Babine & Carrier Phonology
A Historically Oriented Study
Gillian L. Story
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Gillian L. Story

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## CONTENTS

Alphabetical List of Rules \hspace{1cm} vii
Abbreviations \hspace{1cm} ix
Map \hspace{1cm} x

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.1</td>
<td>Babine-Carrier language designations</td>
<td>1</td>
</tr>
<tr>
<td>1.2</td>
<td>Fraser Lake Carrier</td>
<td>3</td>
</tr>
<tr>
<td>1.3</td>
<td>Lexicostatistic time depths</td>
<td>5</td>
</tr>
<tr>
<td>1.4</td>
<td>Early white contact period</td>
<td>7</td>
</tr>
<tr>
<td>1.5</td>
<td>A. G. Morice</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Central Carrier phonology</td>
<td>8</td>
</tr>
<tr>
<td>2.1</td>
<td>The consonant system</td>
<td>11</td>
</tr>
<tr>
<td>2.1.1</td>
<td>\textit{b, m, and reflexes of *w}</td>
<td>11</td>
</tr>
<tr>
<td>2.1.2</td>
<td>The obstruent series</td>
<td>12</td>
</tr>
<tr>
<td>2.1.3</td>
<td>\textit{n} and reflexes of *y</td>
<td>15</td>
</tr>
<tr>
<td>2.1.4</td>
<td>Other deductions from Morice's consonant transcriptions</td>
<td>18</td>
</tr>
<tr>
<td>2.2</td>
<td>The vowel system</td>
<td>19</td>
</tr>
<tr>
<td>2.2.1</td>
<td>Morice's syllabary</td>
<td>19</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Deductions from Morice's vowel transcriptions</td>
<td>20</td>
</tr>
<tr>
<td>2.2.3</td>
<td>Vowel Raising and Lowering</td>
<td>22</td>
</tr>
<tr>
<td>2.3</td>
<td>Pitch phenomena in Carrier</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>Babine phonology</td>
<td>25</td>
</tr>
<tr>
<td>3.1</td>
<td>The consonant system</td>
<td>25</td>
</tr>
<tr>
<td>3.2</td>
<td>Stem-final consonant manners</td>
<td>27</td>
</tr>
<tr>
<td>3.3</td>
<td>Fortis-lenis classification and synchronic processes</td>
<td>29</td>
</tr>
<tr>
<td>3.3.1</td>
<td>Vowel allophones</td>
<td>30</td>
</tr>
<tr>
<td>3.3.2</td>
<td>Morphophonemic processes</td>
<td>31</td>
</tr>
<tr>
<td>3.3.3</td>
<td>Pitch phenomena in Babine</td>
<td>33</td>
</tr>
<tr>
<td>4</td>
<td>Babine vowel shift</td>
<td>35</td>
</tr>
<tr>
<td>4.1</td>
<td>L- and F-Mutation</td>
<td>35</td>
</tr>
<tr>
<td>4.2</td>
<td>Infrequent or rare consonant-vowel sequences</td>
<td>39</td>
</tr>
<tr>
<td>4.3</td>
<td>L-Mutation and e-Sharpening</td>
<td>40</td>
</tr>
<tr>
<td>4.4</td>
<td>Chronological stages in L- and F-Mutation</td>
<td>41</td>
</tr>
<tr>
<td>5</td>
<td>Reflexes of reduced vowels in Babine-Carrier</td>
<td>44</td>
</tr>
<tr>
<td>5.1</td>
<td>Reduced Vowel Neutralization</td>
<td>44</td>
</tr>
<tr>
<td>5.2</td>
<td>Reflexes of reduced vowel and stem-final velar in Carrier</td>
<td>45</td>
</tr>
<tr>
<td>5.2.1</td>
<td>Reflexes of stem-final velar continuants</td>
<td>45</td>
</tr>
<tr>
<td>5.2.2</td>
<td>Reflexes of stem-final *g</td>
<td>50</td>
</tr>
<tr>
<td>5.2.3</td>
<td>Reflexes of stem-final *G</td>
<td>54</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>5.2.4</td>
<td>Further reflexes of *ug</td>
<td>61</td>
</tr>
<tr>
<td>5.2.5</td>
<td>Reflexes of *u: summary</td>
<td>69</td>
</tr>
<tr>
<td>5.3</td>
<td>o in Carrier</td>
<td>70</td>
</tr>
<tr>
<td>5.4</td>
<td>Differences between Babine and Carrier reflexes of reduced vowels</td>
<td>71</td>
</tr>
<tr>
<td>5.4.1</td>
<td>Reflexes of reduced vowel and front velar</td>
<td>71</td>
</tr>
<tr>
<td>5.4.2</td>
<td>Partial neutralization of Cig, Cag</td>
<td>75</td>
</tr>
<tr>
<td>5.4.3</td>
<td>Reflexes of reduced vowel and back velar</td>
<td>77</td>
</tr>
<tr>
<td>6</td>
<td>Zeros</td>
<td>81</td>
</tr>
<tr>
<td>6.1</td>
<td>Stem-final h</td>
<td>81</td>
</tr>
<tr>
<td>6.1.1</td>
<td>Final h in verb stems</td>
<td>82</td>
</tr>
<tr>
<td>6.1.2</td>
<td>Final h in noun stems</td>
<td>85</td>
</tr>
<tr>
<td>6.2</td>
<td>Stem-initial h</td>
<td>86</td>
</tr>
<tr>
<td>7</td>
<td>Babine stem syllable types</td>
<td>88</td>
</tr>
<tr>
<td>8</td>
<td>Rule summary</td>
<td>92</td>
</tr>
<tr>
<td>8.1</td>
<td>Carrier rules</td>
<td>92</td>
</tr>
<tr>
<td>8.2</td>
<td>Babine rules</td>
<td>94</td>
</tr>
<tr>
<td>Addendum</td>
<td></td>
<td>96</td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td>98</td>
</tr>
<tr>
<td>Bibliography</td>
<td></td>
<td>107</td>
</tr>
</tbody>
</table>
ALPHABETICAL LIST OF RULES

In the alphabetical list of rules below, the page references are to where the rule is introduced for Carrier and/or Babine. When a rule pertains to one of the languages only, this is indicated by C or B in parentheses for Carrier and Babine respectively. A rule given in brackets is incorporated in a rule introduced later in the paper, or, in the case of Vowel Assimilation, is the conflation of Vowel Lowering and Vowel Raising.

<table>
<thead>
<tr>
<th>Rule number</th>
<th>Rule Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>[F-Mutation] (B)</td>
<td>38</td>
</tr>
<tr>
<td>16</td>
<td>[g-Vocalization] (C) (incorporated in g(w)-Vocalization)</td>
<td>53</td>
</tr>
<tr>
<td>23</td>
<td>g(w)-Vocalization (C)</td>
<td>59</td>
</tr>
<tr>
<td>17</td>
<td>G-Weakening (C)</td>
<td>56</td>
</tr>
<tr>
<td>34</td>
<td>[h-Shortening] (C)</td>
<td>83</td>
</tr>
<tr>
<td>35</td>
<td>h-Shortening (C)</td>
<td>84</td>
</tr>
<tr>
<td>27</td>
<td>Inverse Velarization</td>
<td>65, 73</td>
</tr>
<tr>
<td>4</td>
<td>L-Mutation (B)</td>
<td>38</td>
</tr>
<tr>
<td>26</td>
<td>Labialization Loss</td>
<td>60, 66</td>
</tr>
<tr>
<td>7</td>
<td>Reduced Vowel Neutralization (RVN)</td>
<td>45</td>
</tr>
<tr>
<td>15</td>
<td>Reduced Vowel Raising (RVR)</td>
<td>49, 71</td>
</tr>
<tr>
<td>29</td>
<td>RVR Extension (B)</td>
<td>72</td>
</tr>
<tr>
<td>32</td>
<td>Rounding Progression (B)</td>
<td>80</td>
</tr>
<tr>
<td>6</td>
<td>[Rounding Regression]</td>
<td>45</td>
</tr>
<tr>
<td>28</td>
<td>Rounding Regression</td>
<td>65</td>
</tr>
<tr>
<td>25</td>
<td>Semivowel Deletion (C)</td>
<td>59</td>
</tr>
<tr>
<td>18</td>
<td>[Velar Fronting]</td>
<td>57</td>
</tr>
<tr>
<td>21</td>
<td>Velar Fronting</td>
<td>58, 71</td>
</tr>
<tr>
<td>19</td>
<td>[Velar Labialization]</td>
<td>58</td>
</tr>
<tr>
<td>20</td>
<td>Velar Labialization</td>
<td>58, 71</td>
</tr>
<tr>
<td>3</td>
<td>[Vowel Assimilation]</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>Vowel Lowering</td>
<td>22, 31</td>
</tr>
<tr>
<td>1</td>
<td>Vowel Raising</td>
<td>22, 31</td>
</tr>
<tr>
<td>22</td>
<td>w-Adjustment</td>
<td>59, 75</td>
</tr>
<tr>
<td>12</td>
<td>x-Segmentation (B) (the Carrier rule is incorporated in x(w)-Segmentation)</td>
<td>47, 89</td>
</tr>
<tr>
<td>24</td>
<td>x(w)-Segmentation (C)</td>
<td>59</td>
</tr>
<tr>
<td>9</td>
<td>x-Segmentation (C)</td>
<td>47</td>
</tr>
<tr>
<td>13</td>
<td>[y-Deletion] (C) (incorporated in Semivowel Deletion)</td>
<td>47</td>
</tr>
<tr>
<td>Rule Number</td>
<td>Rule Description</td>
<td>Page</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>30</td>
<td>[y-Deletion] (B)</td>
<td>75</td>
</tr>
<tr>
<td>36</td>
<td>y-Deletion (B)</td>
<td>88</td>
</tr>
<tr>
<td>31</td>
<td>a-Lowering (B)</td>
<td>78</td>
</tr>
<tr>
<td>11</td>
<td>[a-Raising] (incorporated in RVR)</td>
<td>47</td>
</tr>
<tr>
<td>8</td>
<td>[a-Velarization] (C)</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>-- a-Velarization (C)</td>
<td>56</td>
</tr>
<tr>
<td>14</td>
<td>[u-Velarization]</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>-- u-Velarization</td>
<td>58, 80</td>
</tr>
<tr>
<td>10</td>
<td>[γ-Deletion]</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>-- γ-Deletion</td>
<td>49, 80</td>
</tr>
<tr>
<td>33</td>
<td>?-Softening</td>
<td>83</td>
</tr>
</tbody>
</table>
### ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>asp</td>
<td>aspirated</td>
</tr>
<tr>
<td>Bab</td>
<td>Babine</td>
</tr>
<tr>
<td>Beav</td>
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</tr>
<tr>
<td>C</td>
<td>consonant, i.e., [-syl]</td>
</tr>
<tr>
<td>Car</td>
<td>Carrier</td>
</tr>
<tr>
<td>CCBD</td>
<td>Central Carrier Bilingual Dictionary</td>
</tr>
<tr>
<td>Ch1</td>
<td>Chilcotin</td>
</tr>
<tr>
<td>Chip</td>
<td>Chipewyan</td>
</tr>
<tr>
<td>cns</td>
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</tr>
<tr>
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<td>continuant</td>
</tr>
<tr>
<td>cor</td>
<td>coronal</td>
</tr>
<tr>
<td>d1</td>
<td>dual</td>
</tr>
<tr>
<td>[e]</td>
<td>a rather open [e]</td>
</tr>
<tr>
<td>[e]</td>
<td>a very close [e]</td>
</tr>
<tr>
<td>f.</td>
<td>and the following page</td>
</tr>
<tr>
<td>ff.</td>
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</tr>
<tr>
<td>F</td>
<td>future</td>
</tr>
<tr>
<td>F-</td>
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</tr>
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</tr>
<tr>
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<td>French</td>
</tr>
<tr>
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<td>glottalized</td>
</tr>
<tr>
<td>gmt</td>
<td>glottalized</td>
</tr>
<tr>
<td>I</td>
<td>imperfective</td>
</tr>
<tr>
<td>IN</td>
<td>imperfective negative</td>
</tr>
<tr>
<td>K</td>
<td>any front velar</td>
</tr>
<tr>
<td>Koy</td>
<td>Koyukon</td>
</tr>
<tr>
<td>Kut</td>
<td>Kutchin</td>
</tr>
<tr>
<td>L-</td>
<td>lenis-</td>
</tr>
<tr>
<td>Matt</td>
<td>Mattole</td>
</tr>
<tr>
<td>Nav</td>
<td>Navajo</td>
</tr>
<tr>
<td>[o]</td>
<td>a rather open [o]</td>
</tr>
<tr>
<td>O</td>
<td>optative</td>
</tr>
<tr>
<td>ON</td>
<td>optative negative</td>
</tr>
<tr>
<td>opt</td>
<td>optional</td>
</tr>
<tr>
<td>OTan</td>
<td>Outer Tanaina</td>
</tr>
<tr>
<td>P</td>
<td>perfective</td>
</tr>
<tr>
<td>PA</td>
<td>Proto-Athapaskan</td>
</tr>
<tr>
<td>PBC</td>
<td>Proto-Babine-Carrier</td>
</tr>
<tr>
<td>pl</td>
<td>personal communication</td>
</tr>
<tr>
<td>PN</td>
<td>perfective negative</td>
</tr>
<tr>
<td>Prog</td>
<td>progressive</td>
</tr>
<tr>
<td>Q</td>
<td>any back velar</td>
</tr>
<tr>
<td>rnd</td>
<td>rounded</td>
</tr>
<tr>
<td>RVN</td>
<td>Reduced Vowel Neutralization</td>
</tr>
<tr>
<td>RVR</td>
<td>Reduced Vowel Raising</td>
</tr>
<tr>
<td>S</td>
<td>stem-final voiceless</td>
</tr>
<tr>
<td>Sar</td>
<td>Sarcee</td>
</tr>
<tr>
<td>sg</td>
<td>singular</td>
</tr>
<tr>
<td>son</td>
<td>sonorant</td>
</tr>
<tr>
<td>stP</td>
<td>stative perfective</td>
</tr>
<tr>
<td>stPN</td>
<td>stative perfective negative</td>
</tr>
<tr>
<td>str</td>
<td>strident</td>
</tr>
<tr>
<td>syl</td>
<td>syllabic</td>
</tr>
<tr>
<td>T</td>
<td>stem-final nonglottalized</td>
</tr>
<tr>
<td>T'</td>
<td>stem-final glottalized</td>
</tr>
<tr>
<td>TCL</td>
<td>The Carrier Language</td>
</tr>
<tr>
<td>U</td>
<td>usitative</td>
</tr>
<tr>
<td>UK</td>
<td>Upper Kuskokwim</td>
</tr>
<tr>
<td>UT</td>
<td>Upper Tanana</td>
</tr>
<tr>
<td>voi</td>
<td>voiced</td>
</tr>
<tr>
<td>V</td>
<td>vowel</td>
</tr>
<tr>
<td>Z</td>
<td>stem-final voiced</td>
</tr>
<tr>
<td>continuant</td>
<td></td>
</tr>
</tbody>
</table>
The Babine-Carrier Region in Central British Columbia
1 INTRODUCTION

The present work is an outgrowth of the 1974 unpublished manuscript by Hildebrandt and Story in which the Babine vowel system was studied synchronically and diachronically. Much of the material of that paper is incorporated here, but the focus has shifted to include Carrier and to broaden the discussion of the historical developments. Like the earlier study, this also concentrates on stem phonology.

Carrier and Babine are Athapaskan languages spoken in central British Columbia between 52° N and 55° N, and longitude 122° W and 128° W. Carrier speakers number between two and three thousand, and Babine speakers between one thousand and fifteen hundred.

The discussion in the 1974 paper has been taken up by Kari (1975), who has shown that River Babine (spoken on the Bulkley River) and Lake Babine (spoken on Babine Lake) are distinct from Carrier and that "it is clear that the Babine (or Northern Carrier) group should be classified as a distinct language" (p. 5). This claim, made explicit by Kari, was only implicit in Hildebrandt and Story: "Northern Carrier, herein called Babine, and Central Carrier, together with Southern Carrier, have been considered dialects of one language. It has been recognised that Southern and Central are probably closer to each other than either is to Babine; the present paper will show that the Babine divergence is greater than has been suspected. It will be shown that the historical development of the vowels in Babine depends basically on a fortis-lenis classification of syllable initials, a type of development which has not been documented previously for an Athapaskan language" (p. 1).

The one feature above all others that makes Babine distinct from Carrier is the Babine vowel shift (which is conditioned by the fortis-lenis consonant classification); this is stated by Kari: "Due to the Babine vowel shift, a large percentage of vowel nuclei in Babine do not correspond to vowel nuclei in Carrier, which is the major reason for the low intelligibility across the Babine-Carrier language boundary" (p. 16; see also pp. 4-5).

1.1 Babine-Carrier language designations

Kari has commented on what to call Babine and agrees that Babine is probably best. However, as he says, "The term Babine is unfortunate from the point of view of the Bulkley River people who use the term solely for the people of Babine Lake. A regional designation and the word Carrier would be the other choice as
it would be inclusive and the people in this area identify themselves culturally as Carrier. The chief problem with the name Northern Carrier or Western Carrier is that the language would tend to be considered as a "dialect" of Carrier" (p. 6). One solution is to use the term Babine as a technical linguistic one and to use Northern (or Western) Carrier for practical purposes.

The term Western Carrier was used by Jenness (1943: ms. 1924) to designate the Bulkley River and Babine Lake people. Northern Carrier is a term which has been put to a variety of uses. Morice usually subdivided Carrier (distinct from Babine) into two major groups, Upper and Lower Carrier (1893:25, 26; n.d.:38; 1932:xii and sects. 281ff.), but also occasionally used Higher for Upper (1932:sects. 2828, 2830, 2833), and Northern and Southern for Upper and Lower (1932:sects. 9, 13, 14).

Morice's subgroups within Upper and Lower correspond closely to those listed by Jenness (1943) and to the tribes and bands of the Reserve Commission report of 1916 listed by Duff (1964). There is disagreement between Morice and Duff concerning Morice's Fraser Lake and Fort George subgroups, which are included in Lower Carrier by Morice but in Upper Carrier by Duff. Morice's Fraser Lake subgroup is subdivided by Jenness and Duff into four: Fraser Lake proper, Cheslatta (called St. Mary's Lake in Morice 1932: introduction to sect. 2818), Stony Creek (near Vanderhoof), and small groups about the eastern end of Francois Lake. The groups included in Lower Carrier by both Morice and Duff are centered in Alexandria (between Quesnel and Williams Lake), Quesnel and the mouth of the Blackwater (or West Road) River, and the basin of the Blackwater, the last named including the Alkatcho now of Anahim (or Anaham) Lake in former Chilcotin country (Lane 1953).

The groups included in Upper Carrier by both Morice and Duff are two, one in the area of Tremblay (Trembleur) Lake and the northern end of Stuart Lake, and the other centered in Fort St. James at the southern end of Stuart Lake. It is the dialect of the latter group which is described by Morice in The Carrier Language (1932:sect. 9 and introduction to sect. 2818). Hereafter, in our frequent reference to this work, we shall abbreviate the title to TCL and refer to the section numbers (which carry across the two volumes) rather than to the page numbers.

In recent literature (for example, Carrier Linguistic Committee 1974 and Cook 1976), Morice's Upper Carrier has been called Central Carrier. Central Carrier, Southern Carrier, and Northern Carrier are the three terms which have been used in the last decade to designate Upper Carrier, Lower Carrier, and Babine respectively, and are used in this sense in Krauss 1973. However, the dialect designated Northern Carrier in Clark Davis's paper (1975, ms. 1971; see Krauss 1973:916) is, in fact, Central Carrier, the data being drawn from Morice (1932) and Walker (n.d.).

The use of the term Northern Carrier to refer to Babine reflects the tradition that Babine is a dialect of Carrier. Morice himself, while speaking of the Babine as a subtribe of the Carriers (1893:30), never speaks of the subtribe as other than simply Babine. With reference to the language of the Upper and Lower Carriers and the Babine he says, "I have even sometimes asked
Introduction

myself whether distinct individuality as a tribe should not be granted to the Babines" (1893:27). In more than one place he gives equal status to the Carriers, Babines, Chilcotins, and Sekanais (Sekani). When a Department of Mines Report of 1924 uses the term Carrier in referring to the Babine in connection with the work of Jenness and Barbeau at Hazelton and Hagwiligate, Morice is prompted to write in objection (Morie 1925). Later, speaking specifically of the language, he says: "As to the Babine, its grammatical, terminological and morphological peculiarities are perhaps marked enough to make it a really distinct Déné dialect--more so, at any rate, than is the Lower from Higher Carrier" (TCL:2828). Also, "So far we have considered terminological differences and cases of phonetic transmutability as they affect the Carrier language itself [in discussing the differences from Upper Carrier in Lower Carrier and Babine]--assuming Babine to be nothing else than a series of variations of the same, which is probably saying too little" (TCL:2841; bracketed material mine). The terms Lake Babine and River Babine are adopted by Osgood (1936) from Morice (n.d.: 37) to designate the two Babine subgroups, centered on Babine Lake and Bulkley River respectively.

Of the groups called Carrier by Jenness, it was the Babine groups which adopted a phratry-clan system from their western neighbors, the Gitksan. Some of the Carrier subtribes to the eastward adopted an adumbrated system of phratries (Jenness 1943:584). It is in connection with this cultural borrowing that the third use of the term Northern Carrie has occurred. Steward (1960) uses northern Carrier (with lower case n) to exclude the Aikatcho Carrier but to include other Carrier groups who adopted some kind of phratry system; that is, the Babine subgroups, and the Stuart Lake and Stony Creek Carrier subgroups. In addition, the Cheslatta and Fraser Lake subgroups had adopted a phratry system (Jenness), but were not discussed by Steward. Goldman (1940:337, 371), in describing the Aikatcho Carrier, has used the term Upper Carrier in a sense parallel to Steward's use of the term northern Carrier.

In the remainder of this study, the terms Babine and Carrier will be used in Morice's sense; that is, Carrier excludes Babine and therefore comprises Lower and Upper (Central) Carrier. This includes Fraser Lake Carrier in Lower Carrier, but we shall see in the next section that Fraser Lake Carrier contains certain features that differentiate it from some other Lower Carrier dialects.

1.2 Fraser Lake Carrier

It appears that the Carrier subgroup with which the Babine had the most contact was the Fraser Lake (Jenness 1943). It is therefore of particular interest to examine the dialect of Fraser Lake for Babine-like features. This it is possible to do from observations made by Morice and also from data obtained by Kari in 1975. Kari's data is ample to show that no vowel shift has occurred in Fraser Lake and that therefore by definition it is Carrier and not Babine.

The Fraser Lake vowels correspond to the regular Central Carrier reflexes of the Proto-Athapaskan (PA) vowels, and in particular they exhibit a rule of a-Velarization (sect. 5.2.1), which is a rule of Carrier and not of Babine. It is interesting to notice
that there is no case of e-Sharpening (sect. 2.2.2), a rule of some dialects of Central Carrier.

Concerning the consonants, Kari (1975) notes that the reflexes of the PA *ts-series have merged in Fraser Lake Carrier with the reflexes of the PA *tš-series (see Krauss 1976), so that, for example, sda 'he is sitting' is homophonous with sda 'my lip'. We shall see that this merger seems to be general in Babine and Carrier, however.

Stem-initial š occurs in the data, the reflex of PA *x which in River and Lake Babine became k in stem-initial position: River Babine kas 'grizzly', but Fraser Lake šas, Central Carrier šas. In Lake Babine, the stem-initial reflexes of the PA *k-series are palatoalveolar (excepting *ŋ > y): *kas > tšas 'grizzly'.

In Central Carrier dialects the future prefix is ti- ~ ta- (depending on the verb base) or ti-; in River Babine it is always ta-, and in Lake Babine da-. Morice notes that the future prefix is te- at Fraser Lake, a fact confirmed by Kari.

In Central Carrier the disjunct negative prefix is tà- and in Babine it is we-. Morice notes that in the Fraser Lake area the prefix is tša- but that this prefix is absent in other Lower Carrier dialects. Recent data obtained by Cook (1976) shows that the prefix is tša- in the Anahim Lake (Alkatcho) dialect of Lower Carrier.

Other indications that Fraser Lake Carrier and Alkatcho Carrier may group together in Lower Carrier occur in the literature. Lane (1953:65) reports, "The Chilcotin consider that the Alkatcho and the "Ootsa Lake Indians" formed one group, the aboriginal center of which was further north towards Ootsa Lake." Morice distinguishes these dialects of "Fraser Lake and south-west" from other Lower Carrier (TCL:14, 2826). Ootsa Lake is close to Chelasatta, both Ootsa Lake and Chelasatta lying southwest of Fraser Lake.

There are further features, in this case not confined to Fraser Lake but possibly characteristic of Lower Carrier as a whole, which are of special interest in being transitional between Babine and Central Carrier.

The third person singular possessive prefix in Central Carrier is b- before vowel-initial stems, be- before r-initial stems, and u- before other consonant-initial stems (TCL:355ff.). In Lower Carrier (TCL:2820) and Babine, this prefix is ba-, never u-.

The first person dual subject prefix in Central Carrier is D̓and in Babine d̓, According to Morice (TCL:2827) this prefix contains an extra syllable da- in Lower Carrier. The example he gives is tenadidali 'we both pray' (Central Carrier tenadidi). This is a class verb (the full Central Carrier paradigm of which is given in TCL:1968) with stem-initial l (since the cognate stem in Koyukon and Upper Kuskokwim is -l). The full shape of the Lower Carrier prefix is therefore d̓.

The first person singular subject prefix in Lower Carrier fuses with the l-classifier and the resultant prefix complex is d̓a-, corresponding to Central Carrier z- and Babine g1-. The Babine prefix complex should perhaps be written g1- since the
Introduction

phonetic syllabification is exactly the same as in the first dual with 1-classifier, dal-. The difficulty here is that in Lake Babine the reflex of the syllable-initial *g is dz, palatoalveolar in common with all reflexes of the PA *k-series (excepting *q > y), in prefix syllables and in stem syllables. To write gal- means introducing a phoneme g in Lake Babine which is unique to this morpheme. The corresponding problem does not arise when the classifier is t, in which case the Babine form is gi- [kt-], the Central Carrier form is s- (< s̩-), and the Lower Carrier form is t- in at least some cases. Morice's statement (TCL:2825) may mean that *s̩t- does not always become t- in Lower Carrier and even implies that *s- may become t- with zero and D-classifiers, although the four verbs he chooses in exemplification all contain the t-classifier (as may be seen by reference to TCL:591, 691, 857). In some cases at least, then, we have the correspondences gi- : z- : t̪a- and gi- : s- : t- for the prefix complexes of first person singular with 1- and t-classifiers in Babine, Central Carrier, and Lower Carrier respectively, or probably *gi̱- : *sa- : and *gi̱- : *s̩t- in pre-Babine and pre-Carrier. The only other Athapaskan languages that have similar reflexes are Kwalhioqua-Tlatskanai (gi̱o- and gi̱/-x̱t-) and Galice and Chasta Costa (s̩- and s̩t-) (Krauss 1976).

1.3 Lexicostatistic time depths

The "low intelligibility across the Babine-Carrier language boundary" (Kari) has been mentioned above, a fact that had been noted earlier also (see Krauss 1973). It is therefore worth attempting some assessment of the degree of distance between the two languages and between them and their neighbors. Hoijer (1956) made a lexicostatistic study of Athapaskan languages, including Carrier, Beaver, and Chipewyan. His study was reviewed by Hymes (1957), who concluded that a more accurate evaluation of the time depths was obtained by using only the 78 items of Hoijer's 100-word list drawn from Swadesh's 100-word list and using the 86% retention rate determined for that list.

Hoijer's Carrier, Beaver, and Chipewyan word lists were drawn from Morice (TCL), Goddard (1917), and Li (1932). The Carrier data represented is therefore Central Carrier. Goddard's Beaver data was from Vermilion in the northeastern section of Beaver territory, and Li's Chipewyan from Fort Chipewyan at the western end of Lake Athabasca. Hoijer was able to find only 67 items in Goddard of the list of 78 words, and probably did not always choose the normal translational equivalents. Reexamining Goddard and revising Hoijer's compilation in the light of firsthand experience with Doig Beaver (spoken in the Fort St. John area, towards the southwest of Beaver territory), the Vermilion and Doig Beaver 78-word lists are found to be almost 100% cognate (only one item noncognate). Doig Beaver data are substituted in the revised calculations which follow.

These calculations use the 78-word list and the 86% retention rate so that the results can be compared with Hymes's revised calculations for other Athapaskan languages, for which he used the same list and retention rate. The languages covered here are Ba-
bine (Bab), (Central) Carrier (Car), Chipewyan (Chip), (Doig) Beaver (Beav), and Chilcotin (Chil), the southern neighbor of Babine-Carrier. Babine data are from Hildebrandt (p.c.); Doig Beaver from Holdstock (p.c.); and Chilcotin from Krauss (1924), Cook (1976), and King (p.c.). The Carrier data are essentially those used by Hoijer (that is, from TCL) but checked for translational equivalence and five substitutions made (for items 38, 43, 66, 70, and 74); the data were also checked against the modern forms contained in the Central Carrier Bilingual Dictionary (CCBD) (Carrier Linguistic Committee 1974). No adjustments were made in the Chipewyan data from Li.

The results, expressed as cognate percentages (counting items 3, 32, 33, 35, and 62 cognate in the Carrier-Chipewyan data, which (Hoijer did not), are as follows: Bab-Car 91.0, Bab-Chip 82.1, Bab-Beav 77.9, Bab-Chil 74.4, Car-Chip 83.3, Car-Beav 77.9, Car-Chil 76.9, Chip-Beav 74.0, Chip-Chil 78.2, Beav-Chil 75.3. These cognate percentages lead to the time depths set out in the following table:

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<th>Car</th>
<th>Chip</th>
<th>Beav</th>
<th>Chil</th>
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<td>650</td>
<td>830</td>
<td>980</td>
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These figures cluster about three points: 310, 630, and 900, and on a lexicostatistic basis show that Babine and Carrier are closely related languages and that both are more closely related to Chipewyan than these three languages are to Beaver and Chilcotin, or Beaver and Chilcotin to each other. The time depth between Chipewyan and Beaver is surprising; even with some plausible adjustments made with respect to translational equivalence, Beaver will still be found to be no closer to Chipewyan than to any of the other languages.

Swadesh (1954) suggested time depths of up to 500 years as those distinguishing dialects from languages. Using this criterion, Babine and Carrier are dialects of one language, and linguistically it is only on the basis of the mutual unintelligibility caused by the Babine vowel shift that they are to be classified as separate languages. Referring to Hymes's recalculations for the Apachean languages, we find that the lexicostatistic distance between Babine and Carrier is approximately the same as the average distance between any pair of Apachean languages.

The Hoijer-Hymes calculations show that Chipewyan and Navajo are the closest pair lexicostatistically of a Northern with an Apachean Athapaskan language. In comparing Chipewyan and Navajo, Hoijer disallowed items 13, 35, and 66 as cognates, but in each of these three cases one of the roots in a compound stem in one language is cognate with a simple stem in the other language. Allowing these as cognates, the time depth reduces from 860 to 710 years. The time depths for Babine and Carrier with respect to Navajo are about 930 and 820 respectively, so that at least the approximate lexicostatistic separation of Navajo from any one of Babine,
Introduction

Carrier, and Chipewyan is of the same order as that of Babine, Carrier, and Chipewyan from Chilcotin and Beaver.

1.4 Early white contact period

Alexander Mackenzie reached the Pacific Ocean through Sekani and Carrier territory by way of the Parsnip, Fraser, and West Road Rivers in 1793; but it was not until 1805 that a fur-trading post was set up west of the Rockies, in Sekani territory at Fort McLeod (McLeod Lake). Fort St. James was established the next year and Fort Fraser, on Fraser Lake, the same summer (Morie 1905:54, 63, 68). Babine territory was not visited until 1812 and Fort Babine, on Babine Lake, not established till ten years later (p. 92, 124). French Canadians were in the employ of the fur traders so that the earliest French loans in Carrier and Babine date from the beginning of the nineteenth century.

1.5 A. G. Morice

The present study draws heavily upon Morice's work for its Carrier data, and a brief sketch of Morice's personal history is in order so that his contribution may be seen in perspective. The information is drawn largely from his abridged memoirs (Morie 1930).

Adrien Gabriel Morice was born in France in 1859. He arrived in Canada in 1880 to serve with the Oblate Fathers and upon being ordained a priest in the summer of 1882 he was posted to Williams Lake. Here he was made principal of a school and started learning Carrier from one of the students. Early in 1883 he was assigned to the Chilcotin mission, remaining resident in Williams Lake and visiting a Chilcotin woman every afternoon for the purpose of learning Chilcotin. He was also in charge of the mission to the southernmost villages of the Carrier and made periodic visits to Chilcotin and Carrier villages in discharge of his mission duties.

In August 1885 he was assigned to the Stuart Lake mission and had charge of the Upper Carrier villages, of the Lower Carrier villages from Fort George westwards (Stony Creek, Fraser Lake, and Chaslatta), and also had charge of the Babine. He lived at Fort St. James and made periodic visits to each of the other areas once, twice, or three times a year. In part of September and October each year he was at liberty to explore the Carrier-Babine region, undertaking this with Carrier traveling companions. His opportunities, therefore, to observe dialect differences and to use the language as a means of communication were considerable.

He was at the Stuart Lake Mission for nineteen years (1885-1904). In his later years he was transferred to the Oblate province of Manitoba, where much of his time was absorbed in the compilation of his "Grammar-Dictionary" (TCL), in the interests of which he made a return visit to Stuart Lake for fourteen days in the spring of 1919. The work was finally completed in 1930 (see TCL Preface:v, ix).
2 CENTRAL CARRIER PHONOLOGY

A synchronic study of Central Carrier phonology was made recently by Cook (1976). The present study is chiefly concerned with the historical aspects of Carrier phonology. For its Carrier data it is based mainly upon Morice (TCL), and some discussion of his transcription in relation to the phonemic-phonetic values of certain of his symbols is given later in this section.

The phonemes of Central Carrier are as follows:

\[
\begin{array}{cccccccc}
  b & d & d\check{a} & (d\check{z}) & dz & d\check{z} & g & g^W \\
  t & t\check{i} & (t\check{s}) & ts & t\check{s} & k & k^W & h \\
  t' & t\check{i}' & (t\check{s}') & ts' & t\check{s}' & k' & k'^W & ? \\
  l & (\check{z}) & z & y & y & w \\
  l & (\check{s}) & s & s & x & x^W \\
  m & n & \eta & i & u \\
  e & a & o \\
  a & \\
\end{array}
\]

The distinctive feature system that will be used in the following pages in discussing the historical phonology of Carrier and Babine is given in the accompanying table. The system follows that used by Kari (1973) for Navajo, which in turn was based on the system developed by Hale and Honie. It varies from Kari's in including both front and back velars, labialized velars, the segments \( \eta, \check{y}, \) and \( W \)--the latter two occurring in the Proto-Athapaskan phoneme inventory (Krauss and Leer 1976)--and a complement of five long vowels and three short vowels. Also, front velars and \( y \) are considered [-cor], front and back velars are distinguished by the features [+high], and nonlabialized and labialized velars by [+rmd]. The features [+asp] are not used; instead the features [-frt] are introduced. Nonfortis continuants are [+voi], and these are the only voiced consonants. Therefore the features [+voi] are in fact always redundant. However, the features [+frt] and [+glt] are more suitable to syllable initials, and the features [+voI] to syllable finals. The vowel features [+back] are always redundant and are not used.
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**Table of distinctive features**

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The distinctive feature system has not differentiated the tš-series, a series which has marginal status in modern Carrier. It is debatable whether the features [+sharp] or [+flat] might be introduced to differentiate this series from the ts-series. In Doig and Beaver the cognate series has sharpened vowels, whereas in Chilcotin it has flattened neighboring vowels (Krauss 1975; Cook 1976). When we consider the Carrier rule of e-sharpening, we shall see at least that the tš-series is not significantly sharpening.

2.1 The consonant system

2.1.1 b, m, and reflexes of *w

In Carrier, b is the regular reflex of PA *w; m is a phoneme of infrequent occurrence. Krauss and Leer (1976:26) note that in any modern Athapaskan language in which b, m contrast, "m is either clearly secondary, arising only from wNn, and/or the m is marginal." Leer (1974:4) has found that in the transition from early PA to late PA, *VnC > VC, a process distinct from the later nasalization of CVn stems that has occurred in some Athapaskan languages. In stems which are reflexes of *wNn(C), the reflex of *w in Carrier is generally b: ban- 'lake', -ban- 'be full', -ban- 'edge', bił- 'snare' (Chip bịł), -bas- 'wheel (v.)' (Chip -bəaθ, Nav -bəás 'roll a wheel-like object'); but note also nani:nmaz 'button' (Chip -bənɑ̌, Nav -bəs- 'be round-shaped') and compare -bəλ 'swing in space' with intli:asmał 'tress (of hair). Another example of stem-initial m with identifiable cognates is teñmağ 'whitefish' (Koy dalba:g, UK dəlmaði:k 'common whitefish'). (For the shortened language names, see the list of abbreviations.)

In final position, b and m are almost invariably found following a, rarely after u or o. Final g has a similar distribution, and it is probable, at least in the case of b, that it is a variant reflex of *g following a reflex of *u. (g is the regular reflex of *g following the reflexes of reduced vowels.)

Note, for example, -t'ub ~ -t'ab 'bite (of insects)' (TCL:36, 1150, 2320); -t'ug ~ -t'ag 'suck/suck on pipe' (TCL:38, 1227, 1230, 2350) < *t'ug 'suck U'; and (ke)ltšəb 'spoon' < *-kug (where *kug possibly is the usitative stem of *-kud 'take', a stem used in Athapaskan of taking or giving food). In the case of m, a hypothesis that in some cases *g > ʔm > m following reflexes of *u could be made but cannot be given much substantiation. Cognates of most Cam stems are lacking. One Cam stem is -t'am ~ -t'om ~ -t'um 'very small' (TCL:40, 201, 1131); nt'am is recognized by Morice as a Babine term (used in Carrier). The form of the stem in Babine is -t'aʔm, as in halt'aʔm 'it's very small', and no other example of ʔm has been recorded. Morice relates the form nt'am to Babine nt'og̡ 6 'short' (TCL:2837); and, if his supposition is correct, the sound change *g > ʔm > m following reflexes of *u has some plausibility.

Forms suggesting other sources for final m are ʔam 'floe' (PA *l̩aw or *l̩aw, cf. Car enlu(-tsan) 'hail'; also Koy, UK ʔu, Kut liő 'ice', sam 'star' (PA *sun or *saw), and -zam 'gland' (note also Car and River Bab -za, Lake Bab -zo, 'castor'). The first two forms have been discussed by Krauss and Leer (1976:26, 28) in connection with a possible PA *w. There is also the stem-set -dli -dliʔ -dlo̩h -dlo̩h 'be cold' (TCL:666). The first stem in the set is
stative perfective, not imperfective; the imperfective stem is probably the same as the optative. Krauss and Leer (1976:26a) reconstruct *-dlaw, *-dliw, possibly related to *law or *law 'ice', for the imperfective and perfective stems; therefore probably *dlaw > dlaw > dlaw* = dlux in PBC, and *dlux > dloq in Carrier. Therefore, as *law (or *law) > lm and *d-law > dlux > dloq, so possibly *-zaw (or *-zaw) > -zam 'gland' and *-zaw > -zur > -zo, 'castor'; and *w > m/(u)γ. The regular Carrier reflexes of Proto-Babine-Carrier (PBC) *ux, *uy are oh, o respectively (see sect. 5.2.1; see also sect. 5.4.3 for the Babine reflexes). It is interesting to note a stem-initial instance in which it is probable that the reflex of *w is variably b/m/γ: -bas, -baz 'wheel (v.)', -maz in nanizmaz 'button', and -yos, -yoz 'roll; be spherical' < *-wass (< *-wass or *-wans) (cf. Nav -bãs 'roll (a wheel-like object)', -mãs or -mãs 'roll (a spherical object)'). In the third reflex, the labiality of the stem initial is transferred to rounding in the stem vowel—or alternatively *a > q > o (as, g for example, in Beaver) when the vowel is preceded by a nasal. In support of the first alternative rather than the second, we may note the additional form recorded by Morice, nanizwus (w = γW) 'a ball'. That γ can be the reflex of *w cannot be taken as proved, but the forms discussed are at least suggestive.

The tentative conclusion is that stem-final m may be a reflex of *w or *w and that stem-final b, m (< *m), and g may each be reflexes of *g following a reflex of *u. Stem-final g and gw are to be discussed further in connection with the reflexes of reduced vowels (sect. 5.2.2).

2.1.2 The obstruent series

The obstruents in Carrier other than b, the partial t-series of phonemes, and the t-series, may be compared with the PA series as follows, in terms of Krauss's two-dimensional scheme (1964; *tš* replaces *kw*; see Krauss 1976):

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The current status of the tš-series has been discussed by Cook (1976:4); at least for younger speakers it has merged with the ts-series. Morice transcribed members of the tš-series with an inverted circumflex over the s or z, that is, dž, tš, tš, ž, ř. His description of ř was "a fricative which is almost equivalent to the English th of "thin", Lepsins' [sic] θ, though it seems slightly more of a sibilant. ž is the corelative [sic] softer form of the same. Both letters might be represented as kinds of lispèd s and z" (TCL:3). He gives contrasts between s and ř (his ř): "tha-usta, I am thirsty: tha-usta, he is thirsty; na-nisthi, I feel sleepy: na-nisthi, he is sleepy; na-thišqa, I went back: na-thišqa, he went back" (TCL:56).

The contrast between the two series certainly existed therefore in Morice's time, though the fairly frequent failure to distinguish a member of the tš-series probably means that in the period 1885-1904 this series was already in process of merging with
the ts-series. Morice notes the difficulty that he had with these sounds (TCL Preface:viii) and the conflicting statements of Carrier speakers concerning them. Where cognate evidence leads one to expect a member of the ts-series, in only about one-third of the cases does Morice use the inverted circumflex either stem-initially or stem-finally. In the case of the s-perfective morpheme, he omits the circumflex more often than he uses it. Morice himself placed reliance in his transcription of the voiceless continuant member only of the series, and then only finally (probably finally in the word). Very rarely does he use the diacritic where it would not be expected; no examples of such use have been noted in monosyllabic noun stems, though in verb stems we may quote the example džaih (džaih) 'handle granular objects' (cf. Chip -džaih, Nav -jááh). The ts-series will not be distinguished in transcriptions given in this discussion. However, some memory of the ts-series evidently lingers on today (see its use in CCBD), albeit inconsistently with PA reconstructions.

Stem-initially, the ts-series is transcribed by Morice as q tc q y and c. These are reflexes of the PA *k-series. The reflex of *y is merged with the reflex of *y in modern y. The merger is general in Athapaskan (Krauss and Leer 1976:7), and the reflex is regularly y (or equivalently z). The phonetic values of q and q have been discussed by Hoijer (1963:14, fn.15), who concluded that the segments were q and k y respectively. However, Jenness's data, which Hoijer in support of this conclusion, is not strictly relevant at this point since it is from River Babine, in which the cognate series is front velar throughout. According to Hoijer, in Jenness's data the reflex of *q was always q y, the reflex of *k alternated between k y and ts depending on the speaker, and the reflex of *k' was most often k but was ts' for some speakers. In view of the front velar reflexes recorded in recent River Babine data, either River Babine is not a uniform dialect in respect to the reflexes of the PA *k-series, or some Lake Babine admixture is contained in Jenness's data.

Morice (TCL:3) describes q as "a palatal resulting from the release of the tongue pressing against the palate, and has its counterpart in the c of the French words coeur, curé, vicaire, such as pronounced by the French Canadians of the lower classes." According to information given to Hoijer, this sound in French Canadian may be [k y], [t y], or [ts]. Morice's q must represent a sound closer to the last two than to the first, that is, approximately d y or dz, for the following reasons: (1) his own description of the position of articulation implies a palatal and not a front velar; (2) he says that q and q become tq and tq respectively when the vowel of a preceding open syllable is a, e, o, or u (TCL:17; in fact, he writes tq and tq when the vowel is i also); (3) in his transcriptions of Sekani (TCL:2843), he writes q and q for palatalized d and t respectively.

However, in writing the Babine first person singular subject prefix with the l- or l-classifier (which is [k] with these classifiers), he writes k with the l-classifier ([k3]) and k or q with the l-classifier ([kal] in modern Babine). His use of q in this case is puzzling, since it is the only evidence militating against taking q to represent d y or dz.
The matter can be resolved, in fact, by appealing to other works of Morice. He says (Morice 1890:172), "q corresponds to the hard c in the words 'coeur, curé' such as pronounced by Northwestern Frenchmen: it can be described as approaching the sound of ty both letters being consonants and sounded simultaneously. The dot in k, t, q, adds to the regular pronunciation of those letters the exploding sound peculiar to most Indian languages...." He gives a further description of q in his review of Sapir's Notes on Chasta Costa Phonology and Morphology: "The consonant q reminds me of Dr Sapir's dj. If my own letter represents the same sound which that gentleman has in mind when he uses his double consonant, I must be allowed to object to the latter as misleading. Pronounce it as you will, you are bound to have a double operation of the tongue and mouth when you utter the sound dja, the dental one being always distinct from that caused by the fricative j, whilst in pronouncing the sound I render by q but one operation is needed" (Morice 1915:349). Elsewhere he says, "q nearly resembles ty, both letters being simultaneously sounded" (Morice 1893:34; similarly Morice n.d.: 23, fn. 1).

We may conclude that at the turn of the century the whole series was palatalized, though the plain and glottalized members of the series were not yet affricated (as they are in modern Carrier), evidenced by the fact that Morice represented the series as q tc g y c and not as dj tc tc y c. In the light of the foregoing discussion, we shall write d and t: when transliterating Morice's q and g. The shift from front velar to palatoalveolar was in two stages, at least in the case of the reflexes of *g and *k', [-cor] → [+cor] followed by [-str] → [+str]. The aspirated member and the fricative member of the series preceded the plain and glottalized members in the shift. This is probably explained by supposing that *k, the aspirated member, had a fricative offglide parallel to the fricative offglide that commonly occurs with Athapaskan reflexes of *q.

Stem-finally, members of the tš-series do not occur, though ŋ and ẑ may occur as rare variants of s and z following a rounded vowel. Morice's only examples are: ninwoš 'soapberry' (TCL:35) (Cook 1976: ninwoš), and dasmaž 'I am dumpy' (TCL:37) (cf. Bab nuwas (or nowas ?) and modž 'smallest', respectively). Morice also records dimoš 'Sunday' (TCL:2836) in Babine, from French dimanche [dimæš];12 modern Carrier is dimos (dzin) (CCBD).

The reason for the absence of stem-final members of the tš-series is that the reflexes of the members of the *k-series have merged with the reflexes of the corresponding members of the *q-series stem-finally. In the other series, the noncontinuant members of the series have merged with the voiced continuant member stem-finally so that generally the stem-final obstruents are the voiced and voiceless continuant members of a series only. However, the merged reflexes of the front and back velar series are g, ŋ, and h stem-finally, that is, g as well as ŋ and h stem-finally. A little more accurately, the reflexes of the front velar series are g, y, and x (=yh), and of the back velar are g (rarely), ŋ, and h. However, if stem-final y is written as i and yh as ih, as has been the custom in writing Carrier, then we may say that the stem-final reflexes of both series are g, ŋ, and h, and that the
reflexes of the front velar series follow the stem-nuclei i, ai, and u (iy > i, and uy > u), and the reflexes of the back velar series follow e, a, and o in modern Carrier (see sect. 2.2.3). The stem-nucleus au (= aw, parallel to ai = ay) also occurs rarely.

In general, the stem-final obstruents in Carrier are the voiced continuant member of any obstruent series (Z), and the voiceless continuant member (S), with the exception that in the tS-series and the k-series, Z is equivalent to zero, and S to h. In addition, as exceptions to this general rule, b, d, and g occur stem-finally; these represent noncontinuant, nonglottalized members of an obstruent series (T). (The Z, S, and T notation is taken from Leer 1974.) Carrier follows what Leer calls the "Canadian" pattern, in which the T and the noncontinuant glottalized member of a series (T') have merged with the Z of the same series stem-finally. However, *g and *G have not always merged with the reflexes of *y and *γ stem-finally in Carrier. The reflexes of the stem-final front and back velars are to be more fully discussed in later sections (2.2.3 and 5.2).

The total inventory of stem-final phonemes is: m, b, g, gw (these occurring only following a or secondarily lengthened u, o; see, for example, sect. 5.2.2), n, η, d, t, l, s, z, ?, h. For the purposes of general statement the absence of a final consonant is conveniently shown by including the symbol in the list of stem finals. Additional stem finals are x, y, xw, and w, if sequences ah, ai, aw, and au are interpreted as VC sequences and written as ax, ay, axw, and aw respectively (see sects. 5.2.1 and 5.2.3 concerning x- Segmentation).

2.1.3 n and reflexes of *γ

Besides m, the nasal phonemes of modern Carrier are n and η. n is the regular reflex of PA *n, stem-initially and stem-finally. The phoneme η is of rare occurrence and has been attested recently in only two words: -tsan 'meat' and xatsosan 'spider'.

Morice transcribes the nasal in these two words with the symbol ń (TCL:3, 41). ń is described as "a sort of semi-nazalized [sic] n, which recalls the -ng of English "slang, sing, song." Elsewhere, Morice describes ń as "ń as in Spanish" (1890:172); also "ń represents a nasal n followed by a common or sounding n" (1893:34). By "a nasal ń," he appears to mean nasalization of a vowel; thus in 1890 he was writing an n and on n for sequences which he later, in TCL, wrote an and on respectively. N, he says, "is nasal." His 1893 description of ń seems to imply that ań and an, and oń and on, are equivalent. However, in TCL, an and on in stems are used consistently for sequences whose modern reflexes are ai and u respectively, and ań and oń for sequences whose modern reflexes are an and on. In prefixes, an and on are used for sequences whose modern reflexes are an and on, and medially in compounds ań and oń are used for sequences in which n assimilates to an immediately following velar or (TCL:18-21).

There are certain questions here which we must attempt to answer. (1) What is the phonetic value of Morice's ń? (2) What explanation can be given for the fact that Morice's an and on in stems have different modern reflexes from Morice's ãn and ãn in
prefix strings? Also, (3) what explanation can be given for the fact that the sequence αη (a) has i for its regular modern reflex in stems, but (b) has the reflex an in the two stems for 'meat' and 'spider', and (c) medially denotes a sequence in which n assimilates to an immediately following velar or ? ?

We will consider the prefix strings first. The modern γ-perfective prefix and the progressive prefix are both i-, and the optative prefix is un-; and by the morphophonemic rule i + i > a and u + i > o, the sequences an and on occur in the second person singular forms of γ-perfectives, progressives, futures, and optatives of zero- and D-class verbs. By the same morphophonemic rule, since the first person dual prefix is (D)-, the vowels a and o also occur in the first person dual forms of these paradigms. The sequence an also occurs in the first person plural and third person forms of γ-perfectives of zero-class verbs.

The second person singular prefix and the perfective marker (distinct from the conjunctival perfective prefixes which are reflexes of *ya-, *na-, and *sa-) are each reflexes of *ya- (Krauss and Leer 1976:14ff.). The perfective marker (i)n- does not appear in negative perfective forms. Instead there is a perfective negative prefix i-, which occurs in the perfective forms only. To see what are the reflexes of these prefixes in Carrier, consider the following first, second, and third person singular prefix strings:

<table>
<thead>
<tr>
<th>zero- or D-class</th>
<th>zero-class</th>
<th>zero- or D-class</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Prog F O</td>
<td>stative</td>
<td>stative active</td>
</tr>
<tr>
<td>(a)s- is- tis- us-</td>
<td>(a)s-</td>
<td>(a)s- is- nas-</td>
</tr>
<tr>
<td>in- an- tan- on-</td>
<td>in-</td>
<td>in- an- nin-</td>
</tr>
<tr>
<td>(a)- i- ti- u-</td>
<td>n-</td>
<td>in- an- nin-</td>
</tr>
</tbody>
</table>

I, Prog, F, O, P stand for imperfective, progressive, future, optative, and perfective respectively. (U for usitative will also be used.) The P subscripts θ, γ, and n indicate the conjugation markers, modern θ, i, and na respectively. The stative Pγ bears the same semantic relationship to the stative Pθ or the stative Pγ as the active perfectives bear to the imperfectives; for example; nli 'he is', inle? 'he was' (stative Pθ and Pγ); sda 'he is sitting', inda? 'he was sitting' (stative Pθ and stative Pγ). Compare ?atsan a?aľ 'he is eating meat', ?atsan s?an?al 'he ate meat' (imperfective and active P). In the stative Pθ, the perfective marker is in- when not initial: hinli 'they are'; and in the stative P the conjunctival perfective prefix i- is overt when not initial: hanke? 'they two were sitting' (ha- + i- + in- > han-).

a in parentheses represents the peg element, and θa- is the disjunct negative prefix. It is simplest to assume that Carrier has deleted the perfective marker in all first and second person forms and that the first and second person singular prefixes are always
s- and in- respectively. Similarly, Carrier deletes the perfective negative prefix under the same conditions. Therefore in the third person perfective forms above, the prefix strings are ø-n-, ø-in-, i-in- > an-, na-in- > nin-, and tá-1- > til- respectively. The perfective marker is the reflex of *yə- and since the reflex in- may occur initially, both in the case of the perfective marker and the second person singular prefix, it is easiest to assume a reduplication *yə- > *yə-y-; *yə-y- > în- to give Morice's ān = [ân] < i-in in prefix strings. The nasalization is lost in the modern forms. Such a reduplication offers some explanation for the reflexes of the second person singular free pronoun nyən, and the second person singular possessive prefix n(yə)-, reflexes of *yən and *yə- respectively (Krauss and Leer 1976:5, 17), if reduplication occurs in these forms also.

In stems, Morice's ān and ôn (TCL:2815) are the reflexes of *ay- and *u̯- respectively; for example, -thän (in his transcription) 'thick', modern -tai (cf. Chip -tä, Sar -tān-, Nav -tā, Kut -tä); -zōn 'good', modern -zu (PA *-z-y). It is posited, therefore, that his ān in stems represents [ân]. Assuming, then, that his ān has the same phonetic value in both prefix strings and stems, ān in prefix strings would represent [ân] < i-jäh (where jäh < *yəy), rather than [ân]. The sequence [ân] (< *ay) has the modern reflex an medially (that is, in prefix strings) and ai finally (in stems). The sound change stem-finally had already occurred in the speech of all but the very old speakers of Carrier in 1885 when Morice arrived in Fort St. James (Morice 1890:210; cf. TCL:2815). Early nineteenth century evidence for nasalized reflexes of stem-final *y is discussed by Krauss and Leer (1976:40, fn. 5).

Of the short list of words which Morice transcribes with final an (TCL:3, 41, 2815), three have been recorded again recently: ?an 'cave, den', -ban 'edge around', and xasdzun 'dwarf maple'. The cognates of the first two of these in Chipewyan are -?et and -bəyə, suggesting that n in Morice's data has the phonetic value n, at least following long vowels, and that in pre-Carrier these stems were *CnQ (where Q is a back velar), and that *n > [n] in this environment. The back velar was subsequently lost. We have seen that synchronically in Morice's data, n assimilated to an immediately following velar or ? and was written ń. The assimilation of n to [n] preceding a velar consonant is a modern synchronic process also (Cook 1976:28). Since the late nineteenth century, stem-final [n] > n following a long stem vowel.

However, when the stem vowel is short, Morice's ń cannot always have the phonetic value n. In fact, Morice (TCL:41, 1454, 2815) writes ń stem-finally in the reflexes of *Cəy that have modern reflexes Ci; in only the two words already cited, -tsən 'meat', and *ətsotsən 'spider', does ń correspond to modern n. Cook (1976:28f.) reports that in one Carrier dialect, a final consonant cluster ng (/ng/ in the dialect) occurs in these two words. The PA reconstruction in the first case is *-tsəj 'flesh' (Krauss and Leer 1976:12). The same sequence *a̯y has the modern reflex i in ?ət̥i, 'gun': *-təyj 'handle, bow' > -ti, which parallels the modern reflex i of *a̯y. Therefore, exceptionally, *-tsəj > -tsəy > -tsən(g). Possibly the same process accounts for 'spider'. Among the stems that Morice wrote as Cən (representing the speech
of the passing generation) is modern ْلِل 'dog', < PA *tin-k' (Krauss and Leer 1976:6). The possessed form is -لِل (TCL:213), suggesting that the vowel shortened so that *tin-k' > لِل = لِل > لِل. Stem-final g in the possessed form could be a reflex of PA *k' or of *لِل where *لِل < stem-final لِل + possessive marker لِل (< لِل). Therefore, stem-finally following short vowels, Morice's لِل almost certainly represents either [ن] or [ن], depending on the lexical item.

Returning now to consider the Carrier sonorant system in relation to the PA sonorant system, and summarizing some of the points already made, the Carrier nasals are م, ن, and, in some dialects, ن, م is the irregular reflex of PA *w stem-initially, and possibly of PA *w if *w is contrastive with *w (see Krauss and Leer 1976:33), and م is also the reflex of PA *w (and/or *w) stem-finally. Possibly, also, stem-final م is the irregular reflex of ر following a reflex of م; in this case م > م > م. ن is a marginal phoneme, occurring contrastively only stem-finally and only in some dialects.

In addition to ن, لِل, لِل, and *w members of the PA sonorant system. In Carrier, however, لِل and *w are members of the obstruent system since they represent the voiced continuant members of the ت- and ك- series respectively; لِل is the merged reflex of PA *لِل and لِل, a merger that occurs in Athapaskan generally. لِل also occurs stem-initially in verb stems as a reflex of لِل, that is, in verb stems that lacked a consonantal stem initial in PA. As shown by Krauss and Leer, Babine and Carrier are among the few languages that provide evidence for PA لِل and are the only ones in which لِل is also the reflex of لِل, stem-initially and stem-finally. *w (≈ لِل) is the stem-initial reflex of PA *ل in preceding a reflex of ن (see rule 6, Rounding Regression, sect. 5.1, also 5.2.4). Stem-finally, both لِل and *w occur following the vowel a only. Stem-final *w is of rare occurrence (the only verbal and nominal examples noted are لِل 'bark', and لِل 'sandpiper, snipe', the latter also recorded in Cook 1976; note that لِل = لِل).

2.1.4 Other deductions from Morice's consonant transcriptions

Mention has been made in passing of some of Morice's symbolization; we turn now to consider in more detail the phonemic-phonetic values of some of his consonant symbols in TCL. His transcription is a phonetic one; it is interesting, therefore, to realize that he was well aware of the sounds it was necessary to differentiate in a practical alphabet. (This is particularly well-illustrated in his syllabary; see section 2.2.1.)

Symbols b and p, d and t, and g and k are used to represent the phonemes /ب/, /د/, and /غ/ respectively. The symbols b, d, and g are probably never used in stems, initially or finally. /د/ is a phoneme of frequent occurrence in prefix strings, and the symbol د is frequently used, but t is also used in the same environment. That b, d, and g are not used stem-initially is probably indicative of the fact that the stem syllable is a "controlled" syllable and that nonstem syllables are "ballistic" syllables. The controlled stem syllable is characterized by a delayed transition between the
stem-initial consonant and the stem vowel, so that, especially when
the segment immediately preceding the stem initial is the short
vowel a, the stem initial constitutes a phonetic "interlude"
(Hockett 1955:52) between the stem syllable and the syllable
immediately preceding it. Hence Morice could write /nn, ll, and
tq intervocalically for the stem-initials n, l, and d. Note also his
observation of "some kind of a slight rest on the last syllable of
each word" (TCL:10) (the last syllable is the stem syllable in the
absence of an enclitic). The phenomenon of controlled stem
syllables might be found in most Athapaskan.17

Morice uses an additional symbol, kr, for the phoneme g. With
rare exceptions, the symbols k and kr are mutually exclusive in
distribution, k occurring before the rounded vowels /u/ and /o/,
and kr elsewhere. Stem-initial k is also found before /a/ when the
stem final is one of the bilabial phonemes /b/ or /m/. This use of
r in association with k indicates that the velars were back velar
in point of articulation. However, Morice rarely uses r in
transcribing the other noncontinuant velar phonemes. Exceptions to
the mutually exclusive distribution of the symbols k and kr appear
to arise for grammatical reasons; that is, he never varies the
symbol used for the stem initial within one verb stem set, for
example, imperfective kr̄t and usitative krok 'go on all fours'.
Similarly, kr and krm are used for the phonemes /g/ and /ǧ/
respectively when these arise through "D-effect."

Stem-finally, the phonemes /x/ and /h/, represented by the
symbols rh and h, respectively, contrast following the vowel /o/
only. orh represents the reflex of *ax, modern /oh/ (see sect.
5.2.1), and in Morice's time the sound change *ax > ox > oh was
only incipient.

2.2 The vowel system

2.2.1 Morice's syllabary

Morice set up his syllabary for Carrier as early as November
1885 (Morice 1930:88). It is published in one of his early articles
submitted to the Canadian Institute (Morice 1890:175). Symbols are
provided for all phonemic CV sequences (including ØV) except gØV,
k'ØV, k'wV, and ?V, which were evidently divided g-wV, k-wV, k'-wV
and ?-V. This necessitates symbols for k and k' "alone," by which
he must mean syllable-finally. Segments occurring "alone" and not
as syllable initials are h/ŋ (one symbol provided), z, and ñ, the
latter the only member of the tš-series distinguished in any
position.

The vowels represented in Morice's syllabary are a, a, e, i,
o, u. There is also a symbol for vowel length; it is not clear why
this should be needed. It was probably to represent a variant of e,
described by Morice as long (TCL:2). These six vowels are related
to the PA vowels as follows: the reflex of *a is a, and the
reflexes of *i, *e, and *u are generally i, e, and u respectively.
The reflexes of the PA reduced vowels *a, *a, and *u are generally
all a. However, when any of the vowels except *a precedes a
stem-final front or back velar, certain sound changes occur. These
will be the subject of following sections. The Carrier stem-vowel o
is the reflex of *u, *u, or *a preceding the reflex of a back velar.

2.2.2 Deductions from Morice’s vowel transcriptions

For the six phonemic vowels of Carrier, Morice uses in the main ten phonetic symbols a, e, ê, i, i, o, ô, u and ŭ. The circumflex is used to indicate a close variety of the vowel. In addition, â and ô represent nasalized a and o respectively and occur only with syllable-final n in the sequences ân and ôn discussed above (2.1.3). ë is used to denote a "long" vowel, occurring generally stem- and word-finally only (this is probably a particularly lax pronunciation of the vowel, but the distribution of this variant has not been studied). ë is not listed with the other vowel symbols (TCL:2) but occasionally replaces ë (for example, së or sè 'belt', tšëtsiião or tšëtsií 'axe'). â and ô in stems represent the reflexes of *ay and *uy respectively, both modern o. ô has been noticed only in sô ‘hoar frost’, and its phonetic value was [ɔ] (TCL:2). ñ is used by Morice in his transcription of the same reflexes of *ay in Babine, modern Babine /a/, and its phonetic value is likely to have been a central-to-back [a], whereas the phonetic value of his symbol a is likely to have been closer to [%] (TCL:2).

Underlining of vowels is used to denote "pitch accent" (TCL:10). Most often, this pitch accent is a stress, serving to differentiate otherwise homophonous nominal and verbal forms (TCL:62; for examples, see TCL:140, 361). Pitch phenomena in Carrier are discussed in section 2.3.

The phoneme /a/ is always represented by a and the phoneme /õ/ by diacritically unmarked e (except that ug represents the phonemic sequence ag, see sect. 5.2.2). The phonemes /u/ and /õ/ are represented by u, ŭ and o, ô respectively, the uncircumflexed varieties always occurring before stem-final l, l, and usually before stem-final s, ê, h, and ?, and the circumflexed varieties usually occurring before stem-final z, d. Stem-final n rarely occurs following rounded vowels.

There are four sources of potential difficulty in deducing the phonetic values of i, i, ê, and ê: (1) a subphonemic sound change, (2) a phonemic sound change, (3) dialect differences, and (4) allophonic variation.

Morice (TCL:2816) says: "Within the last forty years, the writer has himself noticed.... -íl has become -él. Ex.: tíl of older days: têl, crane; thiľ, berry basket: thêl; ethistéľ. Likewise, -is, -iz are now -ês, -ës: ke-nnesês, I break asunder by pressing with the foot: ke-nnesês; ..." The modern forms of the stems are -deľ, -tel, -t'èľ, and -ës respectively. Since the stem vowels are the reflexes of PA *e, at least in the case of deľ 'crane' (cf. UK deľ, Nav dééľ) and -ës 'step I' (cf. Chip -ës, Nav -ées) the reflexes of PA *e cannot have merged with those of PA *i and later have split with them, since no reflex of PA *i is /e/ preceding a stem-final lateral or sibilant. The sound change must have been a subphonemic one in which /e/ before stem-final laterals and sibilants became closer and then later more open.
Central Carrier Phonology

Before considering the sound changes affecting the reflexes of PA *e further, we will discuss the allophonic variations indicated by Morice's use of his front vowel symbols. Morice never writes ēl or ǣl unless the preceding consonant is a velar, and he never writes ēs or ēz. Following a velar, the front vowel symbol used is either ē(i) or ē, ēl occurring word-finally. ē(i) and ē therefore represent flattened allophones of /i/ and /e/ respectively, immediately following a velar consonant. (See Cook 1976:39 for flattened allophones of ē in modern Carrier.) On this hypothesis, /i/ and /e/ are found to be reflexes of PA *i and *e in the lexical item concerned, with very few exceptions, thus confirming the conclusion. Before laterals and n, i, and ē contrast (or ē and ē if the immediately preceding consonant is a velar), and before sibilants i and ē contrast (or ē and ē). The symbol ē is seldom used. As regards the other stem finals, i and ē are generally written before ŏ, h, and ĕ, ē rarely. It can be seen, then, that in Carrier at the end of the nineteenth century the phoneme /e/ is sharpened before the laterals and n. Some sharpening appears to occur when the stem final is d, but in the few examples there are of Ced stems where C is not a velar, Morice's transcriptions are about equally divided between Ćēt and Ćēt.

There is a residue in which reflexes of PA *e are /i/ in TCL and either /i/ or /e/ in CCBD in the same lexical items. Where these sources disagree, some allowance must be made for dialect difference. Cook 1976 has two stems in which the vowel is /i/ where TCL and CCBD both have /e/ and in which the vowel is a reflex of PA *e: -zi 'mouth' and -tši 'tail'. Cook's data are from one of the Central Carrier dialects, and he notes that within Central Carrier there are dialectal differences with respect to /i/ and /e/ (1976.53). He also gives some Southern Carrier data from Anahim Lake which include: xaneg 'word' (CCBD xani; cf. Kut gi°džig, UT he'de'k, OTan qenaga 'word', Koy xanex 'he's talking'), dzen 'day' (CCBD dzin; PA *dž'en), -yen 'be standing' (CCBD -yin; PA *-ōen), and the two stems -zeg 'mouth' (cf. Nav -zēʔ, Chip -dē, Kut -yig, OTan -zaq'; PA *-sa-yag' > *-zeg' 'inside of mouth'), and -tše 'tail' (cf. Nav -tsēʔ, Chip -tšē). In these last two the stem-vowels /e/ are reflexes of PA *e but correspond to /i/ in at least some Central Carrier.

When TCL represents a reflex of PA *e by the phoneme /i/, the stem final is most often a sibilant, less often a lateral. However, the stem-final lateral examples are considerably increased when the future, future negative, and perfective negative verb stems are included; these are the reflexes of PA *Ce-l or *Ce-l. In the great majority of these cases Morice records Cti and Cil respectively. When the stem final is n, the examples are about evenly divided between those in which nasal umlaut has occurred and those in which it has not. When the stem final is d, reflexes of PA *e rarely merge with those of PA *i.

The merger of reflexes of PA *e with those of PA *i before the stem-final sibilants and laterals is understandable in view of the nineteenth century allophonic sharpening of /e/ before these stem finals. The merger, e-Sharpening, occurred in some Central Carrier dialects and in some lexical items. The examples noted in TCL when the stem final is a sibilant are -γiz 'egg', -liz 'dust', bīzk'i
'gull' (CCBD besk'î), -yiz 'be long', -dis 'younger sister', -biz(-) 'father's sister, mother-in-law', bis 'flint', gis 'spring salmon', $is 'wart', and -dlis 'plaster (v.)', the last a derivative of t1z 'dust'. Where CCBD contains the item, it has the same vowel as TQL in some cases, but not in all. In addition, TQL records -tli'es 'throw, hurl a single object; hammer; paint', and Moric notes that it was "modified from the tli's of seventy-five years ago" (TQL:958). The classifier occurring with the stem is $ and CCBD records $-tli's 'throw'(t+t1' > $?, see TQL:2016); cf. Sar -tli's, -tli'as 'throw', in which, perhaps, PA *e(n) ~ *a(n). This is a rare case in which TQL /e/ corresponds to CCBD /i/; the only other example so far noted is TQL tseen, CCBD -tsin 'double, shadow'. When the stem final is a lateral, examples of the merger include xîl 'a load, pack', $-tli$ 'float, swim pl', and -dit 'go pl; throw pl objects'.

We should ask whether, when the stem final is a sibilant, e-Sharpening is at all dependent upon whether the stem final is a reflex of a member of the *ts-series or the *ts(r)-series. A count of those cases in TQL in which e-Sharpening has or has not occurred and for which the series membership of the stem final can be deduced from cognates yields no significant results. Since e-Sharpening is a late rule and probably the contrast between members of the ts- and ts-series was already becoming marginal, this is not surprising. A little more significant is the stem class of the form, e-Sharpening occurring more frequently in noun stems than in verb stems (sixteen examples to five counterexamples). Later, we shall consider the relationship, if any, of e-Sharpening to the Babine rule of L-Mutation (sect. 4.3).

2.2.3 Vowel Raising and Lowering

When the stem final is Ø, h, or ?, it may be a reflex of zero, *?, or a front or back velar. No examples in TQL or CCBD have been noted in which the reflex of *e is i before a reflex of zero or *?; Cook's -tīli 'tail' in a Central Carrier dialect constitutes the only example. When the stem final is the reflex of a front or back velar, additional factors come into play. We have already assumed that the stem-nuclei i, ai, and u occur only before the reflexes of front velars, and the stem-nuclei e, a, and o occur only before the reflexes of back velars (sect. 2.1.2). If this is true, and considering the reflexes of full vowels only (the reflexes of reduced vowels are discussed in sect. 5), we require rules of Vowel Raising and Vowel Lowering:

1. **Vowel Raising**
   
   \[ e \longrightarrow i \quad / \quad \{K, y\} \quad \# \]

2. **Vowel Lowering**
   
   \[ \begin{align*}
   i \quad | \quad & \quad u
   \end{align*} \quad \longrightarrow \quad \begin{align*}
   e \quad | \quad & \quad o
   \end{align*} \quad / \quad \{Q\} \quad \# \]

K represents any front velar and Q any back velar. Conflating these rules in a rule of Vowel Assimilation:
(3) Vowel Assimilation

\[
\begin{array}{c}
\text{V} \\
[+\text{long}] \\
[-\text{high}] \\
[-\text{low}] \\
\end{array}
\rightarrow [\text{a high}] / \\
\begin{array}{c}
\text{C} \\
\beta \text{cns} \\
\beta \text{son} \\
\text{a high} \\
\end{array}
\]

Vowel Assimilation includes o \(ightarrow u\), but there is no PA vowel *o, and this part of the rule is vacuous. The features [ cns, - son] specify that the stem-final consonant is an obstruent or semivowel.

Examples of reflexes of PA *CiK are most readily found for K = x, and evidence for Vowel Raising includes reflexes of PA *Ce-x where *-Ce is an underlying verb stem of shape CV and *-x19 is the momentaneous imperfective suffix: -kih 'go by boat' (*-qe-x), -tih 'handle animate object' (*-te-x), -yih 'pack on back' (*-ye-x). Three examples of which *x is the underlying PA stem final are -t'ih 'stretch string I' (cf. Nav -t'eeh, Sar -t'ah); -t'yih 'hit with missile I' (cf. Koy -k'ex); and -t'sih 'drive in a long object I' (Nav -t'seeh, Sar -t'sah). Reflexes of stems *-Cix are also -Cih: -tih 'break, fracture I', -ts'ih 'blow (of breeze) I', -nih 'handle pl objects'. Similarly, reflexes of stems *-Cux are -Cuh: int'suh 'wild rose' (cf. Koy kux), -dzuh 'brush, comb I'.

Reflexes of PA *CuQ are Co(h): soh 'robin' (cf. UK s\textsuperscript{r}ux), to 'fish' (cf. UK t\textsuperscript{u}k'e), -t'oh 'shoot, sting I' (PA *-t'ux), and -zoh 'scrape I' (cf. Chip -\textcircled{b}oy 'shave tr. I-O, P').

Reflexes of PA *CeQ are plentiful and are Ce(h). Reflexes of PA *Ciq are rare, if indeed they occur at all. Possible examples of reflexes of PBC *Ciq are -yeh 'melt, thaw' (cf. Koy -y\textsuperscript{i}x) and -\textsuperscript{2}eh 'teach, learn, practice' (cf. Koy -\textsuperscript{i}x). But the stems in Chilcotin are -\textsuperscript{2}ax and -\textsuperscript{2}ax\textsuperscript{2} respectively, and nasal umlaut may account for the Koyukon stem vowels, so that the PA reconstructed stems may be -y\textsuperscript{ex} and -\textsuperscript{2}ex respectively (in Chilcotin, *e > a before *x and *y, Krauss 1975:28). However, Vowel Lowering with respect to front vowels is a necessary rule in Babine, as we shall see (sect. 4.1), counterfeeding a rule of L-Mutation. One further probable example of a reflex of PBC *Ciq is -dzh 'earhole' (cf. OTan -dziq', Bab -dzeG).

The Southern Carrier form xaneg 'word' (PA *xaneg) may indicate that Vowel Raising is not a rule of that dialect, although the correspondence Upper Carrier i to Lower Carrier eg is not one noted by Morice (TCL:2818).

The Central Carrier form -zi 'mounth' (PA *-zeqI) recorded by Cook and corresponding to -ze in other Central Carrier dialects and to Southern Carrier -zeg shows that e-Sharpening is a late rule which counterfeeds Vowel Lowering.

The Central Carrier rules which derive stem-final \( \emptyset \) and h from the PBC front and back velar stem-finals *x, *g (< PA *g and *k'), *\textsuperscript{x}, *\textsuperscript{y}, and *G (< PA *G and *q') will be discussed in the sections covering the reflexes of the PA reduced vowels before reflexes of PA front and back velar stem finals (sect. 5).
2.3 Pitch phenomena in Carrier

No modern evidence has so far been found for stem-syllable tone in Carrier. When monosyllabic noun stems were run through the frame ɪlo 'it is not a', the pitch pattern was most often ̣̣, infrequently ̣̣. The difference might be thought to be due to contrastive pitch in the substitution items, but consistency is not obtained on repeat utterances. The explanation is probably that the first pitch pattern corresponds to one phonological word and the second to two phonological words.

When prefix syllables are considered, pitch contrasts occur; for example: ?adits' o ̣̣ ̣ ̣ ̣ 'he hears', ?adits' o ̣̣ ̣ ̣ ̣ ̣ 'we two hear' and, similarly, ɪukad 'he claps', ɪukad 'we two clap'. In the absence of disjunct prefixes, the first person dual subject prefix regularly carries raised pitch, but the raised pitch can be "stolen" by a disjunct prefix or close-knit postposition.

Raised pitches also occur in s-perfective forms when the s-perfective prefix is elided, as exemplified in the following paradigm, 'be sleeping':

1 sg nanisti 1 pl nats'anistez
2 sg naninti 2 pl nanîntez
3 sg nanisti 3 pl nahanistez

Again, the raised pitches can be stolen, for example: ukɔnístai 'I looked for it', where the close-knit postposition is kâ-.

The following paradigms for 'start off walking' illustrate these raised pitches further:

\[
\begin{array}{ccc}
I & P_s & F \\
1 sg & tasyaih & tîsyay & tîsyâl \\
2 sg & tinyaih & tînya & tînyał \\
3 sg & tayaih & tîzya & tîyał \\
1 dl & tît'as & tît'âz & tât'as \\
\end{array}
\]

Raised pitches occur in association with other morphemes also, some inflectional and some derivational. It is not possible yet to describe the occurrence of raised pitch in any detail.

It is not clear whether the raised pitch should be described in terms of tone or of stress. Apart from the fact that a word may contain no raised pitch, the system seems to function like a stress system. A stressed syllable is raised in pitch and is phonetically lengthened. In addition, disyllabic verb and derived noun pairs that are identical segmentally may contrast in stress placement, the noun carrying stress on the prefix syllable. Morice noted this fact (TCL:62) and gives a number of examples (see especially TCL:140, 361; note also TCL:258 in which the stems are "adjectives"). This stress differentiation between verbs and derived nouns is confirmed by Walker (p.c.).
3 BABINE PHONOLOGY

Just as for the Carrier sections of this study I am indebted to Father Morice, so for the Babine sections I am indebted to the joint work of Henry Hildebrandt and Mark Michelle. Mr. Michelle is a native speaker of Lake Babine and has been an untiring language consultant, whose patience and good humor have been very greatly appreciated.

The phonemes of Babine are as follows:

\[
\begin{align*}
\text{b} & \quad \text{d} & \quad \text{dl} & \quad \text{dz} & \quad \text{g} & \quad (\text{dž}) & \quad \text{G} & \quad \text{G}^w \\
\text{t} & \quad \text{t}^l & \quad \text{ts} & \quad \text{k} & \quad (\text{tš}) & \quad \text{q} & \quad \text{q}^w & \quad \text{h} \\
\text{t}^l & \quad \text{t}^l & \quad \text{ts} & \quad \text{k} & \quad (\text{tš}) & \quad \text{q} & \quad \text{q}^w & \quad (?) \\
\text{l} & \quad \text{z} & \quad \text{y} & \quad \text{γ} & \quad \text{w} \\
\text{=} & \quad \text{s} & \quad \text{x} & \quad \text{χ} & \quad \text{x}^w \\
m & \quad n & \quad \text{i} & \quad \text{u} \\
\text{e} & \quad \text{a} & \quad \text{o} \\
\text{a} & \quad \text{a} \\
\end{align*}
\]

(\text{dž}, \text{tš}, \text{and tš}' are the Lake Babine phonemes corresponding to the River Babine g, k, and k').

The members of the labialized velar series G\text{w} q\text{w} q'\text{w} w (= γ\text{w}) x\text{w} have front and back velar allophones. The allophones are front velar stem-finally following a long vowel, back velar stem-finally following the short vowel a, and back velar stem-initially also (sect. 5.4.3). Labialized front velars g\text{w} x\text{w} arise as stem finals following long stem vowels in the output of rules to be discussed, and g\text{w} (= G\text{w}) and x\text{w} (= x\text{w}') will be written in this environment in quoting Babine forms.

3.1 The consonant system

Kari (1975) adds the phoneme h\text{w}, in contrast with x\text{w} (i.e., x\text{w}'), to the inventory of consonants. The River Babine sequences eh\text{w} and ax\text{w} correspond to ux\text{w} and ax\text{w} in Lake Babine (see sects. 5.4.1, 5.4.3). The River Babine example of a syllable-initial h\text{w} is a realization of the space-time prefix before the long vowel a, a comparatively rare example of a labialized consonant before a long vowel. Probably the contrast should be reviewed.
Before we discuss details of the River and Lake Babine phonemes, it will be helpful to compare the Babine obstruents of the ts-, k-, and q-series with the PA series (and, for completeness, with the Carrier series) as follows:

<table>
<thead>
<tr>
<th>Babine</th>
<th>Carrier</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ts</td>
<td>ts</td>
<td>*ts</td>
</tr>
<tr>
<td>k(tš)</td>
<td>tš</td>
<td>*k</td>
</tr>
<tr>
<td>q</td>
<td>k</td>
<td>*q</td>
</tr>
</tbody>
</table>

Apart from the possible difference noted by Kari above, the phoneme inventories of River and Lake Babine correspond phoneme for phoneme. The only difference is that the reflexes of the noncontinuant members of the PA *k-series are front velar in River Babine and, syllable-initially, palatoalveolar [+cor, +str] in Lake Babine. dž in Lake Babine has allophones [tš] syllable-initially and [k] in syllable finals, the latter including the sequences [k1] and [kəl], phonemically /džt/ and /džl/ respectively. We have already mentioned the difficulty in the phonetic syllabification at this point—that if [kəl] is treated as a phonemic syllable ga1, a phoneme q is introduced in Lake Babine which is unique to the first person singular subject prefix (sect. 1.2).

In the following sections, when the discussion concerns the historical developments which have occurred in Babine, the reflexes of the noncontinuant members of the PA *k-series will be transcribed as front velars, reflecting the more conservative River Babine dialect. When the discussion is of synchronic matters, the Lake Babine forms may be given, since the bulk of the data used is from that dialect.

The phoneme x is marginal to the system and only occurs stem-finally. An alternative interpretation of stem-final x, which eliminates x from the phoneme inventory, will be considered in section 7. The reflex of PA *x stem-initially is k in River Babine; examples are kan 'song', ken’22 'summer', kas 'mountain', kas 'grizzly' -kod 'grab', -kos 'handle a fabric'. The corresponding tš in Lake Babine is taken to be a later development, the sound change *x > k being common to both dialects, followed by palatalization of the k-series in Lake Babine.

In transcribing Babine (TCL:282ff.), Morice wrote q tc q for the reflexes of PA *g *k *k’, which would lead one to assume that the dialect he was recording was Lake Babine. Unexpectedly, the one item he labels River Babine contains a palatoalveolar: tsekt, that is tsagt 'lynx'.23 In any case, just as the Carrier reflexes of the PA *k-series were in process of change from front velar to palatoalveolar at the end of the last century, so they were in dialects of Babine also.

In three Babine instances Morice writes fronted alveolar sibilants, corresponding to fronted alveolar sibilants in Carrier: tšak (tš'ag) 'dish', -tseš (-tsaš) 'get whipped', and -tiš (-diš) 'be wrapped, twisted around'. The modern reflexes of the PA
*ts-series have merged with the reflexes of the PA *tś(r)-series, and there is no tś-series in modern Babine.

As in Carrier, the usual reflexes of PA *w in Babine are b or m, and the reflexes of *γ and *ŷ are merged with the reflex y of *y. y also occurs stem-initially in verb stems as a reflex of *ʊ.

In comparing the consonant phoneme inventories of Carrier and Babine, we find that they are almost the same. Apart from the Carrier tś-series corresponding to the River Babine k-series, and the tś-series--marginal in modern Carrier and absent in Babine--the difference is in the phoneme n̄, present marginally in some dialects of Carrier and absent in Babine.

However, distributionally there are greater differences. Babine syllable types are to be discussed in section 7. Here we will be concerned only with simple syllable finals. As we have noted, in Carrier m, b, g, and gr occur stem-finally but in general only following a. In Babine this is true of m, but b, g (dz), G, g and G̃ (where gw and Gw are in complementary distribution stem-finally; see sect. 5.4.3) are not similarly restricted. All lenis noncontinuants may occur stem-finally, including dl and dz. All continuant obstruents, including the back velar continuants y and x, as well as the nasal n, and the laryngeals h and ?, may also occur stem-finally. Babine stem-final h will receive special discussion in section 6. The differences in the distribution of stem-final velars in Carrier and Babine will be accounted for in section 5.

PA stem-final *? is generally lost in Babine; for example, tsa 'beaver', -yu 'tooth', -di 'horn (of animal)', -qe 'foot', ye 'louse' (for the PA reconstructions, see Krauss 1964). Most occurrences of stem-final ? in Babine are plainly suffixal; for example, in the stem sets of CV verb stems. Examples of stem-final ? in noun stems are quite possibly suffixal, since they all occur in inalienably possessed nouns: -tso? 'grandmother', -tse? 'daughter', -yi? 'son', and -qay? 24 'blood'. With the exception of 'grandmother', stem-final ? occurs in the Central Carrier cognate stems. Cook (1976:51) remarks that no stem-final ? occurs in Southern Carrier (the dialect of Anahim Lake).

The PA possessive suffix is *-a?, but since the vowel of any *-a(?) suffix is lost in Babine and Carrier, the basic form of the modern possessive suffix is -. Stem-final ? occurs irregularly in the possessed stem forms of alienably possessed nouns of CV stem shape in Babine. In the dialect of Central Carrier described by Morice, the possessive suffix has zero realization with CV stems (see TCL:222). In the dialects recorded by Cook, the possessive suffix -? may have overt realization with CV stems (and in addition, in the dialect of Trembleur Lake, the possessed form of CVn stems is CVn'). (1976:17, 32).

3.2 Stem-final consonant manners

Even though all lenis noncontinuants may occur stem-finally in Babine, and in particular dl and dz, which do not occur stem-finally in Carrier, it is still true that Babine in general follows the "Canadian" pattern (sect. 2.1.2), in which the PA noncontinuant
members $T$, $T'$ of a series have merged with the voiced continuant member $Z$ of the series stem-finally. For example, in general, the stem-final manner in a perfective verb stem is $Z$, whether the PA stem final was $T$, $T'$, or $Z$. Exceptions occur when the stem final is front or back velar. In particular, present evidence suggests that all reflexes of a PA front velar, whether $^*g$, $^*k'$, or $^*Y$, final to perfective verb stems, are $g$ (when the stem vowel is the reflex of a PA full vowel) and not the expected $y$. Examples are -Geg 'run P', -t'ig 'stretch string P', -dzeg 'handle granular material P', -nig 'remember P' (and other -nix stems), -lig 'plant (put in a hole) P', -dzig 'comb P' (for a discussion of the last stem, see sect. 5.4.1).

There is evidence to suggest that the $T$ stem-final manner arises in Babine through comparatively surface phenomena. Stem-final $T$ regularly occurs in negative imperfective, future, and optative verb stems of variable verb stem sets when the stem final of the corresponding positive imperfective, future, or optative verb stem is $S$, whether $S$ is suffixal or is an underlying stem final. When the positive stem is CVØ, the negative stem is formed by $?-s$-suffixation (see sect. 6.1.1); we may assume, therefore, that when the positive stem is CVS, the negative stem is formed by the same process: CVS$?- (> CV?S) > CVT$.

The same process occurs in the formation of possessed noun stems, for certain lexical items in certain idiolects. More often, there is either no change in the stem final, or $S$ may become $Z$. In those cases in which a stem-final $T$ in a possessed noun stem corresponds to $S$ or $Z$ in the unpossessed noun stem, we may assume that the same process occurs: $S/Z?- (> ?S/Z) > T$. An exhaustive listing of the examples to date is $\{\text{les, } _{-\text{ledz}} \text{ 'bread, flour'; } \text{dastl'as, } _{-\text{dastl'adz}} \text{ 'paper'; } \text{sas, } _{-\text{sadz}} \text{ 'black bear'; } \text{tatsas, } _{-\text{tatsadz}} \text{ 'whip'; } \text{lez, } _{-\text{lidz}} \text{ (River Babine) 'dust'; } \text{taz, } _{-\text{tadz}} \text{ 'cane'; } _{-\text{lez}}, _{-\text{ladz}} \text{ 'urine'; } _{-\text{faatax}}, _{-\text{laatag}} \text{ 'knife'.}$

The Carrier process, reported by Morice, (TCL:208ff.) is considerably more regular, with very few exceptional cases. Stem-final changes occur only when the stem final is $i$ or $h$; and in those cases $i$ becomes $l$, and $h$ becomes $\emptyset$. (Stem-final $h$ includes all reflexes of stem-final $^*x$ if stem-final $y$ and $x$ are written $i$ and $h$, but only reflexes of $^*x$ following the reflex of a full stem vowel; see sect. 5.2.1.)

The main outline of the process of possessed noun stem formation in Babine and Central Carrier is summarized in the accompanying table.

Stem-final $T$ does not occur in Babine positive verb stems unless the verb stem is invariable, or the stem final is $d$, or the P stem vowel is long and the P stem final is $g$ (see above) (or unless the stem final is front or back velar and the P stem vowel is short, in which case the P stem final may be $g$ or $G$; (see sects. 5.4.1, 5.4.3, and also 5.2.2, and 5.2.3). Examples of stem-final T invariable verb stems are -dul 'be hunchbacked', -q'odz 'lap up', -yadz 'hiccup'. Stems which are continuable perfective stems
<table>
<thead>
<tr>
<th>stem final of unpossessed form</th>
<th>stem final of possessed form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babine</td>
<td>Carrier</td>
</tr>
<tr>
<td>1</td>
<td>1, l</td>
</tr>
<tr>
<td>(V)s</td>
<td>s, one example dz</td>
</tr>
<tr>
<td>(ə)s</td>
<td>s, dz</td>
</tr>
<tr>
<td>(V)x</td>
<td>y (one example)</td>
</tr>
<tr>
<td>(ə)x</td>
<td>x, one example g</td>
</tr>
<tr>
<td>(V)x</td>
<td>no change</td>
</tr>
<tr>
<td>(ə)x</td>
<td>no change</td>
</tr>
<tr>
<td>Ø</td>
<td>no change</td>
</tr>
<tr>
<td>other</td>
<td>no change</td>
</tr>
</tbody>
</table>

derived from variable verb stems by a process of ?-suffixation, a process outlined by Leer (1974:21), are included in invariable verb stems. The following example is of a stem specifically discussed in Leer's paper: -q'adz 'be cold (of weather)'. Another continuative perfective example is -tła'aw 'be soaked', derived from a variable verb stem of which the perfective stem is -tłey 'handle mush P'.

There are noun stems in Babine with stem-final T that correspond to stem-final Z in Carrier. Examples include -tsedl 'wood chips', -ʔadz 'hip' (cf. UK -ʔats'e?, Chip -ʔaʔe), xelt'adz (River Babine) 'water lily' (cf. UK kelt'ats'e), -t'odz '(tree) bark', -tł'adz '(fish) entrails, milt' (cf. UK -tł'ats'e?), honlidz 'skunk', deGodl 'safety pin'. In two recorded cases, Babine stem-final T in noun stems corresponds to Carrier stem-final S: -wadz 'shoulder' (cf. UK -yedze?, Chip -yəʔe), -Gudz 'fish scales' (cf. UK -gusdZe, OTan -Guts'a, Chip -qəʔe).

### 3.3 Fortis-lenis classification and synchronic processes

Allusion has already been made to the Babine vowel shift and to the fact that it is dependent upon a fortis-lenis classification of syllable initials (sect. 1). Here we shall discuss synchronic phenomena which are dependent upon the same fortis-lenis classification: the vowel allophones (sect. 3.3.1), certain allomorphic conditioning (chiefly prefixal) (sect. 3.3.2), and certain features in the pitch system (sect. 3.3.3). The diachronic vowel shift constitutes the subject matter of section 4.

The class of consonants that function as fortis syllable initials comprises the aspirated and glottalized noncontinuant members and the voiceless continuant member of each obstruent series, and the laryngeals h and ?. Any other syllable initial, including zero (in a vowel-initial syllable), is lenis. The class of lenis consonants comprises the simple noncontinuant member and
the voiced continuant member of each series and the nasals m and n. Syllables that contain a fortis initial will be called F-class syllables, and syllables that contain a lenis initial will be called L-class syllables.

3.3.1 Vowel allophones

Each of the six vowel phonemes has allophones conditioned by the syllable initial, higher in L-class syllables and lower in F-class syllables. In the absence of other conditioning factors, the allophones of the phonemes i, e, a, o, u, and a are [i, e, æ, o, u, a] in L-class syllables, and [ɛ, ɛ, a, ɔ, ɡ, ʌ] in F-class syllables. Since [ɛ] is lower than [e] and [ɡ] is lower than [o], there is phonemic overlap between the pairs of phonemes i, e and u, o respectively.

i and u shorten phonetically before word-final x and gʷ, xʷ (= Gʷ, Xʷ; see sect. 5.4.3) respectively, and any of the five long vowels shortens phonetically before word-final h, and also, as we shall see in section 6, before word-final h. (Our study has concentrated on stem syllables that are generally the final syllable of the word.) In addition, the phoneme i tends to shorten phonetically before word-final T and θ, and especially if the syllable initial is ρ.

In the case of a there is marked lowering of the vowel in L-class syllables contiguous to back velars, nonlabialized or labialized, in the same syllable, so that the allophone [ʌ] occurs contiguous to back velars in both L-class and F-class syllables. a also has an allophone [ɔ] before syllable-final labialized velars. The phonemicization of axʷ [ɔx] and axʷ [ɔx] is discussed in section 5.4.3.

In view of the fact that the fortis-lenis opposition is operative at the subphonemic level, it is important to establish that the opposition has also led to splits and mergers in the vowels at the phonemic level. Therefore at this point we will present examples to establish the vowel contrasts:

i [i] in L-class syllables: dial 'crane', -yiz 'egg', -Gis 'tie up I', write I', -dis 'fall, stumble O (twist O)', bid 'char', -di 'horn (of animal)'


e [e] in L-class syllables: wesdel 'I didn't sit', dasdel [tastel]'I will sit', -yez 'run pl P', -Ges 'scratch self I', -des 'weigh I', -bez '(start to) roll P', bed 'mits', -de 'lips'


[a] in F-class syllables: t'əɬ 'food', -təɬ 'kick I', -t'əs 'cut I', t̪əsən 'rain', sən 'sun'

(Examples of u in F-class syllables are rare. The phonetics of rounded vowels have sometimes been in doubt, but those given below seem well-established.)

u [u] in L-class syllables: nuʔ 'up (river, lake)', t̪əndəu 'jackpine', bəyu 'his tooth', nunəsədə 'he crept (hunting)', dəut'en 'what does it look like?', qənanyu 'matches'

[o] in F-class syllables: yətɬ'u [yətɬ'o] 'she knits it', təstɑq [təstəkq] 'women', suziʔ [səziʔ] 'my name', hunzəu [hənzu] 'it's a nice day'

o [o] in L-class syllables: -moʔ '(mother's) milk', nido 'white man', dəlyo 'it bellows', nəzoatal 'he kicked', dəot'en 'what does it (house) look like?', dəzəyo 'bull moose'

[ə] in F-class syllables: yətɬ'əɬ [yətɬ'əd] 'she braids it (hair)', tə [tə] 'water', hozəli [həzəli] 'he's born', honzəu [hənzu] 'it's become a nice day'


[ə] elsewhere in L-class syllables: yəs 'snow', -zəd 'liver', dal 'coagulated blood', bən 'lake', balədəɬ [pəɬədəɬ] 'his dog', dəəɬ 'mountain'

Generally, long vowels in Babine are the reflexes of PA full vowels, and the splits and mergers in the full vowels are described in the processes of Vowel Raising and Vowel Lowering (sect. 2.2.3) which are rules of Babine as well as Carrier, as well as in the processes involved in the vowel shift (sect. 4.1). Short vowels in Babine are generally reflexes of PA reduced vowels, but when a reflex of a reduced vowel precedes a stem-final front or back velar, then under conditions to be described in section 5, the reduced vowel may be lengthened. Thus the reflexes of PA *a and *ə (merged with PBC *a) include i and a, and the reflexes of PA *u include u and o in Babine.

3.3.2 Morphophonemic processes

Stem allomorphs occur conditioned by the fortis-lenis opposition when the basic stem vowel is a or e and, when prefixed, it
immediately follows a lenis consonant; then a becomes e and e becomes i. This situation occurs when (1) the stem initial is a continuant which becomes voiced under prefixation, or (2) the stem initial is a vowel and the stem is prefixed by a lenis consonant. The examples are s-an (River Babine) 'my mother', b-en 'his mother'; s-aq'ay 'my maternal aunt', b-eq'ay 'his maternal aunt'; s- eni 'my brains', b-ini 'his brains'; se 'belt', bazi(?) 'his belt'; xe 'grease', syi(?) 'my grease'. There are no similarly conditioned stem allomorphs for stems with u as the initial vowel (the only other stem-initial vowel occurring in the data): s-undi 'my older brother', b-undi 'his older brother'; s-u zi? 'my name', b-u zi? 'his name'.

The vowel changes a > e and e > i are synchronic equivalents of diachronic L-Mutation (sect. 4.1). Synchronic L-Mutation operates across morpheme boundaries, but diachronic L-Mutation occurs within the morpheme. That there are no stem allomorphs when the stem vowel is u in the vowel-initial stems above suggests that there is no synchronic rule of F-Mutation although there is a diachronic intramorphemic subrule of F-Mutation in which u > o following fortis consonants.

Prefix allomorphs occur conditioned by the fortis-lenis opposition when the allomorphs of a given prefix include forms with initial e. The basic forms of these prefixes are progressive e-, y-perfective e- (both reflexes of *G0-), and s-perfective sa- (with morphologically defined allomorph ezə-). These prefixes have phonologically defined allomorphs i-, i-, and izə- respectively. By a synchronic process of L-Mutation across morpheme boundaries, e becomes i when the vowel is preceded by a lenis consonant (see examples below). Other vowel-initial prefixes do not have such alternants, but the vowel of the prefix is i (or u) whether the vowel is preceded by a lenis or by a fortis consonant.

The absence of a synchronic morphophonemic rule of F-Mutation accounts for the nonoccurrence of allomorphs o- of prefixes of the basic form u-, as well as for the absence of stem allomorphs of noun stems with an initial vowel when that vowel is u; for example, s-u zi? 'my name' and not s-o zi?.

However, the phonemic value of rounded vowels in prefix strings needs further checking. If the allomorph of the optative prefix (reflex of *G0-) following fortis consonants is o-, and not u-, then the basic form of the optative prefix is o-, and by a synchronic process of L-Mutation, the allomorph u- occurs following lenis consonants. (There is no diachronic subrule of L-Mutation in which *o becomes u; L-Mutation is a comparatively early rule and there is no PA vowel *o.)

Examples follow in illustration of the above paragraphs.

Presence of synchronic L-Mutation:

e- ~ i- progressive

helGix 'they two are running', weseyedl 'I'm not walking'; ilGix 'he's running', wetazisdlidl 'I will not be'
e- ~ i-  γ-perfective
ntesdjei 'I slept', ?est'e?n 'I worked', ts'edney?
'we drank'; isney? 'I drank', nidžii?e?n 'I looked
at it'

ez(a)- ~ iz(a)- s-perfective (other allomorphs of this prefix are
s(a)- and z(a)-) tezasye 'I've started to go'; nizasdzhen
'I'm getting old', dizban 'it's full'

Absence of synchronic F-Mutation:

i-  perfective negative
wedinil 'he didn't say'; wentisdlai 'I didn't sleep',
wetš'issał 'I didn't chop'

in-  perfective marker
?ayinley 'he made it'; ts'inli 'we are'

in-  second person singular subject
int'ay 'you have it'; ?inley 'you made it', sištš'ał
(n-1 > ½) 'you bit it', ntnile 'you sleep'

u-  conative26
udadžiqad 'I ask', nusde 'I creep (hunting)'; tš'udil?ex
'you are learning', suzišts'ay 'you listen to me'

u-  optative
nusbi? 'I may swim', udžltśod 'I may take it',
wedazusni? 'I may not say'; nats'ubi? 'we may swim',
nawesusbi? 'I may not swim';

One further morphophonemic process should be mentioned:
overlong vowels (phonemically a long vowel plus a) arise in third
person plural verb forms when a CV prefix (or prefix complex or a
postpositional stem close-knit to the verb word) immediately
precedes the third person plural prefix ha- and the vowel of the
preceding form is long (that is, CV-ha- → CVa-). Usually the
overlong vowel is of the quality of the original long vowel
throughout, but occasionally a variant is heard with a offglide.
There is a marked pitch downglide associated with an overlong
vowel. Examples for prefixes Ci-, Ce-, Ca-, and Cu- are nianintsay
'they are tired', neaništsal 'they are damp', kaanates 'they camp',
and buadarqad 'they asked'. If the prefix preceding ha- contains a
short vowel (that is, a), then no overlong vowel occurs but Ca-ha-
> Ca-; for example: ?at'ah 'he works', ?at'ah 'they work'.

3.3.3 Pitch phenomena in Babine

Babine is nontonal; it is not clear yet whether stress, or
pitch accent, is phonemic. Kari (1975) has enunciated rules for
River Babine, predicting stress placement when all prefix vowels in
a word are short. The rules do not seem to work without exceptions
in Lake Babine. While it is true that in the case of disyllabic
words in which the first (prefix) syllable contains a short vowel,
stress tends to occur on the final syllable, there is a tendency,
at least in verb words, for the stress to be thrown back to the
penultimate syllable. In words of three syllables or more, when
all the prefix vowels are short, stress occurs on the penultimate syllable and on preceding alternate syllables: bayaslī 'I'm watching him', wadāt'ay 'we two live there', wañālwās 'it's warm (weather)', bayāk'ats'āt'ay 'we lent something to him', dayādatōldās 'he's stumbling (getting his feet twisted)'.

The interesting case arises when the prefix syllables contain more than one long vowel. Kari says that any long prefix vowel carries heightened pitch. This is true for Lake Babine also. Further, other factors being equal, a syllable containing a long vowel and a voiced continuant syllable-finally has an extra heightened pitch and marked pitch downglide. Such syllables are not different suprasegmentally from sequences CVa, that is, phonetic syllables containing an overlong vowel. There is some degree of heightened pitch when the prefix syllable contains a short vowel and a voiced continuant syllable-finally.

Other factors are equal only when all the prefix syllables contain the same long vowel. The pitch carried by a vowel is primarily determined by the tongue height of the vowel. The pitch is low when the tongue height of the vowel is high, and is high when the tongue height of the vowel is low. Intermediate pitches occur on a cline from low to high depending on the phonetic tongue height of the vowel, high to low. However, i carries lower pitch than u, and e carries slightly lower pitch than o; there is, therefore, some skewing from high front to low back. This skewing correlates with the axis of diachronic L-Mutation and F-Mutation which tend to be sharpening and flattening processes (sect. 4.1).

These pitch phenomena can be related to the fortis-lenis distinction as follows: the syllable initial, fortis or lenis, determines the tongue height of the vowel allophonically, morphophonemically, and diachronically, higher if the initial is lenis, lower if fortis. Further, as we have just noted, syllables with higher long vowels carry lower pitch, and syllables with lower long vowels carry higher pitch.27

<table>
<thead>
<tr>
<th>Lenis initial</th>
<th>higher vowel</th>
<th>lower pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fortis initial</td>
<td>lower vowel</td>
<td>higher pitch</td>
</tr>
</tbody>
</table>
4 BABINE VOWEL SHIFT

The discussion of the historical development of Babine vowels will be limited to those occurring in stem syllables. The development of the full vowels, apart from Vowel Raising and Vowel Lowering (sect. 2.2.3), depends upon the stem-initial consonant; splits and mergers have occurred which are the product of the same processes that have led to the vowel allophony. These processes are (diachronic) L-Mutation and F-Mutation (sound changes conditioned by lenis and fortis consonants respectively).

4.1 L- and F-Mutation

In L-Mutation the tongue height of a vowel in an L-class syllable is raised; in F-Mutation the tongue height of a vowel in an F-class syllable is lowered. The PBC full vowels are *i, *e, *a, *u, as in PA. These are shown in the accompanying table with their modern reflexes and the allophones of these latter. The table does not include [æ], L-class allophone of /a/; [o], L-class allophone of /o/; and [o], F-class allophone of /u/, since these are not the regular stem reflexes of any PBC vowels but are found in loanwords, exceptionally in other stem syllables, and in prefix string syllables.

<table>
<thead>
<tr>
<th>L-class</th>
<th>F-class</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBC *i</td>
<td>[i] /i/</td>
</tr>
<tr>
<td>PBC *e</td>
<td>[i] /i/</td>
</tr>
<tr>
<td>PBC *a</td>
<td>[e] /e/</td>
</tr>
<tr>
<td>PBC *u</td>
<td>[u] /u/, [i] /i/</td>
</tr>
</tbody>
</table>

The information contained in the table is alternatively represented in the two accompanying diagrams for L-class and F-class stem syllables. The allophones that are not the regular reflexes of any PBC vowel are included in the diagrams in parentheses, so that the five allophones in L-class stem syllables and the five allophones in F-class stem syllables of the five long vowels /i, e, a, o, u/ of Babine are shown in the respective diagrams, with the addition of [ʌ\*i] (the alternate reflex of PA *i) in F-class stem syllables. It may be noted that [ʌ\*i] is derived from PA *i occurring in open stem syllables or in stem syllables...
with syllable-final ñ, h, or x (see sect. 6 for discussion of the source of h).

Allophonically, L-Mutation and F-Mutation have led to phonemic overlap, since the [e] and [o] allophones of /e/ and /o/ in L-class syllables are higher than the [ɛ] and [œ] allophones of /i/ and /u/ in F-class syllables. This overlap has been illustrated previously (sect. 3.3.1).

Phonemically, L-Mutation has led to splits and mergers of the front full vowels and F-Mutation to a split of the rounded full vowel. The reflex of PBC *a has become Babine e and that of PBC *e Babine i in L-class stem syllables, and the reflex of PBC *u has become Babine o in F-class stem syllables. In addition, there are two further splits and mergers due to L-Mutation and F-Mutation that are limited by the stem final. In L-class stem syllables PBC *u has become Babine i when the stem final is front velar (labialized by Velar Labialization, sect. 5.2.3; for examples, see sect. 5.4.1); and in F-class stem syllables PBC *i has become Babine ay when the stem final is Ø, ? , h, or x. It will be shown in section 7 that syllables with syllable-final Ø, ?, h, or x (and y or y?) may be classified together as essentially "open" syllables. (However, the split in the reflexes of *u in L-class stem syllables does not occur in "open" syllables; but a stem-final front velar is an essential part of the conditioning environment; for example, *nu 'island' > nu, not ni or niw.)

The merger of PBC *u with PBC *i in L-class stem syllables suggests that the processes of L-Mutation and F-Mutation are sharpening and flattening processes rather than raising and lowering processes. It also points up the fact that the net result of L-Mutation and F-Mutation is not a chain process of the musical chair type.

L-Mutation is a comparatively early rule and there is no PA vowel *o, so that no diachronic subrule of L-Mutation in which o > u is to be expected. The "o-creating rules" of Babine are Vowel Lowering (sect. 2.2.3), u-Velarization (5.2.1), and Inverse Velarization (5.2.4) (as well as F-Mutation).

o occurs in L-class syllables infrequently. Examples are nido 'white man', qeGoni 'shoes', q'almos 'crab' (Gitksan loan, Kari
Babine Vowel Shift

1975:16), **džeyo** 'bull moose' (Sekani loan, TCL:2806), **tadžo** 'young bull moose'. The first two words are of native origin and o occurs in Carrier in the same two lexical items, so that we may assume that they are derived by regular Babine-Carrier historical processes. In the case of the loans, o corresponds to o in the source language (or nasalized o). Note also the first vowel of **džeyo**, which has not become i by L-Mutation, and of **dayi** 'chief' (Chinook loan, TCL:2810), not **deyi**, so that the vowels of loans in general, including French loans, constitute exceptions to L-Mutation.

Other examples of a in L-class syllables, in loanwords, are **Χάδο** 'moose' from Sekani (actually cognate with Babine **haney** 'animal', which has undergone L-Mutation), and, from French, **labuda** 'bottle' (la bouteille), **ladab** 'table' (la table), **lalam** 'oar' (la rame), **labaz** 'boat' (la passe 'ferry crossing'). In the light of evidence to be presented concerning the chronology of the Babine vowel shift (sect. 4.4), we cannot say that the loans were borrowed subsequently to the shift. Rather, the case seems to be that they were felt to be foreign and extrasystemic and so were not subject to L-Mutation.

Before L-Mutation and F-Mutation are discussed further, some examples of the historical developments will be given:

<table>
<thead>
<tr>
<th>L-class stem syllable</th>
<th>F-class stem syllable</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA *i</td>
<td></td>
</tr>
<tr>
<td>-dis</td>
<td>'turn, twist'</td>
</tr>
<tr>
<td>-ts'id</td>
<td>'tell lie'</td>
</tr>
<tr>
<td>-yiz</td>
<td>'breath'</td>
</tr>
<tr>
<td>tsidl</td>
<td>'red coals'</td>
</tr>
<tr>
<td>-dzid</td>
<td>'be, occur, do'</td>
</tr>
<tr>
<td>taq'ay</td>
<td>'three'</td>
</tr>
<tr>
<td>-ni(?)</td>
<td>'say'</td>
</tr>
<tr>
<td>ts'ay</td>
<td>'canoe'</td>
</tr>
<tr>
<td>-dl'i</td>
<td>'sing, pray'</td>
</tr>
<tr>
<td>say (Lake 'I, me' Babine)</td>
<td></td>
</tr>
</tbody>
</table>

PA *e
| -di                  | 'horn'                |
| t'es                 | 'charcoal'            |
| -qe                  | 'foot'                |
| tse                  | 'rock'                |
| -yiz                 | 'egg'                 |
| -bissq'ay            | 'gull'                |
| t'es                 | 'flour'               |
| dzin                 | 'day'                 |
| -'en                 | 'see'                 |

PA *a
| -de                  | 'lip'                 |
| tsa                  | 'beaver'              |
| -le                  | 'hand'                |
| -?ad                 | 'wife'                |
| ye                   | 'louse'               |
| sa                   | 'sun'                 |
| -yed                 | 'shake'               |
| -tał                 | 'kick'                |

PA *u
| nu                   | 'island'              |
| to                   | 'water'               |
| -yu                   | 'tooth'               |
| -lod                  | 'scab'                |
| -zud                  | 'skate'               |
| tł'oł                 | 'rope'                |
| -yuł                  | 'blow, inflate'       |
| -t'odz                | '(tree) bark'         |

However, when the PA stem final is a reflex of a back velar, Vowel Lowering counterbleeds L-Mutation:

PA *e
| -dex                  | 'brush off'           |
| -nex                  | 'extinguish'          |
| -dxež                 | 'pitch, gum'          |
| -yež                  | 'grow'                |
| -1ež, -nex            | 'make, do'            |
Rule order in respect to Vowel Raising and Lowering, and L- and F-Mutation is discussed below.

The L-Mutation rule comprises two subparts:

(4) L-Mutation

(a) \[ e \quad \xrightarrow{a} \quad i \quad \left/\begin{array}{l}
C \quad \text{(-frit)}
\end{array}\right. \quad \text{(C) #} \]

or, \[ +\text{syl} \quad \xrightarrow{\text{alpha}l ow} \quad -\text{high} \quad \left/\begin{array}{l}
C \quad \text{(-frit)}
\end{array}\right. \quad \text{(C) #} \]

(b) \[ u \quad \xrightarrow{\text{u}} \quad i \quad \left/\begin{array}{l}
C \quad \text{(-frit)}
\end{array}\right. \quad \text{[-syl]} \quad \text{(+high) #} \]

Subpart (a) in feature terms applies to i vacuously.

The F-Mutation rule also comprises two subparts:

(5) F-Mutation

(a) \[ u \quad \xrightarrow{\text{u}} \quad o \quad \left/\begin{array}{l}
C \quad \text{(+frit)}
\end{array}\right. \quad \text{(C) #} \]

(b) \[ i \quad \xrightarrow{\text{ay}} \quad a \quad \left/\begin{array}{l}
C \quad \text{(+frit)}
\end{array}\right. \quad \text{(?)} \quad \text{Ø} \quad \text{x #} \]

Subpart (b) will receive some revision, resulting in a more economical statement, when stem-final "zeros" and Babine syllable-types have been discussed in sections 6 and 7. The subpart as presently formulated does not include Cih in its structural description.

L-Mutation and F-Mutation cannot apply to the same input, since one applies when the stem initial is lenis and the other when it is fortis. Vowel Raising and Vowel Lowering also cannot apply to the same input, since one applies when the stem final is a front velar or y and the other when it is a back velar. However, one of the mutation rules may apply to the same input as either Vowel Raising or Lowering; we must therefore consider the rule orders.

Vowel Raising and L-Mutation may both change the vowel e to i, and Vowel Lowering and F-Mutation may both change the vowel u to o. Both pairs of rules are in mutual bleeding order, but the ordering is immaterial. However, L-Mutation counterfeels Vowel Raising since the reflex of *aK (where K is front velar) in L-class syllables is eK by L-Mutation and eK does not then become 1K by Vowel Raising; for example, *-Gax 'run I' > -Gex, *-dzag 'handle granular material P' > -dzeg, *k'andag 'flower' > k'andeg.

Vowel Raising feeds F-Mutation since the reflex of *ex in F-class syllables is ax (there are no available reflexes of *ey, and F-Mutation does not apply when the stem final is g); for example, *-t'ex 'stretch string I-O' > -t'ix (Vowel Raising) >
-t'ax (F-Mutation); *-k'ej 'shout I-O' > -k'iix > -k'ax. Also, F-Mutation counterfees Vowel Raising if the latter applies to o as well as to e; in feature terms, it is simpler to include o than to exclude it. However, if Vowel Raising is an early rule (and it is earlier than the other rules we are considering), then there is no input o since there is no PA *o and no necessity to posit *o for PBC.

L-Mutation feeds Vowel Lowering and Vowel Lowering counterfees L-Mutation since the reflexes of *iQ and *eQ are both eQ in either L-class or F-class stem syllables; for example, *-p'iix 'learn, teach I' > -p'ëx (Vowel Lowering), *-γiix 'melt I' > -γëx (Vowel Lowering counterfeeding L-Mutation), *-zeG 'mouth' > -zïG (L-Mutation) > -zëG (Vowel Lowering), *dzej 'gum' > dziç > dzëç, *-nëx 'extinguish I' > -mïç > -nëx.

4.2 Infrequent or rare consonant-vowel sequences

As a result of L-Mutation and F-Mutation, certain stem initial + vowel sequences are rare. These are L-class stem initial and vowel a, and F-class stem initial and vowel u. The sequences of L-class syllable initial + vowel a and F-class syllable initial + vowel u are more frequently found in prefix syllables than in stem syllables. The first type of sequence occurs as the result of morphophonemic contractions; for example, the future prefix complex da- < *da-ya- (in Lake Babine), or sequences Ca- including na- from Ca-ha > Ca-ya- where ha- is the third person plural subject prefix: nazbi 'they swarm'. The second type of sequence occurs in prefix syllables since there is no morphophonemic synchronic rule of F-Mutation (sect. 3.3.2).

Examples in which F-class stem initial does occur before u are -t'I'u 'knit, weave', ts'aqu 'women', ?usa 'pot', and q'udani 'Fort St. James people' (q'u- is of unknown etymology; the second element is danj 'man, person'). No explanation can be given as to why F-Mutation does not apply to these forms.

L-class stem initial and vowel o occurs with some frequency, but only because of the process of Vowel Lowering (and because o is also the reflex of *u before the reflex of stem-final *γ, see sect. 3.2.1) so that the stem final in these cases is the reflex of a back velar.

There is a pair of Babine stems containing L-class stem initial and vowel o which could possibly represent examples of stems in which L-Mutation of an additional type (*a > o) has occurred. The stems are modz 'very small' and -mo? '(mother's) milk'. The Carrier stem cognate with Babine modz is -maz (see sect. 2.1.2). Cognates of -mo? are Nav -bë? 'milk', Kut -maa? 'breast, breast milk' (Mueller 1964), Kut -më? 'suck' (Sapir 1964). Babine -mo', therefore, might be a reflex of *-më? (< *-wë?). A parallel sound change has occurred in the case of the loan dimos 'Sunday' (TCL:2836) (where s > [S] following the rounded vowel) from French [dimas]; that is, ma > mo. Therefore, rather than setting up an additional type of L-Mutation, we may posit a rule *a (or *γ) > o/m---(C)#. The rule bleeds L-Mutation.
F-class stem initial and front vowels, i and e, are only rare in syllables of certain structures: i in "open" syllables (sect. 7) and e in K-final syllables. F-class stem initial and vowel i in "open" stem syllables have been found occurring only in waq'e?ix 'less than' and -?ix 'hide I', the latter apparently fluctuating with regular -?ax.

F-class stem initial and vowel e are found in the following examples:

(1) -teg 'break, fracture IN-ON'
    (cf. Nav -tiih) PA stem vowel *i

(2) -qeg 'go by boat IN'

(3) -teg 'lie down (anim.) IN'

(4) -tex ~ -tax 'lie down (anim.) I'

These are apparent exceptions to the rule of Vowel Raising (which in Carrier has no exceptions). Note that the stem vowel is a reflex of PA *i in example (1) and of PA *e in examples (2) to (4). To account for *i > e in (1), an irregular extension of F-Mutation, i > [C] #, might be posited. This same irregular extension for stem-final x as well as g can also account for examples (2) to (4) if we posit prior Vowel Raising; for example, *-qeg > -qig (by Vowel Raising) > -qeg (by irregular F-Mutation). No exceptions need be made, therefore, to the rule of Vowel Raising. In (4) it should be noted that a variant -tax has been recorded; this is actually the expected form, since F-Mutation contains the subrule i > a #:

4.3 L-Mutation and e-Sharpennng

Since the sound change *e > i occurs in the Babine rule of L-Mutation and in the Carrier rule of e-Sharpennng (sect. 2.2.2), we should ask whether either rule is a subpart of the other. First we will look for any traces of L-Mutation in Carrier. Restricting our attention to the corpus of twenty-one noun and verb stems considered in section 2 with respect to e-Sharpennng, in which the stem vowel is a reflex of *e and the stem final is a sibilant, we find that eleven stems contain a stem-initial lenis consonant. In these eleven cases, therefore, the stem vowel could be subject to L-Mutation, and in eight cases e-Sharpennng has occurred in the forms recorded in TCL. In only two of the ten stems which contain a stem-initial fortis consonant has e-Sharpennng occurred. The figures of this pilot study are suggestive of a correlation, although it must be pointed out that L-Mutation is a very regular rule in Babine and no exceptions have been noted. Also, under L-Mutation, the sound changes *a > e and *u > i may occur, but no corresponding sound changes have been noted in Carrier. Moreover, the correlation between L-Mutation and e-Sharpennng for the
twenty-one noun and verb stems is of the same order as the correlation between the stem class (noun or verb) and e-Sharpening (sixteen to five in both cases).

In looking for traces of e-Sharpening in Babine, we need to look at stem syllables in which the stem vowel is a reflex of *e and the stem initial is fortis, and ask whether the sound change *e > i has occurred; if so, since the stem initial is fortis, the change cannot be attributed to L-Mutation. No examples have been found. In verb stems which are reflexes of *Ce(n)-t, only in those stems which are reflexes of *Cen* has the sound change *e > i occurred, due to the early nasalization of these stem vowels in PA, a process separate from any later nasalization of *Cen (or *CVn stems in general) that may have occurred in a given Athapaskan language (Leer 1974:4). Nasal umlaut of *Cen stems is not a rule of Babine: -t'ën 'work, do P', -t'en 'see', tšen (Lake Babine) 'summer', -tšen 'shadow', q'en 'red willow', -qen '(beaver) lodge'.

4.4 Chronological stages in L- and F-Mutation

In TCL (sects. 2828-40), certain contrasts are drawn between Babine and Carrier, and transcriptions are given of some Babine words. When the vowels of Morice's Babine transcriptions are charted, some significant facts emerge:

<table>
<thead>
<tr>
<th></th>
<th>*i</th>
<th>*e</th>
<th>*a</th>
<th>*u</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-class syllable</td>
<td>i</td>
<td>i, ê</td>
<td>ē, a</td>
<td>u</td>
</tr>
<tr>
<td>F-class syllable</td>
<td>i, ê</td>
<td>ē</td>
<td>ē</td>
<td>a</td>
</tr>
</tbody>
</table>

According to the description given by Morice, in section 2 of his work, of the phonetic values of these symbols, this chart can be transliterated as follows:

<table>
<thead>
<tr>
<th></th>
<th>*i</th>
<th>*e</th>
<th>*a</th>
<th>*u</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-class syllable</td>
<td>i</td>
<td>ē</td>
<td>ē ~ a</td>
<td>u</td>
</tr>
<tr>
<td>F-class syllable</td>
<td>ē</td>
<td>ē</td>
<td>a</td>
<td>o</td>
</tr>
</tbody>
</table>

Possibly the reflex of *a in L-class syllables is [a] rather than [e] ~ [a], an intermediate vowel with respect to Morice's frame of reference; otherwise there seems no reason to doubt Morice's transcriptions, which elsewhere are trustworthy. On the other hand, it may be that L-Mutation had not yet affected certain reflexes of *a in L-class syllables--and the language probably contained [a] in L-class syllables at this time in such loanwords as dayl 'chief'. L-Mutation and F-Mutation are plainly discernible in each of the vowels. However, the processes have not evolved so far that a phonemic realignment of the phones has occurred yet (that is, there are no splits and mergers), although there appears to be phonemic overlap between the L-class allophone of /e/, the reflex of *e, and the F-class allophone of /i/, the reflex of *i. A realignment becomes possible after the former has merged with the L-class allophone of /i/ as it has in modern Babine. The overlap apparently discernible in Morice's transcription is not that
corresponding to the overlap of phonemes occurring in modern Babine, which is between the L-class allophone of /e/, a reflex of *a, and the F-class allophone of /i/, a reflex of *i. It may also be noticed that the output of open syllable F-Mutation, insofar as it is discernible in Morice's transcription, is not a falling diphthong but *i > [e], a monophthong: gatsë 'bad', gatsi 'meat', gaste 'have', tsethe 'old woman', and ninastci 'I gave up' (substituting a for Morice's e but otherwise leaving the transcriptions unaltered); all these contain final ay(?) today.

The accompanying diagrams illustrate some of these points. In each, the reflexes of *a are enclosed in squares, and the reflexes of *e are enclosed in circles. Solid lines connect the L-class and F-class allophones of each phoneme, and in the last diagram, broken lines connect the reflexes that were originally allophones of the same phoneme.

The picture concerning the rounded vowels in Morice's transcriptions is not clear. All that can be safely said is that F-Mutation affecting the F-class allophone of *u had not proceeded so far as it has today, since Morice nowhere uses ō, which would be his transcription of [ɔ], for example, modern [tʰɔ] 'water', Morice's thō- in 'I am baptized', reflexes of *tu.

Morice's publications cover the period about 1890-1930. In 1896 a "good-sized Dictionary" had been compiled in French-Carrier, which was to have been published, and since his opportunities for field work ended in 1904, it seems reasonable to conclude that his Babine transcriptions reflect a state of the language of the order of eighty years ago. In Jenness's River Babine transcriptions of kinship terms, dating from 1924-25, we find sa·k'ai 'my mother's sister' corresponding to Carrier sak'i, suggesting that fifty years ago the output of open syllable F-Mutation was diphthongal: i > ay. However, -te 'old' in 'old man', 'old woman' is also found, implying /-ti/, not /-tay/, unless e ~ ay.
In Kari's River Babine data of 1973 and 1975, L-Mutation is seen to have resulted in the merger of not only the L-class reflex of *e with the L-class reflex of *i in the phoneme /i/, but in a few instances of the L-class reflex of *a also. Thus -bib'30 'father', mi'3l 'berry', -yiz 'little', -di' 'past time', sabi 'Dolly Varden trout', ditsan ~ detsan 'crow', -Gig 'run P', and -ndig ~ -ndeg 'flower'. In each of these cases Carrier a(i) corresponds to River Babine i. That there are instances of this further merger is not surprising when it is recalled that the L-class allophone of /e/, the reflex under discussion, is higher than the F-class allophone of /i/. However, more frequently the L-class reflex of *a is the L-class allophone of /e/ without recorded alternant.
5 REFLEXES OF REDUCED VOWELS IN BABINE-CARRIER

In general, the three PA reduced vowels *a, *a, and *u are merged in Babine-Carrier in the reflex a, as discussed in section 5.1. Contiguity to front and back velars has conditioned certain splits and mergers in the reduced vowels. The factors conditioning these are relatively complex when the velar is stem-final; these factors will be discussed in section 5.2 and its subsections.

5.1 Reduced Vowel Neutralization

As already stated, in most cases a is the merged reflex of the PA reduced vowels. In the examples in this section the modern Carrier forms are given. However, the Babine forms can be obtained from the Carrier by noting that the q-series in Babine equates with the k-series in Carrier (both being reflexes of the PA *q-series), and the k-series in River Babine equates with the tš-series in Carrier and Lake Babine (both being reflexes of the PA *k-series).

The PA forms of many of the stems chosen are given in Krauss 1964. When a future (F) stem form is given as an example of a reflex of *a or *u, it is substantiated by a reconstruction of the PBC underlying stem form containing the stem-vowels *a or *u respectively. The verb stems are ones that frequently find cognates in Athapaskan languages.

Examples of the reduced vowel merger are:

PA *a
-`ts'ad 'scratch (v.)', -`zad 'liver', -`lad 'smoke', -`bad 'stomach', -dzəl 'mountain', tsəz 'firewood', -zəz 'sip (v.)', -`zəz 'skin', k'as 'alder', -ʔəl 'spruce boughs', datələn 'stick, tree'.

PA *a
-`tafl 'kick F' (PBC stem *-tafl), -ʔəfl 'eat F' (PBC stem *-ʔəfl), -ʔəfl 'throw fabric F' (PBC stem *-ʔəfl), -ʔəs 'go dì F' (PBC stem *-ʔəs), -təs 'cut F' (PBC stem *-təs), -k'əz 'be cold' (Car; Bab -q'ədz) (PBC stem *-q'əs), yəs 'snow'.

PA *u
-`yafl 'chase F' (PBC stem *-yud), -`yafl 'blow F' (PBC stem *-yufl), -təfl 'suck (on pipe) F' (PBC stem *-təud), -təfl 'grab F' (PBC stem *-kud), -təfl 'bite' (PBC stem *-k'ufl), -təsň 'handle fabric F' (PBC stem *-kuš), təsľ 'boil, abscess', som 'star' (PA *sun? or *səm? 33).
We shall therefore reconstruct PBC reduced vowels *a and *u. It is not necessary at any point in Babine-Carrier to recognize the separate existence of PBC *a; PBC *a is the merged reflex of PA *a and *u.

The marginality of the contrasts between the reduced vowels in PA has been pointed out by Krauss (1964:127; 1976:41), and we will assume that *Q = *Q^w*Q and *uQ = *uQ^w = *uQ in PBC. We shall work with the PBC representations *Q and *uQ.

The reflex of a stem-initial back velar is labialized before the stem-vowel *u. Examples are k'wan 'fire', -g'ad 'knee', k'was 'a cold' x'was 'rosebush, thorn', k'was 'a (stratus) clouds', -was 'foam' (w = y), -was 'shoulder' (Car; Bab -wadz) (cf. UK -yadze?, Koy -yadla?, Kut -yah-k'ad, Chip -yâš̂ē but Nav -yâš̂ with rounded vowel). Therefore a Rounding Regression rule is required:

(6) Rounding Regression

\[ Q^w \rightarrow Q^w^a \]

\[ \text{Stem} \]

The earlier examples in this section are covered by a rule of Reduced Vowel Neutralization (RVN):

(7) Reduced Vowel Neutralization (RVN)

\[ u \rightarrow a \]

Rounding Regression bleeds RVN and RVN counterbleeds Rounding Regression.

5.2 Reflexes of reduced vowel and stem-final velar in Carrier

We have, then, in considering the reflexes of PBC *a and *u in the environment of stem-final front and back velars, to consider the following sequences:

\[\begin{array}{llllll}
    ag & ay & ax & ug & uy & ux \\
    aG & aY & aX & uG & uY & uX \\
\end{array}\]

The merger of PA *y with *y is assumed (and also of PA *y with *y) (see Krauss and Leer 1976). Therefore in "heavy-light" stem-final alternations, PBC *y alternates with PBC *x.

5.2.1 Reflexes of stem-final velar continuants

The reflexes of each of these sequences will be discussed first for Carrier relative to verb stems. Some preliminary discussion of verb stem sets will be necessary. Leer (1974) has shown that the PA primary (i.e., not secondarily derived) stem-set types of variable closed stems may be classified by the (early) PA stem-nuclei V V' V", and by the perfective stem-final consonant manner T', T, or Z (sect. 3.2), giving a 3 x 3 classification. In Carrier, since in general the reflexes of the PA stem-final manners T' and T have merged with Z, the primary stem sets are of three types in a 3 x 1 classification and the stem-set types are in
one-to-one correspondence with (underlying) stem types. The stem-set types, alias stem types, may be related to the PA stem nuclei as follows:

<table>
<thead>
<tr>
<th></th>
<th>PA</th>
<th>I-O</th>
<th>P</th>
<th>F-U^35</th>
</tr>
</thead>
<tbody>
<tr>
<td>type 1</td>
<td>V</td>
<td>CVS</td>
<td>CvZ</td>
<td>CvS</td>
</tr>
<tr>
<td>type 2</td>
<td>V?</td>
<td>CVS</td>
<td>CVZ</td>
<td>CvS</td>
</tr>
<tr>
<td>type 3</td>
<td>V</td>
<td>CVS</td>
<td>CVZ</td>
<td>CvS</td>
</tr>
</tbody>
</table>

In the body of the table, V represents a long vowel and v a short vowel, and Z, S represent voiced and voiceless continuants respectively. When the stem final is d, t, or s, each of the three stem-set types is represented in the data, even though, as pointed out by Leer, in Carrier (and in Navajo), in many cases the F-U stem vowel in the third type has shortened analogously with the stem vowel in the first and second types. The stepped line in the table separates the reflexes of full and reduced vowels.

When the stem final is the reflex of a PA front or back velar, these three stem-set types are still apparent when the modern stem vowel is e or a:

<table>
<thead>
<tr>
<th></th>
<th>I-O</th>
<th>P</th>
<th>F-U</th>
<th>I-O</th>
<th>P</th>
<th>F-U</th>
<th>I-O</th>
<th>P</th>
<th>F-U</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ceh</td>
<td>Cay</td>
<td>Cax</td>
<td>Cah</td>
<td>Cay</td>
<td>Cax</td>
<td>Caih</td>
<td>Ci</td>
<td>Cih</td>
</tr>
<tr>
<td>2</td>
<td>Ceh</td>
<td>Ce</td>
<td>Cax</td>
<td>Cah</td>
<td>Ca</td>
<td>Cax</td>
<td>Caih</td>
<td>Cai</td>
<td>Cih</td>
</tr>
<tr>
<td>3</td>
<td>Ceh</td>
<td>Ce^37</td>
<td>Ceh</td>
<td>Cah</td>
<td>Ca</td>
<td>Cah</td>
<td>Caih</td>
<td>Caih</td>
<td></td>
</tr>
</tbody>
</table>

Concerning the alternation between Cay and Co, for the P stem in different stem sets of this type, Morice gives either Cay or Co. The modern form in each case is Co, and Morice yields some chronology for the change Cay > Co. In his symbolization we find the progression e(r) > ā(r) > ô > o^36 where e = a, ā = α, ô = o, a change that was in process during the time of his residence at Fort St. James (1885-1904), Cay being the pronunciation of the passing generation and Co of the younger. A rule of a-velarization accounts for the vowel: a > o/ γ/. Also involved is the loss of stem-final γ. As may be seen from the P stems of Ceh and Cah stems of types 2 and 3 (with long stem vowel in P), this is part of a general process γ-Deletion of the loss of the reflex of *γ following long stem vowels.

Looking now at the F-U stems of Ceh and Cah stems, we find that no sound change had occurred in Morice's time in reflexes of PBC *Cax; at least any change was only incipient. In his transcription, Corrh is very infrequently found for Cerh (Cax); for example, korh 'rabbit', tetorh 'branchy, bushy'. However, the modern F stems of the stems in question are of the shape Coh; for example, tisnoh 'I will swallow', stem -neh; utast'oh 'I will give it a blow', stem -t'ah; ?atissoh 'I will shoot something off', stem -tseh (Walker p.c.); similarly goh 'rabbit', dat'oh 'bushy'. The rule of a-velarization may therefore be extended to stem-final *ç:
Reflexes of Reduced Vowels

(8) a-Velarization

\[
\begin{array}{c}
a \rightarrow o \\
\end{array}
\]

Parallelizing the loss of stem-final *γ following long vowels, we have a rule in which *χ > h following long vowels, illustrated by these modern F stems and also by the I-O stems of the same stem sets. Alternatively, we may handle this process by rewriting stem-final *χ as γh so that *χ > h is accounted for by χ-Segmentation and γ-Deletion:

(9) χ-Segmentation

\[
\begin{array}{c}
\chi \rightarrow γh \\
\end{array}
\]

(10) γ-Deletion

\[
\begin{array}{c}
γ \rightarrow 0 \\
V \text{long} \\
\end{array}
\]

a-Velarization feeds γ-Deletion and γ-Deletion counterbleeds Vowel Lowering (sect. 2.2.3). χ-Segmentation feeds γ-Deletion and, as the rules are written, also counterbleeds a-Velarization and Vowel Lowering:

<table>
<thead>
<tr>
<th>PBC</th>
<th>*-tsɔγ</th>
<th>*Gɔx</th>
<th>*-γiɔx</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-Velarization</td>
<td>-tsɔγ</td>
<td>Gɔx</td>
<td>---</td>
</tr>
<tr>
<td>Vowel Lowering</td>
<td>---</td>
<td>---</td>
<td>-γeɔx</td>
</tr>
<tr>
<td>χ-Segmentation</td>
<td>---</td>
<td>Goyh</td>
<td>-γeyh</td>
</tr>
<tr>
<td>γ-Deletion</td>
<td>-tso</td>
<td>Goh39</td>
<td>-γeɔh</td>
</tr>
</tbody>
</table>

The stem sets of Caih stems may be accounted for by a parallel set of rules:

(11) a-Raising

\[
\begin{array}{c}
a \rightarrow i \\
\end{array}
\]

(12) χ-Segmentation

\[
\begin{array}{c}
\chi \rightarrow yh \\
\end{array}
\]

(13) γ-Deletion

\[
\begin{array}{c}
y \rightarrow 0 \\
V \text{high} \\
\end{array}
\] #

The stem finals which condition a-Raising are the semivowel y and the front velar x. The specification of the feature [+high] in γ-Deletion is necessary, since y is not deleted following the
stem-vowel a. y is deleted following the stem-vowel u as well as i (see examples later in this section). In comparing y-Deletion with γ-Deletion, it should be noted that the feature specifications are such that a [+high] vowel is redundantly [+long].

x-Segmentation involves a reanalysis of the falling diphthong ai in modern Carrier, rewriting the sequence as ay, and the transcriptions ai and aih may be considered equivalent to ay and ayh respectively. If x-Segmentation were reformulated and supplemented in an Extended Segmentation rule in which stem-final x became ih and stem-final y(?) became i(?), the alternative transcriptions would be obtained and other rules would require only minor adjustments (g-Vocalization feeding Extended Segmentation). However, the formulation of such a rule has its difficulties, centering mainly in the incorporation of y? > i? in the rule, so that the formulation becomes something of a tour de force without offering any corresponding insights.

a-Raising and Vowel Raising (sect. 2.2.3) feed y-Deletion, and x-Segmentation feeds y-Deletion and, as the rules are written, also counterbleeds a-Raising and Vowel Raising:

<table>
<thead>
<tr>
<th>PBC</th>
<th>*-Gay[^40]</th>
<th>*danax</th>
<th>*-t'ex</th>
<th>*?ax</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>'be dry'</td>
<td>'kinnikinnick'</td>
<td>'stretch'</td>
<td>'snowshoe'</td>
</tr>
<tr>
<td>a-Raising</td>
<td>-Gly</td>
<td>danix</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Vowel Raising</td>
<td>---</td>
<td>---</td>
<td>-t'ix</td>
<td>---</td>
</tr>
<tr>
<td>x-Segmentation</td>
<td>---</td>
<td>daniyih</td>
<td>-t'iyh</td>
<td>?ayh</td>
</tr>
<tr>
<td>y-Deletion</td>
<td>-Gi</td>
<td>danih</td>
<td>-t'ih</td>
<td>---</td>
</tr>
</tbody>
</table>

Turning now to cases in which the stem final is the reflex of a PA front or back velar, and the modern stem vowel is o, i, or u, three stem-set types are no longer apparent but are merged in a stem-set type of the form CVh CV CVh (except that when the stem vowel is i or u, the P stem final may be g instead of zero). Considering first the modern stem-vowel o, the PBC underlying stem is *Cux, and the stem form with reduced vowel is *Cux in F-U, *Cuy in P. Therefore, paralleling the rule for a-Velarization there is a rule of u-Velarization:41

(14) u-Velarization

\[
\begin{array}{c}
u \\
\rightarrow \text{o} \\
\quad \quad \frac{[Q\text{cnt}]}{\#}
\end{array}
\]

Unlike a-Velarization, the process of u-Velarization was completed in Morice's time, an intermediate point in the sound change being recorded in only one stem, sö [sɔ] in his transcription, modern form so 'frost'.

u-Velarization feeds γ-Deletion and, as the rules are written, x-Segmentation counterbleeds u-Velarization. u-Velarization bleeds Rounding Regression and RVN, and reciprocally is counterbled by them:
Reflexes of Reduced Vowels

Since o is a [+long] vowel, and a- and u- Velarization precede γ-Deletion, the feature [+long] need not be specified in the structural description of γ-Deletion. With this revision, γ-Deletion counterbleeds a- and u-Velarization.

We have already accounted for the stem sets of Cih-stems in considering Caih stems since PA *a is merged with *a in PBC. a-Raising may be rewritten as a rule of Reduced Vowel Raising (RVR) to include the derivation of Cuh stems:

(15) Reduced Vowel Raising (RVR)

\[ [-\text{long}] \rightarrow \begin{array}{c} +\text{long} \\ +\text{high} \end{array} / \begin{array}{c} -\text{sy} \\ +\text{high} \\ +\text{cnt} \end{array} (?) \ # \]

RVR feeds γ-Deletion, and the two rules together with x-Segmentation correctly account for the stem-set -kuh -ku, reflexes of the stem *-qux 'vomit', cognate with a stem set in Navajo which is of stem-type 1 (that is, the I stem vowel is the reflex of a full vowel and the P stem vowel of a reduced vowel). RVR bleeds Rounding Regression and RVN, and reciprocally is counterbled by them:

\[ \begin{array}{c|c|c|c|c} \text{PBC} & *-\text{zuy} & *-\text{qux} & *-\text{quy} & *-\text{qux} \\ \hline \text{RVR} & \text{---} & \text{---} & \text{---} & \text{---} \\ \text{x-Segmentation} & \text{---} & \text{---} & \text{---} & \text{---} \\ \text{γ-Deletion} & \text{---} & \text{---} & \text{---} & \text{---} \\ \text{Rounding} & \text{---} & \text{---} & \text{---} & \text{---} \\ \text{Regression} & \text{---} & \text{---} & \text{---} & \text{---} \\ \text{RVN} & \text{---} & \text{---} & \text{---} & \text{---} \end{array} \]

We have therefore accounted for the reflexes of the eight sequences listed above of PBC reduced stem vowel and front or back veiar continuent stem final. These reflexes are summarized in the following table:

\[ \begin{array}{c|c|c|c|c} \text{v} = *e & \text{v} = *u \\ \hline \text{v} \text{y} \text{y}, \text{v} \text{x} & \text{v} \text{u} > \text{o} & \text{v} \text{x} (> \text{oh}) \\ \text{v} \text{y} \text{y}, \text{v} \text{x} & \text{i} \text{h} & \text{u} \text{uh} \\ \end{array} \]
For the reflexes of \(*aQ\), both Morice's forms and the modern forms are given.

We have now to consider the cases of stem-final \(g\) that occur in modern Carrier.

### 5.2.2 Reflexes of stem-final \(g\)

In section 5.2.1 it was tacitly assumed that the stem final in \(P\) stems is always \(Z\) in Carrier. However, when the stem final is the reflex of a velar, the stem final in the \(P\) stem may be \(T\); that is, the stem final may be \(g\). We shall seek to show that Carrier stem-final \(g\) is found only following the reflexes of reduced stem vowels.

Before considering the cases of stem-final \(g\) that occur in the perfective of \(-Cih\) and \(-Cuh\) verb stems, we will consider the usitative (customary) stem of \(-Cvd\) underlying stems in which, when the stem is of type 1 or 2 (that is, the stem vowel in the usitative is short), the Carrier stem final is \(g\). There is more data for the \(g\)-final usitative (\(U\)) stems than for the \(g\)-final \(P\) stems. Carrier stem-final \(g\) in a \(U\) stem is a reflex of PA \(*g\) and is cognate with Chipewyan \(iy\), Sarcee \(z\) (\(\sim dz\) when a vocalic suffix follows), and Chilocotin \(g\) (King p.c.), for example; and also with Navajo \(\gamma\). (The stem-final reflexes of PA \(*g\), \(*k\)', \(*G\), and \(*q\)' are all \(\gamma\) in Navajo.)

Leer (1974:17f.) has discussed the stem sets of \(-Cvd\) underlying stems. In the Alaskan languages, from his account, the stem sets appear to be as follows. There is no "light-heavy" stem-final alternation between the I-0 and the \(P\) stems. In the case of the \(F\) and the \(U\) stems, the stem finals are \(j\) and \(g\) (reflexes of the suffixes \(*-j\) and \(*-g\) respectively), if, and only if, the stem vowel is a reflex of a reduced vowel; that is, if the stem is of type 1 or 2. If the stem is of type 3 it is invariable (and the stem vowel is the reflex of a full vowel throughout the stem set).

The Carrier \(-Cvd\) stem sets follow the same pattern. We have seen that stem-type 3 has generally combined with stem-type 2 in Carrier. However, there are two examples of \(-Cvd\) underlying stems in Carrier that remain in stem-type 3. \(-ts\)ad 'untwist' (TCL: 2148), which is invariable in Carrier, is probably cognate with Navajo \(-t\)s\(\ddot{a}\)ad 'card (wool)', which belongs to stem-type 3 in Navajo. \(-\gamma\)ad 'shake' (TCL:1184, 1228) is the second example of a stem that (in some of its derivational bases) is invariable in Carrier, and in Navajo belongs to stem-type 3.

In the \(U\) stems of \(-Cvd\) stems, therefore, Carrier stem-final \(g\) is the reflex of \(*g\) following reflexes of a reduced vowel. Stem-final \(g\) in \(U\) stems is not found following the reflex of a full vowel.

The PBC reflexes of PA \(U\) stems in the stem sets of \(*-Cvd\) stems of types 1 and 2 will be \(*-Cag\) in the stem sets of \(*-Cid\), \(*-Ced\), and \(*-Cad\) stems, and will be \(*-Cug\) in the stem sets of \(*-Cud\) stems, or in the stem sets of \(*-Cvd\) in which \(V \neq \upsilon\) and the ablaut \(*V \sim \upsilon\) occurs.
Reflexes of Reduced Vowels

The reflexes in Carrier of the PBC U stems in the stem sets of *CVd stems of types 1 and 2 are found to be -Cug in one stem set in TCL, -Cog in two stem sets, and -Cag in other stem sets. The table shows the U stem, the underlying stem of the stem set in which it is a member, and hence the PBC U stem of which it is the reflex.

<table>
<thead>
<tr>
<th>Carrier U stems</th>
<th>Carrier underlying stems</th>
<th>PBC U stems</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Cug</td>
<td>-Cud (one example)</td>
<td>*-Cug</td>
</tr>
<tr>
<td>-Cog</td>
<td>-Ced, reflexes of *-Ced, *e (\sim) *u (two examples)</td>
<td>*-Cug</td>
</tr>
<tr>
<td>-Cag</td>
<td>(1) -Cud (four examples)</td>
<td>*-Cug</td>
</tr>
<tr>
<td></td>
<td>(2) -CVd, V (\neq) u</td>
<td>*-Cag</td>
</tr>
</tbody>
</table>

The one example of a -Cud stem with U stem -Cug is -zud 'skate' (TCL:1123). The two examples of -Ced stems that are reflexes of stems in the stem sets of which ablaut *e \(\sim\) *u occurs are -ged (CCBD; -gid TCL:686) ‘go on all fours’ and -ged ‘spear’ (TCL:635); their U stems are therefore reflexes of *-Qug, where Q is a back velar. These reflexes will be discussed in section 5.2.4. The four examples of -Cud stems with U stems -Cag are -qud (modern -džud) ‘frighten’ (TCL:798), -tšud ‘take’ (TCL:872), -yud ‘chase’ (TCL:1100), and -t'ud ‘suck on pipe’ (TCL:1230).

Given that the stem-final g is the reflex of PBC *g, no further rule beyond RVN is required to account for the U stems -Cag as reflexes of PBC *-Cag or *-Cug. However, an alternative derivation of reflexes -Cag of *-Cug will be considered in section 5.2.3 involving a rule of Labialization Loss in which -Cag is derived from the reflex -Cag\^w of *-Cug. The reflex -Cag\^w is covered by a rule of Velar Labialization, which is described in the same section.

We need to consider the phonetic-phonemic value of -Cug in TCL before we are in a position to consider its derivation. The index to CCBD contains no instances of -Cug. Morice's -Cug corresponds to CCBD -Cag\^w. The CCBD examples and the examples of -Cug that have been found in TCL are as follows:

- t'ag\^w 'suck U'            - t'ug (\(~\sim\)t'ag) (TCL:38, 1227, 1230, 2350)
- nag\^w 'flash U; be polished, shining' - nug -nag (TCL:728, 731, 2149)
- dląg\^w 'pull, tow, lead with rope P' - dlug (TCL:972, 1220)
- dag\^w 'be short' - dug (TCL:251, 1062, etc.)
  \(~\sim\)dag 'be close by/soon' - dug (TCL:449, 490)
---- 'sweepings' (h\(^w\)a)zug\(^44\) (TCL:38)
---- 'be inside out' - gug\(^45\) (TCL:1169)
(dą)tš'ag\^w 'porcupine' (da)t'y'ug (TCL:54)
- tsag\^w 'penis; testicles' - ts'ug\(^46\) (TCL:38, 72)
Cock (1976:25) gives the two forms nillag\(^W\) 'it's short' and dats'ag\(^*\) 'porcupine quill', and states that the vowel is unround-
ed, so that Morice's -Cug is likely to have represented [-Cuk],
become modern [-Cak].

We shall find further reflexes of *-Cag and *-Cug in certain
perfective stems, discussed in the following paragraphs. The dis-
cussion of reflexes of *-Cug is continued in section 5.2.3 in
association with the rule of Velar Fronting, and in section 5.2.4.

As further illustration of the reflexes of *-Cag and *-Cug,
and of the hypothesis that Carrier stem-final g is found only
following the reflexes of reduced stem vowels, we shall consider P
stems of -Cih and -Cuh stems where the stem final is g. The
examples, together with Navajo cognates, are as follows:

\[
\begin{array}{ccc}
\text{Carrier} & \text{Navajo} & \\
\hline
\text{I} & \text{P} & \text{I} & \text{P} \\
-nih & -nag & 'tell, announce' & -ni\text{fi} & -në? \\
-tih & -tag & 'crack, break' & -ti\text{fi} & -ti? \\
-(d)luh & -(d)lag\(^W\) & 'snare, lasso; pull, tow, lead
\text{with rope}' & -(d)lë\text{eh} & -(d)lò? \\
-ts'ih & -ts'ag & 'pinch with nails' & ---- & -ts'ì? \\
& & & (neut.) & \\
\end{array}
\]

The first three of the Navajo examples above belong to stem-
type I, and therefore the P stem vowel is the reflex of a reduced
vowel. The stem set for the fourth is invariable, stem -ts'ìh, but
with a neuter perfective -ts'ì??. Recalling that ? is the stem-final
reflex of either PA *g or *k' in Navajo (as well as of *G and *q'),
Carrier g is the reflex of either PA *g or *k' in these examples.

With respect to the P stems of -Cih and -Cuh stems where the
stem final is not g (that is, where it is Ø), the Carrier ex-
amples that can be matched with Navajo cognates are as follows:

\[
\begin{array}{ccc}
\text{Carrier} & \text{Navajo} & \\
\hline
\text{I} & \text{P} & \text{I} & \text{P} \\
-ts'ih & -ts'i & 'blow (breeze)' & -ts'ë\text{ih} & -ts'ë\text{ih} \\
-ts'ìh & -ts'i & 'point, drive in long slender
\text{object}' & -tsë\text{eh} & -ts'ìh \\
-kuh & -ku & 'vomit' & -kô\text{o}h & -kwëh \\
-dìh & -dì\text{ì} & 'breathe' & -džì\text{ìh} & -džì? \\
-nih & -ni & 'handle (momentaneous)' & -ni\text{fi} & -ni? \\
-nih & -ni & 'remember' & -ni\text{ìh} & -ni? \\
-ts'ih & -ts'ì & 'prickle, smart (as from nettle)' & -ts'ë\text{ìh} & -ts'ë? \\
-dzuh & -du & 'brush, comb' & -žô\text{o}h & -žô? \\
\end{array}
\]
The examples divide into two groups, those belonging to stem-type 1 in Navajo and whose P stem vowel is the reflex of a PA reduced vowel, and those belonging to stem-type 2 or 3 and whose P stem vowel is the reflex of a PA full vowel. We have already abstracted from the first group the examples in which the Navajo P stem-final is *.52 Leer does not state the reflex of PA stem-final *γ in Navajo, but assuming that, since the reflex of PA stem-final *g and *k' is ? (not h), the Navajo P stem-final h in this first group is the reflex of *γ (which parallels the fact that Navajo stem-final h may be the reflex of *γ), we find that the reflex of PBC *ay (< PA *aγ and *aγ) is i in Carrier and of PBC *uy (< PA *uγ) is u.

At this point, therefore, we conclude that in Carrier the reflex of PA *g and *k' in verb stems is g and of *γ > *y is Ø following the reflexes of reduced stem vowels. To cover the latter case, no addition needs to be made to RVR and y-Deletion (and RVN).

In the second group of Carrier-Navajo verb stem-set correspondences, in which the Navajo verb stems are of types 2 or 3, Carrier stem-final Ø corresponds to Navajo stem-final ?. We can show that at least four of these stem finals are the reflexes of PA *g or *k'. The tones of the Navajo I stems enable us to reconstruct PA stem-final *k' in the case of -dzih and -niih, and PA stem-final *g or *x in the case of -niih, -tiš'ih, and -zóoh. For three of these five stems we have Leer's early PA reconstructions -dzih < *-D-xiʔk'w (> *-D-xiʔk'), -niih < *-niʔg, and -zóoh < *-xu'g (the stem finals are spirantized in the imperfective). We are left with Navajo -tiš'ih in which the stem final is ambiguously the reflex of *g or *x. It is not essential to our argument that all the stem finals should be the reflexes of PA *g or *k', but only that some at least should be, in order to demonstrate that the reflex of PA *g and *k' is zero in Carrier following the reflex of a full stem vowel.

In the stems under discussion, Carrier stem-final g corresponds to Babine stem-final g following short stem vowels, but Babine stem-final g corresponds to Carrier Ø following long stem vowels. Therefore, the above discussion suggests that the PBC reflex of stem-final PA *g and *k' is *g53 and that the stem-final reflexes of PBC *g in Carrier are g following the reflexes of reduced vowels and Ø following the reflexes of full vowels. However, our discussion has been confined to -Cih and -Cuḥ verb stem sets. Both *g and *y are deleted following long high stem vowels, but when our survey is extended to -Caḥ verb stem sets, it is found that the reflex of *g is y following a long nonhigh stem vowel. *g becomes y following long stem vowels and y is deleted following high stem vowels. A rule of g-Vocalization therefore feeds y-Deletion.

(16) g-Vocalization

\[
g \rightarrow y / \left[ \begin{array}{l} V \\ [+\text{long}] \end{array} \right] \quad \# \]
5.2.3 Reflexes of stem-final \textit{*g}

We have found that there are overt reflexes \textit{g} of PBC \textit{*g} stem-finally in Carrier following the reflexes of reduced stem vowels. We shall find that there are no certain overt reflexes of \textit{*G} stem-finally except in a certain special case to be discussed in the second half of this section. At that point we shall take up again the reflexes of \textit{ug}, which in the previous section have not been fully covered.

In Carrier -\textit{Ceh}, -\textit{Cah}, and -\textit{Coh} verb stem sets, stem-final \textit{g} is never found in the perfective, either following the reflexes of reduced vowels or of full vowels. Verb stem sets in which Carrier stem-final \textit{g} might have been looked for in the perfective, in view of the PA stem final, are given below. The stem sets are selected on the basis of the availability of cognates in at least one of Navajo, Chipewyan, and Sarcee. Tentative reconstructions of the early PA underlying stems are given in the final column, replaced by Leer's reconstructions if available. Those stem sets are chosen which, when the PA underlying stem is reconstructed, have stem finals which are the reflexes of PA \textit{*G} or \textit{*q}' . In the cases where Leer's reconstruction is not available, then PA \textit{*G} is reconstructed if the Sarcee perfective stem final is \textit{g} and \textit{*q}' is reconstructed on the basis of the tone carried by the vowel of the I stem in any of the three languages (high in Chipewyan, and low in Sarcee or Navajo). (See chart on following page.)

Again, the stem sets divide into two groups, those in which the (late) PA stem vowel is reduced in the perfective (corresponding to the stem-nucleus \textit{V} in the early PA underlying stem), and those in which the PA stem vowel is full in the perfective (corresponding to stem-nucleus \textit{V}' or \textit{V}' in the early PA underlying stem). In neither case do we find any examples of stem-final \textit{g} in the Carrier reflexes of the perfective stems. This is parallel to what is found in verb stem sets generally in which, as noted above, the P stem final is \textit{Z} (sect. 5.2.1) (the exception occurring when the stem final is the reflex of a front velar when the stem final may be \textit{g}, sect. 5.2.2). The stem-final \textit{?} occurring in the P stems of Carrier -\textit{ah} 'deceive' and -\textit{tleh} 'handle mush' should not be assumed to be a reflex of a PA back velar,\textsuperscript{55} since the suffixes that occur in the stem sets of open CV stems may often have overt realization in the stem sets of closed CVC stems when the stem final is the reflex of a back velar and when the stem vowel is the reflex of a full vowel; for example, -\textit{yeh}\textsuperscript{56} -\textit{yai} -\textit{yit} -\textit{yej/yij} 'grow' in Carrier, -\textit{yex} -\textit{yey} -\textit{yax/yit} -\textit{yex/yij} in Babine. The PA perfective suffixes include \textit{*-y} and \textit{*-?}, so that the stem-final \textit{?} in the P stems of -\textit{ah} and -\textit{tleh} are probably reflexes of the PA \textit{*-?} suffix.
<table>
<thead>
<tr>
<th>Carrier</th>
<th>PA reconstruction</th>
<th>Source</th>
<th>Reconstructed stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>-t'ah</td>
<td>'fly'</td>
<td>Nav, cf. Sar</td>
<td>*-t'aG</td>
</tr>
<tr>
<td>-neh</td>
<td>'fall (anim.); extinguish'</td>
<td>Leer</td>
<td>*-neG</td>
</tr>
<tr>
<td>-dzh</td>
<td>'hook, clasp'</td>
<td>Chip</td>
<td>*-d̂z'eq'</td>
</tr>
<tr>
<td>-neh</td>
<td>'swallow (v.)'</td>
<td>Sar, Nav, Chip</td>
<td>*-neq'</td>
</tr>
<tr>
<td>-dloh</td>
<td>'laugh (v.)'</td>
<td>Leer</td>
<td>*-dluq'</td>
</tr>
<tr>
<td>-ʔah</td>
<td>'deceive'</td>
<td>Sar, Nav, Chip</td>
<td>*-ʔaʔG</td>
</tr>
<tr>
<td>-ba</td>
<td>'war (v.)'</td>
<td>Leer</td>
<td>*-waʔG</td>
</tr>
<tr>
<td>-deh</td>
<td>'wake pl'</td>
<td>Leer</td>
<td>*-deʔG</td>
</tr>
<tr>
<td>-zoh</td>
<td>'spit (v.)'</td>
<td>Nav, Chip Hupa -Weq'</td>
<td>*-š'eq'</td>
</tr>
<tr>
<td>-ts'e nh</td>
<td>'worm crawls'</td>
<td>Chip ('wiggle')</td>
<td>*-ts'eʔq'</td>
</tr>
<tr>
<td>-dzh</td>
<td>'gum (v.)'</td>
<td>Sar, Chip</td>
<td>*-d̂z'eq'</td>
</tr>
<tr>
<td>-ʔleh</td>
<td>'handle mush'</td>
<td>Nav, Chip Hupa -tiq'</td>
<td>*-ʔleʔq'W</td>
</tr>
<tr>
<td>-ʔohs</td>
<td>'count'</td>
<td>Leer</td>
<td>*-taʔq'</td>
</tr>
</tbody>
</table>

Reflexes of Reduced Vowels
However, in Babine we have one known case in which the P stem final is G: -naG 'extinguish P'. This stem corresponds to Carrier -no given in the table above, earlier -nay. On this somewhat slender evidence, we will assume that in pre-Carrier stem-final PBC *G merged with PBC *γ in a process of G-Weakening, rather than that stem-final *G and *γ were both lost following long stem vowels.

(17) G-Weakening

\[ G \rightarrow \gamma \]

G-Weakening feeds a-Velarization and also u-Velarization and γ-Deletion. However, since the sound changes *a > o and *u > o described by a- and u-Velarization occur when the stem final is *G as well as *χ or *γ, the feature [+cnt] can be omitted in the structural descriptions of a- and u-Velarization. G-Weakening is then independent of a- and u-Velarization but still feeds γ-Deletion.

PBC

<table>
<thead>
<tr>
<th>Stem</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>*-naG</td>
<td>'extinguish P'</td>
</tr>
<tr>
<td>*-dluG</td>
<td>'laugh P'</td>
</tr>
<tr>
<td>*-kaG</td>
<td>'ribs'</td>
</tr>
<tr>
<td>*suG58</td>
<td>'saliva'</td>
</tr>
</tbody>
</table>

(Vowel Lowering)

<table>
<thead>
<tr>
<th>Stem</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>-nay</td>
<td>(soG)</td>
</tr>
<tr>
<td>-dluy</td>
<td>soy</td>
</tr>
<tr>
<td>-kay</td>
<td>soy</td>
</tr>
</tbody>
</table>

a/u-Velarization

<table>
<thead>
<tr>
<th>Stem</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>-noγ</td>
<td>soy</td>
</tr>
<tr>
<td>-dloγ</td>
<td>soy</td>
</tr>
</tbody>
</table>

γ-Deletion

<table>
<thead>
<tr>
<th>Stem</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>-no</td>
<td>so</td>
</tr>
<tr>
<td>-dlo</td>
<td>so</td>
</tr>
</tbody>
</table>

The stems which in Carrier have stem-final g (or gW) and which are certainly or probably reflexes of PA *G or *q', PBC *G, are as follows:

- gant'ag  'collarbone'
- datš'agW 'porcupine'
- cf. tš'oh 'quills; be pointed'
- -dagW ~ -dag 'short, short of; near'
- -tsagW (CCBD) 'penis; testicles'
- cf. -ts'ug (TCL) 'penis, testicles'
- -dlagW 'pull, tow, lead
with rope P'

Koy -t'uGaʔ, Nav -t'ōg
Kut -tš'ōg 'sharp-pointed'
OTan k'eh, Kut tš'ōʔ, Koy k'ux, UK tš'uh, Chip tš'ōy
Chip -důwē, Sar -důwē
Matt -tšōʔg, Hupa -tšWōq',
Nav -tšōʔ, Kut -tšōg; Chip
-tšōγ 'round protuberance,
lump'
Matt -low 'lasso, fish with
line' (i.e., 'pull up
fishing line'); and other
cognates

In the following examples, the cognates are uncertain:

- gag  'rub, massage; iron'
  ? U stem of -ged 'spear'.
  Note meaning of cognate
forms: Chip -gër 'spear at, poke, chisel'; Hupa -ged 'shove (a stick-like object)'; i.e., 'move a stick-like object at an incline to a surface' (?) (but see sect. 5.2.4)

-gag 'scar' ? Matt gak'eh

It is noticeable that these examples of stem-final g, gW are generally the reflexes of *G (or PA *q') following the reflex of the rounded reduced vowel *u. -gag 'scar' is the most likely exception. The stem final of -gag 'rub', if it is a U stem as suggested, is a reflex of *g and not *G.

There is, therefore, evidence of a split in the reflexes of *uG. *uG may merge with *ug in pre-Carrier, by a process of Velar Fronting. If Velar Fronting does not occur, then *uG > o (by u-Velarization and subsequent rules), and if Velar Fronting does occur, then *uG > *ug > agW. The same process occurs in pre-Babine, but not necessarily affecting the same lexical items. It is not understood what further factors condition the split.

There are a number of examples that seem to substantiate Velar Fronting. The reflexes of the PA verb stem *-s'eq' > *-s'eq' 'spit' exhibit Vowel Lowering in Carrier (showing that the back velar stem final was not fronted), but Velar Fronting in Babine: Car -zoh -zoh, Bab -zuxW (an invariable stem and therefore a reflex of *-s'eq with reduced stem vowel; see Leer 1974:23f.). The corresponding noun stem exhibits Vowel Lowering in both languages: Car so, Bab soG 'spittle, saliva'. Two other lexical items that differ with respect to Velar Fronting in the two languages are (1) porcupine: Car datš'agW, Lake Babine [tatš'3k] (phonemically parallel to Carrier; see sect. 5.4.3), PBC *dak'iG; and (2) short': Car ndagW, Bab [nt3k], PBC *nduG. Velar Fronting has occurred in the Carrier forms but not in the Babine. But in the case of the cognate 'quill', PBC *k'ux, Velar Fronting has occurred in neither language.

Velar Fronting has occurred in both the Carrier and Babine reflexes of the PA lexical item *-dluq' < *-dleq'W (see sect. 5.4.1 for the PA reconstruction) 'tow, hoist' throughout the stem set, showing that the process of Velar Fronting needs to be extended to any stem-final back velar following a rounded vowel, reduced or full.

(18) Velar Fronting

\[
Q \xrightarrow{opt} K \left/ \left[ V \right] \right. \text{+rnd} \rightarrow \#
\]

If Velar Fronting operates on one member of a verb stem set, it probably operates on all members of the set; there are, for example, no stem-sets oh u/agW oh oh in which Velar Fronting has operated in the P stem only. The Carrier reflexes of the stem *-dluq' 'tow, hoist' are -dluh -dlagW -dluh -dluh.
Velar Fronting bleeds those rules which apply when the stem final is the reflex of a back velar and the stem vowel the reflex of a rounded vowel, Vowel Lowering, G-Weakening, u-Velarization, x-Segmentation, and y-Deletion. Velar Fronting feeds RVR, g-Vocalization, and x-Segmentation as follows:

<table>
<thead>
<tr>
<th>PBC</th>
<th>*CuG</th>
<th>*CuY</th>
<th>*CuX</th>
<th>*CuG</th>
<th>*CuY</th>
<th>*CuX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velar Fronting</td>
<td>Cug</td>
<td>Cuγ</td>
<td>Cux</td>
<td>Cug</td>
<td>Cuγ</td>
<td>Cux</td>
</tr>
<tr>
<td>RVR</td>
<td>---</td>
<td>Cuγ</td>
<td>Cux</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>x-Segmentation</td>
<td>---</td>
<td>---</td>
<td>Cuγh</td>
<td>---</td>
<td>---</td>
<td>Cuγh</td>
</tr>
<tr>
<td>g-Vocalization</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>Cuy</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>y-Deletion</td>
<td>---</td>
<td>---</td>
<td>Cuh</td>
<td>Cu</td>
<td>---</td>
<td>Cuh</td>
</tr>
<tr>
<td>RVN</td>
<td>Cag</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

The output is correct in the case of Velar Fronted *CuX, *CuG, and *CuX, but incorrect in the case of *CuG (Cag instead of Cag) and *CuY and *CuY have yielded a stem-final segment γ which needs to be deleted (on the basis of parallelism with y in sequences iy and assuming that some of the stem-sets Cuγ Cu may be the reflexes of Velar Fronted *CuX *Cuγ, or *CuX *Cuγ).

The sound change *ug > ag can be described by a Rounding Metathesis rule or in two stages ug > ug > ag in which the second stage is covered by RVN. We shall adopt the two-stage solution and introduce a rule of Velar Labialization:

(19) Velar Labialization

\[ K \rightarrow K^w / \left[ V^{+\text{rnd}} \right] \quad \# \]

Velar Labialization has been formulated so as to include \( x > x^w \) as well as \( g > g^w \) (and \( \gamma > \gamma^w \); \( y \) does not meet the feature specifications of \( K \)). Therefore in cases of Velar Fronting, if Velar Fronting feeds Velar Labialization, \( Q \rightarrow K \rightarrow K' \). Suppose instead \( Q \rightarrow K \rightarrow K^w \) and \( K \rightarrow K^w \), following rounded stem vowels. These rules will generate the correct input to RVN in the case of *CuG and Velar Fronted *CuG. Velar Labialization and Velar Fronting are now revised as follows, Velar Labialization feeding Velar Fronting:

(20) Velar Labialization

\[ \left[ Q \right] \rightarrow \left[ Q^w \right] / \left[ V^{+\text{rnd}} \right] \quad \# \]

(21) Velar Fronting

\[ Q^w \rightarrow K^w / \quad \# \]

Velar Labialization entails writing Cug\(^w\) and Cog\(^w\) for Cug and Cog in the ultimate output, a result in accord with the phonetic facts. Velar Fronting has become an obligatory rule fed by the optional
part of the rule of Velar Labialization. Therefore Velar Fronting is seen as a consequence of the labialization of a back velar. It will also apply to PBC sequences \( *aq_w \). There are examples of \( Ca_u \) (= \( Caw \)) and \( Ca_w \) stems in Carrier which suggest PBC stems \( *Caq_w \). The examples include 'wau 'bark' (Bab -Gew < -Gaw by L-Mutation). There are also sequences \( au_h \) (= \( ax \)) and \( iu_h \) (= \( ix \)) (and \( ex_w < ax \) by L-Mutation in Babine in which \( uh \) is suffixal: ts’iyauh ‘all’, diuh 'four (kinds)'. The rule of Velar Fronting may be related to the synchronic fact concerning labialized velars that they are not "back" or do not "flatten" contiguous vowels in any environment. The phonetic characteristics of labialized velars in Carrier are discussed by Cook (1976:22, 40).

Velar Fronting generates the stem-final segments \( g^w x^w \) as well as \( y^w \), the latter replacing \( \tilde{y} \) which is generated by the first formulation of the rule. The rules of g-Vocalization, x-Segmentation, and y-Deletion therefore need to be expanded. We shall also add a rule of \( w \)-Adjustment so that \( w \) instead of \( \tilde{y} \) appears in the ultimate output and makes the labialized front velars parallel the nonlabialized front velars (in which \( *\tilde{y} > y \)). \( w \)-Adjustment is required only in the case of Velar Fronted *Cu_y and *Cu_y of which there are no certain examples. P stems in -Cu_h -Cu stem sets for which no cognates are available or for which the PA stem cannot be reconstructed could be reflexes of these Velar Fronted PBC forms: *Cu_y > Cu_y > Cu_y > Cu_y or *Cu_y > Cu_y > Cu_y; in both cases, Cu_y > Cu_w > Cu, by Velar Labialization, Velar Fronting, RVR, \( w \)-Adjustment, Semivowel Deletion.

(22) \( w \)-Adjustment
\[ \tilde{y}^w \rightarrow w \]

(23) \( g^w \)-Vocalization
\[ \begin{array}{c|c|c}
| g^w | & | y^w | & \left[ V \begin{array}{c}
+\text{long}
\end{array}\right] & # \\
\end{array} \]

(24) \( x^w \)-Segmentation
\[ \begin{array}{c|c|c}
| x^w | & | y^w | & h / # \\
\end{array} \]

(25) Semivowel Deletion
\[ \begin{array}{c}
\{ y^w \} \rightarrow \emptyset / \left[ V \begin{array}{c}
+\text{high}
\end{array}\right] (H) # \\
\end{array} \]

where \( H = \begin{bmatrix} -\text{syl} \\ -\text{cns} \\ -\text{son} \end{bmatrix} \); that is, \( h \) or \( ? \).

\( \tilde{y}^w \) necessarily occurs stem-finally since it is the output of Velar Labialization and Velar Fronting. In the same way that g-Vocalization does not apply to \( *eg \), \( g^w \)-Vocalization does not apply to \( *ug > ug^w \) either and so stem-final \( g^w \) occur in the output of the rules. Semivowel Deletion applies to any one of the sequences \( iy, uy, \)

i\textnu and \textit{uw}, but not to \textit{ay} or \textit{aw}. We have seen that \textit{y} is correctly deleted following \textit{i} or \textit{u}. There are no data concerning \textit{iw} (= \textit{iu}) except the numerals \textit{d\textnuh} 'four (kinds)' and \textit{\textit{itak\textacircumflexacute{a}n\textacute{t}\textnuh} 'seven (kinds)' in which, as noted, \textit{uh} (= \textit{x}) is a suffix. Semivowel Deletion needs to be restricted so that either it does not apply to the sequence \textit{iw}, or it applies only within the stem. We shall leave the problem of \textit{iw} unresolved lacking further data. (In Babine we shall find that a modification of the equivalent rule is required.)

Even as Velar Fronting (or Velar Labialization under the revision) bleeds those rules that apply when the stem final is the reflex of a back velar and the stem vowel the reflex of a rounded vowel, so Velar Labialization and Velar Fronting feed the rules that apply when the stem final is the reflex of a front velar and the stem vowel the reflex of a rounded vowel; that is, they feed \textit{w}-Adjustment, \textit{g}\textsuperscript{w}-Vocalization, and \textit{x}\textsuperscript{w}-Segmentation, and \textit{w}-Adjustment feeds Semivowel Deletion. Velar Fronting also feeds RVR which does not require revision since it applies to \textit{\textstar{Cu}x}\textsuperscript{w} and to \textit{\textstar{Cu}y}\textsuperscript{w} already. In the table of examples, \textit{\textstar{k}'ux} 'quill' is added as a case in which Velar Labialization and Velar Fronting do not occur; \textit{u}-Velarization (in which \textit{u} \rightarrow \textit{o}) and subsequent rules bleed RVN and the output in this case is \textit{k}'\textnuh (cf. \textit{*-dl\textnuh}\textsuperscript{w} > \textit{-d\textnuh}).

<table>
<thead>
<tr>
<th>PBC</th>
<th>\textit{*-dl\textnuh}\textsuperscript{w}</th>
<th>\textit{*-dl\textnuh}\textsuperscript{w}</th>
<th>\textit{*-dlug}\textsuperscript{w}</th>
<th>\textit{*-dak'ug}\textsuperscript{w}</th>
<th>\textit{*-k'ux}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velar Labialization</td>
<td>\textit{-dl\textnuh}\textsuperscript{w}</td>
<td>\textit{-dl\textnuh}\textsuperscript{w}</td>
<td>\textit{-dlug}\textsuperscript{w}</td>
<td>\textit{-dak'ug}\textsuperscript{w}</td>
<td>\textit{-}</td>
</tr>
<tr>
<td>Velar Fronting</td>
<td>\textit{-dl\textnuh}\textsuperscript{w}</td>
<td>\textit{-dl\textnuh}\textsuperscript{w}</td>
<td>\textit{-dlug}\textsuperscript{w}</td>
<td>\textit{-dak'ug}\textsuperscript{w}</td>
<td>\textit{-}</td>
</tr>
<tr>
<td>RVR</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
</tr>
<tr>
<td>\textit{x}\textsuperscript{(w)}-Segmentation</td>
<td>\textit{-dl\textnuh}</td>
<td>\textit{-dl\textnuh}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
</tr>
<tr>
<td>\textit{g}\textsuperscript{(w)}-Vocalization</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
</tr>
<tr>
<td>Semivowel Deletion</td>
<td>\textit{-dl\textnuh}</td>
<td>\textit{-dl\textnuh}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
</tr>
<tr>
<td>RVN</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
<td>\textit{-}</td>
</tr>
</tbody>
</table>

Rounding Regression (stem-initial \textit{C} = \textit{Q}) and RVN (stem-initial \textit{C} \neq \textit{Q}) counterbleed Velar Labialization. Apparent counter-examples in which the reflex of \textit{*Cuq} is \textit{Q}\textsuperscript{ag} when \textit{C} = \textit{Q} or \textit{Cag} when \textit{C} \neq \textit{Q} can be handled by a late rule of Labialization Loss. Labialization Loss is an optional rule since the reflex of \textit{*Cuq} may be \textit{Cag}\textsuperscript{w}, \textit{Cag}\textsuperscript{w} \sim \textit{Cag}, or \textit{Cag}:

(26) Labialization Loss

\[
g\textsuperscript{w}\xrightarrow{\text{opt}} g / \text{a} \quad \#
\]
Reflexes of Reduced Vowel

<table>
<thead>
<tr>
<th>PBC</th>
<th>*-yug</th>
<th>*-nug</th>
<th>*-t'ug</th>
<th>*-kug</th>
</tr>
</thead>
<tbody>
<tr>
<td>'wriggle U'</td>
<td>'flash U'</td>
<td>'suck U'</td>
<td>'take U'</td>
<td></td>
</tr>
<tr>
<td>Velar Labialization</td>
<td>-γug&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-nug&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-t'ug&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-kug&lt;sup&gt;W&lt;/sup&gt;</td>
</tr>
<tr>
<td>Rounding Regression</td>
<td>-γag</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>RVN</td>
<td>-----</td>
<td>-nag&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-t'ag&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-kag&lt;sup&gt;W&lt;/sup&gt;</td>
</tr>
<tr>
<td>Labialization Loss</td>
<td>-γag&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-nag&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-t'ag&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-kag&lt;sup&gt;W&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

The above examples are all usitative stems of underlying stems *CVd. Some preliminary discussion of these stems was given in section 5.2.2. -γag 'wriggle U' (w = γ) is derived from the underlying stem *-γag 'jump (of fish)'; 'bend', etc. -nag and -γag<sup>W</sup> are variant reflexes of a PBC stem of the form *-Qag where Q = γ. -γag<sup>W</sup> is taken to be the regular reflex and reflexes -Qag<sup>W</sup> of *-Qag are to be discussed in section 5.2.4.

-nag is a variant of -nag<sup>W</sup> 'flash, shine U', underlying stem -nad (< *-nud, cf. Hupa -nud); and -t'ag 'suck on pipe' is a variant of -t'ag<sup>W</sup> 'suck U', underlying stem -t'ud. -t'ag (< -kag) 'take U', underlying stem -t'ud, has no variant -Cag', in common with -d'ag 'frighten U', underlying stem -d'ud, and -γag 'chase U', underlying stem -yud. In these last three cases, the stem initial is a member of the t<sup>3</s> series which are reflexes of *γ or front velars, and it is possible that in these three usitative stems *u > a by an early rule.

There are also other examples in which Labialization Loss has occurred and the stem final is not a reflex of *g but of Velar Fronted *G. These are both included in the listing at the beginning of this section: -gantag 'collarbone' < *-Gantag<sup>U</sup>, and -dag 'be close (in space or time)', a variant of -dag<sup>W</sup> 'be short', < *-duG.

5.2.4 Further reflexes of *γag

In section 5.2.2 we noted reflexes -Cag, -Cag<sup>W</sup> (= -Cag<sup>U</sup>), and -Cag<sup>W</sup> of PBC U stems *-Cag and *-Cag of underlying stems *-CVd. We have discussed the first two reflexes but not the third, -Cag<sup>W</sup>. As already stated, -Cag<sup>W</sup> when it has been found as a U stem, belongs to the stem set of a -Ced stem where C = Q and there is a PA umlaut *e ~ *u, *u occurring in F-U stems.

However, there are other examples of -Cag<sup>W</sup> stems in which C ≠ Q. The exhaustive listing of -Cag<sup>W</sup> stems so far noted is as follows:

- -gag<sup>W</sup> 'go on all fours U' underlying stem -gid (TCL), -ged (CCBD)
- -gag<sup>W</sup> 'spear U' underlying stem -ged
- ?akag<sup>W</sup> 'mouse' (TCL) Bab k'aHGag 'mouse'
- cf. ?akag<sup>W</sup> 'mouse' (CCBD, Cook) underlying stem -ged 'go on all fours; burrow'
- -γag<sup>W</sup> 'bend knee; have battlements' (TCL:1137, 2149) underlying stem -γag<sup>W</sup> 'wriggle' (derived stem -wad 'be curved up'), Hupa
cf. -wag 'wriggle U' (TCL B32); 'be flexible, make flexible P' (TCL: 1138)

and -yog\textsuperscript{w} 'jump (of fish)' (CCBD)

-gog\textsuperscript{w} 'trumpet (of swan)' (TCL: 1225)

textšangog\textsuperscript{w2} 'underwater snag' (TCL: 112)

tš'og\textsuperscript{w} 'mountain ash' (CCBD)

-k'og\textsuperscript{w} 'drink (of child); drink from stream' (TCL: 2802, 1227)

cf. -k'\textsuperscript{\textw{ad}z\textsuperscript{63}} 'gulp' (CCBD p. 43)

-ts'og\textsuperscript{w} 'kiss (of child)' (TCL: 2802)

cf. -ts'us 'kiss (of adult)'

-t'og\textsuperscript{w} 'kiss (of child)' (TCL: 2802)

 cf. -t'ag 'flap (of sail)' (TCL: 2276)

Two points may be made. The first is that a high proportion of the stem initials are velars, and the second that in the other cases, apart from tš'og\textsuperscript{w} 'mountain ash' for which no cognates have been found, stem-final g can be identified as a reflex of the "percussive" suffix. This reflex is overt in Koyukon as g (and in Sarcee as d) (Leer 1974:23). The PA suffixed stem form is *-CuSg
where S is a voiceless continuant. Leer observes that the manner of formation of the usitative stem and the percussive stem is not the same although the suffixes are both reflexes of \( *g \). In Carrier, the U stems of the last three examples would be \(-k'\text{w}as\), \(-ts'\text{as}\), and \(-t'\text{as}\) respectively. It seems fairly certain that these three examples are correctly identified as percussive stems, especially in view of the Babine (nonpercussive) cognates \(-q'\text{odz}\) and \(-ts'o's\) in two of the examples, and the Koyukon percussive cognate \(-t'\text{usk}\) in the third. All three examples are described by Morice as used in speech with children.

Other stems which are generally percussive in Athapaskan do not occur with stem-final \( g(w) \) in Carrier: \(-\text{w}as 'sneeze' and \(-yus -\text{yuz} \) (Babine invariable \(-yuz\) 'whistle'; however, \(-t'\text{ag} 'flap (of sail) seems to be a reflex of \(*-t'\text{u}s\-g 'make a slapping noise' and is not a "nursery term" but does occur with stem-final \( g \). By exactly what rules \(-C\text{og}w \) is to be derived from \(*-\text{CuSg} \) is not clear, and we cannot say whether in pre-Babine-Carrier \( *S \) metathesizes with \( *g \) or not. \( gs \) is attested once in Babine as a stem-final cluster: \( q'\text{adag}t \) 'pack strap'; there is also one example in which \( G \) precedes a voiceless continuant: \( ho'\text{oG}s 'balsam'. There are no other types of stem-final obstruent consonant clusters in Babine.

There are four other, possibly interrelated, Carrier stems, \(-\text{wag}w \) 'gabble (of geese)', \(-\text{wan} 'snarl', \(-\text{wau} 'bark (of bull-dog)' \), and \(-\text{yo} 'growl; snore; low, bellow', for which cognates may be found and of which one seems to be an additional percussive stem. The various cognates are overlapping in meaning and some attempt is made to sort them out on the basis of form in the accompanying table, forms most likely to be cognate on that basis being assigned to the same column. The first column contains those forms that appear to be percussive stems, reflexes of early PA \(*-\text{xa}5'g \), underlying stem \(*-\text{xa}2\text{s}' \) (or \(*-\text{xa}2\text{d}2' \)) \('boil up; yell, chatter'. The Carrier stem \(-\text{wag}w \) 'gabble' (\( = -\gamma\text{wag}w \)) is probably derived from \(*-\gamma^w \) \( og\)w (cf. Bab \(-\text{yog}w \)) by an optional rule \( Qo \) (or \( Qu \)) > \( Q\text{a} \) (see the expanded rule of Rounding Regression later in this section. Some attempt is made at reconstruction of the PA forms at the head of the columns, but discussion of these or speculations as to their interrelationships would take us too far afield.66

Returning now to a discussion of those examples in which the stem initial of \( Cog \) stems is a (back) velar and the stem is not percussive, most if not all of these stems are the reflexes of \( *QoG \). A rule of Inverse Velarization may be posited (which does not exclude Velar Fronted reflexes of \( *QuG \):
<table>
<thead>
<tr>
<th></th>
<th>*-\text{yus} \text{g} \text{r} (\sim -\text{ya} \text{s} \text{r})</th>
<th>*-\text{yun} (or *-\text{ya} \text{w} ?)</th>
<th>*-\text{ya} \text{w} (-?)</th>
<th>*-\text{yu} \text{y}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>-\text{wag} 'gabble'</td>
<td>-\text{wan} 'snarl'</td>
<td>-\text{wau} 'bark'</td>
<td>-\text{yo} 'growl;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>snore; low,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>bellow'</td>
</tr>
<tr>
<td>Bab</td>
<td>-\text{yog} 'gabble'</td>
<td></td>
<td>-\text{Gew} 'bark'</td>
<td>-\text{yo} 'snore'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(&lt; -\text{Gaw})</td>
<td></td>
</tr>
<tr>
<td>Hupa</td>
<td>-\text{wa} 'talk, chatter pl P'}</td>
<td>-\text{gan} 'give tongue P'</td>
<td>-\text{wan} 'growl P'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>? -\text{mu} 'snore'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matt.</td>
<td>-\text{go} 'snore'</td>
<td>-\text{go} \text{\text{n}} 'growl'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nav</td>
<td>-\text{yo} 'boil up; shout, yell'</td>
<td>-\text{ha} 'snore I-P-O'</td>
<td>-\text{wa} 'whimpering'</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-\text{wa} 'growling' 67</td>
<td></td>
</tr>
<tr>
<td>Sar</td>
<td>-\text{yu} 'low'</td>
<td></td>
<td>-\text{ma} 'make a big noise with reverberation'</td>
<td></td>
</tr>
<tr>
<td>Chip</td>
<td>-\text{yu} 'bark; be boiling' (\sim -\text{xa} 'boil')</td>
<td>-\text{yu} 'snarl; growl at P'}</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koy</td>
<td>-\text{yu} \text{\text{n}} 'growl'</td>
<td></td>
<td></td>
<td>-\text{yo} 'snore'</td>
</tr>
<tr>
<td>UK</td>
<td></td>
<td></td>
<td></td>
<td>-\text{guk} 'snore'</td>
</tr>
</tbody>
</table>
Reflexes of Reduced Vowels

(27) Inverse Velarization

\[ u \rightarrow o \quad \text{Stem} \quad [Q_{\text{w}}^g] \]

Since \(Q_{\text{w}}^g\) is considered the regular reflex of \(*Q_{\text{ug}}\), Inverse Velarization is not written as an optional rule. However, certain variant reflexes of \(*Q_{\text{ug}}\) are obtained when Inverse Velarization is not applied (see below).

Inverse Velarization is a kind of inverse of \(u\)-Velarization (sect. 5.2.1) in which \(u > o\) before a stem-final back-velar continuant, whereas in Inverse Velarization a stem-initial back velar is part of the necessary environment. Generally, stem-final \(g\) is also part of the necessary environment; when the stem final is not \(g\), nor any front or back velar, \(*Q_{\text{u}} > Q_{\text{w}}^a\) by Rounding Regression; that is, Inverse Velarization bleeds Rounding Regression.

Exceptionally, Inverse Velarization occurs when the stem final is not \(g\), nor any front or back velar. There is some tendency in stems of the shape \(*Q_{\text{uc}}\), \(C \neq g\), for the stem vowel to lengthen so that, for example, we have the stem \(-wad = \gamma_{\text{ad}} < *-\gamma_{\text{ud}}\) 'be curved up', derived from \(-wid\) 'wriggle' (the same stem from which \(-wag\) 'wriggle U' is derived and with which \(-yog_{\text{w}}\) 'jump (of fish); bend knee; have battlements' is cognate), and also the stem which Morice writes \(rwq_{\text{it}}\) (TCL:1138) 'be flexible, make flexible I', which is probably equivalent to \(-yod\), and both \(-wad\) and \(-yod\) appear to be reflexes of \(*-\gamma_{\text{ud}}\). Other probable examples of such vowel lengthening are: \(-kag\) 'hoof' < \(*-qet_Gu_l\) (cf. \(-lang_{\text{ad}}\) 'knuckle', CCBD -langol68; the expected reflex of \(*-Gu_l\) may possibly be contained in the form \(dzeg_{\text{w}}\) 'earring' and \(?at_{\text{ang}}_{\text{al}}\) (CCBD; Cook 1976) 'pine cone'; \(keq_{\text{g}}\) 'shoes' which Morice relates to 'hoof' (TCL:108; cf. kagwad 'moccasins'); and \(hok_{\text{os}}\) 'heat haze' (cf. k' as 'cloud' < \(*q_{\text{us}}\)). An expanded rule of Inverse Velarization covers these stems for stem-final \(C \neq g\).

In the previous section we have informally introduced a rule \(Q_{\text{o}}\) (or \(Q_{\text{u}}\)) > \(Q_{\text{w}}^a\). This rule is fed by Inverse Velarization. It is an optional rule, since the reflex of \(*Q_{\text{ug}}\) is generally \(Q_{\text{w}}^g\) and not \(Q_{\text{w}}^a\), and sequences \(Q_{\text{o}}\) and \(Q_{\text{u}}\) do not generally become \(Q_{\text{w}}^a\). It may be viewed as an expansion of Rounding Regression (sect. 5.1) as follows:

(28) Rounding Regression

\[
\begin{array}{c}
\left[\begin{array}{c}
V \\
+\text{rnd}
\end{array}\right] \\
\leftrightarrow \\
\left[\begin{array}{c}
V \\
-\text{long}
\end{array}\right]
\end{array}
\rightarrow
\begin{array}{c}
\left[\begin{array}{c}
V \\
-\text{rnd}
\end{array}\right] \\
\left[\begin{array}{c}
-\text{high}
\end{array}\right] \\
\left[\begin{array}{c}
+\text{low}
\end{array}\right]
\end{array}
\quad \text{Stem}
\]

1 \quad 2
1 \quad 2

Besides \(-wag_{\text{w}}\) 'gabble (of geese)', \(-g_{\text{w}}\) 'squeak (of strangling fish)' (TCL:1132) also is probably a reflex of \(*Q_{\text{ug}}\) since stem-final \(g\) or \(g_{\text{w}}\) is only expected following the reflex of a reduced
vowel. Velar Labialization feeds Inverse Velarization, and the latter feeds Rounding Regression. In the case of the stem -g\textsuperscript{w}ag\textsuperscript{w}, Rounding Regression feeds an expansion of Labialization Loss: \( g \rightarrow g/a \). Other possible examples of Rounding Regression include \( gus \sim g\textsuperscript{w}h \) as 'cow parsnip', -ki\textsuperscript{w}a? 'burp', ts\textsuperscript{a}xg\textsuperscript{w}ag\textsuperscript{w} 'nightcap', dalk\textsuperscript{w}ah 'frog', -g\textsuperscript{w}a 'be bent, stooped' (cf. Hupa, Matt. -go\textsuperscript{?}), ki\textsuperscript{w}a 'then' (CCBD) (cf. Chip (?e)kū, Nav ?ākō), and -g\textsuperscript{w}az 'nephew/niece'.

RVR, Inverse Velarization, and RVN are in effect disjunctively ordered, each applying to CūK\textsuperscript{w}. RVR applies when the stem final is continual, and one of the remaining two rules applies when the stem final is noncontinuant g\textsuperscript{w}. Inverse Velarization applies when the stem initial is back velar and RVN for any other stem initial. The reflexes of *u are u, o, and a respectively in the three cases, of which the first two reflexes are long vowels. RVR is not ordered with respect to g-Vocalization since it applies only when the stem final is continual, but Inverse Velarization must counterfeed g\textsuperscript{w}-Vocalization (by which g\textsuperscript{w} > w following long stem vowels).

We have already touched on the order of the rules Velar Labialization, Rounding Regression, and RVN as these relate to reflexes of *Cug (sect. 5.2.3). In that context, the stem -wag 'wriggle U' was derived from *-yug by Rounding Regression: -yug\textsuperscript{w} > -ywag\textsuperscript{w} (= -wag). The input -yug\textsuperscript{w}, however, satisfies the structural description of Inverse Velarization, and generally Rounding Regression counterbleeds Inverse Velarization. The reflex -wag is exceptional and perhaps is analogical, since other members of the stem are -wid\textsuperscript{w}, -wad\textsuperscript{w}, -wə̆l\textsuperscript{w}, the last two being the regular reflexes of *-yuc by Rounding Regression where C\textsuperscript{w} ≠ g\textsuperscript{w} or any velar. We consider that the regular reflex of *yug is yog\textsuperscript{w} and the stem -yog\textsuperscript{w} 'jump (of fish)' is probably cognate with -wag 'wriggle U' and is the reflex of *-yug derived by the regular processes, Inverse Velarization bleeding Rounding Regression and Rounding Regression counterbleeding Inverse Velarization.

Just as Inverse Velarization generally bleeds Rounding Regression and Rounding Regression counterbleeds Inverse Velarization, so the same relationship holds between Inverse Velarization and RVN. Here again an exception has been noted. If -gag\textsuperscript{w} (= -gug\textsuperscript{w}, TCL:1169) 'be/put inside out' is a reflex of *Gug by RVN: -Gug\textsuperscript{w} > -Gag\textsuperscript{w} (ultimately -gag\textsuperscript{w}), then the input -Gag\textsuperscript{w} satisfies the structural description of Inverse Velarization. The regular reflex of *Gug therefore, parallelizing the reflexes of *Gog in general, is Gog\textsuperscript{w} (ultimately gag\textsuperscript{w}) by Inverse Velarization. The exceptional reflex -gag\textsuperscript{w} may be another case of analogy since there is reason to suppose that -gag\textsuperscript{w} is a perfective stem, a variant of -g\textsuperscript{w}az in a stem-set -gum -g\textsuperscript{w}az -gum with the same meaning (TCL:1272).69 Inverse Velarization permits stem-sets -Quh -Qog\textsuperscript{w} -Quh -Quh, but such stem sets with the stem-vowel alternation u ~ o seem unlikely. A P stem -Qog\textsuperscript{w} or -Q\textsuperscript{w}ag intuitively seems more probable than -Qog\textsuperscript{w}.

Another possible example parallel to -gag\textsuperscript{w} 'be/put inside out' is -k'ag 'croak' (dalk'ag 'it croaks', TCL:1225) but with Labialization Loss. Kari has recorded stem-final [uk\textsuperscript{w}] in the River Babine cognate, which, when compared with Car dalk'ah 'frog'
Reflexes of Reduced Vowels

(Bab dal'wa), suggests that -k'ag is a reflex of *-q'ug. It is possible that the stem in both the nominal and verbal forms is the reflex of *-q'ux-g, perhaps another percussive stem.

We will review this section by giving the derivation of the reflexes of *Qug for representative examples from the discussion.

<table>
<thead>
<tr>
<th>PBC</th>
<th>*-γug</th>
<th>*-γug</th>
<th>*-Gug</th>
<th>*-γug</th>
<th>*-Gug</th>
<th>*-q'ug</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>'bend U'</td>
<td>'gabble'</td>
<td>'squeak'</td>
<td>'wriggle U'</td>
<td>'inside out'</td>
<td>'croak'</td>
</tr>
<tr>
<td>VL</td>
<td>-γug\textsuperscript{w}</td>
<td>-γug\textsuperscript{w}</td>
<td>-Gug\textsuperscript{w}</td>
<td>-γug\textsuperscript{w}</td>
<td>-Gug\textsuperscript{w}</td>
<td>-q'ug\textsuperscript{w}</td>
</tr>
<tr>
<td>g(w)-V</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>IV</td>
<td>-γog\textsuperscript{w}</td>
<td>-γog\textsuperscript{w}</td>
<td>-Gog\textsuperscript{w}</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>RR</td>
<td>x</td>
<td>-γ\textsuperscript{w}ag\textsuperscript{w}</td>
<td>-G\textsuperscript{w}ag\textsuperscript{w}</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>RVN</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>-Gag\textsuperscript{w}</td>
<td>-q'ag\textsuperscript{w}</td>
</tr>
<tr>
<td>LL</td>
<td>----</td>
<td>x</td>
<td>-G\textsuperscript{w}ag</td>
<td>-γ\textsuperscript{w}ag</td>
<td>x</td>
<td>q'ag</td>
</tr>
</tbody>
</table>

VL = Velar Labialization; g(w)-V = g(w)-Vocalization; IV = Inverse Velarization; RR = Rounding Regression; LL = Labialization Loss.

An x is entered where the structural description of the rule is satisfied, but the rule is not applied in that particular instance. In the first three instances Inverse Velarization has applied; if neither of the optional rules Rounding Regression and Labialization Loss operate, then the reflex Qog\textsuperscript{w}, considered the regular reflex of *Qug, is obtained, represented by -γog\textsuperscript{w} 'bend U'. The last three examples are the three instances in the data of stems which are almost certainly reflexes of *Qug, but in which Inverse Velarization has not applied.

We have also encountered variant reflexes of *QuC\textsuperscript{−} where C\textsuperscript{−} ≠ g or any other velar. The diagram below represents the variant reflexes of *CuC\textsuperscript{−} for C = Q and C ≠ Q, and for C\textsuperscript{−} = g and C\textsuperscript{−} ≠ g or any other velar.
The three axes represent (1) *u > a opposed to *u > o; (2) stem-initial C^wQ opposed to C ≠ Q; and (3) stem-final C^-g^w opposed to C^-g or any other velar. Vertices 1, 2, 3, and 8 represent the regular reflexes of *CuC^-, *QuC^-, *Cuq, and *Quq respectively. Vertex 4 represents the reflexes of *Quq when Inverse Velarization has not applied.

Vertex 5 probably finds a representate in a stem to be discussed in section 5.3.

Vertex 6 represents those reflexes of *QuC^- when Inverse Velarization applies exceptionally for C^- ≠ g. Examples cited have included -ke^gol 'hoof' and hok'sos 'heat haze'.

Vertex 7 represents the stems Cog^- listed at the beginning of this section, of which two were identified as percussive in the following discussion.

The diagram does not represent the reflexes which are the output of the optional rules of Rounding Regression and Labialization Loss. The rules that have been discussed in this section may be associated with certain edges and faces in the diagram: Velar Labialization with 3-4-7-8, Inverse Velarization with 6-8, Rounding Regression with 2-4 (subsequently to Inverse Velarization), and RVN with 1-3.

We have reached the point at which the only examples of words of native origin in which the stem-final g follows a long stem vowel whose stems have not been covered by our discussion are: waldag 'buttercup', gag 'nothing', dlag 'double-edged knife' and zuldabag 'Easter' (CCBD; zul 'disembodied soul' TCL). These then represent our most likely examples of stems in which the stem-final g is not the reflex of *g (or *G) following the reflex of a reduced stem vowel. Morice (TCL:123) notes the forms ind'uuh-isdai and ind'u-isdag for 'rose (flower)', which suggests that in the first case above stem-final g is a reflex of *g and g-Vocalization has failed to occur.

Before leaving the reflexes of stem-final *g and *G, it is of interest to note that stem-final g can occur in Lower Carrier both as the reflex of a front velar following the reflex of a full (as well as of a reduced) stem vowel and as the reflex of a back velar following the reflex of either a full or a reduced stem vowel. The data (TCL:2818, 2825, 2830) are as follows:

<table>
<thead>
<tr>
<th>Lower Carrier</th>
<th>Upper Carrier</th>
<th>PBC vowel and stem final</th>
</tr>
</thead>
<tbody>
<tr>
<td>ts'ag</td>
<td>'dish'</td>
<td>ts'ai</td>
</tr>
<tr>
<td>-dzag</td>
<td>'handle granular material P;'</td>
<td>-dzai</td>
</tr>
<tr>
<td>-kag</td>
<td>'be shallow'</td>
<td>-ka</td>
</tr>
<tr>
<td>-d'ag</td>
<td>'give up P'</td>
<td>-d'a</td>
</tr>
<tr>
<td>-?eg</td>
<td>'be easy'</td>
<td>-?e</td>
</tr>
</tbody>
</table>
Reflexes of Reduced Vowels

-ts'ag 'hear' -ts'o *vQ
   (< -ts'ay)
dag 'up' do *vQ
żąg 'fish' żą *vQ

For comment on the stem żąg 'fish', see section 5.4.2. The list may be supplemented by data from the Anahim Lake dialect (Cook 1976) (Morice includes the Anahim Lake dialect in Lower Carrier, see sect. 1.1):

Anahim Lake

-żsog 'be crying IN' -ts'o *vQ
-żeg 'mouth'  że (TCL, CCBD; *vQ
   Cook -zi)72
-żtseg 'cry IN'  żtse *vQ

It is quite probable that we are not considering one dialect in comparing Morice's Lower Carrier data with Cook's Anahim Lake data. However, it is interesting to notice -ts'ag 'hear' in Morice's data and -żsog 'be crying IN' in Cook's (both reflexes of PBC *CaG). The Cook data are, of course, at least seventy-five years more recent than the Morice; and these forms suggest that ďG might have been in contrast with ďG in Lower Carrier at the end of the nineteenth century and that a > o G # is a rule of modern Lower Carrier:

Lower Carrier

-żs'ag (> -żs'ay >) -żs'ay > -żs'o
   -żs'aG (?)
   -żtseg (> -żtsoG

A parallel sound change has not occurred in the case of a before stem-final ďg; for example, modern Lower Carrier -tág 'speak'.

In view of the posited Lower Carrier rule aG > oG, it would be interesting to know the modern Lower Carrier forms for 'hear' and 'up', both of which were -CaG (or -CaG ?) in the late nineteenth century and in which the stem final is a reflex of *G.

5.2.5 Reflexes of *v: summary

The following table summarizes the reflexes of *CuC\(^{-}\), that is, of *v in different environments.

<table>
<thead>
<tr>
<th></th>
<th>C(^{-}) = K, K # g</th>
<th>C(^{-}) # K, Q</th>
<th>C(^{-}) = K, K = g</th>
<th>C(^{-}) = Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>C = Q</td>
<td>Quk(^{W})</td>
<td>Qw(^{W})aC(^{-})</td>
<td>Qog(^{W})</td>
<td>QoQ</td>
</tr>
<tr>
<td>C # Q</td>
<td>Cuk(^{W})</td>
<td>CaC(^{-})</td>
<td>Cag(^{W})</td>
<td>CoQ</td>
</tr>
</tbody>
</table>
The reflexes which are considered the regular reflexes are given in the table. Alternate reflexes of *QuC' (C' ≠ K, Q) and *QuQg are QuC and Q'ag/qag W respectively. Therefore, neglecting the rare stem-shapes CoC' and CoQ W (C = Q), boxes enclose stem shapes which contain the reflexes of u, o, and a of *u. Basically, RVR accounts for the reflexes u, u-Velarization and Inverse Velarization for the reflexes o, and Rounding Regression and RVN for the reflexes a.

A further summary of Carrier reflexes is given in section 5.4, in comparing Babine and Carrier.

5.3 o in Carrier

In discussing stem-final g and the reflexes of the reduced vowels, we have also almost exhausted examples of o in Carrier stems. To recapitulate, o has been found to be the reflex of:

(1) the full vowel *u preceding the reflex of a stem-final back velar (Vowel Lowering, sect. 2.2.3)

(2) the PBC reduced vowels *a, *u preceding the reflex of a stem-final back velar (a-Velarization and u-Velarization, sect. 5.2.1)

(3) the reduced vowel *u following the reflex of a stem-initial back velar (Inverse Velarization, sect. 5.2.4)

Note that in each case contiguity to a back velar is involved, though stem-finally the reflexes of the back velars generally have no overt realization (except *x > h). There is one further environment in which o is the reflex of the full vowels *e and *a. In this case, as we will see in section 6.1.1 in discussion of stem-final "zeros", the full vowels merge with *a and this case may be subsumed under (2) above.

Otherwise, the only example of o not yet discussed is contained in the stem -dod 'be slender, narrow'. -dod is exceptional in providing an example in which o is not contiguous to the reflex of a back velar in any obvious way. -dod is found in both CCBD and TCL: ndod 'he's slender, lank, puny' (TCL: 234, 251, 991); ndod 'slim' (CCBD); hundod 'it's narrow in area' (CCBD). TCL (234, 251, 861) also has the form ndad 'he, it is narrow (not broad'). Cook (1976) has recorded dindad 'it's skinny', and hundad 'it's narrow (of road)'. Perhaps -dod is the reflex of -duxd < -duq(-d); cf. *duq 'be short', and o < *u in a manner analogous to the percussive stems -Coq W < *Cu(S)-g (see sect. 5.2.4).

o also occurs in prefix strings by the morphophonemic processes (1) u + i > o (cf. i + i > a, and (2) Ca + xa/ha/x'a/łę > o where Ca- is a disjunct prefix (cf. Ca + a > Ca?e(a)).

One last point concerning stem-final g in Carrier may be noticed: with the addition of the loanword masdziq 'muskeg' (see the entry for 'Labrador tea' under 'tea' in CCBD), stem-final g, g' are found following only the long vowels e, a, o (rarely), and the short vowel a, or in other words, only the nonhigh vowels.
5.4 Differences between Babine and Carrier reflexes of reduced vowels

In section 5.1, Rounding Regression and Reduced Vowel Neutralization (RVN) were formulated for both the Babine and Carrier reflexes of *QuC footing and *CuC footing respectively where C ≠ Q and C’ ≠ y, k, or Q.

The reflexes in Babine and Carrier of the PBC sequences of reduced stem vowel and stem-final front or back velar are shown in the following table:

<table>
<thead>
<tr>
<th>PBC stem final</th>
<th>Babine</th>
<th>Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBC sequence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*aK</td>
<td>ag</td>
<td>ag</td>
</tr>
<tr>
<td>*uK</td>
<td>ug=ug^w</td>
<td>u(y)</td>
</tr>
<tr>
<td>*uQ (= *ug^w)</td>
<td>aO[ɔk]</td>
<td>aγ</td>
</tr>
<tr>
<td>*aQ</td>
<td>aO</td>
<td>aγ</td>
</tr>
</tbody>
</table>

T, Z, S denote the PBC stem-final manners, back velar *Q, *γ, *x, and front velar *g, *x respectively; *γ corresponds to the Z stem-final manner in the front velar series. As discussed above (sect. 5.2.3), in both pre-Carrier and pre-Babine, Velar Labialization feeding Velar Fronting may occur when a member of the PBC series *Q follows a stem-vowel *u (or any rounded stem vowel). Where these are different, both the modern Carrier reflex sequences and the sequences recorded by Morice are shown in the table. They do not differ essentially except in the case of the reflexes of the sequences *aQ; the modern forms are ɔ, o, oh of which the last was recorded as aχ by Morice and the first two both as o in the speech of the younger generation, and as ay becoming ay (> ɔ > o) in the speech of the older. These changes in Carrier and the change ug^w > aγ in the reflexes of *ug have been discussed above (sects. 5.2.1, 5.2.2).

5.4.1 Reflexes of reduced vowel and front velar

The table in the previous section is drawn up for Babine disregarding F-Mutation (in which i[?] becomes ay[?]), ax respectively in F-class stem syllables and similarly ug^w u(y) ux become og^w o(y) ox^w.

Assuming Velar Labialization and Velar Fronting, and turning our attention first to the reduced vowel + consonant sequences in which the consonant is [+high, +cnt] (that is, a semivowel or x or x^w), Reduced Vowel Raising (RVR) may be formulated as in Carrier. Since stem-final contrasts between front and back velars occur in Babine, we cannot segment x x^w (and x) without further consideration. If x^w-Segmentation is introduced, then potentially, since there is a Babine rule that deletes semivowels in stem finals, *ix > iyh > ih and *ux^w > uwh > uh, and stem-final x x^w are replaced
by h following i, u. We shall reconsider such an analysis in discussing stem-final "zeros" and Babine syllable types in sections 6 and 7.

Velar Labialization and Velar Fronting feed L-Mutation and RVR counterfeels L-Mutation and feeds F-Mutation; F-Mutation counterfeels RVR.

<table>
<thead>
<tr>
<th>PBC</th>
<th>*-dzux</th>
<th>*-dlux\textsuperscript{73}</th>
<th>*-zux</th>
<th>*dagux</th>
<th>*-Gax</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>'comb I'</td>
<td>'hoist I'</td>
<td>'spit'</td>
<td>'mosquito'</td>
<td>'run F'</td>
</tr>
</tbody>
</table>

| Velar Labialization | -dzux\textsuperscript{W} | -dlux\textsuperscript{W} | -zux\textsuperscript{W} | dagux\textsuperscript{W} | ---- |
| Velar Fronting      | ----              | -dlux\textsuperscript{W} | -zux\textsuperscript{W} | ----              | ---- |
| L-Mutation           | -dzix\textsuperscript{W} | -dlx\textsuperscript{W} | ----              | ----              | ---- |
| RVR                  | ----              | ----              | -zux\textsuperscript{W} | dagux\textsuperscript{W} | -Gix  |
| F-Mutation           |                    |                  |                  |                  |       |

PBC | *-t'ax | *-t'\textsuperscript{1}ux |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>'stretch string F'</td>
<td>'tie together I'</td>
</tr>
</tbody>
</table>

| Velar Labialization | ----              | -t'\textsuperscript{1}ux\textsuperscript{W} |
| Velar Fronting      |                  | ----              |
| L-Mutation           | ----              |                  |
| RVR                  | -t'ix             |                  |
| F-Mutation           | -t'ax             | -t'\textsuperscript{1}ox\textsuperscript{W} |

Exceptionally, RVR may possibly feed L-Mutation. L-Mutation has occurred in the Babine form k\textsuperscript{agix\textsuperscript{W}} 'fish-drying poles'; compare Car \textsuperscript{?adžuh, verb stem-set -džuh, -du 'pin, peg'}. If the PBC stem vowel is reduced, then RVR must feed L-Mutation: *-gux > -gux\textsuperscript{W} (Velar Labialization) > -gux\textsuperscript{W} (RVR) > -gix\textsuperscript{W} (L-Mutation). Cognates are Koy \textsuperscript{guxt\textsuperscript{1} 'cooking stick'}, UK džæ < *gux-t with metathesis. The stem vowel could be expected to shorten under suffixation, and therefore the PBC stem may be *-gux.

A PBC stem *-gux is also assumed in the case of dagux\textsuperscript{W} 'mosquito'. Cognates are Koy -dagux\textsuperscript{1}a? 'gnat' (note the suffixation by -\textsuperscript{1}(a?)), Chip \textsuperscript{dædžæl} 'mosquito'. In this case, as shown in table, RVR counterfaeels L-Mutation.

A second example in which RVR may feed L-Mutation is found in the P stem of 'tow, hoist', regularly -dlug\textsuperscript{W}, but also recorded as -dlig\textsuperscript{W}. The PBC P stem (reconstructed later in this section) is *dlug\textsuperscript{W}; *-dlug > -dlug\textsuperscript{W} (Velar Labialization and Velar Fronting); if RVR counterfeels L-Mutation, then -dlug\textsuperscript{W} > -dlug\textsuperscript{W}; if RVR feeds L-Mutation, then -dlug\textsuperscript{W} > -dlug\textsuperscript{W} > -dlug\textsuperscript{W}. In discussing this P stem we have tacitly extended RVR to cover reflexes of *u preceding stem-final *g. The extended part of RVR that is needed is as follows:

(29) RVR Extension

\[u \rightarrow u / \underline{g}^W\]
RVR Extension, then, is a rule of Babine only, but RVR is a rule of both Babine and Carrier. In Carrier, as we have seen, the reflex of *Cug where C ≠ Q is Cag\textsuperscript{w}, and RVR applies only when the stem final is continuant. The Carrier rule of Inverse Velarization is also a rule of Babine and bleeds RVR extension. RVR Extension applies only to the rounded reduced vowel and there is no rule \( \text{ag} > \text{ig} \) paralleling it; Babine reflexes of *\text{ag} and *\text{ig} are \text{ag} and \text{ig} respectively (but see the following section for some modification of this statement).

Velar Labialization and Velar Fronting feed the extended part of RVR. RVR Extension bleeds RVN (for example, the reflex of *-nug 'flash, shine U' is -nug\textsuperscript{w}, not -nag\textsuperscript{w} as in Carrier) and feeds F-Mutation; RVR Extension counterfeeds L-Mutation in general, though as we have seen, this rule order may admit of some exception and RVR Extension may feed L-Mutation.

<table>
<thead>
<tr>
<th>PBC</th>
<th>*-dlug</th>
<th>*-nug</th>
<th>*-t'ug</th>
<th>*-γug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labialization</td>
<td>-dlug\textsuperscript{W}</td>
<td>-nug\textsuperscript{W}</td>
<td>-t'ug\textsuperscript{W}</td>
<td>-γug\textsuperscript{W}</td>
</tr>
<tr>
<td>Velar Fronting</td>
<td>-dlug\textsuperscript{W}</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>L-Mutation</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Inverse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Velarization</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>RVR Extension</td>
<td>-dlug\textsuperscript{W}</td>
<td>-nug\textsuperscript{W}</td>
<td>-t'ug\textsuperscript{W}</td>
<td>----</td>
</tr>
<tr>
<td>F-Mutation</td>
<td>----</td>
<td>----</td>
<td>-t'og\textsuperscript{W}</td>
<td>----</td>
</tr>
<tr>
<td>RVN</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
</tbody>
</table>

In section 3.3.1 it was noted that \( \text{u} \) shortens phonetically before word-final \( g\textsuperscript{W} \). The reflex of *Cug is Cug\textsuperscript{w} with a phonemically long vowel, phonetically \[ \text{Cug}\textsuperscript{W} \], by RVR Extension, and not Cag\textsuperscript{W} by RVN. This point concerning the taxonomic phonemic interpretation of \[ \text{Cug}\textsuperscript{W} \] is important when we come to consider the phonemicization of stem-final velars (set. 5.4.3). Note also that RVR Extension must be a vowel-lengthening rule if it may feed L-Mutation, since the latter applies only to long vowels.

To confirm that in general RVR Extension as well as RVR counterfeeds L-Mutation and that the PBC sequences *\text{ux}*\text{ug} do not have the same reflexes as *\text{ux} *\text{ug} (in L-class syllables that is), we will consider the verb stem sets of stems which are the reflexes of *-Cux. No cognates have been found for -d\text{zik}\textsuperscript{W} 'leap', and stem-type 2 is assumed on the basis of the absence of stem-final \( g \) in the Carrier P stem (deleted by \( g\textsuperscript{W} \)-Vocalization following a long vowel) and the Babine alternation \( i \sim u \). In the remaining examples the stem type is given on the basis of cognates in Navajo. The stepped line separates stems containing reflexes of reduced vowels and reflexes of full vowels. The data are as follows (with the Carrier forms given below the Babine):

- "hoist P" *-dlug
- "flash U" *-nug
- "suck U" *-t'ug
- "jump (fish)" *-γug
Babine-Carrier

<table>
<thead>
<tr>
<th>I-O</th>
<th>P</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>'drag, drive vehicle'</td>
<td>-Gix&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-Gux&lt;sup&gt;W&lt;/sup&gt;</td>
</tr>
<tr>
<td>'tow, hoist'</td>
<td>-g&lt;sup&gt;W&lt;/sup&gt;ez&lt;sub&gt;76&lt;/sub&gt;</td>
<td>-g&lt;sup&gt;W&lt;/sup&gt;az</td>
</tr>
<tr>
<td>'leap (as frog), launch through air'</td>
<td>-dlux&lt;sup&gt;W&lt;/sup&gt;</td>
<td>-dlux&lt;sup&gt;W&lt;/sup&gt;</td>
</tr>
<tr>
<td>'comb'</td>
<td>-d&lt;sup&gt;W&lt;/sup&gt;uh</td>
<td>-d&lt;sup&gt;W&lt;/sup&gt;u</td>
</tr>
</tbody>
</table>

Leer has reconstructed the stem -* ż<sup>W</sup>u·g'. The reconstructed underlying stems in the first two examples may be *-dlux' < -dleq<sup>W</sup> and -*Guk' < -Gek<sup>W</sup> = -Getšr<sup>W</sup>. The glottalized stem finals are reconstructed on the basis of the Navajo tones. The back velar point of articulation of the stem-final *q' accounts for the Hupa-Mattole cognate stem-final which is w, and the labialized front velar stem-final *k<sup>W</sup> accounts for the Babine Carrier stem-final z (occurring in Chipewyan also) in the perfective of -Gix'. The PBC reflexes of the stem set of PA *dlux' are *dlux<sup>W</sup>, *-dlux<sup>W</sup>, *-dlux<sup>W</sup>. If *-*dlux' is a correct reconstruction, then the stem is one in which Velar Fronting has occurred in both Babine and Carrier (sect. 5.2.3).

In these four stem sets, each with lenis stem initial, the reflexes of *ug(w) and *ux(w) (including Velar Fronted *ux) are ig<sup>W</sup> and ix<sup>W</sup>, and the reflexes of *ug(w) and *ux(w) (including Velar Fronted *uG and *ux) are ug<sup>W</sup> and ux<sup>W</sup> respectively.

These reflexes, and the reflexes of *ag, *eg, and *ig, illustrate that g-Vocalization (in which g > y following long vowels) is not a rule of Babine; for example, ts'ag (Car ts'ai) 'dish'; -dzeg (Car -dzai) 'handle granular material P', -t'ig (Car -t'i) 'stretch string P', -nig (Car -ni) 'remember P'.

The rules that we have not considered yet in relation to Babine, and that account for reflexes of reduced vowels and stem-final [+high] consonants, are w-Adjustment and Semivowel Deletion. The reflexes of *ay(?) in Carrier are i(?); in Babine they are i(?) when the stem initial is lenis and ay(?) when the stem initial is fortis. RVR feeds Semivowel Deletion, and F-Mutation applies to the output when the stem is fortis; for example, (*-Goʒ > ) *-Gay > -Giy > -Gi 'be dry'; (*-taŋ > ) *tay > tiy > ti > tay 'trail'; (*-qoŋ > ) *-qay > *qi > -qi > -qay 'husband'; (*-tš<sup>W</sup>y > ) *-ts'ay > -ts'iy > -ts'i > ts'ay 'blow (wind) P'. In addition, according to the structural descriptions of the rules, L-Mutation feeds Semivowel Deletion: *ey > iy by L-Mutation when the stem initial is lenis and iy > i by Semivowel Deletion. However, there are no examples in the data. (In any case, Vowel Raising applies to *ey with the same output, both when the stem initial is lenis and when it is fortis.)
In Carrier, Semivowel Deletion also deletes \( y \) following the vowel \( u \). The available examples in Babine of reflexes of *Cu\( y \) or *Cu\( y ^{\prime} \) (including *Cu\( y ^{\prime} \)) are -q\( u y ^{\prime} \) 'vomit' (an invariable stem in Babine), -q\( a y ^{\prime} \) 'limp, hop' (also invariable), -zu 'be good', and possibly -tsaw '(man's) sister's child'.

-q\( u y ^{\prime} \) 'vomit' is a reflex of *-qu\( y ^{\prime} \) (compare, for example, Koy -qu\( x \) and the Navajo P stem -kw\( h i \): *-qu\( y ^{\prime} > -qu ^{\prime} \) by RVR and -qu\( y ^{\prime} > -qu ^{\prime} \) by F-Mutation. This is the correct output. The Carrier cognate of Bab -q\( a y ^{\prime} \) is -ku\( ? \), the perfective stem in the stem-set -kuh -ku\( ? \) -kuh 'hop, walk as on one leg' (that is, a variable stem in Carrier). Since in perfective stems it has been found that the reflexes of perfective suffixes are not overt unless the stem vowel is the reflex of a full vowel (see sect. 5.2.3), a PBC reconstruction *-qu\( y ^{\prime} \) is assumed. (In any case, if the PBC stem vowel is reduced, *-qu\( y ^{\prime} > -qu ^{\prime} \) by RVR.) In these two examples, \( y \) is not deleted following the vowel \( u \).

However, -zu 'be good' is the reflex of *-zu\( y ^{\prime} > PA *\( z u \)\( y \), and in this case deletion of \( y \) does occur following the stem-vowel \( u \). -tsaw '(man's) sister's child' (Carrier cognate -tsu\( \)a 'grandchild') may be the reflex of PA *-tsu\( y ^{\prime} \)a 'grandchild'. If so, in this case also, \( y \) is deleted following \( u \). We may suppose that -tsu > -tsaw exemplifies a variant F-Mutation subrule \( u > a w \) (instead of the regular F-Mutation subrule \( i > a y \), both \( u > a w \) and \( i > a y \) occurring only in open stem syllables.

If it is significant that in the first two examples, -q\( u y ^{\prime} \) and -q\( a y ^{\prime} \), the stem initial is the reflex of a back velar, whereas in the last two examples, -zu and -tsaw, it is not, then Cu\( y > Cu \) only when \( C \neq Q \). We might say informally that Qu\( y = Q_i \) and there is no deletion of \( y \), whereas when \( C \neq Q \) there is no stem initial which can be labialized; \( Q_i \) does not reduce but Cu\( y > Cu \) for \( C \neq Q \).

Therefore, assuming the correctness of this hypothesis (concerning the conditions under which \( y \) deletes following the stem-vowel \( u \)), we may formulate \( y \)-Deletion in Babine:

\[
(30) \ y \text{-Deletion} \quad y \rightarrow \emptyset / \begin{cases} i \\ Cu \end{cases} (?) \ # \text{ where } C \neq Q
\]

-\( q a y ^{\prime} \) 'limp, hop' is still not accounted for unless, for this form, we set up the equation Qu\( y = Q_i \) as a rule which feeds F-Mutation: *-qu\( y ^{\prime} > -q ^{\prime} i > q a y ^{\prime} \). Since a rule of \( x ^{\prime} -\text{Segmentation} \) has not been set up for Babine (but see sect. 7), and sequences \( i w \) and \( u w \) will arise only in Velar Fronted reflexes of *\( u y \) and *\( u y ^{\prime} \), of which we have no recognized examples (see sect. 5.2.3), we have no \( w \) in the stem final following the high vowels \( i, u \). However, \( w \text{-Adjustment} \) is assumed, to account for a stem such as -Gew 'bark'.

5.4.2 Partial neutralization of Cig, Ceg

In general, Bab ig corresponds to Car i, and Bab ag to Car ag (where Bab ag is in contrast with aG). However, there are exceptions in which Bab ag corresponds to Car i. The exceptions noted are as follows:
## Babine and Carrier Phonology

<table>
<thead>
<tr>
<th>Babine</th>
<th>Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Cag</td>
<td>-Ci</td>
</tr>
<tr>
<td>-laztag</td>
<td>-lazti?</td>
</tr>
<tr>
<td>sag (River Babine)</td>
<td>si</td>
</tr>
<tr>
<td>-nag</td>
<td>-ni</td>
</tr>
<tr>
<td>-nag</td>
<td>-ni(?)</td>
</tr>
<tr>
<td>-qanag</td>
<td>xani</td>
</tr>
<tr>
<td>ḧag</td>
<td>ḫi</td>
</tr>
<tr>
<td>detag</td>
<td>dati</td>
</tr>
</tbody>
</table>

IN and FN are derived from the corresponding I and F stems by -sufffixation (sect. 3.2). In Babine, if the stem final is S, S- > T (with no change in the stem vowel, that is, no shortening or lengthening). Therefore the regular IN or FN corresponding to I or F -Cix (or -Cax if C is fortis) is -Cig. FN -Cag has been recorded corresponding to -nix 'be jealous F, -nix 'taste tr. F', -lix 'plant (i.e., put pl objects in a hole) F', and IN -Cag corresponding to -tax (i.e., the long object classificatory stem) 'rain I'. The rule for the formation of IN and FN stems from the corresponding positive stems is of very widespread and general applicability, and is also a relatively surface rule. Therefore it seems probable that the Babine vowels have shortened phonemically rather than that the Carrier vowels have lengthened. The shortening cannot be due to F-Mutation since (a) shortening has occurred in stems in which the initial consonant is lenis (see examples above), and (b) shortening has not occurred in stems in which the initial consonant is fortis; for example, hols'ig 'nettles', -t'ig 'stretch string P', -tš'ig 'shoot FN', -ts'ig 'blow (wind) FN', and -tšig 'be buried (a body) FN'. (These FN are regular, corresponding to F stems Cix.)

Possessed noun stem forms in some cases are derived by the same process (sect. 3.2), so that the expected possessed form corresponding to the unpossessed form of Bab laztax (c) lazti) is -laztig, and not -laztag as recorded. Morice notes that in Carrier the possessed form is irregular: -lazti? (TCL:214), not -lazti (< -lazth-?) as expected.

Modern River Babine sag 'I, me' corresponds to the form quoted by Morice for Babine generally (TCL:2837) and equated by him with Carrier si-t'I'ax 'myself', modern Car si-tš'oh 'I, me (emph.)'. It is probably a reflex of PBC si-k'(-). The PA reconstruction of the first singular pronoun is *Sí (or *Sá-na in some Athapaskan, Krauss 1964:125) with full stem vowel.

The PA reconstruction of 'nostril' is *-nik' (Krauss and Leer (1976:24) with full stem vowel. Babine -nag, Carrier -ni(?) (TCL: 748, 2818) 'be noisy', an invariable verb stem, has a cognate -nig in Koyukon, again with full stem vowel. -qanag 'word, language'
has been recorded in Babine in possessed form and corresponds to
Upper Carrier xani, Anahim Lake Carrier xaneg (see sect. 2.2.2).

The Carrier forms ti, -lag 'dog' have already been discussed in
relation to the PA reconstruction *Tin-k' (sect. 2.1.3). The
Babine unpossessed and possessed forms are lag, -rag.

The remaining example, 'doorway', or the correspondence ag : i
is problematical concerning its cognates. The stem may contain a
reflex of PA *tay(a) 'trail', the etymological meaning being 'way
in', prefix da- 'in'; (cf. Nav tsi ?et ?tiin 'doorway (= way out)',
?at ?iin 'road, trail'). On the other hand, the Carrier form da ?i
'door' is probably composed of da- 'in' and an inflection of the
stem -tan 'handle a long object', two elements that occur in the
verb bases for 'shut the door' and 'open the door'. A reflex of a
suffix *-x accounts for the stem-final h.

The various cognates and reconstructions tend to support the
hypothesis that it is the Babine vowel that has shortened in the
correspondences of Bab ag, Car i. However, no conclusion can be
drawn concerning the source of the shortening (unless a parallel is
to be found in the phonetic shortening of /Cug/, phonetically
[Cuk]; see sect. 3.3.1).

Morice notes (TCL:13, 2818) that Lower Carrier ag may cor-
respond to Upper Carrier i. The examples he quotes are xwasag 'I
am foolish' and tadasag 'I make a noise'. The former example is a
verb which is intrinsically negative (that is, it does not contain a
disjunct negative prefix but contains a conjunct negative prefix
za- or i- and a verb stem). The negative stem -nag parallels the
irregular Babine negative stems -Cag corresponding to
positive stems -Cix. These Babine stems include -tag 'rain IN', a
stem form recorded by Cook (1976:53) also in the Anahim Lake
dialect of Lower Carrier. The second Lower Carrier example above
containing the stem -nag corresponds to the Babine stem -nag 'be
noisy'. There is evidence therefore of the same vowel shortening in
Lower Carrier (or in some dialects of Lower Carrier) as occurs in
Babine.

In the Lower Carrier data the shortening may extend to u be-
fore stem-final g. Morice gives the Lower Carrier form lag 'fish'.
Kari records tsalag 'salmon' in the Fraser Lake dialect, and Cook
has lag 'fish' in the Anahim Lake dialect, noting that the vowel is
"very short and lax" (1976:52), perhaps phonemically /lag/ (lag is
unexpected since, if correct, Vowel Lowering has not occurred). See
also Morice (TCL:13) for correspondences nu? : nag in Upper and
Lower Carrier respectively.

5.4.3 Reflexes of reduced vowel and back velar

We return now to the table of Babine-Carrier correspondences
in the reflexes of PBC reduced vowels and stem-final front and
back velars (sect. 5.4). In Carrier, stem-final contrast between
front and back velars has been lost by (1) Semivowel and γ-Deletion
in the case of the continuants (fed by x - and γ-Segmentation in
the case of voiceless continuants) and by (2) g -Vocalization and
G-Weakening feeding Semivowel and γ-Deletion in the case of the
noncontinuants. The only velar stem finals are g g.
Y-Deletion in Babine is similar to Semivowel Deletion in Carrier (the pertinent difference is that uy does not always become u in Babine, sect. 5.4.1). Y-Deletion does not occur in Babine except in some noun stems when the stem vowel is o, and then perhaps always with o, oy in free variation; for example, tlo'o(') 'hay'. It has not been observed in verb stems (except in one case where the stem vowel is a: -tla(y) 'rub with liniment'), even when the verb stem is invariable; for example, -dzoy 'shave'. X-Segmentation leads to no useful result in Babine, and g/w- Vocalization and G-Weakening do not occur, so and so the contrast between front and back stem-final velars is preserved in Babine (when the velars are not labialized).

Velar Fronting may occur in Babine and in Carrier. Babine examples have been given in section 5.2.3.

Babine does not share with Carrier the rule of a-Velarization; a rule of a-Lowering occurs which is restricted to stem syllables in which the stem-final back velar is the voiced continuant y:

(31) a-Lowering

\[ a \rightarrow a \bigg/ \underline{\gamma} \# \]

a-Lowering counterfeeds L-Mutation and, if its structural description does not include the feature [+long] (see sect. 5.2.1), Y-Deletion may counterfeed a-Lowering; for example, *-yay 'play P' > -yay by a-Lowering, the correct output (not *-yay > -yay > -yey by a-Lowering and L-Mutation); *-dzay 'handle water P' > -dzay; *-tlay 'rub with liniment' > -tlay by a-Lowering, sometimes counterfeled by Y-Deletion: -tlay > -tla.

In a parallel way, u-Velarization, sometimes counterfeled by Y-Deletion, is restricted to stem syllables in which the stem-final back velar is the voiced continuant y. However, this rule may be in process of extension to all stem syllables in which the stem final is a back velar. It is often difficult to decide phonetically whether reflexes of *ux and *ux are in contrast or not, and similarly whether reflexes of *UG and *uG are in contrast. The difficulty is encountered chiefly in the verb stem sets of -CoG stems in the F and I-O stems, reflexes of *-CuG and *-CuG respectively, and the FN and IN-ON stems, reflexes of *-CuG (< *-CuG-?) and *-CuG (< *-CuG-?): for example, in the stem sets of -t'ox 'string' and -zox 'scrape'. In other cases the vowel seems to be consistently short; for example, [-t's'5x] 'be angry F', [-t's'k] 'be wet, soaked', [tst'5k] 'porcupine'.

The stem syllables of these latter examples are phonemicized taxonomically as /CaG\^/ and /CaG\^/.

To see the reason for this, let us consider the output of the rules already set up. These rules have not treated the finer phonetic points, and in particular the vowel allophony, so that in fact their output to date corresponds to the taxonomic phonemic representations. *CuG and *CuG become Q\^aG and Q\^aG by Rounding Regression when C = Q, and become CaG and CaG by RVN when C ≠ Q. The outputs CaG and CaG for C ≠ Q are certainly incorrect
since the reflexes of *Cux and *CuG are in contrast with the reflexes of *CaK and *CaG (the vocalic contrast is [5] versus [A]). We might accept Q\textsuperscript{exK} and Q\textsuperscript{eG} as taxonomic phonemic representations for [Q5x] and [Q5k]. There are no examples of [Q5x] in the data (all examples of [C5x] are for C \neq Q), but there are examples of [Q5k] : [payo\textsuperscript{eK}] 'raspberry', and [t\textsuperscript{sa}\textsuperscript{2}as\textsuperscript{eK}] 'navel', the stems presumably reflexes of *-GuG\textsuperscript{78} since there is no other source for them. Phonetically therefore, the reflexes of *CuG are quite parallel for C \neq Q and C \neq Q. The representation Q\textsuperscript{eG} when C = Q is therefore unsatisfactory, because the parallel C\textsuperscript{eG} is not possible when C \neq Q.

To see what the necessary phonemization is, we will chart the output of the rules for each of the sequences *Vg and *VG:

<table>
<thead>
<tr>
<th>PBC</th>
<th>Babine</th>
<th>Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>*ig, *eg</td>
<td>ig</td>
<td>i</td>
</tr>
<tr>
<td>*ag</td>
<td>ag (eg)</td>
<td>ay</td>
</tr>
<tr>
<td>*ag</td>
<td>ag</td>
<td>ag</td>
</tr>
<tr>
<td>*ug</td>
<td>ug\textsuperscript{w} (ig\textsuperscript{w})</td>
<td>u</td>
</tr>
<tr>
<td>*ug</td>
<td>ug\textsuperscript{w}, og\textsuperscript{w}</td>
<td>ag\textsuperscript{w}, og\textsuperscript{w}</td>
</tr>
<tr>
<td>*iG, *eG</td>
<td>eG</td>
<td>e</td>
</tr>
<tr>
<td>*aG</td>
<td>aG (eG)</td>
<td>a</td>
</tr>
<tr>
<td>*aG</td>
<td>aG</td>
<td>ay &gt; o</td>
</tr>
<tr>
<td>*uG</td>
<td>oG</td>
<td>o</td>
</tr>
<tr>
<td>*uG</td>
<td>[5k]</td>
<td>0</td>
</tr>
</tbody>
</table>

The Carrier forms are given for comparison. The Carrier reflex of *ug corresponding to Bab ug\textsuperscript{w} is ag\textsuperscript{w}; the phonetic values of these reflexes have been noted in section 5.2.2 (Carrier) and section 5.4.1 (Babine). The Babine sequences in parentheses are the output of L-Mutation and do not otherwise appear in the chart.

The sequence that is missing from the chart therefore is ag\textsuperscript{w}. Consider the following rearrangement of the Babine sequences:

\[
\begin{align*}
ig & \rightarrow eg & ag & ag & \text{---} & \text{---} \\
ig\textsuperscript{w} & \rightarrow eg\textsuperscript{w} & ag\textsuperscript{w} & [5k] & ig\textsuperscript{w} & ug\textsuperscript{w} \\
\text{---} & \rightarrow eg & aG & aG & oG & \text{---}
\end{align*}
\]

eg\textsuperscript{w} is included by analogy with ex\textsuperscript{w} and ew which are actually occurring sequences in Babine. og and ug are not in contrast with og\textsuperscript{w} and ug\textsuperscript{w}, and iG and uG are nonoccurring sequences (since Vowel Lowering counterfeeds L-Mutation). Therefore the necessary taxonomic phonemic representation of [5k] is /ag\textsuperscript{w}/ (= /aG\textsuperscript{w}/, see below). Similarly the taxonomic phonemic representation for [5x] is /ax\textsuperscript{w}/ (= /aG\textsuperscript{w}/).

The phonetic sequence [5y] does not occur. The reflex of *Cuy for C \neq Q and C = Q is Co(y) by u-Velarization (γ-Deletion occurring optionally): *suy 'frost' > soy, *-yuy 'snore' > -yo.
To circumvent the incorrect outputs $Q^w aC^-$ and $CaC^-$ from Rounding Regression and RVN respectively for $C^-=\chi, G$, we must either add a restriction to the structural descriptions of these rules, or write a rule that they counterbleed and that bleeds them. Such a rule should also counterbleed u-Velarization and be bleed by it. We will write a rule of Rounding Progression expressing the taxonomic phonemic value of [3k] and [3x], the reflexes of $*u\chi$ and $*uG$ respectively:

(32) Rounding Progression

$$uQ \longrightarrow aQ^w / \_ \_ \_ \_ #$$

As we have noted, u-Velarization in Babine may possibly be in process of extension to all sequences $uQ$, in which case Rounding Progression becomes a nonrule of Babine.

Finally, we need to consider the representation of labialized velars. At this point in our discussion, $Q^w$ occurs stem-initially in the rule output, $k^w$ occurs stem-finally following long vowels, and $Q^w$ occurs stem-finally following $a$. $Q^w$ and $k^w$ are therefore in complementary distribution, which accords with the phonetic facts. Stem-initially, a labialized velar subphonemically lowers the stem vowel $a$ (as does a stem-initial nonlabialized back velar); for example, [sk^\*\_at] /sg^\*\_ad/ 'my knee', not [sk^\*\_at] (note that the stem initial is lenis so that the allophone [\_] is not conditioned in this case by a stem-initial fortis consonant).

To lend some support for the phonemic interpretation of [3x] and [3k], let us consider the second person plural subject prefix. The PA reconstruction is $*(a)\chi^w$- (Krauss 1965:24) (= $*u\chi$-). The Babine reflex is $(a)\chi^w$- and the segment $\chi^w$ has the phonetic quality [x] following the short vowel (the rounding occurring phonetically in the vowel), and [x^w] following a long vowel: /nay\_\_zan/ 'think 2 pl I' [n5x\_\_zan], /nix\_\_zi\?\_n/ 'think 2 pl P' [nix\_\_zi\?\_n].

This alternation [(5)x] $\sim$ [\_x^w] in the case of the Babine second person plural subject prefix is, of course, a synchronic one. In Carrier a parallel diachronic process has occurred. Morice wrote erh to represent $a\chi$, his use of r denoting back velar friction (TCL:3, 6). Under a-Velarization (and the subsequent processes of x-Segmentation and $\gamma$-Deletion) this has become oh, the modern form. With the lengthening of the vowel, the back velar friction was lost.
The taxonomic phonemic inventory of Babine includes h and ?. h contrasts with x and x. 0, h, and ? constitute a class of "zero" elements occurring as syllable initials and as syllable finals, the latter, in respect of h and ?, generally only in word-(or stem-) final position. Syllable-initially, both h and ? are fortis consonants. This is in contrast with 0 syllable-initially, which classes as lenis. h and ? are "manner consonants" syllable-initially, paralleling (with 0) the three noncontiguous members of a series (such as g q q'): lenis (0), non-glottalized fortis (h), glottalized fortis (?). Syllable-finally, 0, h, and ? parallel the three members of a series which may occur as finals (such as y x G): voiced continuant, voiceless continuant, and noncontinuant. The following discussion will be concerned chiefly with h, which occurs intervocally or word-initially, stem- or word-finally, and under certain conditions as a stem initial.

Intervocally or word-initially its phonetic value is [h], glottal fricative. Examples of intervocalic h in River Babine are neweholtil 'it didn't rain', bə̑t neholnag 'he told him'. In Lake Babine h becomes 0 between long vowels: neweholtil, bə̑t neolnag. In both dialects, h in the prefix hə- 'third plural subject' becomes 0 when the prefix is medial in the word: ?at'ah (< ?ə-hə-t'ah) 'they work' (see sect. 3.3.2). Examples of word-initial h in both dialects are hoquezdza 'it's cold', honzu? 'it's become nice weather'. In these cases it is a prefix initial and is the reflex of a PA back velar.

6.1 Stem-final h

Stem- or word-finally, both h and ? shorten the preceding vowel phonetically. In Lake Babine, there is word-final shortening without any necessarily overt realization of h. Kari says that in River Babine h is "introduced automatically to word final /a/" (1975:29). There are in fact contrasts between phonetically short vowels word-finally, whereas there is only one short vowel, a, that needs to be recognized at other points in the phonemic system of Babine. Therefore these occurrences of contrastive short vowels cannot be interpreted as phonemic a. Examples of contrasts are [wetat'he] wedadghen 'we two are not sitting', [pə̑γə̑weiniq̄k̄h̄] baγə̑wenidż̄q̄ah 'I didn't lend it (container) to him'; [pewekt'ẽ] bewedż̄ʔeh 'I didn't wait for him', [pə̑γə̑weiniq̄k̄h̄] baγə̑wenidż̄ʔah
'I didn't lend it (round object) to him'. In Chilcotin also, word-final h occurs with the same phonetic realizations (Krauss 1975:226).

6.1.1 Final h in verb stems

In considering the sources of stem-final h, the discussion will first take up verb stems. In Babine, h, sometimes alternating with ? in a given stem, occurs as a suffix in stative per- fective negative stems in certain stem sets of variable verb stems with underlying stem -CV (see Leer 1974:7 for the stem sets). ? occurs as a suffix in (positive) perfective and optative stems, and also occurs as the overt imperfective negative suffix if the imperfective stem is unsuffixed (suffix Ø), and as the overt optative negative suffix if the optative suffix in the stem set is also ? (and not ㈜).

In Carrier, the corresponding suffixes are the same except that the imperfective negative suffix is h alternating with Ø; and in the stative perfective negative also, h alternates with Ø. (There is one instance of an imperfective negative stem -CV? corresponding to a positive imperfective stem -CV: -ti? 'get tired of IN'. TCL:1144.) The alternation between h and Ø is partly conditioned by the stem vowel, the alternant Ø occurring perhaps more frequently than the alternant h when the stem vowel is i and rarely otherwise (there is practically no data concerning the stem-vowel u).79

These statements are summarized in the following table of the suffixes occurring with -CV underlying stems. The table includes the perfective suffixes not mentioned above, Ø~y (where y is the reflex of *y) in the positive and 1 in the negative, and also the future suffixes. stP stands for stative perfective and P for active perfective (for the use of stative and active, see, for example, Leer 1974).

<table>
<thead>
<tr>
<th>Babine</th>
<th>I</th>
<th>stP</th>
<th>P</th>
<th>F</th>
<th>O</th>
</tr>
</thead>
</table>
| positive stem   | Ø | ~   | Ø | ~ | y | ?/Ø~y | | ?
| negative stem   | ? | h~? | 1 | d1| ? |

<table>
<thead>
<tr>
<th>Carrier</th>
<th>I</th>
<th>stP</th>
<th>P</th>
<th>F</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>positive stem</td>
<td>Ø</td>
<td>Ø~y</td>
<td>?</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>negative stem</td>
<td>h~Ø</td>
<td>h~Ø</td>
<td>1</td>
<td>1</td>
<td>?</td>
</tr>
</tbody>
</table>

Therefore the hypothesis is made that the PBC negative verb stem suffixes are *? in the imperfective, optative, Ø and stative perfective, and *1 in the active perfective. In Babine, the suffix *? becomes h in certain stative perfective negative stems. In Carrier, it either becomes h or is lost in both the imperfective and the stative perfective negative stems.

PA *-CVn stems occur with the same set of suffixes as *-CV stems (Leer 1974). In Babine, the imperfective negative stem cor-
responding to positive -CVn is generally -CV?n, but in Carrier there is no stem change.

Cognate evidence supports the hypothesis that the source of zero h in the imperfective negative and stative perfective negative stems is ?? . For example, in Koyukon the occurrences of a ? suffix parallel those found in Babine, except that in the stative perfective negative the Koyukon suffix is ? and not h: ili?da?-e (i < PA *s) 'he's not sitting', ile?-e (stem ile) 'he's not standing', ile?-e 'he is not'. (The positives of these forms are lada, laheN, and naleN respectively; the -e is a negative enclitic.) Leer (1974:10) notes that in Alaskan languages, in the case of -CV stems, there may be no suffix in the stative perfective but that in Ahtena the vowel of the stative perfective negative stem is shortened, and he observes that elsewhere full vowels are shortened only before a glottal stop and suggests therefore that the shortening is a reflex of stem-final PA *h. His hypothesis seems to be confirmed by the Babine-Carrier data.

A process, then, of ??-Softening is posited in these stem finals whereby ?? > h. The PA stem vowel is necessarily a full vowel since the underlying stem shape is CV, and it is phonetically shortened. In Babine, ??-Softening is restricted to the stative perfective negative stem:

(33) ??-Softening

\[
\begin{array}{c|c|c|c|c}
\hline
? & \rightarrow & h & \[ & \text{Stem} \\
& & & & \# \\
& & & +\text{neg} \\
& & & +\text{stative} \\
\hline
\end{array}
\]

In Carrier, ??-Softening is extended to the imperfective negative as discussed above. We have noted that when the stem vowel is i (and possibly u also), ??-Softening frequently does not occur but instead suffixal *h is deleted.

The table below displays the reflexes of *VV? when ??-Softening has occurred in negative stems (the table neglects the vowel changes consequent upon L-Mutation and F-Mutation in Babine). The reflexes are Vh for each of the stem-vowels i, e, a, u in Babine, but are Vh for only the stem-vowels i and u in Carrier. When the stem vowel is e or a (reflexes of *e and *a respectively), then Vh becomes a? (that is, merges with reflexes of *a?), ultimately oh.

<table>
<thead>
<tr>
<th>stem vowel</th>
<th>i</th>
<th>e</th>
<th>a</th>
<th>u</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babine</td>
<td>ih</td>
<td>eh</td>
<td>ah</td>
<td>uh (?)</td>
</tr>
<tr>
<td>Carrier</td>
<td>ih</td>
<td>a? ( &gt; oh)</td>
<td>a? ( &gt; oh)</td>
<td>uh 81</td>
</tr>
</tbody>
</table>

A process of h-Shortening accounts for the sequences a? in Carrier:

(34) h-Shortening

\[
\begin{array}{c|c|c|c|c}
\hline
V & -\text{high} & -\text{rnd} \\
\rightarrow & a? & \[ & \# \\
\hline
\end{array}
\]
Since h-Shortening is always fed by ?-Softening, the input vowel is necessarily a long vowel.

The sequences ax in the negative stems under discussion were recorded by Morice. h-Shortening feeds a-Velarization and the modern reflexes of the sequences are oh: for example, nařazaskoh, IN of naske 'I travel by boat'; nařazəoh, IN of nas'a 'I carry a single object'; əakařaṇastoh, IN of əakanast 'I look for something'; təsdoh, stPN of tasda 'I am sitting'; təkoh, stPN of askə 'it (a container) is lying'; təsətəo, stPN of sašt (underlying stem -te) 'I am lying down'; təsədəlo, stPN of așdəli (underlying stem -le) 'I am' (Walker p.c.).

In h-Shortening, a PA full vowel *e or *a is shortened, but its modern reflex, o, is a long vowel by a-Velarization. h-Shortening is the only process in Carrier in which a PA full vowel becomes a short vowel. (In Babine, the only process in which a PA full vowel becomes a short vowel is the F-Mutation subrule i > ay.)

h-Shortening need not be restricted to [-high] vowels. Suppose it is expanded to include *ih > ax and *uh > ux. Then h-Shortening feeds RVR, and the ultimate output with respect to *ih and *uh is ih and uh respectively. (h-Shortening feeds Velar Labialization also in the case of *uh > ux.)

An expanded h-Shortening rule might be framed as follows:

\[
(35) \quad h - \text{Shortening} \\
\begin{array}{c}
V \\
\alpha_{\text{high}} \\
\beta_{\text{brnd}} \\
1 \\
2 \\
1 \\
2
\end{array} \rightarrow \left[ \text{-long} \right] + \text{cns} / \alpha_{\text{high}} #
\]

The expanded rule includes *oh > ux. However, since h-Shortening can be assumed to be an early rule, this subpart is vacuous, since there is no PA *o.82

γ-Deletion counterfees the restricted h-Shortening rule, since the output of γ-Deletion is CV(h) where CVh is the reflex of *CVx.

We have seen previously that in Carrier the reflexes of *Vx and *Vx are Vh, and that the stem-final reflex h of *x follows the stem syllable-nuclei i, ai, u (by Vowel Raising and other processes; see sects. 2.2.3 and 5.2.1) and the reflex h of *x follows the stem syllable-nuclei e, a, o (by Vowel Lowering and other processes). With the introduction of ?-Softening and h-Shortening, the ultimate rule output contains sequences ih, oh, and uh in which stem-final h is not the reflex of *x or *x, but of *?

In Babine, the stem-final reflexes of *x and *x are not merged with h (sects. 5.4.1, 5.4.3), but stem-final x, x (and x'), are in contrast with h. There is no h-Shortening rule in Babine at the phonemic level and therefore no merger of h < *? with x, x.

Besides these occurrences of stem-final h in negative verb stems, there are other nonsystematic stem-final occurrences. The
widely occurring Athapaskan "reference verb" (Hoijer 1968), PA stem *
\textit{t'eh}, is recorded as en\textit{torh} by Morice, modern form in Carrier
\textit{qant'oh}. In this case, it appears that stem-final \textit{\textit{\textalpha}} > \textit{h}:
*-t'\textit{e} > -t'\textit{eh} > -t'\textit{ax} > -t'\textit{oh} (h-Shortening and \textalpha-Velarization).

6.1.2 Final \textit{h} in noun stems

There are occasional examples of noun stems in Babine with
stem-final \textit{h}. One such is -q'\textit{ah} [-k'\textit{\textalpha}] 'track', in which the vowel
is probably a reflex of PA *e (cf. Chip -k'\textit{e} 'place where something
has been', Sar -k'\textit{\textalpha} 'tracks'). However, the PA full vowel has
become shortened in several languages: Nav -k'\textit{eh}, UT k'\textit{eh}, Koy
-q'a, UK -k'\textit{a}. In Outer Tanaina the vowel has been lost: -ba-q'.
The modern Carrier form is -k'\textit{oh}, earlier -k'\textit{ax} (TCL:69, 240; but
-k'\textit{oh} TCL:71). If, in view of the widespread stem-vowel shortening
and to explain the Babine vowel (a, not e), the PBC form *-q'\textit{a} is
reconstructed, then in pre-Babine the allophone of \textit{a} following the
back velar stem initial is [\textalpha], to be phonemized as /ah/ in
modern Babine when the stem final is zero. In pre-Carrier, it can be
assumed that *-q'\textit{a} > *-q'\textit{ax} in a process analogous to
h-Shortening.

There are no certain cognates on the Babine noun stem \textit{payah}
'saskatoons', though the form of the stem suggests that it might be a
color term with prefix \textit{\textalpha}-. The Carrier term for 'saskatoons' is
\textit{mai dan\textalpha}g\textit{as} (\textit{d\textalpha}g\textit{as} 'it is black'), literally 'round black
berries', so that we might hypothesize that \textit{payah} was cognate with
-*\textit{\textalpha}gas (the latter with compound classifier \textit{\textalpha}D). If a process of
stem-final consonant loss is supposed, then \textit{payas} > [\textit{\textalpha\textgamma\textalpha}] (the
allophone [\textalpha] occurs following the back velar), phonemically \textit{payah}.
L-Mutation is countered. A process of stem-final consonant loss
may also explain the Babine verb stem -t'\textit{ah} [-t'\textit{\textalpha}] 'do, work 1-0'
which corresponds to Carrier -t'\textit{ih} < *-t'\textit{ix}. The expected Babine
reflex is -t'\textit{ax} [-t'\textit{\textalpha}x] by F-Mutation.

In two further cases of stem-final \textit{h} in Babine noun stems, the
preceding stem vowel is the reflex of a full vowel: ts'\textit{an\textalpha}h
'orphan' and -q'\textit{ah} 'river'. Cognates of the first are Kut
ts'\textit{e}n\textit{in}, UT ts'\textit{een\textalpha}n, OTan ts'\textit{an\textalpha}k'-, Chip ts'\textit{in\textalpha}i, meaning
'child, offspring' ('orphan' in Chipewyan). These cognates sug-
ggest a PA reconstruction *-n\textit{an}(h)(-k'\textit{\textalpha})(-) and L-Mutation accounts
for the Babine stem vowel. The modern Carrier cognate is ts'\textit{anoh},
earlier ts'\textit{an\textalpha}x (TCL:84), so that a PBC form *ts'\textit{an\textalpha}h is suggested,
where *h < *k' irregularly. h-Shortening and \textalpha-Velarization account
for the stem vowel in Carrier, and L-Mutation for the stem vowel in
Babine.

A parallel process may account for Bab -q'\textit{ah} 'river', Car
-koh, cognate with Nav -k\textit{oh} 'arroyo'. The Navajo form implies a PA
stem-vowel *u and a stem-final front or back velar. The Carrier
stem in compounded form is -\textit{ku}-: -k\textit{uba} 'riverside' (TCL:31). If the
stem-final consonant became \textit{h}, then the PBC form may have been
*-qu\textit{h}, and the Babine form is accounted for by the process *Qu >
Q'\textalpha (sect. 5.2.4). However, the Carrier stem vowel is not accounted
for (since the reflex of *uh by h-Shortening is uh). Alternatively,
some irregular shortening of the stem vowel and loss of the
stem-final consonant might be posited whereby a PBC form *-qu
occurred and the subsequent development paralleled that of *-q'a 'track'.

6.2 Stem-initial h

We have considered h (1) intervocally or word-initially, (2) stem- or word-finally; we will now consider it (3) stem-initially.

In verb stems, h stem-initially in Babine is in complementary distribution with ?. Stem-initial h occurs following a consonantal syllable final (the latter representing a classifier or subject prefix), and ? occurs intervocally (with zero classifier and deictic subject). Phonetically, h is a zero segment and its presence is only detectable paradigmatically and in the fortis allophone of the stem vowel. It may be that, at a certain speech tempo, h represents phonetic syllable division, but verb forms in which stem-initial h occurs have been transcribed with the consonant immediately preceding h (that is, the phonemic syllable final of the preceding syllable) as initial to the syllable containing the stem vowel: [yanilin] /yanilhen/ 'he's looking at it'. Also, there are no voiceless continuant verb stem initials in Babine which are obstruent, so that, for example, yanile would be an anomaly. h, while being a voiceless continuant, is not an obstruent but is a "manner" consonant, paralleling the nonglottalized fortis (aspirated) noncontiguous members of obstruent series.

The following paradigms illustrate the complementary distribution of h and ?:

<table>
<thead>
<tr>
<th>'see it I'</th>
<th>'look for it I'</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 sg ishen</td>
<td>1 sg bakayteshen</td>
</tr>
<tr>
<td>2 sg inhen</td>
<td>2 sg bakaytenhen</td>
</tr>
<tr>
<td>3 sg yì?en</td>
<td>3 sg yàkayte?en</td>
</tr>
<tr>
<td>2 pl ix'hen</td>
<td>2 pl bakaytêx'hen</td>
</tr>
</tbody>
</table>

Other examples are as follows: ?aìlah 'he's working at it' (see above for discussion concerning stem-final h in the stem -t'ah < -D-?ah 'do, work I-O'); yabašaìhay 'he's waiting for him' (-hay stative perfective stem, Car -?i, cognate with Chip -?i); neydaìhadž 'he keeps spilling it' (underlying stem -tì?id : ìtì? > ì? (cf. TCL:2816); -hadž ~ -?adž is the usitative stem).

Although in verb stems stem-initial h and ? are in complementary distribution, they can be contrasted stem-initially in locative and noun stems, for example, nhan 'away, out of (of movement)', nhad 'round about at', nhaxw 'round about' (Car n?an, n?ad, n?ah respectively): n?al 'your spruce boughs', n?ad 'your wife'. Note that the phonetic sequences [nän] and [nän] are represented phonemically as nhan and nàn (the latter sequence occurring in tsì'iyenan 'the last time of all'), so that the vocalic contrast is accounted for by the presence or absence of h: (n)hø(n) versus (n)a(n).
Note that the verb forms bewedžì?eh 'I didn't wait for him' and bayawenidžì?ah 'I didn't lend it to him' in section 6.1 should now be rewritten as bewedžì?eh and bayawenidžì?ah.

In Babine, stem-initial h in verb stems has been shown to be in paradigmatic alternation with ?. In Carrier, this alternation does not occur, but an exceptional example of stem-initial h has been noted: natazhuh 'I rest and exclaim huh!' (TCL:1226).
7 BABINE STEM-SYLLABLE TYPES

In this section, the consequences of reinterpreting x in Babine as yh will be examined, particularly in respect to the stem-syllable types.

First it will be necessary to show that there is no contrast between the stem-syllables Cix and Cih. Examples of Cix include wadzix 'caribou', ṭš'adix 'ant', dānix 'mooseberry', dabix 'mountain sheep', tšănix 'marten', Guzix 'bluejay (Steller's)', tš'ănix 'its sap'. In all of these examples, the stem initial is lenis. Examples of Cix with fortis stem initial are rare since, with rare exceptions, Cix > Cax by F-Mutation when C is a fortis consonant (sect. 4.1). (The exceptions were given in section 4.2.)

Examples of Cih can be looked for in stative perfective negative stems of which the underlying stem is -Ci. Stems -Ci that have stative perfectives are -li 'be', -?i 'wait', -t'i 'have, live in', and -ts'i 'sit pl'. Of these, only the first has a lenis stem initial. Its stative perfective negative stem is -lix: wesdlīx (si > sdi) 'I am not'; that is, when -li carries the stative perfective negative suffix -h, -lih is not in contrast with -lix.

The stative perfective negative stems of -?i, -t'i, and -ts'i are -?ax, -t'ax, and -ts'ax respectively: bewedžhax ˈb3 (-hax ˈ -?ax) 'I am not waiting for him', west'ax 'I don't have', and wezdīlts'ax 'we pl are not sitting'. These stem forms are not in contrast with stems Cax < Cix by F-Mutation (where C is a fortis consonant). That is, stems which are derived from Cih by F-Mutation are not in contrast with stems which are derived from Cix by F-Mutation.

We conclude that Cih is not in contrast with Cix. Therefore, if x is rewritten as yh, Cix = Ciyh > Cih by a revision of y-Deletion (see sect. 5.4.1):

(36) **y-Deletion**

\[
y \rightarrow \emptyset / \left\{ \begin{array}{c}
i \\
Cu
\end{array} \right\} \quad (H)^{84} \quad \# \quad \text{where C } \neq \text{ Q}
\]

We may also revise subrule (b) in F-Mutation (sect. 4.1):

(37) **F-Mutation (b)**

\[
i \rightarrow ay / \left[ \begin{array}{c}
C \\
+f_r t
\end{array} \right] \quad (H) \quad \#
\]

88
Babine Stem-Syllable Types

The Babine stem-syllable types are:

1. \( C \{V\} \) \( C \) where \( V \) represents any long vowel and \( C \) is an obstruent and does not include \( ?, h, m, n, x (= yh) \), or \( y \) (but does include \( g \));
2. \( C \{V(?)\} \{m\} \) of which there are no recorded examples of \( CV(?)m; \)
3. \( C \{V\} y(H) \) (the type which includes \( CVx \) and \( Cax \)); and
4. \( CV(H) \). (In addition, there is the syllable-type \( C \{V\} g \{i\} \) occurring in first person singular verb prefix strings and \( C \{V\} x \{i\} \) occurring in second person plural.)

If there were no exceptional examples of \( Ci h (= Ci x) \) where \( C \) is fortis, then all stem-syllables \( Ci (H) \) would contain a lenis stem initial. All stem-syllables \( Cay(H) \) contain a fortis stem initial. Therefore, apart from the exceptional examples, \( i \) and \( ay \) are in complementary distribution and \( Cay(H) \) can be represented abstractly as \( Ci (H) \) where \( C \) is fortis and so \( Cay(H) \) eliminated from the third syllable type. This leads to a conflation of the third and fourth syllable types in \( CV(y)(H) \). In contrast to the other two syllable types, the stem vowel is \( V \), never \( a \). Syllables of this type may be termed open. The syllable finals in open stem syllables are \( \emptyset, h, ?, y, yh (= x) \), or \( y \). We shall call stem syllables with any one of these stem finals open in the surface representation of the syllable types also. Subrule (b) of F-Mutation, therefore, operates in stem syllables which can be classified as open.

The advantages that accrue if \( x \) is reinterpreted as \( yh \) by the rule of \( x \)-Segmentation are as follows:

1. The reinterpretation of \( x \) offers some explanation for its limited distribution, i.e., its occurrence word-finally only, since stem-initial \( *x > k \) in Babine and stem-initial \( k \) in Lake Babine becomes \( tS \) (sect. 3.1).
2. With the elimination of \( x \) as a phonemic unit, \( y \) can be considered a member of the sonorant system instead of a member of the obstruent, the front velar series therefore comprising the three noncontiguous members only. It is these three members of the series which become palatoalveolar in Lake Babine.
3. With \( y \) as a member of the sonorant system, the consonant classes, obstruents, laryngeals \( (h, ?) \), and sonorants (the last conflating nasals and the semivowel \( y \)), are in accord with consonant classes set up on the basis of distribution in the syllable types. Also, as we have seen, subrule (b) of F-Mutation operates in open syllables, in which the syllable final is not an obstruct or a nasal.
4. The noncontrastiveness of the sequences \( Ci h \) and \( Ci x \) is economically accounted for.

The following table summarizes the open stem syllables for the stem-vowels \( a \) and \( V = i \).
<table>
<thead>
<tr>
<th>PHONEMIC</th>
<th>PHONETIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) $C = [-\text{frt}]$</td>
<td></td>
</tr>
<tr>
<td>$\text{Ci}$</td>
<td>$\text{[Ci]}$</td>
</tr>
<tr>
<td>$\text{Cih}$</td>
<td>$\text{[Cix]}$</td>
</tr>
<tr>
<td>$\text{Ci?}$</td>
<td>$\text{[Ci?]}$</td>
</tr>
<tr>
<td>$\text{Ciy}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Ciyh}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Cay}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Cayh}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Cay?}$</td>
<td></td>
</tr>
<tr>
<td>(2) $C = [+]\text{frt}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Ci}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Cih}$</td>
<td>$\text{[Cix]}$</td>
</tr>
<tr>
<td>$\text{Ci?}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Ciy}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Ciyh}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Ciy?}$</td>
<td></td>
</tr>
<tr>
<td>$\text{Cay}$</td>
<td>$\text{[Ca^i]}$</td>
</tr>
<tr>
<td>$\text{Cayh}$</td>
<td>$\text{[Ca^ix]}$</td>
</tr>
<tr>
<td>$\text{Cay?}$</td>
<td>$\text{[Ca^i?]}$</td>
</tr>
</tbody>
</table>

If $x$ is reinterpreted as $\text{yh}$, the consequences of possibly reinterpreting $x^w$ as $\text{wh}$ should be considered. But (1) $x$ occurs word-finally only, whereas $x^w$ (= $x^w$) occurs as a stem initial also (and elsewhere) so that $x^w$ is not limited in distribution. (2) If it were possible to eliminate $x^w$ as a phonemic unit (or to represent it as $h^w$, with which it is not in contrast), then no real advantage would be gained in considering $w$ (the voiced continuant member of the same obstruent series) as a sonorant, since the nonlabialized (back) velar series is a full series of three noncontinuants and two continuants, and $x^w$ are the two continuant members of the labialized velar series. Also, there are no labialized "zeros" to complete a series containing $h^w$, corresponding to $\emptyset$, $h$, ?.. (3) Any remaining advantage in reinterpreting $x^w$ as $\text{wh}$ stem-finally lies in the fact that $\text{Cux}^w$ and $\text{Cuh}$ can be assumed to be not in contrast in the same way that $\text{Cix}$ and $\text{Cih}$ are not in contrast. Therefore, of the sequences $\text{CVx}^w$, $\text{CVx}$, $\text{CVh}$, where $V = \mu$ or $o$, no pair is contrastive. Choosing the representations $\text{Cux}^w$ and $\text{Cox}^w$, these are then included in the closed syllable-type
C \{V\} C^- where C^- includes x^W. The syllable-type C \{V\} C^- also correctly includes Cix^W (and Cig^W). (4) Note also that subpart (b) of L-Mutation (sect. 4.1) does not apply in open syllables (and there are therefore such forms as mu 'island', honzu 'it's become a nice day'), but it does apply in closed syllables with stem-final x^W, g^W (see sect. 5.4.1 for examples). (5) If x^W were reinterpreted as wh, then the open syllable type would be expanded as CV ((y)?)x((w)h), but no stem syllable-final w? has been recorded.
8 RULE SUMMARY

In the two following subsections, the rules which have been set up for Carrier and Babine are presented in order (where this may be relevant). The rule numbers correspond to the rule numbers in the earlier sections.

8.1 Carrier rules

(33) _-Softening

\[
? \rightarrow h / \quad \text{] Stem} \\
\quad [\text{+neg}] \\
\quad [\text{+stative}] 
\]

(34) _-Shortening; see also (35)

\[
\begin{bmatrix}
V \\
-\text{high} \\
-\text{rnd}
\end{bmatrix}
\rightarrow a \chi / \quad #
\]

(20) Velar Labialization; cf. (19)

\[
\begin{bmatrix}
\text{opt} \\
\langle Q \rangle
\end{bmatrix}
\rightarrow
\begin{bmatrix}
\langle Q^w \rangle \\
\langle Q^w \rangle
\end{bmatrix}
\quad / \\
\quad
\begin{bmatrix}
V \\
+\text{rnd}
\end{bmatrix}
\quad #
\]

(21) Velar Fronting; cf. (18)

\[
Q^w \rightarrow K^w / \quad #
\]

(1) Vowel Raising; see also (3)

\[
e \rightarrow i / \quad \{K, y\} \quad #
\]

(15) Reduced Vowel Raising (RVR); see also (11)

\[
\begin{bmatrix}
-\text{long} \\
+\text{long}
\end{bmatrix}
\rightarrow
\begin{bmatrix}
+\text{high} \\
-\text{syl} \\
+\text{high} \\
+\text{cnt}
\end{bmatrix}
\quad (?) \quad #
\]
(22) \( w \)-Adjustment
\[
\gamma^w \rightarrow w
\]

(23) \( g^w \)-Vocalization; see also (16)
\[
\begin{align*}
g^w & \rightarrow y^w / \left[ \begin{array}{c} V \\ +\text{long} \end{array} \right] \quad #
\end{align*}
\]

(24) \( x^{(w)} \)-Segmentation; see also (12)
\[
\begin{align*}
x^w & \rightarrow y^w / h \quad #
\end{align*}
\]

(25) Semivowel Deletion; see also (13)
\[
\begin{align*}
y^w / w & \rightarrow \emptyset / \left[ \begin{array}{c} V \\ +\text{high} \end{array} \right] \quad (H) #
\end{align*}
\]

(27) Inverse Velarization
\[
u \rightarrow o / \left[ Q \quad g^w \right] \\
\text{Stem}
\]

(2) Vowel Lowering; see also (3)
\[
\begin{align*}
i / u & \rightarrow e / o \quad Q #
\end{align*}
\]

(17) \( \gamma \)-Weakening
\[
\gamma \rightarrow \gamma \quad #
\]

(8) \( a \)-Velarization (see sect. 5.2.3 for revision)
\[
a \rightarrow o \quad Q #
\]

(14) \( u \)-Velarization (see sect. 5.2.3 for revision)
\[
u \rightarrow o \quad Q #
\]

(9) \( x \)-Segmentation
\[
x \rightarrow \gamma h \quad #
\]

(10) \( \gamma \)-Deletion (see later in sect. 5.2.1 for revision)
\[
\gamma \rightarrow \emptyset \quad (h) #
\]
(28) Rounding Regression; see also (6)
\[
Q \begin{bmatrix}
V \\
\text{+rnd} \\
\text{<-} \\
\text{-long}
\end{bmatrix}
\xrightarrow{\text{opt}} Q^W \begin{bmatrix}
V \\
\text{-rd} \\
\text{<-} \\
\text{+high}
\end{bmatrix}
\quad \text{Stem } [\_]
\]

(7) Reduced Vowel Neutralization (RVN)
\[v \rightarrow a\]

(26) Labialization Loss
\[g^W \rightarrow g / a\quad #\]

8.2 Babine rules

Where the Babine rules are the same as the Carrier rules, the rule number and designation only are given.

(33) -Softening

(20) Velar Labialization

(21) Velar Fronting

(1) Vowel Raising

(4) L-Mutation

\[(a) \quad \begin{array}{l}
| e | \\
| a |
\end{array} \rightarrow \begin{array}{l}
i \\
e
\end{array} / \begin{bmatrix}
C \\
\text{-frt}
\end{bmatrix} \quad (C) \quad #\]

\[(b) \quad u \rightarrow i / \begin{bmatrix}
C \\
\text{-frt}
\end{bmatrix} \quad \begin{bmatrix}
\text{-syl} \\
\text{+high}
\end{bmatrix} \quad #\]

(15) Reduced Vowel Raising (RVR)

(22) w-Adjustment

(12) x-Segmentation
\[x \rightarrow yh / \quad #\]

(36) y-Deletion; see also (30)
\[y \rightarrow 0 / \begin{bmatrix}
i \\
\{C\}
\end{bmatrix} \quad (H) \quad #\]

(27) Inverse Velarization

(29) RVR Extension
\[u \rightarrow u / \quad g^W \quad #\]
Rule Summary

(5) F-Mutation

(a) \( u \rightarrow o \) / \( [C^{+frt}] \) —— (C) #

(37)

(b) \( i \rightarrow ay \) / \( [C^{+frt}] \) —— (H) #

(2) Vowel Lowering

(31) a-Lowering

\( a \rightarrow a \) / —— \( \gamma \) #

(14) u-Velarization (see sect. 5.4.3 for Babine revision)

\( u \rightarrow o \) / —— \( \gamma \) #

(10) \( \gamma \)-Deletion (optional; see sect. 5.4.3 for Babine revision)

(32) Rounding Progression

\( uQ \rightarrow aQ^{w} \) / —— #

(28) Rounding Regression

(7) Reduced Vowel Neutralization (RVN)

(26) Labialization Loss
ADDENDUM

A number of references are made to Leer 1974 in the present study. Leer 1974 was a forerunner to Proto-Athabaskan Verb Stem Variation, of which Part One has recently been published (Leer 1979). Between 1974 and 1979 Leer made certain revisions in his theory. The purpose of this addendum is to point out how these revisions affect the present study, written in 1978.

But first it should be noticed that we have spoken of early PA and (late) PA. The current terms for these are Pre-Proto-Athapaskan (PPA) and Proto-Athapaskan (PA) respectively. PPA *kʷ > PA tʃ (written tʃ in the present study) and similarly for the other members of the PPA *kʷ-series. Therefore in the verb stem reconstructions, which are PPA reconstructions (with stem-nuclei V, V? and V'), members of the series should be represented by *g, *k, *kʷ, *x (there are no voiced fricatives reconstructed for PPA).

In particular, in Leer's theory, the reconstructions of *CV'T' and *CV'TT' roots have been reversed, i.e., for *CV'T' read *CV'T", and for *CV'TT' read *CV'T" (for example, see sect. 5.2.3 in which reconstructions */Cæ'q' should now read */Cæ'q').

Also, in momentaneous stem sets, F-U stems occur with short vowels for any of the stem-nuclei V, V?, or V'. Therefore, for PBC, in which the contrast between the stem-final manners T', T, and Z in P stems is neutralized, and also the contrast between PPA *V? and *V' is neutralized, the chart in section 5.2.1 reads:

<table>
<thead>
<tr>
<th></th>
<th>PPA</th>
<th>I-O</th>
<th>P</th>
<th>F-U</th>
</tr>
</thead>
<tbody>
<tr>
<td>type 1</td>
<td>V</td>
<td>CVS</td>
<td>CvZ</td>
<td>CvS</td>
</tr>
<tr>
<td>type 2</td>
<td>V?, V'</td>
<td>CVS</td>
<td>CVZ</td>
<td>CvS</td>
</tr>
</tbody>
</table>

Type 1 remains distinct (with P stem CvZ), but type 3 conflates with type 2 (with P stem CVZ). Stem-sets CVS CVZ CVS (former type 3) exist but are "invariable" stem sets (invariable in some languages, variable in others, Leer 1979:81) in Babine-Carrier (for example, see TCL:2166, especially those with S or t stem final). In section 5.4.1, Bab -dzix, Car -dzuh is such a stem.

These revisions do not affect the arguments employed in this study. Since in PBC the contrast between PPA *V? and *V' is neutralized, the reversal of *CV'T' and *CV'T" is immaterial. In
sections 5.2.1, 5.2.2, and 5.2.3, use is made of the fact that certain PBC stem sets contain P stems with reduced stem vowel and others with full stem vowel, and similarly in F-U stems. This fact remains. In particular, it is still the case that stem-final *g occurs in the U stems of *-CVd underlying stems if and only if the stem vowel is reduced.

In section 5.2.1, footnote 37, it is said that the ablaut e ~ a frequently occurs in a stem set which has I-O and F stems Ceh. Stem sets in which such ablaut occurs are not, in fact, the reflexes of the stem sets of P roots (i.e., underlying stems) with final uvular but of *-Ca·y and *-Ca·y roots with suffix *-x in the I, F, and O stems (Leer 1979:30). With this theory of the origin of ablaut, Leer's reconstruction of the PPA root for 'grow' is not *-xa but *-xa·y with suffix *-x in the I stem (and in the O stem in PBC; see sect. 5.2.3).

A suffix *-x will account for the Carrier reflex -tî'oh of the I, F, and O stems of the PPA root *-tî'ũ 'tie', discussed in footnote 60.

Leer reconstructs the negative enclitic as *+he·, though in his footnote 46 he notes that in some languages in PN forms it is attested as *+tê·. In Babine, *? is not attested in PN stems of CVC roots in any synchronic process, but it is attested in their IN, FN, and ON stems (in the process S-? > T, sect. 3.2). Babine PN stems of CVC roots are parallel to Carrier FN stems, with S stem finals following reduced vowels and Z stem finals following full vowels. The processes of negative stem formation in Carrier correspond to the processes described by Leer (1979:68) except that the processes do not cover the formation of the PN stem of a CVC root when the stem vowel is full; in that case the stem-final manner is S in Carrier, not Z as might perhaps have been expected and as is found in Babine.

Section 6.1.1, footnote 80, implies a synchronic process of ?-suffixation in the formation of negative stems, not only in Babine but in Carrier also. Any overt manifestation of a "zero" negative suffix in Carrier is -h, manifested in the formation of certain negative stems of CV roots (sect. 6.1.1). However, for PBC we must reconstruct a negative suffix *-?, the reflex of a negative enclitic *+tê·. In Babine, -* occurs overtly in the IN stems of CV(n) roots and is attested in the process S-? > T. In Carrier, -* occurs overtly in the IN stems of CV roots by the process of ?-Softening, *? > h. In both languages, *? > h in stative PN stems of CV roots.
I am indebted to Jim Kari and Michael Krauss for the opportunity to see Kari's fieldnotes, which were taken down at Hagwilgate in August 1973 and August 1975, and which mostly comprise data in the River Babine dialect, but which include a small amount of data from a speaker of Fraser Lake Carrier living at Hagwilgate. The term Hagwilgate has been used in recent literature to designate River Babine data recorded by Kari.

The other ŝ initial in the Fraser Lake data is in ŝen 'summer', Central Carrier ŝin, River Babine ken, Lake Babine tšen. In this case the PA reconstruction is *šen (Krauss 1976:30), not *xen, but an early sound change *š > *x must have occurred in Proto-Babine-Carrier to account for the point of articulation in the modern forms and for the stop or affricate stem initial in Babine (from the sound change *x > k) (see Krauss 1976 for discussion of irregular developments in the PA fricatives).

It is interesting to speculate on the origin of these diverse negative prefixes. The tentative suggestion made here is that they are incorporated elements and are cognate with the modern Central Carrier postverbal particle iloh (< ilax, TCL: 502) < *iile (by regular diachronic rules) 'don't', and with the Chipewyan negative verbs: Chip hîle 'it is not'; Chip hûle, perhaps also Bab welew 'there is not'. There are two disjunct positions in the Carrier verb in which incorporated elements may occur, one between the iterative prefix and the negative prefix, and the other further to the left (TCL:1538ff., 1828ff.).

See sect. 2.3 for a discussion of pitch-stress in Central Carrier.

See sect. 2.1.2 for Morice's phonetic description of ŝ.

See note 59 for further discussion of -t'og.

The stems of a verb stem set are generally presented in the order imperfective, perfective, future, and optative. (However, as noted in the text, in this case the first stem is stative perfective.)

See sect. 5.2.4 for the Babine-Carrier stem -yo 'snore', PBC reconstruction *-yəy, possibly paralleling -zo 'caster' and -dloh 'be cold F-O' in respect of PA *əw (or *əw) > PBC *yə.

See sect. 4.2 for a Babine rule *q > o / m ____ (C) #.
10 The modern forms of the last two pairs are distinguished by pitch differences. See sect. 2.3.

11 One might also have argued that, since he writes q for the stem initial of 'go sg P' with D-classifier and this stem initial is not the reflex of a velar but of *da-y, it might have been expected that q would represent d' (or dž) and not g. However, the reflex of *da-y in River Babine is g: nauzasge 'I was hunting' (Kari fieldnotes, p.c.).

12 In other loans, French [g] (and [ç]) correspond to Carrier or Babine a; for example, tabsa 'bread' (CCBD liba; Fr le pain [pe]), Bab liga 'gloves' (Fr les gants [g]).

13 Kari (p.c.) has pointed out that the absence of n in the third person singular prefix string of the negative perfective (m-, not m-un-) shows that the i is not to be identified with the perfective marker. Note also that i occurs left of the D-classifier and the stem initial is d in the negative perfective stem -dal of the underlying stem -ya 'go sg' with D-classifier, whereas the perfective marker (y-component; Krauss 1969:54, 71f.) is manifested to the right of the D-classifier and the stem initial is dž in the positive perfective stem -dža?.

That the negative optative stem is -dža? probably shows, not that the y-component is present in the negative optative, but that that stem is derived from its positive counterpart. It is interesting to note, however, that there is a set of verb bases containing the same underlying stem but in the stem sets of which the optative stem is -da?, not -dža? (TCL:1200). The common component of meaning of these bases seems to be circumstantial (i.e., to go berry picking, hunting, visiting traps, etc.). The same phenomenon occurs in Beaver: tš̱øḏásə 'I will move away again' (cf. tš̱uuḏásə 'I will (start to) move away again'; ʔ < sdž; kaduúsásə 'I will go (looking for power)' (in which da- is not the inceptive prefix but probably reflexive). -šə is an enclitic commonly occurring with optative forms.

14 Carrier Linguistic Committee 1973:22. In TCL the initial consonant was k and the consonant cluster ss, probably underlingly sz > sdž in, for example, first person singular forms of z-initial verb stems.

15 Chipewyan has a form horáʔsn 'grasshopper' which could be cognate and in which the final syllable is identical in form to the stem -tšn 'meat'.

16 See Pike 1955 for these terms, and Bauernschmidt 1965 for illustration of their use in a phonemic description.

17 See Krauss 1976:6 for a "special fricative-voicing juncture marking the initial boundary of the verb stem" in PA.

The same phenomenon of controlled stem syllables in Tlingit (in which controlled vs. ballistic is nonphonemic since the stem syllable is the tonic syllable carrying the high or low tone) perhaps more readily distinguishes such nonsense pairs as kakagán and kakágán than do the pitch contours, since the contours are virtually the same in the two cases.
18 Probably 1882-1919, from the time of his arrival in Williams Lake during the summer of 1882, to his ten-day return to Fort St. James in the spring of 1919.

19 Strictly, the PA suffix is *-x (Leer 1974:8f.).

20 ŋ and ฿ denote "flat" velars in Chilcotin (Krauss 1975).

21 Criteria for the differentiation of tone and stress have been given by E.V. Pike (1974).

22 See note 2.

23 It was noted in sect. 2.1.2 that River Babine might not be a uniform dialect in respect of the reflexes of the PA *k-series.

24 See note 85.

25 The basic forms of the corresponding Carrier prefixes are progressive i-, γ-perfective i-, and s-perfective sa-. Corresponding to Babine allomorphs ezə- and ez- of the s-perfective are Carrier i- and iz- respectively. Compare also the s-perfective prefix in Upper Kuskokwim (-e)z(a)-.

26 For a discussion of the conative prefix in Athapaskan, see Krauss 1970:225, note 3.

27 Correlations of tongue height and pitch have been noted in other languages. In Mixtepec Mixtec and Ayutla Mixtec of Mexico, both tone languages, higher allotones occur with higher vowels (E.V. Pike 1974). In Xavante, a nontonal language of Brazil, pitch is dependent upon vowel length (lower when the vowel is long), but dependent to a greater degree upon tongue height: high if the vowel is high and low if the vowel is nonhigh (Burgess 1960). In these cases, the correlations are opposite to those found in Babine.

In Palantla Chinantec (Merrifield 1963), a tone language of Mexico, syllables may be ballastic or controlled. The initial of a ballastic syllable is fortis, and of a controlled syllable is lenis. In controlled syllables with mid tone, higher allophones of high vowels and lower allotones occur. In this case, the correlations between tongue height and pitch parallel the Babine.

28 Further examples of the French article occurring in loanwords in Babine are lili 'bed' (le lit) and liGa 'gloves' (les gants). Note that Babine is more regular than Carrier in its treatment of the French article, ll- from the masculine or plural article and 1a- from the feminine.

29 cf. Koy taq'i, UK tak'i, OTan tuq'i.

30 Jenness's transcription in 1924-25 was -beb; also dettsan 'raven', sa·bekyo 'big Dolly Varden', corresponding to Carrier -ba, datSan, and tsabai-tšo respectively.

31 The corresponding Carrier form is mai 'berry'. Morice (TCL:1133) notes a stem me? that he says is the Babine word for 'fruit, berry'. The Babine stem is used in the Carrier verb form daname? 'it is very fruitful', and it is quoted with the Carrier phonetic value of the stem vowel: me? [me?] The stem has not
been found in modern Lake Babine except in the phrase sas mi? 'bearberries'.

32 "Reduced" and "full" are being used of the PA and PBC vowels, but "short" and "long" of Carrier and Babine vowels, since the reflexes of PA reduced vowels are not necessarily short vowels and any degree of consistent pairing of reduced and full vowels in morphological alternations that there was largely lost in the modern languages.


34 Leer 1974 is a forerunner to a monograph on Athapaskan verb stem variation of which Part One has now been published (Leer 1979). The present study was written before its publication and an addendum (q.v.) updates the discussion in sect. 5.2.1 and following sections in the light of the revisions that Leer has made in his theory where these relate to the present work. The addendum also supplements the discussion in sect. 6.1.1 of negative verb stems in Babine and Carrier. The variant spelling in 'Athapaskan' is intentional. Leer spells it 'Athabaskan' in the title to his monograph. 'Athapaskan' has been the more usual modern spelling.

35 I imperfective, P perfective, F future (progressive), O optative, U usitative. When a stem set is listed in whole or in part, the stems are given in the order I-O P F-U for underlying stems CVC and I P F O U for CV.

36 If the stem final is d, then Z, S are both realized by d in I-O and P, and by d in F-U if the stem vowel is long and t, g in F, U respectively if the stem vowel is short.

37 The ablaut e ~ a frequently occurs in this stem set; that is, I Ceh, P Ca(1); the stem-final i is the reflex of PA *y, a perfective suffix. See Krauss 1964:123 for the ablaut. It occurs with reflexes of early PA *y and almost certainly not with reflexes of *y; that is, in all probability, it is dependent upon the stem nuclei of early PA and not the full and reduced vowels of late PA. (See Leer 1974 for early and late PA stem nuclei.) See also note 57.

38 See TCL:992, 996, and 2816, also the Reminders in sects. 587, 736, 840, 844, 1009, and 1105.

39 Ultimately, goh. We are writing the Carrier reflexes of the PA *q-series as g, k, k', y, x since the reflexes of the PA *k-series are palatoalveolar and there is only one (nonlabialized) velar series in Carrier.

40 The PA reconstruction is *-Goh (Krauss and Leer 1976:12). PA *a merges with *a and PA *y with *y.

41 We might consider alternatively whether *u > *a Q #, *a then merging with PBC *a so that reflexes of *CuQ from that point parallel the reflexes of *CaQ. However, in the stem sets in which the morphophonemic alternation *e ~ *u occurred, Morice recorded Coh, not Cerh ( = Caq) for the F-U of precisely these Ceh stems; the examples are -goh (= -ty'oh, modern -t's'oh) 'be
angry U' and -tłołh 'handle mushy material F-U'. Therefore a merger of *Caχ and *CXχ had not yet occurred.

42 See sect. 5.2.4 for the reconstruction of this stem.

43 The PA reconstruction is *-żu-n (Krauss and Leer 1976:13), and *Y merges with y. This is a stem in which Morice noted nasalization; -zōn [-zuŋ ?] (TCL:2815), in the speech of the older generation. In Sect. 2.1.3 it was concluded that the phonetic value of Morice's än was [aŋ]. Similarly, the phonetic value of his ōn was probably [uŋ]. His writing ōn and not ūn may not be significant since in French (of which he was a native speaker) there are no high nasalized vowels.

44 It seems likely that the stem -zug is another occurrence of the U stem of -zud 'skate', cognate with stems in other Athapaskan languages meaning 'drag; skate, ski', or (in Navajo) 'move (of a mass of objects)'. Alternatives to consider are that it is a reflex of the early PA stem *-t'ug 'comb, brush, rake' or that it is cognate with Kutchin -t'ioqg in ?ā-t'ioqg 'wood shavings, kindling'; (cf. UK -dredži, Koy -zega 'shavings', Nav -žēeh -zēed? -žih 'shave, mow', Sar -zāh -žāz 'trim bark, peel off'). The Kutchin form would therefore be the reflex of *-t'ug < *-t'eqg, the sound change *e > *u paralleling *s'eq' > s'ug' 'saliva', Kut s'tioqg, and conditioned by the stem initial. In either of these alternatives, Carrier g would be the reflex of a velar following the reflex of a full stem vowel.

45 The verb stem-set -guh -g'aw -guh is used of 'putting inside out' or 'being inside out' (TCL:1272). If -gug contains the same underlying stem, then the underlying stem cannot be -gud with the d stem final, and therefore -gug cannot be a usitative stem. -gug may therefore be an alternate P stem, a reflex of *-Gug (see sect. 5.2.4).

46 The glottalization of the consonant may be a mistranscription. For example, Navajo has -tšōʔ, Kut -tsōɡ.

47 The form should be datč'ag (in Cook's transcription) which TCL and CCBD translate 'porcupine'; Morice's word for the quill is tš'oh.

48 In addition there are -CVD stem sets in which the P stem has the form of the U stem -Caq. One such stem set is that of the stem -tšud 'take' (PBC *-kud), P stem -tšag. In Babine, the regular P stem -kod can be used.

49 The Navajo imperfective tones imply that the stem final is the reflex of *g (or *x) in the first two cases and of *k' in the third. See Leer 1974:14, 15.

50 TCL gives no verb base for 'vomit (momentaneous)', but this I stem is deduced from the F stem of 'start vomiting' and 'stop vomiting'.

51 The perfective of -d'iyh is given as -d'iy (TCL:2166) or -d'iy iz (TCL:781).

52 There is one exceptional example in which the Carrier stem-final o corresponds to Navajo stem-final ?: -t'ih -t'i 'stretch a
line' (cf. Nav -t'ēēn -t'ī?). The cognate evidence is conflicting, the (early) PA reconstruction of the underlying stem from Navajo being *-t'eg (assuming stem-final *g rather than *x on account of the Navajo stem-final *), Sar *-t'ēk', and Chip *-t'eq'. The P stem of the PA reconstruction from Chipewyan would have a full stem vowel and the corresponding reflex in Carrier would lose stem-final g following the long stem vowel. The Babine cognate is -t'īg.

53 In general, Babine-Carrier follows the "Canadian" pattern (Leer 1974:11) (see sect. 2.1.2), in which the stem-final noncontinuants have merged with the voiced continuant member of the series (though in Babine the stem-final manner T is not restricted to T = d, g, G, and b).

54 cf. Car hułts'ī, Bab hołts'īg 'stinging nettle'. The corresponding verb stem, meaning 'prickle, smart as from nettle sting', has been listed above with its Navajo cognate; cf. also Koy -ts'īk 'be bitter, strong'.

55 The Carrier vowel is unexplained. Cognates are Chip -tā, Sar -tāy, Hupa -tq', Matt. -tāq. The cognate Babine stem is -tōy which, as we shall see, implies PBC -*tūy or -*tūy.

56 This is not to say that stem-final * in Carrier is never the reflex of a PA back velar. An example in which * is the reflex of *g is -tśo' 'be wet, soaked', Bab -tśog' [tśōk], > late PA -tśi'q', derived from *-tśeq', *e ~ *u 'handle mushy object'.

57 The early PA reconstruction given by Leer (1974:6) for this stem is -*xa, *a ~ *e. However, the PBC reconstruction is -*yak in the imperfective. This stem is the possible exception to the statement in note 37 concerning the correlation of the ablaut *a ~ *e with early PA stem-nucleus *V*. However, the Babine F stem -yak could be analogical, < -*yak, since--as noted--stem-type 3 has often combined with stem-type 2 (sect. 5.2.1).

58 PA *scopy', see note 44. The cognate Babine form is soG.

59 Morice writes the Babine form nōk (TCL:2887) [ntōk] and notes the exceptional correspondence t' : d. If PBC -*duq < -*dqi (note the Chipewyan tone: -duwē) and -*duq' > pre-Babine *-t'eq', then the Babine stem -t'aʔm in hait'aʔm 'it's very small' may be a reflex of *-t'eq suggesting the source *q'm for Babine stem-final *m. No other instance of stem-final *m has been recorded. Krauss and Leer note Galice -t'äm 'small; jump', thought to be cognate with Bab -t'aʔm. If this Galice stem is indeed cognate, then Babine stem-final *m may rather be a reflex of a PA sonorant and not of a PA labialized velar *q'w in the obstruent system.

60 There is one possible exception to this statement. Morice includes the stem-set -tš'oh -tš'uk -tš'oh (TCL:2178), negative stems -tš'uk -tš'ul -tš'uk -tš'uk 'fasten, tie, attach with rope'. Elsewhere (TCL:973) the stem set is given as -tš'uk -tš'uk -tš'uk -tš'uk (or -tš'uh, see TCL:1063), negative stems -tš'uk -tš'uk -tš'uk -tš'uk. The alternation o ~ u occurs in no other stem set in TCL. Morice states (TCL:976) that -tš'oh is the pronunciation of the older generation, -tš'uh of the
younger. The modern form is -tł'uh (CCBD). The stem set may be compared with Babine -ʔex -ʔayʔ -ʔex -ʔex 'teach, learn'; -ʔex < *ʔɪx (by Velar Lowering), -ʔayʔ < *ʔɪʔ (by F-Mutation) (see sect. 2.2.3 for a discussion of this stem in Carrier). The stem -tł'oh, however, is a reflex of PA *-tł'u (Leer 1974) and not of *-tł'ux. Nevertheless, there are verb stems of the shape CVh (V = e, a, or o) in Carrier for which the regular PBC reconstruction would be *CVx, but for which the PA reconstruction is *CV: -yeh 'grow', -neh 'move camp O', -leh, -neh 'make, do'; Leer gives the PA reconstructions for the first two of these stems. The PBC reconstruction *-tł'ux 'tie with rope I-O, F' may be correct therefore. Vowel Lowering accounts for the Carrier stem-vowel o.

61 See sect. 5.4.1 for the PA reconstruction of this stem.

62 The first morpheme is transcribed by Morice thërhn 'underwater'. This is a rare example of his rh following a long vowel. The modern form is teh.

63 The stem-final dz (that is, T = dz) is extrasystematic in Carrier. CCBD contains at least two other examples: ?ayadz 'cartilage' and ?atast'odz 'fascia'. -t'odz has the appearance of a Babine stem in which F-Mutation has applied. Morice gives two examples of stem-final dl in Carrier of which he says the second "is properly speaking a Babine term" (TCL:43): dazadl 'tough, leathery', t'ink'adl 'Indian potato'.

64 The Koyukon stem arises from the metathesis of the stem final with a suffix *-g. Koyukon has another stem -ts'u? 'kiss', which is probably cognate with Bab -ts'o? 'kiss', Kut -ts'i??, Chip -ts'ünk. The Babine stem therefore is probably not cognate with Car -ts'og/-ts'us; the stem initial in the Babine case being a reflex of PA *ts', and in the Carrier case, of *tš'.

65 Stem-final *ǧr or *ďr (but not *s or *ď) can account for the late PA ablaut *a ~ *u.

66 See, however, sect. 2.1.1 for tentative PA reconstructions -*Caw or -*Caw of certain stems -Co and -Coh for which the PBC reconstruction is -*Cuy or -*Cuʔ.

67 Young and Morgan 1943:224.

68 A mistranscription of k' for g is assumed here.

69 See note 45. Note that the alternation -gaw ~ -gement suggests that -guyh 'be/put inside out' is a reflex of *-Gug or *-Guk' < *-Gv̌/*-GV̌k' where V is an unrounded vowel and *ǧ/k' = *ď/ts' (see note 75).

70 This statement has been made before -gaw was recognized as a probable variant perfective stem.

71 See TCL:738 for the verb base in which this stem occurs; the cognate Babine stem set is -nex, -gery 'do (refl.)'.

72 See sect. 2.2.2 for a discussion of e-Sharpening.

73 See later in this section the reconstruction of this stem.

74 A mistranscription of G for g is assumed.
75 The verb stem-set *ghwaz *ghw is also used of 'putting inside out' and 'being inside out' (TCL:1272). Since *gweg ( = modern Carrier *gag), see sect. 5.2.2) is also used of 'put inside out, be inside out' (TCL:1169), *gweg may be an alternate perfective stem in the stem set (see note 45).

76 Compare the derivation of *xuk* (C from *-xik*W-C 'whistle', underlying stem *-xik*W = *-xikt*S, 'breathe' (Leer 1974:23), in which the labialization of the stem-final consonant passes to the stem vowel. The reflexes of the P stem in Carrier are dži (< *-džiy) or -džiz 'breathe P', I-O stem -džih. The reconstructions *-dluq* and *-Guk* are early PA in form, but the vowel change *e > u may not belong to early PA.

77 If PBC were to be reconstructed with respect to all Carrier dialects, the Lower Carrier data that is available indicates that this statement is an insufficient statement, since there are examples of stem-final g in Lower Carrier that correspond to the stem-final y in Babine. Lower Carrier data is given in sect. 5.2.4; the available Babine cognates are -džey 'do (refl.) P', -ts'ay 'hear', da6 'up', Io6 'fish', -tsa6 'be crying IN', and -ze6 'mouth'.

78 There is a real paucity of recognized reflexes of *QuQ in the data, for any Q, initial or final. Two probable examples we have already encountered are -yo 'snore' and dalq'Wax 'frog' (sect. 5.2.4).

79 Suffixal h also occurs as an alternate of h in the imperfective negative of Morice's Carrier stem sets when the stem shape is variable -CV or -CV'; that is, invariably in the sense that all the positive forms are the same, and generally any variation is only in the PN stem, which may carry the suffix i. The alternate imperfective negative stem -CVh occurs rarely in the case of -CV stems, more frequently in the case of -CV'. Babine does not appear to have this alternate stem in these cases.

80 In accordance with this hypothesis, it was assumed in sect. 3.2 that negative imperfective, future, and optative verb stems in the modern languages are formed from their positive counterparts by a process of *-suffixation. In this process a stem-final voiceless continuant becomes occluded in Babine (S-* > T), and becomes voiced in Carrier following a long stem vowel and unchanged following a short stem vowel. The perfective negative stems, stative and active, are not formed directly from their positive counterparts but directly from the underlying stem analogously to positive stems.

81 See TCL:2181, Reminder II.

82 The subpart would feed the optional part of Velar Labialization which feeds Velar Fronting, so that the reflex of *oh (if it occurred) could be uh.

83 In sect. 6.1 a variant of this form was given:bewedźi?eh (or, correctly, bewedźi?eh). The expected stem form is -hax < -hîh ( ~ -?ih = -?ix) by F-Mutation. It was suggested in sect. 4.2 that certain stem-forms -Ceg, where C is a fortis consonant, are the output of an irregular extension of F-Mutation in which i > e. The variant -heh < -hîh could be accounted for similarly.
84 $H = \{ h, ? \}$; see sect. 5.2.3.

85 -zqay? is the form that would be expected in the light of comparative evidence (cf. Koy 1aqana?); Cay? is in contrast with Cay?; for example, -ts'ay? 'listen P'. 
BIBLIOGRAPHY


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BABINE AND CARRIER PHONOLOGY

A synchronic and diachronic study of two Athapaskan languages, Carrier and Babine, which are spoken in Central British Columbia. Concentrating on stem phonology, it is shown that Babine (also known as Northern Carrier) must be classified as a language distinct from Carrier (which consists of the two more closely related dialects, Central Carrier and Southern Carrier). The one feature above all others that makes Babine distinct from Carrier is the Babine vowel shift, which is conditioned by a fortis-lenis classification of syllable initials, a type of development which has not been documented previously for an Athapaskan language.