1 Empirical Issues

(1) Prominent Positions (Π): (i) onsets
(ii) stressed syllables (σ)
(iii) root-initial syllables (σ₁)

(2) The Subset Principle in Prominent Positions:
Contrasts in non-Π ⊆ Contrasts in Π
(i.e. neutralization in non-prominent positions)

(3) Empirical Issue: Do other logical possibilities exist?
(i) Contrasts in non-Π ⊂ Contrasts in Π
(i.e. neutralization in prominent positions)

(ii) Contrasts in Π and those in ~Π are disjoint
(i.e. allophony conditioned by prominent positions)

(4) Answer: • Yes, all three possibilities do exist. (Trubetzkoy 1939)
• However, the types in (3) are more restricted than the one in (2).
• The types in (3) only apply to classes defined by sonority, not by individual features such as Place, [back], etc.
2 Theoretical Proposals

(5) To account for the patterns in (3), I argue that:

☐ Markedness constraints motivate Π-neutralization (3i) and Π-allophony (3ii).
☐ These markedness constraints are formed by the combination of the sonority scale with prominent positions.
☐ More generally, the creation of markedness constraints is fairly free.
☐ However, a general principle restricts the form of markedness constraints:

(6) The Planar Accessibility Principle:

   (i) Elements that appear on the prosodic plane: Root, μ, σ, Ft, …
   (ii) Elements that appear on the featural plane: Root, [labial], [coronal],…

For any markedness constraint \( C^M \),
and for every pair of elements \( e_1, e_2 \) in \( C^M \),
\( e_1 \) and \( e_2 \) are on the same plane.

E.g. *σ/CODA is fine since both σ and CODA are on the prosodic plane.
*σ/[labial] is ill-formed since σ is on the prosodic plane and [labial] is on the featural plane.

3 Π-Allophony in Niuafo’ou

(7) Niuafo’ou [niuafo’ou] is a Polynesian language, described by Tsukamoto (1988). The data and generalizations presented here are primarily from Tsukamoto’s dissertation; I recently confirmed them with a native speaker.

(8) • Syllables are (C)V_i(V_i/k)
• Stress falls on the penultimate vowel (like the closely related Tongan).
• Vowels = /i e a o u/

(9) Vowel Devoicing
High vowels devoice:
(1) between voiceless stops [p t k (?)] \( (C^\text{stop}_e - C^\text{stop}_e) \)
(2) between a voiceless stop and a word boundary \( (C^\text{stop}_e - #) \)
[kàpikápi] wedge cf [mokimokì] shatter
[tápi] wipe cf [táñi] weep
[hàu.a lié.kj.sí.a] attended by chiefs
(3) after voiceless continuants [f s h] and before another consonant (C^+cont \_C)

- [mòfímòfi] slight fever cf mokimoki
- [pàšikàla] bicycle
- [lahēlahē] somewhat many cf [mòfûike], *[mòfûike]

(10) **Analysis**:
- The exact analysis of devoicing does not affect the argument.
- It is provided in Appendix 1 for the sake of completeness.
- For the rest of this talk, I will call the set of constraints that trigger devoicing “DEVOICE”.

(i) || DEVOICE » IDENT[voice] ||

3.1 **Exceptions**

(11) Vowels do not devoice in certain positions:

(i) Prosodic Word-initial syllables:

<table>
<thead>
<tr>
<th>[kití:]</th>
<th>game</th>
<th>*[kití:]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[tutûku]</td>
<td>stop</td>
<td>*[tutûku]</td>
</tr>
</tbody>
</table>

(ii) Stressed syllables:

<table>
<thead>
<tr>
<th>[lahîni]</th>
<th>large+deictic</th>
<th>cf [lāhi] large</th>
</tr>
</thead>
<tbody>
<tr>
<td>[hîfo]</td>
<td>descend</td>
<td>*[hîfo]</td>
</tr>
<tr>
<td>[tûkûtûku]</td>
<td>put down for a while</td>
<td>*[tûkûtûku]</td>
</tr>
</tbody>
</table>

(12) This is a case with disjoint sets:

In the devoicing environment, prominent positions (σ, \( σ_1 \)) contain voiced vowels while non-prominent positions contain devoiced vowels.

3.2 **Analysis**

(13) **The Challenge**:

How can we block the effects of DEVOICE in stressed syllables and initial syllables?

(14) Faithfulness constraints aren’t any use:

By Richness of the Base, we have to consider an input like /kìti:/, with the initial vowel already devoiced. With a faithfulness constraint on initial syllables, the vowel will incorrectly remain devoiced:

<table>
<thead>
<tr>
<th>/kìti:/</th>
<th>IDENT(σ_1[VD])</th>
<th>DEVOICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>✦ kìti:</td>
<td>x!</td>
<td>x</td>
</tr>
</tbody>
</table>
(15) So, we need to use a **markedness constraint**: * $\sigma_1/V$

<table>
<thead>
<tr>
<th>/kiːti:/</th>
<th>* $\sigma_1/V$</th>
<th>DEVOICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>kiti:</td>
<td>x!</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/tiːkːiː/</td>
<td>* $\sigma/\mathcal{V}$</td>
<td>DEVOICE</td>
</tr>
<tr>
<td>tukku</td>
<td>x!</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(16) Ditto for stressed syllables: *$\sigma/\mathcal{V}$

<table>
<thead>
<tr>
<th>/tukku/</th>
<th>* $\sigma/\mathcal{V}$</th>
<th>DEVOICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>tukku</td>
<td>x!</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.3 Π-Normalization

(17) An example of normalisation in prominent positions is found in Campidanian Sardinian.

(18) Campidanian Sardinian (Bolognesi 1998)

- Does not allow rhotics or glides (prosodic) word-initially, but they can appear elsewhere.
- A metathesis process repairs PrWd-initial glides and rhotics

(19) Positional faithfulness is of no use here.

- There is no ranking of IDENT-$\sigma_1$-[r], *r, and IDENT-[r] that could possibly result in [r] being banned from initial position.
- Positional faithfulness constraints promote retention of contrast. Normalization of contrast can only be effected by markedness constraints.

4 The Π-Markedness Constraints

(20) **Question**: Where do the *$\sigma_1/\mathcal{V}$* and *$\sigma/\mathcal{V}$* constraints fit in?

(21) **Proposal**:
They are formed by free combination with the sonority constraints of Prince & Smolensky (1993):
(i) NUC = syllable nucleus
ONS = syllable onset
Sonority scale: | vowels > glides > liquids > nasals > fricatives > stops |

(ii) ❏ $\left[ \begin{array}{l} *\text{ONS/vowel} \rightarrow *\text{ONS/glide} \rightarrow \cdots \rightarrow *\text{ONS/stop} \\ *\text{NUC/stop} \rightarrow *\text{NUC/fricative} \rightarrow \cdots \rightarrow *\text{NUC/vowel} \end{array} \right]$

(i) We can articulate the ‘vowel’ part of the sonority scale more fully, based on work on sonority-driven stress (see esp. Kenstowicz 1994) and the Niuafo’ou case:

$$| a > e, o > i, u > \sigma > i > V |$$

(22) Now combine the sonority constraints with prominent positions:

$\left[ \begin{array}{l} *\sigma_1/\text{ONS/vowel} \rightarrow *\sigma_1/\text{ONS/glide} \rightarrow \cdots \rightarrow *\sigma_1/\text{ONS/stop} \\ *\sigma_1/\text{NUC/stop} \rightarrow *\sigma_1/\text{NUC/fricative} \rightarrow \cdots \rightarrow *\sigma_1/\text{NUC/vowel} \end{array} \right]$

$\left[ \begin{array}{l} *\sigma/\text{ONS/vowel} \rightarrow *\sigma/\text{ONS/glide} \rightarrow \cdots \rightarrow *\sigma/\text{ONS/stop} \\ *\sigma/\text{NUC/stop} \rightarrow *\sigma/\text{NUC/fricative} \rightarrow \cdots \rightarrow *\sigma/\text{NUC/vowel} \end{array} \right]$

$\left[ \begin{array}{l} *\text{ONS/stop} \rightarrow *\text{ONS/glide} \rightarrow \cdots \rightarrow *\text{ONS/vowel} \\ *\text{NUC/vowel} \rightarrow *\text{NUC/fricative} \rightarrow \cdots \rightarrow *\text{NUC/stop} \\ *\text{NUC/stop} \rightarrow *\text{NUC/glide} \rightarrow \cdots \rightarrow *\text{NUC/vowel} \end{array} \right]$

... etc...

* Also see Kenstowicz (1996)

5 Predictions

5.1 Onsets

(23) The sonority hierarchy also applies to onsets:

\[ e.g. \ *\sigma/\text{ONS/glide} \text{ bans glides in stressed syllable onsets.} \]

(24) Prediction borne out in Niuafo’ou:

(i) $V^{\text{high}} \rightarrow \text{glides} /_V$

| /[juniṭi] | unit | */[juniṭi] |
| [waēa] | wire | */[uaēa] |
| [welīṇatōni] | Wellington | */[welīṇatoni] |

| /iuniti/ | ONSET | IDENT-\(\mu\) |
| i.u.nī.ti | x x | |
| ju.nī.ti | | x |
(25) except when the glide will end up in a stressed syllable:

\[
\begin{array}{|c|c|c|c|}
\hline
\text{/iatel/} & *\sigma/\text{ONS/glide} & \text{ONSET} & \text{IDENT-\mu} \\
\hline
\text{\emph{i.\acute{a}te}} & \text{x!} & \text{x} & \text{x} \\
\hline
\text{\emph{j.\acute{a}te}} & & & \text{x} \\
\hline
\end{array}
\]

(26) Note that we cannot use positional faithfulness here either: by Richness of the Base we need to explain why input /jate/ ends up as [iate]. Positional faithfulness won’t achieve this.

5.2 \Pi–Neutralization

(27) The *\Pi/sonority constraints are predicted to effect neutralization, not just allophony:

\[
\begin{array}{|c|c|}
\hline
\text{/wija/} & *\sigma/\text{ONS/glide} \\
\hline
\text{\emph{wija}} & \text{x!} \\
\hline
\text{\emph{vija}} & \text{x} \\
\hline
\end{array}
\]

(28) Gujarati (Cardona 1965:28)

Glides are neutralized word-initially: /w/ \rightarrow [v], as in the tableau above.

(29) Other languages:

Afrikaans \hspace{1cm} \text{no word-initial glides}
Golin (Bunn & Bunn 1970:4) \hspace{1cm} \text{no word-initial liquids}
Chamicuro (Parker 2000) \hspace{1cm} \text{no [h] or [ʔ] in onsets}
Huariapiano (Parker 1999) \hspace{1cm} \text{no [h] in initial main-stressed \sigma}

5.3 Symmetry of Repair

(30) For any markedness constraint *\alpha/\beta, either \alpha or \beta can be affected depending on the ranking of constraints that \textit{locate} (e.g. ALIGN) or \textit{preserve} (i.e. FAITH) \alpha/\beta:

(i) \alpha is affected: || \text{LOCATE/FAITH-\beta, *\alpha/\beta} \Leftrightarrow \text{LOCATE/FAITH-\alpha} ||

(ii) \beta is affected: || \text{LOCATE/FAITH-\alpha, *\alpha/\beta} \Leftrightarrow \text{LOCATE/FAITH-\beta} ||

(31) Example of present interest: The allophony case.

*\sigma/\text{NUC/\nu}, \text{ where } '\alpha' = \sigma \text{ and } '\beta' = \text{NUC/\nu}

This constraint can be satisfied by either eliminating the \nu or by moving \textit{the stress}. 
(32) Eliminate V:

<table>
<thead>
<tr>
<th>/tika/</th>
<th>STRESS=PENULT</th>
<th>*σ/NUC/V</th>
<th>DEVOICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

(33) Move Stress:

<table>
<thead>
<tr>
<th>/tika/</th>
<th>DEVOICE</th>
<th>*σ/NUC/V</th>
<th>STRESS=PENULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

(34) Sonority-Driven Stress

Such cases do exist (Kenstowicz 1996, de Lacy 1997, in prep.)

e.g. Jaz’va Komi (Itkonen 1955, Lytkin 1961)

Main stress falls on the leftmost syllable with a non-high vowel.

<table>
<thead>
<tr>
<th>/mijanlan'/</th>
<th>IDENT-i/u</th>
<th>*σ/NUC/i,u</th>
<th>ALIGN-σ-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>mijánlan'</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>méjanlan'</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 Impossible Π-Neutralizations and Allophonicies

(35) Summary so far:
Π-neutralization and allophony is a response to constraints that refer to Π and classes defined by sonority.

(36) Empirical Issue:
Q: Do Π-neutralizations and allophonies ever refer to classes defined by feature classes like [labial], [back], etc.?
A: No.

(37) Further evidence for this comes from prominence-driven stress:
As shown above, the constraints *σ/SONORITY can drive sonority-sensitive stress. However, there are no prominence-driven stress systems in which stress is attracted to a particular syllable based on a single feature. (e.g. there is no stress system in which stress falls on the leftmost front vowel, ignoring back vowels).

See de Lacy (1997:esp. §1.1.3) for some discussion.
(38) Theoretical Issue:
Q: Why not? Or in present terms: Why are there no constraints of the form \( \Pi/F \)?

(39) My Answer
(i) Sonority is a property of root nodes.
(ii) Prosodic Plane vs Featural Plane
- with root nodes at the axis.
(iii) Planar Accessibility Hypothesis:
Every element in M (M is a markedness constraint) is on the same plane as every other element in M.
(iv) For precursors to this hypothesis, see Ito & Mester (1992) (also see Lacy (1997) for further references).

(40) Example 1: \( \sigma/G_{22}/ONS/glide \) (where ‘glide’ is a sonority level).
- More explicitly: \( \{A(\sigma, \text{ONSET}_i) & A(\text{ONSET}_i, \text{Root}_k) & S(\text{Root}_k, \text{glide})\} \)
  (i) \( A(\alpha, \beta) \) is the association relation
  (ii) \( S(\alpha, \beta) \) is the ‘sonority’ function.
- \( \sigma \), onset, Root are all on the prosodic plane.

(41) Example 2: \( +\text{SON}/-\text{VOICE} \) “no voiceless sonorants”
- More explicitly: \( \{A(\text{Root}_i, [+\text{son}]) & A(\text{Root}_i, [-\text{voice}])\} \)
- Root, [+son], [-voice] are all on the featural plane.

(42) Example 3: \( \sigma/G_{22}/\text{NUC}/[-\text{back}] \)
- More explicitly: \( \{A(\sigma, \text{nuc}_i) & A(\text{nuc}_i, \text{Root}_k) & A(\text{Root}_k, [-\text{back}])\} \)
- \( \sigma \) and \( \text{nuc} \) are on the prosodic plane, but [-back] is on the featural plane.

6.1 Implications
6.1.1 Positional Markedness

(43) Non-\( \Pi \) (traditional) Neutralization:
- Must be effected by FAITHFULNESS constraints, Beckman (1998)-style:
  \( || \text{FAITH-}\Pi-F \rightarrow *F \rightarrow \text{FAITH-F} || \)
  e.g. \( || \text{IDENT-}\sigma-\text{[labial]} \rightarrow *[\text{labial}] \rightarrow \text{IDENT-[labial]} || \)

(44) cf Positional Markedness constraints: \( || *\Pi/F \rightarrow \text{FAITH-F} || \) (e.g. Zoll 1998)
\( || *\sigma/[\text{labial}] \rightarrow \text{IDENT-[labial]} || \)
(45) The issue that positional markedness raises: if *non-$Π/F$ constraints are ok, why aren’t *$Π/F$ constraints allowed?

6.1.2 Featural constraints with Prosodic Domains

(46) The PAH also means that constraints that refer to featural conditions within prosodic domains cannot exist. A classic case is the OCP, as applied to dissimilation: e.g. $OCP_{σ(labial)} ≈ *\{[labial]\}...[labial]}_{σ}$

(47) The PAH requires the featural condition to be decoupled from the statement of domain.
   • This is not an unwelcome requirement, since constraints have become more and more context-free, with domain- and environment-restrictions due to the interaction of faithfulness or related constraints.

(48) An Advertisement: For an OCP approach that decouples the condition and the domain, see Struijke & de Lacy (to appear (in October)).

7 Summary

(49) Empirical:  • Neutralization in prominent positions is attested.
   • Allophony conditioned by prominent positions is attested.

(50) Theoretical:  The $Π$-markedness constraints result from relatively free combination of prominent positions with other constraints.
   • Combination is limited by the Planar Accessibility Hypothesis:
     “You can have elements from different planes in the same markedness constraint.”

(51) Future Issues:
   • Is the PAH correct? Can we absolutely do without any constraint of the form $*π/F$ ($π$ a prosodic element, $F$ a feature)?

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Appendix 1: Devoicing

- Since onset consonants always retain their underlying specification for [voice], IDENT[ONSET][VOICE] must be dominant.
- Since vowels adjacent to continuants devoice (e.g. *mofimofi*): AGREE[-voice]»cont “Segments adjacent to continuants must be [-voice] if the continuant is [-voice]” is high-ranked.
- The other facts are accounted for by ranking || AGREE+[VOICE] » AGREE-[VOICE] ||

\[(52)\]
\[
\begin{array}{c|c|c|c}
 & \text{AGREE-[VOICE]} & \text{AGREE+[VOICE]} & \text{IDENT[VOICE]} \\
\hline
\text{/lahila}\text{hi/} & x & x & x \\
\hline
\text{laha}\text{lihi} & \text{!} & & \\
\text{laha}\text{lahi} & \text{!} & & \\
\hline
\end{array}
\]

\[(53)\]
\[
\begin{array}{c|c|c|c}
 & \text{AGREE+[VOICE]} & \text{AGREE-[VOICE]} & \text{IDENT[VOICE]} \\
\hline
\text{/tapi/} & x & & \\
\hline
\text{tapi} & \text{!} & & \\
\hline
\end{array}
\]

\[(54)\]
\[
\begin{array}{c|c|c|c}
 & \text{AGREE+[VOICE]} & \text{AGREE-[VOICE]} & \text{IDENT[VOICE]} \\
\hline
\text{/mokimoki/} & x & & x \\
\hline
\text{moki}\text{mo} & x & & x \\
\text{mokimo}\text{ki} & \text{!} & & x \\
\hline
\end{array}
\]

Appendix 2: Onset-Sonority-Driven Stress

- Even onset sonority counts:
  - Alyawarra (Yallop 1977) (an Arandic language)
    - Primary stress falls on either the first or second syllable.
    - Analyzed as undominated ALIGN-FT-L with dominated FFORM=TROCHEE.
  - Stress falls on the initial syllable only if it has an onset:
    - *rinh\text{a}*
      - cf. *amp\text{a}, il\text{ipa}*

\[(55)\]
\[
\begin{array}{c|c|c|c|c|c}
 & \text{rinh}\text{a/} & \text{\sigma} & \text{ONSET} & \text{FFORM=TROCHEE} \\
\hline
\text{rinh\text{a} } & & & & \\
\text{rinh}\text{a} & \text{!} & & x \\
\hline
\text{amp\text{a/} } & \text{\sigma} & \text{ONSET} & \text{FFORM=TROCHEE} \\
\hline
\text{amp\text{a} } & \text{!} & & & x \\
\hline
\end{array}
\]
(57) Exception: Stress does not fall on the initial syllable if its onset is a glide:
   e.g.  walijmparra, *walijmparra
         jukántja, *jukántja

<table>
<thead>
<tr>
<th>/junkántja/</th>
<th>*∅/ONS/glide</th>
<th>FTFORM=TROCHEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>jukántja</td>
<td>x₁</td>
<td></td>
</tr>
<tr>
<td># jukúntja</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

(58) A similar (and more interesting situation) exists for Pirahã (see analysis and references in de Lacy 1997).