   |
| s |   |   |   |
| k |   |   |   |

### 3.1 Within but not :

As in Javanese, the co  
articulator nodes. Th  
occurring, even thou  
binary model. There i  
these would be [–cor

- (12) p b m w  
c p s y

Interestingly, if both vowels are /o/, both may go to /e/:

- (9) dokoq/dekeq 'to set'  
kongkon/kengken 'to send'

Although Uhlenbeck is not explicit, as far as I can tell both vowels only change when they are identical, and this would follow if the two vowels resulted from double association of a single melodic element. This in turn requires separation of vowels and consonants, since double association would otherwise result in crossed association lines:



To summarise, Javanese has cooccurrence restrictions that operate on root consonants adjacent at the melodic level, and that disallow two consonants with non-distinct place nodes. The coronal sonorants /ŋ l r/ are not specified for Place, and the laryngeals /ʔ h/ lack Supralaryngeal nodes, and therefore Place nodes.

### 3 Cambodian clusters

Cambodian morphemes have a wide variety of CC-initial clusters, but there are systematic gaps where the two consonants would be homorganic. There are four places of articulation: labial, alveolar, palatal and velar (\* denotes a non-occurring cluster):<sup>11</sup>

(11)

	b	p	m	w	d	t	n	s	c	ɲ	y	l	r	k	ŋ	ʔ	h
p	*	*	*	*													
m	*	*															
t					*	*	*	*	*	*	*	ʔ					
c					ʔ	*	ʔ	*	*	*	*	*					
s										*							
k																	*

#### 3.1 Within but not across articulator nodes

As in Javanese, the cooccurrence restrictions are all within but not across articulator nodes. There are no restrictions on palatals and velars co-occurring, even though these form the natural class [-anterior] in the binary model. There are no restrictions on labials and velars, even though these would be [-coronal]. Instead we find the following identity classes:

(12)

p	b	m	w	[Labial]	t	d	n	[Coronal]
c	ɲ	s	y	[Coronal]	k			[Dorsal]
				[-anterior]				

Two consonants from one of these groups may not cluster. The only exception is initial /s/, which is almost unrestricted. Since /s/ cannot form the second member of a cluster after /t/ or /c/, it must be specified as Coronal, and initially it is presumably an appendix and thus exempt from the usual restrictions, as it is in English.

### 3.2 Total/partial place identity

The facts about the coronal alveolars and palatals are rather unclear. On the one hand \*/ct tc tʃ ts cs/ are impossible, but on the other hand Nacaskul (1978) says that /cd cn ty/ are all found. The examples I have been able to find are very rare, and are summarised below:

- (13) /cd/: very rare; Headley gives 4 examples:  
 cdao 'ingot (of gold)'  
 cdao 'fish similar to pike'  
 cdop 'to sit in a spot as though rooted there'  
 cdɔn 'clitoris' (vulgar)
- /cn/: probably the -n- nominalising infix:  
 cnam 'year'  
 cnu:əl 'hiring price'    cu:əl 'hire'  
 (cf. [tne:] 'seam' from [de:] 'sew')
- /ty/: Jacob gives 2 words:  
 tyu:n 'charcoal'  
 tyi:ən 'meditate'

Assuming coronals and palatals do *not* cooccur, Cambodian is apparently also sensitive to non-distinctness, and the alveolars and palatals form an identity class:

- (14) Coronal            Coronal            /t d n c ɲ s y/  
                                  |  
                                  [-ant]

Note that it is necessary to assume radically underspecified [anterior] here, since if both values were present the alveolars and palatals would be distinct.

### 3.3 Lack of Place features

Cambodian, like Javanese, shows evidence of lack of specification in the sonorants. Among the nasals it is the velar nasal /ŋ/ that is unrestricted. It can co-occur with the velar /k/ (*kɲaan* 'goose', *kɲok* 'bent'), whereas the other nasals cannot cooccur with their homorganic stops. /r l/ are quite unrestricted, and thus presumably unspecified for Place: *cru:t* 'to reap', *drno* 'lateral support'. /ʔ h/ have no supralaryngeal node, and thus no Place node, and are also free. The relevant features of these segments are given below:<sup>12</sup>

- (15) ɲ [+nas]    r [+son]    l [+son, +lat]  
       ʔ h        No supralaryngeal specifications

### 3.4 Complete segm

As in Javanese, consonants may undergo schwa epenthesis and reduplicated forms (N

- (16) kkāy        [kəl]  
       jjik        [cət]  
       tto'm       [də]  
       pphūn      [pə]
- (17) /ppr/        [bə]  
       /gghlo'n/ [kə]

These, like the Javanese examples, are not subject to the same linking.<sup>13</sup>

### 3.5 Adjacency

In Cambodian, the coronal and palatal consonants in clusters are homorganic:

- (18) kək        'cong'  
       tət        'kick'  
       biəm      'hold'  
       cas        'old'

In Cambodian, unlike Javanese, unaccented morphemes may be monosyllabic and the order of segments is

- (19) mlu: 'betel'

C/V segregation is therefore not observed across a vowel.

To summarise: Coronal and palatal consonants with non-distinctness are not adjacent across a vowel. The velar nasal in Cambodian is not adjacent to the laryngeals, and the laryngeals also lack adjacent consonants, ordered underlyingly.

## 4 Semitic root c

McCarthy (1986a, 1986b) shows that the homorganic consonants /c/ and /t/ are adjacent in the Semitic root *c* (Greenberg (1960). *ʔ* depart from him in

### 3.4 Complete segment identity

As in Javanese, completely identical consonants are acceptable, but undergo schwa epenthesis for syllabification. The examples in (16) are reduplicated forms (Nacaskul 1978: 200), and those in (17) are underlying:

- |      |       |           |                               |
|------|-------|-----------|-------------------------------|
| (16) | kkāy  | [kəkə:y]  | 'to scratch constantly'       |
|      | jjīk  | [cəci:k]  | 'to dig out'                  |
|      | ʔʔo'm | [dədəyɪm] | 'at the very beginning'       |
|      | pphūn | [pəpho:ŋ] | 'repeatedly loud and echoing' |

- |      |           |            |          |
|------|-----------|------------|----------|
| (17) | /ppr/     | [bəbɔ:]    | 'soup'   |
|      | /gghlo'n/ | [kəkʰlɔ:n] | 'brazen' |

These, like the Javanese identical consonants, can be attributed to double linking.<sup>13</sup>

### 3.5 Adjacency

In Cambodian, the cooccurrence restrictions only apply to truly adjacent consonants in clusters. Consonants separated by a vowel may be freely homorganic:

- |      |      |                       |      |                     |
|------|------|-----------------------|------|---------------------|
| (18) | kɔ:k | 'congeal'             | tec  | 'a little'          |
|      | tɔ:t | 'kick away'           | ba:p | 'sin'               |
|      | biəm | 'hold in mouth, suck' | cuc  | 'fish trap of cane' |
|      | cas  | 'old'                 | cap  | 'defeated'          |

In Cambodian, unlike Javanese, C/V ordering is not redundant. Native morphemes may be monosyllabic or disyllabic, and even within a monosyllable the ordering of C and V is not predictable:

- |      |      |              |      |         |
|------|------|--------------|------|---------|
| (19) | mlu: | 'betel leaf' | mu:l | 'round' |
|------|------|--------------|------|---------|

C/V segregation is thus impossible in Cambodian, and consonants are not adjacent across a vowel. Cooccurrence restrictions only apply to clusters.

To summarise: Cambodian, like Javanese, does not allow two consonants with non-distinct Place nodes to cooccur. The unmarked nasal is the velar nasal in Cambodian (coronal in Javanese), and the liquids and laryngeals also lack Place nodes. The restrictions only apply to string-adjacent consonants, since in Cambodian vowels and consonants must be ordered underlyingly.

## 4 Semitic root constraints

McCarthy (1986a, 1988) gives a detailed analysis of the constraints on homorganic consonants in Semitic roots first reported on in detail in Greenberg (1960). McCarthy's results are summarised here, although I depart from him in §4.2.

y not cluster. The only restricted. Since /s/ cannot /c/, it must be specified pndix and thus exempt

ls are rather unclear. On but on the other hand id. The examples I have ised below:

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'v')

Cambodian is apparently ars and palatals form an

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k of specification in the /ŋ/ that is unrestricted. ', *kjok* 'bent'), whereas organic stops. /r l/ are fied for Place: *crut* 'to aryngeal node, and thus tures of these segments

#### 4.1 Within but not across articulator nodes

Semitic languages have verb roots which consist of three consonants. Within these roots no two consonants may be homorganic. The identity classes for modern Standard Arabic are given below:

(20)	Labials	f b m
	Velars, uvulars	j/g k q x ɣ
	Coronal obstruents	t d s z θ ð š ʔ d ʕ ð
	High glides	w y
	Gutturals	x ɣ ħ ʕ h ʔ
	Coronal sonorants	l r n

Note that the uvular spirants /x ɣ/ belong to two identity classes: one with the velars, and one with the gutturals (pharyngeals and laryngeals).

The most noticeable aspect of these restrictions is that, like Javanese and Cambodian, none of the restrictions involves consonants from more than one of the three articulators Labial, Coronal and Dorsal. When we look at the identity classes *within* each articulator node, however, the situation is more complex.

#### 4.2 Total/partial place identity<sup>14</sup>

Two of the articulator nodes in Semitic cover more than one place of articulation. The Coronal node has a three-way distinction in the fricatives between interdental /θ/, alveolar /s/ and palatal /š/. The Dorsal node has a three-way distinction between velar /k g/, uvular /q x ɣ/ and pharyngeal /ħ ʕ/. These distinctions are treated differently by the cooccurrence restrictions. The Coronals apparently form a single identity class: none of them may cooccur. The Dorsals form two identity classes, with the uvular spirants being unable to cooccur with any other Dorsals but the velars and pharyngeals cooccurring freely.<sup>15</sup>

The clue to the solution here lies in the behaviour of the uvulars. Notice that the uvular stop /q/ can cooccur with the pharyngeals, whereas the uvular fricatives /x ɣ/ cannot. This suggests that Place features alone are not sufficient, and that [continuant] is playing a role. The pharyngeals and laryngeals themselves (with the possible exception of /ʔ/) are continuants, so the guttural class is the class of continuant dorsals, and the uvular stop /q/ is excluded on these grounds, not because of its Place features. If this is right, the Dorsal identity classes are:

(21)	Velars and uvulars	[-low]
	Pharyngeals	[+low]
	Gutturals	[+cont]

Note that both values of [low] are specified, in line with Steriade's restrictive underspecification, since [low] is a distinctive feature within the class of dorsals.

Returning to the coronals, could the feature [continuant] be involved

here too? Although M cooccur, inspection o relatively frequently v with emphatic /d/:

(22)	Number of roots	
	stop	
	stop	17
	cont	143

The statistical analysis effect: combinations almost without exce differing in continua time, particularly if o to pattern as a [+con Coronals in fact inclu like the Dorsals.

The Labials, howe and [-continuant] /l explanation for this is labials. There is onl dictable from voicing in the cooccurrence 1

#### 4.3 Lack of Place f

In Semitic, unlike Ja consonants are unspe an identity class and t of this class. This fa terms of the Place n freely with the coron [-sonorant] and [- [sonorant] and [conti is relevant *within an*.

#### 4.4 Complete segm

It is well known th striking exception in totally identical, as i this follows if such 1 to right with rightw the surface violatio double linking.

here too? Although McCarthy reports that none of the coronal obstruents cooccur, inspection of his 1986 data shows that the fricatives cooccur relatively frequently with the stops /t d/ and emphatic /t̤/, although not with emphatic /d̤/:

(22) *Number of roots with two coronals, by manner*

	stop	cont
stop	17	71
cont	143	25

The statistical analysis done by McCarthy also shows a strong clustering effect: combinations of coronals with the same value of continuancy are almost without exception significantly infrequent, but combinations differing in continuancy are significantly infrequent less than half the time, particularly if one excludes the voiced emphatic stop, which seems to pattern as a [+continuant] rather consistently.<sup>16</sup> It looks as though the Coronals in fact include two identity classes defined by [continuant], just like the Dorsals.

The Labials, however, do not distinguish between [+continuant] /f/ and [-continuant] /b m/, but form a single identity class. One possible explanation for this is that [continuant] may not be distinctive among the labials. There is only /f b/, no /v p/. Given that [continuant] is predictable from voicing, it should be absent underlyingly, and play no part in the cooccurrence restrictions.

#### 4.3 Lack of Place features

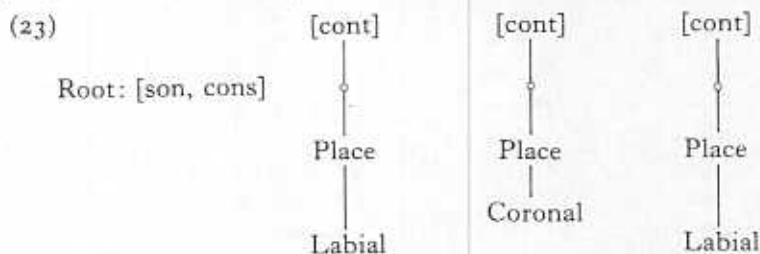
In Semitic, unlike Javanese and Cambodian, there is no evidence that any consonants are unspecified for Place features. The sonorants /r l n/ form an identity class and the remaining non-laryngeal sonorant /m/ is not part of this class. This fact suggests that the class must be defined in part in terms of the Place node Coronal. However, the coronal sonorants occur freely with the coronal obstruents, so I follow McCarthy's suggestion that [-sonorant] and [+sonorant] must be invoked here. The features [sonorant] and [continuant] are behaving similarly in Semitic in that each is relevant *within an Articulator node only*. I will return to this point below.

#### 4.4 Complete segment identity

It is well known that the restriction on homorganic consonants has a striking exception in Semitic. The last two consonants of the root may be totally identical, as in *samam* 'poison'. McCarthy (1981) points out that this follows if such roots are biconsonantal /sm/, and associate from left to right with rightward spreading of the second consonant. Again, then, the surface violation of the cooccurrence restrictions is the result of double linking.

## 4.5 Adjacency

The constraints in Semitic hold over non-adjacent consonants, as in Javanese, and this fact follows from the well-known separation of vowels and consonants in Semitic (McCarthy 1981). Unlike Javanese, the constraints are not limited to consonants which are adjacent in the root, and it is this point I wish to address in this section. Articulator nodes are privative: labials have a node Labial, but not a node [-Coronal], and so on. As a result two labial consonants with an intervening coronal consonant still have Labial nodes that are adjacent on the Labial tier. However, their Place nodes are not adjacent, nor are the manner features [continuant] and [nasal], which are true dependents of the root (McCarthy 1988), nor are the root nodes themselves, which, following McCarthy (1988), I take to consist of the features [sonorant] and [consonantal]:



Given this model, restrictions that are stated directly in terms of articulator nodes should hold between any two root consonants, but restrictions stated either as  $*Place_i Place_j$ , or involving root node features, might be expected to hold only over root-adjacent consonants. Languages like Semitic and Javanese in which identity classes exist for all articulator nodes should involve a general  $*Place Place$  filter, and this should then be local within the root, as it is in Javanese, rather than at a distance, as it is in Semitic. This is even more true for the 'root' features [sonorant] and [consonantal], and for the feature [continuant], and yet these all show restrictions across another consonant in Semitic ([sonorant] in the case of the coronal sonorants, [consonantal] in the case of the glides (not discussed here, but see McCarthy 1986a), and [continuant] in the case of the dorsals and coronals). McCarthy's analysis avoids this problem by stating the restrictions in terms of articulator tiers, where the articulator node is the focus of the restriction, and any node linked to it directly or indirectly can be referred to. For example, the constraint on coronal sonorants is stated on the Coronal tier, and adjacency on that tier is what matters. The adjacent Coronal nodes are then checked for [+sonorant] and if it is present the representation is starred. The claim implicit in this approach is that root features and directly dependent features like [continuant] will only be visible at a distance within but not across articulator nodes: no language will have an identity class involving *all* [+continuant] or *all* [+sonorant] segments that operates on non-adjacent root consonants (see also §10 below). As far as I know this is correct, and indeed restrictions

involving anything else is a reasonable solution since the Place node level, to which distinctions are made, sonorants have Place nodes and their contents that statements can then be made. restriction,  $*Place_i Place_j$

To summarise, Semitic has the same articulator node [low], [continuant], [nasal], again the relevant nodes are evidence for any unstarred consonants which are stated as a g

## 5 Yucatec Maya

Yucatec Mayan (Stratton)

- (24)
- |          |   |
|----------|---|
| Bilabial | / |
| p        | / |
| p'       | / |
| m        | / |

/c c' č č' / ai

The cooccurrence of p and p' is noted by McCarthy (1987) here because the language follows McCarthy's

## 5.1 Within but not

Most Mayan roots allow a cooccurrence restriction on articulation which tallies with the Coronal, /t c č/, an identity class where one is glottalised, the other is not. The following constraint

- (25)  $*p'Vp, t'$

involving anything except Place features seem rather rare. The most reasonable solution seems to be that although the restriction is stated at the Place node level, the actual checking process starts at the first node at which distinctions are available, the Articulator node. All relevant consonants have Place nodes, so checking them directly is not informative; it is their contents that matter. McCarthy's individual Articulator node statements can then be seen more as an algorithm used to check the real restriction, \*Place<sub>i</sub> Place<sub>j</sub>.

To summarise, Semitic root constraints involve consonants sharing the same articulator node, but are fine-tuned within that node by the features [low], [continuant], [sonorant] and [consonantal]. Non-distinctness is again the relevant notion. Unlike Javanese and Cambodian there is no evidence for any unspecified nasal or sonorant. The constraints hold on consonants which are not even adjacent within the root, leading to the conclusion that they must be checked at the articulator node level, even if they are stated as a general constraint on identical Place nodes.

### 5 Yucatec Mayan

Yucatec Mayan (Straight 1976) has the following phonemes:

(24)	Bilabial	Apico-alveo-dental	Lamino-alveolar	Centro-palato-velar	Dorso-palato-velar	Laryngeal
	p	t	c	č	k	ʔ
	p'	t'	c'	č'	k'	
			s	š		
	m	n		y	w	
			l			

/c c' č č' / are affricates. C' are glottalised consonants.

The cooccurrence restrictions of Yucatec Mayan have been discussed by McCarthy (1987) and Lombardi (1989), and are of particular interest here because the language has three different coronal series. The analysis follows McCarthy's, except where otherwise indicated.

#### 5.1 Within but not across articulator nodes

Most Mayan roots are CVC, and the two consonants are subject to several cooccurrence restrictions. Straight distinguishes three places of articulation which tally exactly with the three articulator nodes Labial, /p/, Coronal, /t c č/, and Dorsal /k/. If both consonants are stops, and only one is glottalised, they must differ either in Place or in Manner, or both. The following combinations are impossible:

- (25) \*p'Vp, t'Vt, c'Vc, č'Vč, c'Vč, č'Vc, k'Vk

The condition on glottalisation can be understood as follows: if the two consonants differ in glottalisation, they must have two root nodes, and thus two Place nodes and two Manner specifications. If one or the other is not distinct, the root is disallowed. See § 5.4 for consonants that do not differ in glottalisation.

### 5.2 Total/partial identity

I now turn to the restrictions among the coronals. If both are non-glottalised fricatives or affricates, they must be identical, excluding the following and their mirror-images:

- (26) \*cVč cVs cVš  
           čVs čVš  
                   šVs

but allowing [sVs, šVš, cVc, čVč]. Lombardi (1989: 21), following Straight and McCarthy, states the following generalisation: 'If both consonants in a root are [+cont] they must be identical'.<sup>17</sup> Given that all the [+continuant] segments are Coronal, it is not possible to tell whether this constraint operates within or across articulator nodes. It is certainly consistent with the data from Semitic, which suggest that [+continuant] is relevant only within an articulator node.

### 5.3 Lack of Place features

The sonorants in Mayan play no part in the identity classes, suggesting at first that they are unspecified for Place. However, there are two nasals, /m n/, whose Place features must be distinguished, so instead I assume that the restrictions in Mayan, as in Semitic, make reference to [-sonorant].

### 5.4 Complete segment identity

Total identity is acceptable in Mayan, where either both consonants are glottalised or neither is. Only then can a root node be doubly linked, resulting in two occurrences of the same consonant. If neither consonant is glottalised, the consonants *may* be identical:

- (27) pVp, tVt, cVc, čVč, kVk

If both Cs are glottalised, they *must* be totally identical. This constraint is indifferent to Place features, and rules out the following roots and their mirror images:

- (28) p'Vt' p'Vc' p'Vč' p'Vk'  
           t'Vc' t'Vč' t'Vk'  
                   c'Vč' c'Vk'  
                           č'Vk'

McCarthy assumes that the constraint is \*[constricted glottis] [constricted glottis], but an alternative would be to state it on Laryngeal nodes, since

[constricted glottis] Yucatec. Together glottis] (or Larynge

### 5.5 Adjacency

McCarthy (1987a) t with a fixed morph vowels and conson between the two. If the consonant tier,

## 6 Luo coronals

Mester (1986: 27) coronals in the Nor Luo (data from St

### 6.1 Within but no

The Luo restrict because they shed adjacency requirem /t d/ and interdent /s l r n č/ (orthogr cannot cooccur: \* language must incl

### 6.2 Total/partial

Since the dentals cooccur, it is clear However, /s/ and

- (29) chido  
       chudho  
       sidho  
       sido

In Luo, then, [ante from the palatal /č

- (30) /t/

Coronal  
 |  
 [+ant]

[anterior] here has

[constricted glottis] is the only laryngeal feature used distinctively in Yucatec. Together with a prohibition on double linking of [constricted glottis] (or Laryngeal) this will correctly capture the facts in (28).

### 5.5 Adjacency

McCarthy (1987a) used Mayan data to support his proposal that languages with a fixed morpheme structure, here CVC, tend to have separation of vowels and consonants, since there is no need for underlying ordering between the two. If this is right, the two root consonants are adjacent on the consonant tier, and cooccurrence restrictions are thus possible.

## 6 Luo coronals

Mester (1986: 27–30) discusses restrictions on the cooccurrence of coronals in the Northeast Congo language Alur. Similar facts are found in Luo (data from Stafford 1967), and apparently in Shilluk.

### 6.1 Within but not across articulator nodes

The Luo restrictions are limited to coronals, and are of interest here because they shed light on the range of double linking possibilities, on adjacency requirements and on underspecification. Luo has alveolar stops /t d/ and interdental stops /t̪ d̪/ (orthographic *th, dh*). It also has coronal /s l r n ɕ/ (orthographic *ch*). In CVC roots alveolar stops and dental stops cannot cooccur: \**dh...t, dh...d, th...t, th...d* and mirror images. The language must include a filter \*Coronal Coronal.

### 6.2 Total/partial place identity

Since the dentals and alveolars differ in [distributed], and yet cannot cooccur, it is clear that non-distinctness rather than identity is involved. However, /s/ and /ɕ/ can cooccur with both alveolars and dentals:

- (29) *chido* 'to be/make, dirty or dark'  
*chuodho* 'mud'  
*sidho* 'to put on (a hat)'  
*sudo* 'to move'

In Luo, then, [anterior] must render the dental and alveolar series distinct from the palatal /ɕ/ and /s/, and therefore able to cooccur with them:

- (30)      /t̪/                      /t/                      /ɕ/  
             Coronal                      Coronal                      Coronal  
             |                      / \                      |  
             [+ant]              [+ant] [-distr]              [-ant]

[anterior] here has both values specified, in direct contrast to Javanese.

### 6.3 Lack of Place features

Luo also has /l r n/. The first two of these occur with dentals and alveolars; for /n/ I have only found examples with alveolar /t/:

- (31) *thuolo* 'to be free'  
*tielo* 'to press down'  
*tero* 'to take to'  
*thoro* 'usually to... V' (AUX)  
*tuono* 'to refuse to give'

Here again the sonorants apparently lack Place features, and thus do not form an identity class with their homorganic obstruents.

### 6.4 Complete segment identity

In contrast to most of the languages discussed above, two stops with exactly the same place of articulation but differing in voicing *can* cooccur:

- (32) *thiedho* 'to heal, cure'  
*tedo* 'to cook'  
*diedo* 'to balance'

The last example with two totally identical stops comes, I assume, from double linking of the root node, but what about the first two cases? In Yucatec, stops differing only in another laryngeal feature, [constricted glottis], could *not* cooccur: \*/t'Vt/. Following McCarthy, I attribute this to the presence of two root nodes with identical Place nodes, and thus unacceptable. Double linking of Place nodes is not allowed in Yucatec Mayan. In Luo, by contrast, we must follow Mester's analysis of Alur; Mester attributes the acceptability of *tedo* to double linking of the feature [coronal], with [distributed] dependent on [coronal] and therefore held constant over the morpheme. Luo and Yucatec differ in that only the former allows double linking of Place/articulator nodes.

Luo is the first language I have discussed in which the restrictions are limited to one articulator node. However, the fact that only coronals are involved is illusory. It is clear, following Mester, that Coronal can be doubly linked. Suppose that in fact Place can be doubly linked. Then two labials and two velars will be able to cooccur, and provided there is only one series of consonants under each articulator node no effect will be noticeable.

### 6.5 Adjacency

The prohibition on dentals and alveolars applies to non-adjacent consonants in CVC roots. Given the fixed root shape, lexical entries need include only an ordered pair of consonants and a vowel, not ordered with respect to each other. The root consonants are thus adjacent, and two non-distinct coronal nodes are not allowed.

## 7 Other languages

The following languages have organic consonants, an model.

### 7.1 Pomo

Pomo (Oswalt 1971) has /h q/ and two in the fricative; the roots are canonical

- (33) C1 and C2 can  
 in [continuant  
 a. labial  
 b. dental,  
 c. velar, u

In this subpart of the lexical entries do no consonants, which are strictions.

### 7.2 Ponapean

In Ponapean (Rehg 1971) the following obstruents (retroflex). Consonants cooccur:

- (34) *paip* 'be  
*pwopwe* 'sh  
*rir* 'se  
*rot* 'da

Mester (who only looks at the result of double linking) sonority may differ it

Consonants that have the same features, such as [round], can cooccur, presumably under the same articulator node, and

- (35) /pw/  
 Labial  
 |  
 [+round]

Again, no constraints

## 7 Other languages

The following languages also have cooccurrence restrictions on homorganic consonants, and provide further support for the articulator node model.

### 7.1 Pomo

Pomo (Oswalt 1971) has six places of articulation in the stops: /p t c k q/ and two in the fricatives: /s š/. In Kashaya Pomo inanimate imitatives the roots are canonically CVC, and are subject to several constraints:

- (33) C<sub>1</sub> and C<sub>2</sub> cannot both be from the same group, unless they differ in [continuant]:
- labial
  - dental, alveolar, palatal
  - velar, uvular<sup>15</sup>

In this subpart of the vocabulary roots are canonically CVC, so that the lexical entries do not require ordering the vowel between the two consonants, which are thus adjacent and subject to cooccurrence restrictions.

### 7.2 Ponapean

In Ponapean (Rehg 1973; Mester 1986: 21–27; Steriade 1986a) there are the following obstruents: /pw p t t̚ k s s̚/ (/t/ may be dental; /t̚/ is retroflex). Consonants that are totally identical in all place features may cooccur:

- (34)
- |        |            |       |                 |
|--------|------------|-------|-----------------|
| paip   | 'boulder'  | parem | 'nipa palm'     |
| pwopwe | 'shoulder' | mwopw | 'out of breath' |
| rir    | 'secret'   | tool  | 'mountain'      |
| rot    | 'dark'     | kiik  | 'nail'          |

Mester (who only looks at the labials) and Steriade (1986a) analyse this as the result of double linking of the articulator node. Since nasality and sonority may differ it cannot be the root node that is doubly linked.

Consonants that have the same articulator node but differ in dependent features, such as [round] (/pw/ vs. /p/) or [anterior] (/t/ vs. /t̚/) cannot cooccur, presumably because they involve two instances of the same articulator node, and are non-distinct:

- (35)
- |          |        |         |         |
|----------|--------|---------|---------|
| /pw/     | /p/    | /t/     | /t̚/    |
| Labial   | Labial | Coronal | Coronal |
|          |        |         |         |
| [+round] |        |         | [–ant]  |

Again, no constraints cross articulator nodes.

## 8 Note on [-coronal]

In the light of the lack of evidence for any reference to the class of non-coronals in the identity classes discussed in this paper, one might wonder whether the rest of the phonology ever makes reference to [-coronal]. Obviously the prediction of unadorned Articulator theory should be that such rules cannot exist. I will briefly examine three cases that have been reported to require reference to [-coronal], and show that in each case an alternative explanation is available.

There is considerable literature on the feature [grave] that discusses cases where [+grave], which is equivalent to [-coronal] (Clements 1976), plays a role. First, Yurok (Robins 1958: 25, 51) has an allomorphy rule for the third person prefix /ʔwe/, which can attach to nouns, verbs and adverbs. Before non-coronals (labials, velars and labio-velars) the prefix surfaces as [ʔu]. The alternation is apparently limited to this single prefix, and can thus be dealt with by a statement that the prefix is [ʔwe] before coronals, [ʔu] elsewhere. In this form no reference to the class of [-coronal] is required.

Maltese Arabic (Brame 1972: 28-30) has a rule that changes *i* to *o* before *o* across a consonant, and the rule is blocked by an intervening non-coronal. The data and rule are given below:

- (36) a. /ni + bzo' / [nobzo'] 'I spit'  
           /ti + rbot / [torbot] 'you tie'  
           /ni + drob / [nidrob] 'I wound'  
           /ti + skot / [tiskot] 'you become silent'
- b.                    [+cons]  
           *i* → *o* / — { [+son] } C<sub>0</sub>*o*  
                           { [-cor] }

Maltese Arabic also has a rule of progressive harmony that is unaffected by any intervening consonants:

- (37) *i* → *o* / *o* C<sub>0</sub> —

Brame points out in a footnote that an attractive alternative to the rule in (36) is to posit an exceptionless, bidirectional harmony rule, and then add a rule changing *o* back to *i* before coronals. He gives the rule in (38):

- (38) *o* → *i* / — + { [-son] } C<sub>0</sub>  
                           { [+cor] }

This rule could be simplified given subsequent work spreading the Coronal node syllable-finally (I follow Clements 1976 and Pulleyblank 1989 in assuming that front vowels are Coronal). This analysis is clearly preferable, allowing generalisation of the harmony process, and a rather simple rule of coronal assimilation to explain the persistence of /i/ before coronals. No reference to [-coronal] is required.

Lastly, Odden (1976) reports that in a certain dialect of English, /p/ becomes voiced spirant [ɸ] before /r/. This rule applies to stem-initial /p/. Odden form [ɸr] being equi-informant whose dialects suggest the p rather than a true p 'Intervocally, real-voiced continuants'.

Kjellin (1976) discusses an informant who may be a dialect lacks uvulars and the initial three-way and also lack the tone are neutralised as 'm no mention of any d also explicit that ster description (1976: 1).

Without more info it is not possible to tervocally conson and the rules may ne variable character o Tibetan is not a clea

## 9 Manner featur

The role played by identity is intriguing classes that cross ar within an articulator example, in Semitic [continuant] values [+continuant] from is true of [+sonora [sonorant] may not c from different artic

Contrast this with glottis]. In Yucatec stricted glottis] may nodes.

The model of feat these differences: [ dependent of the ro None of the three be

Lastly, Odden (1978) discusses a dialect of Tibetan where /p k q/ become voiced spirants intervocalically but /t ʈ ʂ kʷ/ do not.<sup>19</sup> The rule applies to stem-initial consonants after the negative prefix *mV*, for example. Odden formulates this as a rule applying to [+grave] consonants, [+grave] being equivalent to [-coronal]. Odden's data come from an informant whose dialect is not specified. However, data from other dialects suggest the possibility that this rule is a phonetic realisation rule, rather than a true phonological rule, and that it may be stateable as: 'Intervocalically, realise coronal stops as stops; otherwise, realise stops as voiced continuants'.

Kjellin (1976) discusses the phonetics of Lhasa Tibetan as spoken by an informant who may also be slightly influenced by Tsang, to the west. This dialect lacks uvulars (1976: 135). He reports that medial consonants lack the initial three-way contrast of voiceless, voiceless aspirated and voiced, and also lack the tonal correlates of these laryngeal features. Instead they are neutralised as 'more or less voiced, or at least unaspirated'. He makes no mention of any differences depending on place of articulation. He is also explicit that stem-initial consonants after the negative prefix fit this description (1976: 138).

Without more information on the dialect spoken by Odden's informant it is not possible to settle the question, but it seems likely that intervocalically consonants are weakened and neutralised in various ways, and the rules may not be phonological, given the apparently gradient and variable character of the changes reported by Kjellin. I conclude that Tibetan is not a clear case of needing [-coronal].

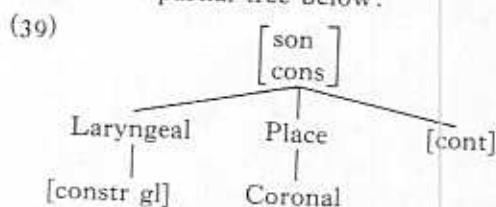
### 9 Manner features

The role played by [continuant] and [sonorant] in the computation of identity is intriguing. There are no cases of these features defining identity classes that cross articulator nodes; instead they serve to refine things within an articulator node (but see Kaisse 1988 on Modern Greek). For example, in Semitic within the Dorsal or Coronal class two similar [continuant] values may not cooccur, but there is no restriction on two [+continuant] from different articulator nodes, say /s/ and /x/. The same is true of [+sonorant]: within the Coronal class two similar values of [sonorant] may not cooccur but there is no restriction on two [+sonorant] from different articulator nodes, say /m/ and /n/.

Contrast this with the behaviour of the laryngeal feature [constricted glottis]. In Yucatec Mayan two consonants with specifications [+constricted glottis] may not cooccur, even if they have different articulator nodes.

The model of feature structure I have assumed so far does not predict these differences: [sonorant] is a root feature, [continuant] is a direct dependent of the root, [constricted glottis] is embedded under Laryngeal. None of the three bears a dependent relationship to the articulator nodes.

Consider the partial tree below:



In a language in which the identity classes involve all the articulator nodes, the constraint can be stated as  $*Place_1 Place_1$ . The features that serve to refine this further, [sonorant] and [continuant], are respectively the immediately dominating root node, and a sister node; the feature [constricted glottis], which cross-cuts the articulators, bears a more distant relationship. Borrowing terminology from syntax, [sonorant] and [continuant] c-command Place, whereas [constricted glottis] does not. Apparently this fact allows [sonorant]+Place or [continuant]+Place to act as a complex in defining identity classes, and blocks [constricted glottis]+Place from so doing.<sup>20,21</sup>

## 10 Underspecification

Underspecified representations have played a crucial role in this paper. They have been used straightforwardly to explain the failure of laryngeals, liquids and one nasal to participate in the cooccurrence restrictions in various languages. They have been used in a less familiar way to allow for a notion of non-distinctness, so that two segments distinguished only by the presence and absence of some feature, say [distributed], are non-distinct. Neither of these uses is original (see McCarthy 1988 on Yucatec Mayan, for example) but the latter invites further comment. In a radical underspecification theory (the terminology is taken from Mester & Itô 1989) like that of Archangeli (1984), no two segments are ever distinct in the sense intended here. This is because each feature has only one value marked underlyingly, and since + or - are non-distinct from zero, no matter how many features are involved the segments will be non-distinct. Other theories distinguish between privative features, where presence and absence are the only possibilities, and binary features, with both values marked. Privative features can never create distinctness in the strict sense, but this is obviously not the intended result. For example, Labial and Coronal, which are privative nodes, must be construed as distinct since they cooccur in all the languages discussed here, and yet formally they are non-distinct. One possibility is that distinctness be defined as follows:

- (40) Two segments are distinct if they differ in either:
- (i) the presence *vs.* absence of a privative node/feature
  - (ii) two opposing values of a binary feature
- Two segments are non-distinct if they differ only in:
- (i) the presence *vs.* absence of some value of a binary feature

This definition entails [low], [continuant], [ ] be unmarked under compatible with Rad some versions of) M

Finally, the difference distinct has forced n features such as [ante present, or restricti obviously undesirab

## 11 Conclusion

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## NOTES

- \* Work on this paper *guistiques de L'Asi* thank my hosts, the participants in paper has also be McCarthy, Alan F
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- [2] Some languages, l identical consonar different view).
- [3] Data in this sectio Kenstowicz (1985)
- [4] Mester notes that in CVCVC roots being overwhelmi
- [5] (i) Palatals and 1 'near, close'. Th Mester (1986: 163 tals, e.g. *duḡuḡ* 'lo dl/ are not allowe *laran* 'expensive', 'swishing past'. ( /ɪɛ/ (15 roots), /j
- [6] Mester says palat flexes, but this is while not statisti

This definition entails that the terminal features [anterior], [distributed], [low], [continuant], [sonorant] are binary features, and that one value may be unmarked underlyingly, or both values may be present. It is not compatible with Radical Underspecification theories, but is with (at least some versions of) Modified Underspecification Theory.

Finally, the different ways in which languages treat consonants as non-distinct has forced me to allow for language-specific variation in whether features such as [anterior] are radically underspecified, with only one value present, or restrictively underspecified, with both values present. This obviously undesirable conclusion invites further research.

## 11 Conclusion

I have given an analysis of the cooccurrence restrictions on homorganic consonants in a range of languages, and conclude that the identity classes found in these languages strongly support a theory with articulator nodes over a theory with binary features. I have also argued that identity classes involve non-distinctness rather than true identity; that adjacency on some level is always involved; that sonorants may be unspecified for Place; and that apparent violations of the restrictions are the result of double linking.

### NOTES

- \* Work on this paper began while I was visiting at the *Centre de Recherches Linguistiques de L'Asie Orientale*, CNRS, Paris, in June 1987, and I would like to thank my hosts, François Dell, Alain Peyraube and Laurent Sagart, and the participants in the seminars for their helpful comments and insights. The paper has also benefited greatly from the comments of Nick Clements, John McCarthy, Alan Prince, Donca Steriade and two anonymous reviewers.
- [1] Steriade (1986b) argues persuasively that Coronal behaves not like a single binary feature, but rather like a node dominating a group of features, particularly [anterior] and [distributed]. Her conclusion is supported by the data in this paper.
- [2] Some languages, by contrast, may prohibit double linking so that even totally identical consonants are not found (e.g. Cantonese, but see Cheng 1989 for a different view).
- [3] Data in this section come from Uhlenbeck (1950a), Horne (1974), Dudas (1976), Kenstowicz (1985) and Mester (1986).
- [4] Mester notes that the apparent lack of cooccurrence restrictions on C<sub>2</sub> and C<sub>3</sub> in CVCVC roots is hard to confirm because C<sub>3</sub> is very restricted (sonorants being overwhelmingly the most common).
- [5] (i) Palatals and retroflexes may cooccur: *jedey* 'outdoor bathroom'; *cedaq* 'near, close'. The only combination that is significantly rare, according to Mester (1986: 163-164) is /dʒ/. (ii) The dental nasal cooccurs with other dentals, e.g. *ɕunɕ* 'location'. (iii) /r/ may not precede /ʃ d l/, but may follow. /tʃ dl/ are not allowed, but /tr dr/ are found in onomatopoeic or derived words: *laran* 'expensive', *daraɕ* 'land', *dalan* 'lead performer in puppet play', *ʃrutus* 'swishing past'. (iv) A few dental+palatal/retroflex combinations are found: /ʃd/ (15 roots), /jɕ/ (11), /jʃ/ (12); e.g. *jidɕ* 'to lose, be defeated'.
- [6] Mester says palatals and dentals cooccur more freely than palatals and retroflexes, but this is not clear. The rarity of the sequences /j...ʃ/ and /ʃ...j/, while not statistically significant, is still noticeable, and the same is true of

- /d...s/ and /d...n/. He agrees that some sequences, such as /t...n, t...s, t...c, d...c, d...j, c...t, c...d/ are significantly rare, but attributes this to a special language-specific constraint that is not OCP (or identity) related, since in his analysis palatals are [+high], while dentals are [+coronal], and they share no features. I claim that both are Coronal, and non-distinct, and thus form an identity class.
- [7] Horne (1974: xxiii) says that the prefix is zero before nasals, suggesting that it deletes. As a result we cannot confirm that /n/ lacks Place features from these data.
- [8] There is one problem with the assumption that /l/ and /r/ are unmarked for Place. In some ways they behave like retroflexes, and this leads Mester to identify them as [retroflex] but not Coronal. For example, /t d/ are the only stops that do not form /Cl/ clusters. However, all consonants may cluster with /r/. One possibility is that retroflexes and /l/ are [+back], as assumed by Mohanan & Mohanan (1984) for Malayalam.
- [9] Note, however, that some of the effects of C/V segregation are not limited to canonical CVCVC roots. For example, the across-the-board effects on vowels discussed by Kenstowicz (1985) and Steriade (1987a) are not limited to CVCVC roots. Neither are the morphological processes that manipulate vowels independently, such as the Krama/Ngoko pairings.
- [10] Steriade (1987a) argues against the separation of vowels and consonants, and in favour of a model in which vowels have Dorsal nodes, while consonants have Labial, Coronal or Velar nodes, and in which only Dorsal nodes may be multiply linked. Under either analysis the articulator nodes of the consonants would be adjacent, but under Steriade's analysis the filter involves a variable \*Articulator<sub>1</sub> Articulator<sub>2</sub> or a list of three separate nodes \*Labial Labial, \*Coronal Coronal, \*Velar Velar. Since a root may have two distinct vowels, and thus two Dorsal nodes, \*Place Place is not possible in her analysis without it wrongly ruling out two distinct vowels.
- [11] The data in this section come from Jacob (1974), Headley (1977) and Nacaskul (1978).
- [12] Levin (1987) has discussed the affiliation of the feature [lateral], which is usually only relevant for coronals. Note that /l/ in Cambodian does not appear to have a Coronal node, and yet it must be distinguished from /r/ somehow. I have used the feature [lateral], in which case [lateral] cannot be a dependent of the Coronal node. An alternative which I have not explored would be to distinguish /r/ and /l/ by continuancy, as done by Mester for Javanese, and in this paper for Semitic uvulars.
- [13] The epenthesis would then have to be postlexical, so as not to violate geminate integrity (see McCarthy 1986b on postlexical rules and Tier Conflation).
- [14] In this section I depart from McCarthy's analysis, although I am still indebted to him for the data.
- [15] A separate problem is that the laryngeals, which in Javanese and Cambodian appear to lack Place features, in Semitic group with the pharyngeals to form the class called gutturals. I shall arbitrarily assume the laryngeals have Dorsal nodes, and are [+low], like the pharyngeals. McCarthy (1986a) assumes [RTR]. For a more recent treatment, written after this paper was in press, see McCarthy (1989b).
- [16] Greenberg (1960: 175ff) says that roots with the order sibilant-dental stop are common, but the reverse order is rare. Note also that the emphatic /d/ was historically a fricative.
- [17] Lombardi argues convincingly, based on these facts, that affricates have unordered [-continuant] and [+continuant] specifications. It is tempting to extend this ban from two [+continuant] to two [xcontinuant], but this cannot be done, since [-continuant] /t/ can cooccur freely with the affricates. Note also that if one of the segments is glottalised, fricatives and affricates can cooccur. I do not have space to discuss this here.

- [18] Oswalt implies that within (but not across) segments.
- [19] I am grateful to an anonymous referee for drawing my attention to this.
- [20] The relationship between the two is complex, and I am grateful to an anonymous referee to explain the almost total lack of gemination in the Yucatec Maya.

## REFERENCES

- Archangeli, D. (1984). U. S. PhD dissertation, MIT.
- Avery, P. & K. Rice (1981). *Working Papers in Linguistics*, 11, 1-10.
- Brame, M. (1972). On the structure of the Yucatec Maya. *Contributions to general linguistics*, 1, 1-10.
- Cheng, L. (1989). *Feature theory and the Cantonese vowel system*. Ms, MIT.
- Cheung, K. H. (1986). *Phonology of the Cantonese dialect*. University College, London.
- Chomsky, N. & M. Halle (1968). *Phonological universals*. Row.
- Clements, G. N. (1976). *The phonology of the Yucatec Maya*. Ms, MIT.
- Clements, G. N. (1985). *Phonological universals*, 2, 225-252.
- Dudas, K. (1976). *The phonology of the Yucatec Maya*. University of Illinois.
- Greenberg, J. (1960). *Universals of human language*, 1, 181.
- Headley, R. K. (1977). *Phonology of the Yucatec Maya*. University of America Press.
- Horne, E. C. (1961). *Beja phonology*. *Journal of African Studies*, 1, 1-10.
- Horne, E. C. (1974). *Javanese phonology*. University of California Press.
- Kaisse, E. (1988). *Morphology of the Yucatec Maya*. University of Washington.
- Kenstowicz, M. (1985). *A phonological theory of the Yucatec Maya*. *Journal of Linguistics*, 21, 1-10.
- Kjellin, O. (1976). *A phonological theory of the Yucatec Maya*. *Institute of Logopedics*, 1, 1-10.
- Leben, W. (1973). *Suprasegmental phonology*. Indiana University Linguistics Club.
- Levin, J. (1987). *A place feature for the Yucatec Maya*. 62nd Annual Meeting of the American Linguistic Society, December 1987.
- Lombardi, L. (1989). *The phonology of the Yucatec Maya*. *Journal of Massachusetts, American Linguistics*, 15, 373-418.
- McCarthy, J. (1981). *A theory of phonological alternations*. 373-418.
- McCarthy, J. (1986a). *Phonological universals*, presented at Brandeis University.

- [18] Oswalt implies that /t/ and /s/ can cooccur, so that [continuant] is relevant within (but not across) articulator nodes.
- [19] I am grateful to an anonymous reviewer for bringing the last two examples to my attention.
- [20] The relationship between [continuant] and articulator nodes might also be used to explain the almost universal limitation of affricates to Coronal places of articulation.
- [21] This account assumes that [constricted glottis], and not Laryngeal, is involved in the Yucatec Mayan constraints.

## REFERENCES

- Archangeli, D. (1984). *Underspecification in Yawelmani phonology and morphology*. PhD dissertation, MIT.
- Avery, P. & K. Rice (1988). Underspecification theory and the coronal node. *Toronto Working Papers in Linguistics* 9, 101-119.
- Brame, M. (1972). On the abstractness of phonology: Maltese S. In M. Brame (ed.) *Contributions to generative phonology*. Austin: University of Texas Press, 22-61.
- Cheng, L. (1989). Feature geometry of vowels and cooccurrence restrictions in Cantonese. Ms, MIT.
- Cheung, K. H. (1986). *The phonology of present-day Cantonese*. PhD dissertation, University College, London.
- Chomsky, N. & M. Halle (1968). *The sound pattern of English*. New York: Harper & Row.
- Clements, G. N. (1976). Palatalization: linking or assimilation? *CLS* 12, 96-109.
- Clements, G. N. (1985). The geometry of phonological features. *Phonology Yearbook* 2, 225-252.
- Dudas, K. (1976). *The phonology and morphology of Modern Javanese*. PhD dissertation, University of Illinois.
- Greenberg, J. (1960). The patterning of root morphemes in Semitic. *Word* 6, 162-181.
- Headley, R. K. (1977). *Cambodian-English dictionary*. Washington, D.C.: Catholic University of America Press.
- Horne, E. C. (1961). *Beginning Javanese*. New Haven: Yale University Press.
- Horne, E. C. (1974). *Javanese-English dictionary*. New Haven: Yale University Press.
- Jacob, J. M. (1974). *A concise Cambodian-English dictionary*. Oxford: Oxford University Press.
- Kaisse, E. (1988). Modern Greek continuant dissimilation and the OCP. Ms, University of Washington.
- Kenstowicz, M. (1985). Multiple linking in Javanese. Ms, University of Illinois.
- Kjellin, O. (1976). A phonetic description of Tibetan. *Annual Bulletin of the Research Institute of Logopedics and Phoniatrics, University of Tokyo* 10, 127-143.
- Leben, W. (1973). *Suprasegmental phonology*. PhD dissertation, MIT. Distributed by Indiana University Linguistics Club.
- Levin, J. (1987). A place for lateral in the feature geometry. Paper presented at the 62nd Annual Meeting of the Linguistic Society of America, San Francisco, December 1987.
- Lombardi, L. (1989). The non-linear organization of the affricate. Ms, University of Massachusetts, Amherst. To appear in *NLLT*.
- McCarthy, J. (1981). A prosodic theory of non-concatenative morphology. *LI* 12, 373-418.
- McCarthy, J. (1986a). Features and tiers: the structure of Semitic roots. Paper presented at Brandeis University.

- McCarthy, J. (1986b). OCP effects: gemination and antigemination. *LI* 17, 207-263.
- McCarthy, J. (1987). Some uncontroversial questions in feature geometry. Paper presented at Brandeis University.
- McCarthy, J. (1988). Feature geometry and dependency. To appear in O. Fujimura (ed.) *Articulatory organization: from phonology to speech signals*. Basle: Karger.
- McCarthy, J. (1989a). Linear order in phonological representation. *LI* 20, 71-100.
- McCarthy, J. (1989b). Guttural phonology. Ms, University of Massachusetts, Amherst.
- Mester, R. A. (1986). *Studies in tier structure*. PhD dissertation, University of Massachusetts, Amherst.
- Mester, A. & J. Itô (1988). Feature predictability and underspecification: palatal prosody in Japanese mimetics. *Lg* 65, 258-293.
- Mohanan, K. & T. Mohanan (1984). Lexical phonology of the consonant system in Malayalam. *LI* 15, 575-603.
- Nacaskul, K. (1978). The syllabic and morphological structure of Cambodian words. In P. Jenner (ed.) *Mon-Khmer Studies VII*. University Press of Hawaii, 183-200.
- Odden, D. (1978). Further evidence for the feature [grave]. *LI* 9, 141-144.
- Oswalt, R. (1971). Inanimate imitatives in Pomo. In J. Sawyer (ed.) *Studies in American Indian languages*. Berkeley: University of California Press, 175-190.
- Paradis, C. & J.-F. Prunet (1988). Markedness and coronal structure. To appear in *NELS* 19.
- Pulleyblank, E. (1989). Articulator based features of vowels and consonants. Ms.
- Rehg, K. (1973). On the history of Ponapean phonology. *Working Papers in Linguistics, University of Hawaii* 5.
- Robins, R. H. (1958). *The Yurok language*. Berkeley: University of California Press.
- Sagey, E. C. (1986). *The representation of features and relations in non-linear phonology*. PhD dissertation, MIT.
- Selkirk, E. (1988). The two-root theory of length. To appear in *NELS* 19.
- Stafford, R. L. (1967). *An elementary Luo grammar*. Oxford: Oxford University Press.
- Steriade, D. (1986a). Articulator harmony. Handout for talk given in series of lectures at MIT.
- Steriade, D. (1986b). A note on coronal. Ms, MIT.
- Steriade, D. (1987a). Vowel tiers and geminate blockage. Ms, MIT.
- Steriade, D. (1987b). Redundant values. *CLS* 23:2, 339-362.
- Steriade, D. (1987c). Locality conditions and feature geometry. *NELS* 17, 595-617.
- Straight, H. S. (1976). *The acquisition of Maya phonology: variation in Yucatec child language*. New York: Garland.
- Trigo, L. (1988). *On the phonological derivation and behavior of nasal glides*. PhD dissertation, MIT.
- Uhlenbeck, E. M. (1950a). The structure of the Javanese morpheme. *Lingua* 2, 239-270. Reprinted in Uhlenbeck (1978), 10-39.
- Uhlenbeck, E. M. (1950b). The Krama-Ngoko opposition: its place in the Javanese language system. Groningen, Djakarta. Reprinted in Uhlenbeck (1978), 278-299.
- Uhlenbeck, E. M. (1978). *Studies in Javanese morphology*. The Hague: Martinus Nijhoff.
- Yip, M. (1988). The OCP and phonological rules: a loss of identity. *LI* 19, 65-100.

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