Bringing sound symbolism under grammatical control: The case of expressive palatalization

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Ubiquity of sound symbolism

The fact of sound symbolism are not in doubt. Diverse types have been documented in dozens of unrelated languages. Some forms, like phonesthemes, are found in all languages where one has looked.

**Phonesthemes**: sublexical sound sequences with strong semantic associations, e.g., gl in English for words relating to light: glitter, glean, glow, glisten, glare, glint

**Ideophones**: words evoking ideas through sounds, often adverbial or predicate, e.g., English: pitter-patter or chop-chop

**Onomatopoeia**: a word that phonetically imitates or suggests the source of the sound that it describes, e.g., animal sounds and bird names

**Meta-linguistic**: sound associations with grammatical classes, e.g., English nouns tend to have back vowels, verbs tend to have front vowels
Some research trends

Research on sound symbolism has been taken up in just about every domain of linguistics.

**Linguistic typology** (Nichols 1971, Ultan 1978, Woodworth 1999)
What are the typological trends in sound symbolism, are there universals?

**Historical linguistics** (Malkiel 1987, 1990)
How are sound symbolism structures retained in history, used in new coinages?

What are the interrelations between language, music, emotion, and ecology?

Is sound symbolism structure harnessed in learning?

**Evolutionary origins of language** (Ohala 1994)
How is sound symbolism rooted in the evolutionary origins of humans?
Formalization: old tools or new approach?

‘It doesn’t fit in formal grammar’ (e.g., Bolinger 1950)

Sublexical parts and difficult to characterize meanings make sound symbolism intractable in traditional morphology. Odd typologies.

Two-dimensional model (Diffloth 1972, Kita 1992, 1997)

The differences between sound symbolism and traditional grammar require a separate dimension of analysis, incorporating iconicity and gesture.

Common practice: reuse tools from linguistic theory

Often the case, however, that traditional tools of linguistic analysis employed in analysis of sound symbolism, e.g., featural affix [-anterior] for Japanese mimetic palatalization.
Research questions

• Case study: sound symbolic consonant palatalization, ‘expressive palatalization’
• Which insights from linguistic theory seem to be relevant to capturing sound symbolic systems? Which do not?
• How do sound symbolic systems compare to phonological systems with the same sound structures?
• If phonological theory is insufficient, what else is needed to analyze sound symbolism?
Expressive palatalization: Japanese baby talk


**Systematic mappings:**
- Coronal fricatives and *ts* change to the affricates *tʃ* and *dʒ*
- Coronal stops do not change.

<table>
<thead>
<tr>
<th>Baby talk form</th>
<th>Source phrase</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>onaka [tʃ]uita</td>
<td>onaka suita</td>
<td>‘(Are you) hungry’</td>
</tr>
<tr>
<td>[tʃ]umetai</td>
<td>tsumetai</td>
<td>‘(Is it) cold?’</td>
</tr>
<tr>
<td>ku[tʃ]u[tʃ]ita o haku</td>
<td>kutsuʃita o haku</td>
<td>‘Put on your socks, would you?’</td>
</tr>
<tr>
<td>[tʃ]eːta: wa doko</td>
<td>seːta: wa doko</td>
<td>‘Where’s the sweater?’</td>
</tr>
<tr>
<td>tʃi:[dʒ]u wa oʃiː</td>
<td>tʃiːzu wa oʃiː</td>
<td>‘The cheese is yummy’</td>
</tr>
</tbody>
</table>
Phonological palatalization: Japanese

**Description** (Vance 1987, Chen 1996, Labrune 2012)
All plain consonants are replaced with their palatal counterparts before \( i \); non-coronals receive secondary palatalization (a) and coronals shift to alveolo-palatals (b).

<table>
<thead>
<tr>
<th>Example</th>
<th>Transcription</th>
<th>Meaning</th>
<th>Example</th>
<th>Transcription</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. /job-itaι/</td>
<td>jο[b'y]itaι</td>
<td>‘call’</td>
<td>jobu</td>
<td></td>
</tr>
<tr>
<td>/wak-itaι/</td>
<td>wa[k'y]itaι</td>
<td>‘boil’</td>
<td>waku</td>
<td></td>
</tr>
<tr>
<td>/kar-itaι/</td>
<td>ka[r'y]itaι</td>
<td>‘shear’</td>
<td>karu</td>
<td></td>
</tr>
<tr>
<td>b. /kat-itaι/</td>
<td>ka[tʃ]itaι</td>
<td>‘win’</td>
<td>katsu</td>
<td></td>
</tr>
<tr>
<td>/kas-itaι/</td>
<td>ta[ʃ]itaι</td>
<td>‘lead’</td>
<td>kasu</td>
<td></td>
</tr>
<tr>
<td>/ʃin-itaι/</td>
<td>ʃi[n]itaι</td>
<td>‘die’</td>
<td>ʃinu</td>
<td></td>
</tr>
</tbody>
</table>
Expressive palatalization: formal properties

Not phonologically triggered: expressive palatalization is a fact of register or word class, like baby talk registers or diminutive constructions, and not triggered phonologically.

Surface-oriented: often a late phonological process that takes as input whole words with derived phonological properties, e.g., /kutu/ → ku[ts]u ‘shoe’ → ku[ʧ]u

Non-structure-preserving: may introduce phonotactically illicit structures, like palatals before e: seːtaː → ʧeːtaː ‘sweater’

Exhaustively applied: may apply exhaustively to all target sounds in a word, e.g., osarusan → otʃarufʃan ‘monkey (honorific)’
Old tools: clunky, but doable

Old tools approach: perhaps expressive palatalization doesn’t need special assumptions. It can be analyzed with a register specific phonological process, ordered after other rules or isolated in a later stage in phonological derivations, or a separate domain of a constraint-based grammar.

Assume that Japanese mimetic palatalization arises through attachment of feature affix with palatal feature structure (e.g., [-anterior]) and that feature is realized via principles of feature alignment.
Captures apparent relationship with default-to-opposite stress:
• Palatalize leftmost of two non-coronals: pioko-pioko; otherwise rightmost of two coronals: dofa-dofa
• Stress rightmost heavy syllable, otherwise leftmost syllable (Zoll 1997)

Prediction: if expressive palatalization is analyzed with the same tools of phonological palatalization, then do not expect substantive differences in the targets and outputs of expressive palatalization.
Typological study

Objective: examine expressive palatalization cross-linguistically and compare its typological properties with known facts of phonological palatalization.

Methods

• Collected 37 cases of expressive palatalization (baby talk registers, diminutive morphology, other sound symbolic systems)
• Genetic diversity: 37 languages from distinct 27 genera and 20 language families (based on WALS classification)
• All cases were analyzed for the natural classes of inputs and outputs and tabulated to look for cross-linguistic trends
• Expressive palatalization systems compared with Bateman’s (2007) survey of 58 systems of phonological palatalization
Results I: A place asymmetry

Commentary. Velar palatalization is quite common in phonological palatalization (10/50 cases), but it is non-existent in expressive palatalization, revealing a coronal bias in expressive palatalization only.

<table>
<thead>
<tr>
<th></th>
<th>cor</th>
<th>dor</th>
<th>cor+dor</th>
<th>lab+cor+dor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonological (n=50)</td>
<td>60%</td>
<td>20%</td>
<td>27%</td>
<td>4%</td>
</tr>
<tr>
<td>Expressive (n=43)</td>
<td>89%</td>
<td>0%</td>
<td>2%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Implicational universal: in expressive palatalization, palatalization of a non-coronal implies palatalization of coronals.
Results II: Manner asymmetries

**Phonological palatalization**: there are no strong trends for the manner of the targeted segment. Some languages palatalize obstruents, some non-rhotic sonorants, others palatalize both obstruents and sonorants (Bateman 2007).

**Expressive palatalization**: the manner of the targeted segment is more restricted, showing a structural preference for obstruents. Some languages target obstruents, others target both obstruents and sonorants, but no language only targets sonorants.

**Implicational universal**: in expressive palatalization, palatalization of a sonorant implies palatalization of an obstruent series.
Results III: Affrication patterns

Phonological palatalization: affrication results sometimes from structure-preservation, but coronal fricatives never affricate: s → tʃ is completely unattested (Bateman 2007).

Expressive palatalization: there is an affricate bias, independent from the output bias for post-antepiors. Many cases involve shifting a coronal fricative to a palatal affricate, cf. phonological palatalization, even as the only possible output sound; others shift antepiors to affricate [ts] without palatalization.

Affrication to [tʃ]

<table>
<thead>
<tr>
<th>K</th>
<th>N</th>
<th>T</th>
<th>S</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>tʃ</td>
<td>tʃ</td>
<td>tʃ</td>
<td>tʃ</td>
<td>1</td>
</tr>
<tr>
<td>tʃ</td>
<td>tʃ</td>
<td>tʃ</td>
<td>s</td>
<td>1</td>
</tr>
<tr>
<td>k</td>
<td>n</td>
<td>tʃ</td>
<td>s</td>
<td>3</td>
</tr>
<tr>
<td>k</td>
<td>n</td>
<td>t</td>
<td>tʃ</td>
<td>8</td>
</tr>
</tbody>
</table>

K = non-coronal
N = sonorant
T = coronal stop
S = coronal fricative

Affrication to [ts]

<table>
<thead>
<tr>
<th>K</th>
<th>N</th>
<th>T</th>
<th>S</th>
<th>Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>k</td>
<td>n</td>
<td>ts</td>
<td>s</td>
<td>Wiyot, Cree</td>
</tr>
<tr>
<td>k</td>
<td>n</td>
<td>t</td>
<td>ts</td>
<td>Nez Perce, Northern Paiute</td>
</tr>
<tr>
<td>k</td>
<td>n</td>
<td>ts</td>
<td>ts</td>
<td>Greek</td>
</tr>
</tbody>
</table>
Problems with the Old Tools approach

**Formal problems**: Expressive palatalization doesn’t fit well in core phonological analyses.
- Register dependent: so need to create context for special phonology
- Non-structure preserving: can’t coexist with regular phonology
- Surface-oriented: must work off the results of core phonology

**Typological problems**: There are important typological differences between expressive and phonological palatalization
- Place asymmetry: only expressive palatalization has a coronal bias
- Manner asymmetry: only expressive palatalization has an obstruent bias
- Affrication patterns: only expressive palatalization has an affricate bias

**Conclusion**: It is possible to take the Old Tools approach and sequester expressive palatalization in a separate mapping domain. But using the same toolbox to describe both types fails to capture the important typological differences between phonological and expressive palatalization.
Expressive vs. phonological palatalization

**New direction:** expressive and phonological palatalization are different because they have completely different functional motivations.

**Motivation for phonological palatalization:** an abstract instantiation of gradient consonant-to-vowel co-articulation (Hyman 1975) and its perceptual miscategorization in phonetics (Guion 1996).

→ Inherently context-sensitive because of its phonetic motivation.

**Motivation for expressive palatalization:** palatals and affricates produce high frequency acoustic structure that supports iconic sound-meaning associations, e.g., ‘childishness’ and ‘smallness’ characteristic of the speech of small children (Ferguson 1977, Ohala 1994).

→ Register dependent because tied to specific talker-listener interactions.
Constraint-based formalization

**Phonological palatalization** (Itô & Mester 1999, Chen 1996)
Unfaithful mappings via context-sensitive markedness over faithfulness
*TI >> Ident[anterior] >> *PalatalFricatives

**Expressive palatalization** (Alderete & Kochetov 2013)
Surface-to-surface mappings caused by Epal constraints that set palatal and affricate targets for sound symbolic systems.

**Surface-to-surface correspondence** (Benua 2000, Steriade 1997, Itô et al. 1996)
The segments of base and derivative words stand in correspondence.

**Epal(Affric)**: If input segment a maps to output b in an expressive mapping domain, then b is an affricate.

**Epal(Dors)**: If input segment a maps to output b in an expressive mapping domain, then b is has a [Dors/-back] specification.’

**Alderete & Kochetov 2013**, Surface-to-surface correspondence and the frequency code: Explaining differences between expressive and phonological palatalization. Submitted.
Formal properties explained

**Register dependence**: expressive palatalization happens at the surface-to-surface level, so natural to relate it to a mapping domain rather than a phonetic context.

**Surface-oriented**: expressive palatalization takes the output of the lexical-to-surface mapping as input, so derived phonological properties are in inputs.

**Non-structure preserving**: out of bounds phonology is possible, because expressive palatalization happens in a separate mapping domain.

**Exhaustivity**: Epal constraints target all relevant sounds, context-free application.

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**Lexical Structure**: /kutu/ ‘shoe’

**Surface Structure**: [kutsu] Base

**EPAL Constraints (surface-to-surface)**
Explaining the place asymmetry

**Theoretical result:** ranking permutation of the Epal constraints, markedness and faithfulness to palatals never produces expressive palatalization of a non-coronal without a coronal series.

**Rationale:** velars and coronals are equal on the Epal constraints, and many faithfulness constraints. However, a mapping from a velar to a coronal incurs both a violation of Ident(back) and Ident(Cplace) that is not felt in coronals (boxed), so velar palatalization mapping more marked.

The markedness of expressive palatalization in velars

<table>
<thead>
<tr>
<th>I</th>
<th>O</th>
<th>Epal(DORS)</th>
<th>Epal(AF)</th>
<th>ID(CPL)</th>
<th>ID(BK)</th>
<th>Dep(VPL)</th>
<th>Dep(CPL)</th>
<th>F(ST&gt;AF)</th>
<th>*C</th>
</tr>
</thead>
<tbody>
<tr>
<td>/k/</td>
<td>k</td>
<td>*</td>
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<td>ti</td>
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</tbody>
</table>
Explaining the manner asymmetry

**Theoretical result:** in expressive palatalization, no ranking of constraints produces sonorant palatalization without obstruent palatalization.

**Rationale:** mappings from /t/ and /n/ are equal on Epal, Dep, and Faithfulness to manner; but sonorant mappings incur violations (boxed) of certain constraints that are not felt in obstruents.

<table>
<thead>
<tr>
<th>I</th>
<th>O</th>
<th>EPAL(DOR)</th>
<th>EPAL(AF)</th>
<th>DEP(VPL)</th>
<th>DEP(CPL)</th>
<th>*PALSON</th>
<th>ID(SON)</th>
<th>F(ST&gt;AFF)</th>
<th>F(FR&gt;AFF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>/t/</td>
<td></td>
<td>*</td>
<td></td>
<td>*</td>
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<td>*</td>
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</tr>
</tbody>
</table>

The table shows the rankings for /t/ and /n/ with violations indicated by the boxed constraints.
Affricate targets

**Theoretical result**: expressive palatalization only has an affricate bias because of the constraint Epal(Affricate).

**Rationale**: the mapping from /si/ → [tʃi] is harmonically bound by /si/ to [ʃi]: former incurs all of the (unshaded) violations of the latter, but has one additional violation of manner faithfulness. No ranking of constraints (excluding Epal constraints) will ever produce the affrication mapping, as attested for phonological palatalization.

<table>
<thead>
<tr>
<th></th>
<th>Epal(DORS)</th>
<th>Epal(AFF)</th>
<th>*TI</th>
<th>Dep(VPLACE)</th>
<th>Dep(CPLACE)</th>
<th>F (FRIC&gt;AFF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/si/</td>
<td>si</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ʃi</td>
<td></td>
<td>*</td>
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<td></td>
<td>*</td>
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</tr>
<tr>
<td>tʃi</td>
<td></td>
<td></td>
<td>*</td>
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<tr>
<td>sʃi</td>
<td></td>
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</tr>
</tbody>
</table>
Grey Area: Japanese mimetics

**Objection.** Examination is limited to black and white cases (baby talk vs. phonological palatalization). Perhaps some cases, like mimetic words, can be treated with standard tools of phonological analysis.


a. Coronal + noncoronal, palatalize coronal: šaka-šaka, *sak'y-a-sak'y a

b. Leftmost of two noncoronals: ڤоко-ڤоко, *پک'y-o-پک'y o

c. Rightmost of two coronals: دوا-دوا, *ژوسا-ژوسا

d. Avoid /ɾy/: ɲoro-ɲoro, *ɲor'y-o-ɲor'y o

**Potential insights from theoretical phonology**

- Palatalization involves realization of floating features (Itô Mester, Akinlabi)
- Alignment of floaters have different edge orientations, the ‘conflicting directionality’ pattern of (b-c), like stress (Zoll)
Japanese mimetics: corpus study


No lexico-graphic evidence for conflicting directionality
Examination of the actual forms from prior research and two mimetic dictionaries shows that there is no basis for ‘leftmost noncoronal, rightmost coronal’ generalization.

• Coronal + coronal: 1 form leftmost šana-šana, 1 form rightmost doša-doša
• Noncoronal + noncoronal: only two forms: p'oko-p'oko, h'oko-h'oko

Exhaustive search for conflicting directionality: no evidence
Asked native speakers to supply mimetic palatalization in 1098 logically possible CVCV mimetic words. Still no empirical evidence.

• Coronal + coronal: 1 leftmost, 4 rightmost
• Noncoronal + noncoronal: 6 leftmost, 7 rightmost
Psycholinguistic study: no directionality effects

**Objection.** While there may be little or no evidence from actual words, perhaps native speakers none the less have intuitions consistent with phonologically motivated conflicting directionality.

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**Percentages of C1 (high) or C2 (low) palatalizations.**

Significant coronal bias, and also rhotic avoidance.

But noncoronal-noncoronal (g-b) and coronal-coronal (t-d) CVCV words are at chance.
More evidence: manner asymmetry

**Tally so far:** no evidence for phonological palatalization, but significant evidence for expressive palatalization, given coronal bias.

**Manner biases:**

Obstruents significantly more likely to be palatalized than sonorants

Sibilant fricatives also significantly more likely to receive palatalization that other coronals.

- Manner biases thus further confirm expressive palatalization analysis.
Conclusions

- Expressive palatalization is a type of sound symbolism that does submit to formal analysis. By placing output constraints in a distinct mapping domain, it comes under formal control.

- Formal analysis seems to require type of analysis, consistent with Kita’s findings but based on other evidence, and also consistent with its distinct functional motivation.

- The circumscription of sound symbolic expressive palatalization (motivated by different constraints, limited to different mapping domain) is a welcome theoretical result, because it makes possible a more restrictive typology of phonological palatalization.
An intriguing question

Our implementation. Epal constraints are OT constraints that have general application, derive typological results through usual ranking permutation.

Question. Are the forces that underlie expressive palatalization universal (possibly innate) constraints, or do cross-linguistic trends emerge as the result of experience in language development? Absolute or statistical universals?

In support of a statistical universal, driven by experience: Holy Grail of research on sound symbolism: universal substrate for size symbolism. Strong trends, but no absolute patterns.

- Experimental research (Sapir, Newman): greater-than-chance correlation between articulatory position and pitch and size categories
- Typological research (Jesperson, Nichols, Ultan): strong associations between smallness and palatals, affricates and high front vowels
- Developmental research: perceived associations between high pitch and small size develops much later (age 11) than might be expected if it was an innate instinct.
Thank you!

Further comments/questions:
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