Charles Reiss's "Substance free phonology" (SFP)

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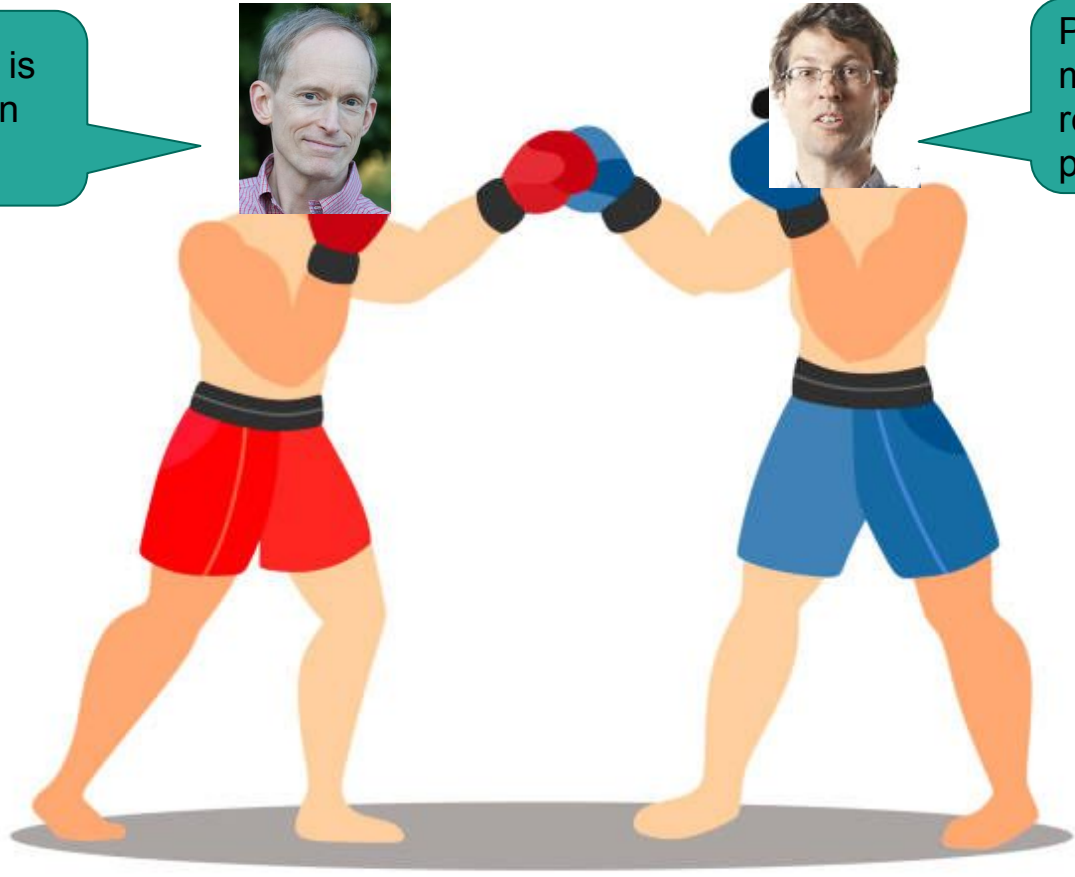
Background

What is Substance Free Phonology?

In short, Substance Free Phonology is a phonological theory that does not make reference to the following:

- Well-formedness
- Repair
- Contrast
- Typology
- Variation
- Language Change
- Markedness
- Child Phonology

- Faithfulness
- Constraints
- Phonotactics
- Articulatory or Acoustic Phonetics
- Speech Perception

What is left when we remove all of these factors?

What is Substance Free Phonology

Reiss uses word final obstruent devoicing as an example:
A substance free theory cannot capture that some languages have word final obstruent devoicing, and some do not, but no language have word final obstruent voicing.

According to Reiss, a phonological theory should not:
Account for every true generalization about attestable phonological systems.
Especially should not account for generalizations about statistics of attested or attemptable patterns of phonetic substance no matter how absolute.

Substantive vs Formal

What are Substantive universals:

Like what Chomsky said in *Aspects of a Theory of Syntax*: - "A theory of substantive universals claims that items of a particular kind in any language must be drawn from a fixed class of items."

What are Formal universals:

"Formal universals involve rather the character of the rules that appear in grammars and the ways which they can be interconnected (Chomsky, 1965)"

"In Phonology, a formal universal would be the discovery that the phonology of all languages is a complex function, the composition of a strictly ordered set of rules of some well defined class or some alternative computational system."

Features in Substance Free Phonology

Phonology is epistemologically prior to phonetics- we must know phonology to understand phonetics.

Without innate features people wouldn't be able to parse input at all.

Hall (2014) says: "Assume that features are innate and universal and have substantive phonetic content"

SFP rejects the idea that features are induced from patterns in the learners input. One cannot induce patterns from phonological behavior without an innate feature system. Without innate substantive features we cannot determine what the rules and segments are.

SFP uses discrete binary features.

Feature Geometry is problematic to SFP: These models somewhat mimic the vocal tract. These models aims to illustrate common well established cross-linguistic patterns simply. The human phonological faculty is the main factor in determining the set of attested phonological systems.

Some SFP

Reiss claims that much of the literature on formal properties of phonological computation is either compatible with SFP or if it proves superior it should be incorporated into SFP. Reiss also praises work that examines phonology through the perspective of Formal Language theory. He notes the work of Jeff Heinz and his colleagues and students.

Every phonological theory has a substance free component.

Syllabification and Metrical phonology can easily be put in a Substance free framework. Raimy(2000) in *Remarks on Backcopying* was able to show that derivational models can handle cases of over and under application that McCarthy and Prince (1995) claimed in *Faithfulness and reduplicative identity* could only be addressed in OT.

Base and copy, and Correspondence notions deal with reduplication and do away with the notions of markedness.

Not SFP

Reiss does not consider literature that considers formal properties of OT to be part of literature relevant to SFP. The notion of CON is substance abusing. SFP does not allow for markedness. The notion of Optimality is troubling for SFP because it means that the other forms are less optimal. More on this later.

Search and Copy models models developed somewhat in parallel with the Base and Copy and Correspondence models. Some approaches to Search and Copy models use Contrast and Markedness, however there are many aspects of these models that can and should be incorporated into SFP,

Reiss's work on SFP

Reiss believes that these work show his vision of SFP:

Quantifiers in Phonology Reiss (2003): Argued that to handle anti-gemination and anti-anti gemination phenomena, phonological rules must be able to compute identity and non identity between segments. He claims this is best expressed with the power of first order quantificational logic.

Phonological Acquisition Halle and Reiss (2003, 2008, 1998): Attempted to model phonological acquisition without markedness and no attempt to account for children's superficial speech output. This work denys the validity of the "Emergence of the Unmarked"

Operations on Phonology Bale et al. (2014): A deconstruction of the arrow in traditional phonological rules, Instead the arrow corresponds to two different types of operations: set subtraction and unification.

Types of Underspecification in Phonology Bale et al. (2016): Explores the ramifications of treating segments as sets of valued features.

Debate

An informal description of Reiss's rationalist argument-style

1. CLAIM + ONE REAL EXAMPLE AS ILLUSTRATIVE SUPPORT
2. CLAIM + ONE HYPOTHETICAL EXAMPLE AS ILLUSTRATIVE SUPPORT
3. CLAIM + EMPIRICAL OR EXPERIMENTAL EVIDENCE
4. PREMISES + CONCLUSION

1. Is OT "substance abusing"?

REISS

- Only the EVAL function is substance-free (4).
- The "presumably universal" constraint set CON is "substance abusing" because it is based on grammar-external phonetic, physiological and physical factors.
    - Duplication of explanation

OT ENJOYERS

- Still need a **mechanistic account** of how typological tendencies emerge
- CON is **typologically, not functionally motivated** ⇒ no duplication
- Removing substance **limits your ability to make typological predictions**
    - The resulting theory is **too unconstrained**

FIGURE 2   The shape of a linguistic theory
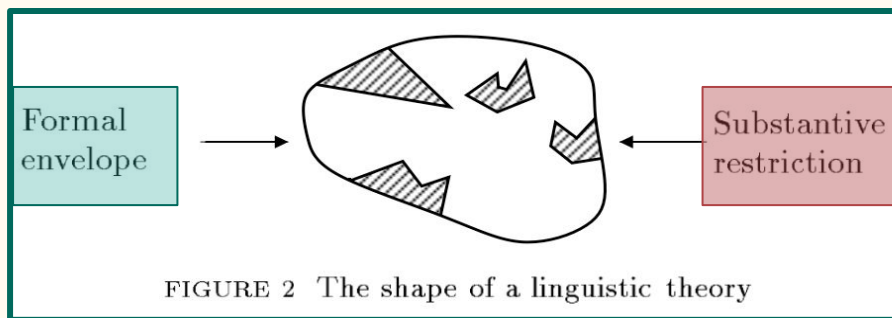
2. Is well-formedness a useful term to use? (1/3)

REISS

CLAIM: "Sentences are not ill- or well-formed–they are just what grammars generate" (p. 6); this is about syntax, but we can think of strings in the same way.

HYPOTHETICAL EXAMPLE AS SUPPORT:

- If we have a grammar, G, that generates outputs with transparent word-final devoicing, an output like [bunt] could be generated, while an output like *[bund] would not.
- But that does not mean that "bund" is not "well-formed". It just isn't generated by G (p. 6-7).

WELL-FORMEDNESS ENJOYERS

- If words are well-formed iff they are generated, **difference is purely definitional**
- **Repairs of ill-formed words** do happen in borrowings
  - e.g. Italian /spagetti/ → Spanish /espageti/
- **Conspiracy:** ill-formedness ⇒ separation between what's bad and how we fix it
  - e.g. Ilokano: both glottal epenthesis and glide formation **repair vowel hiatus**

2. Is well-formedness a useful term to use? (2/3)

REISS

CLAIM: If we build constraints into UG based on notions of well-formedness, we end up with a theory full of irrelevant and misleading hints for certain language learners (p. 7)

REAL EXAMPLE AS SUPPORT:

- There is a constraint in CON against front rounded vowels and ejective stops.
- But French and Navaho have these sounds!
- Why would a theory of UG have a constraint like this?! Language learners will get confused... (p. 7)

CALABRESE

- Some articulatory actions are **more complex than others ⇒ harder to learn**
- For Navajo speakers, ejective stops will be easy to pronounce, but only after an **extended acquisition process**
- English speakers will have trouble producing ejective stops without exposure since **they are marked ⇒ hard to produce**

2. Is well-formedness a useful term to use? (3/3)

REISS

CLAIM: "Without a notion of well-formedness, there is no sense to the idea of the grammar optimizing output forms in any way. That grammar generates, not the best form, but just the form it generates". (p. 9)

WELL-FORMEDNESS ENJOYERS

- Reiss claims that "there's no way in which words are broken and need to be fixed" but then **why do repairs occur in borrowings?**
  - Have to somehow know that the borrowed form needs to be fixed
- **Emergence of the unmarked** in child speech suggests a markedness hierarchy correlated with production effort

3. Should *contrast* be considered an ontological notion of phonology? (1/2)

REISS

PREMISES:

1. Functional features should not be used to describe the ontological status of language.
   a. Some people believe that language exists as a mean to transmit information, or communicate.
   b. While this is true, generativists like Halle have shown that ambiguity and redundancy exists in all languages, which makes communication hard!
   c. Therefore, we can conclude that communication, or any other functionalist features like it, should not be used to describe the ontological status of language.
2. Contrast is a functionalist feature of phonology because it exists to "minimise confusion".

CONCLUSION:

Because phonology is not functional in nature (1), and because contrast is a functional feature (2), SFP dismisses contrast as an ontological notion of phonology.

3. Should *contrast* be considered an ontological notion of phonology? (2/2)

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EVIDENCE FROM ACQUISITION

THEORETICAL ARGUMENTS:

- **Contrast ≠ functionalism**
  - Acquisition ⇒ learning **meanings and how they map to phonological form**
  - No claims about efficiency, **clarity vs. ease**
- Can you do acquisition without contrast?
  - Under collapsing contrast view, **what's the cue to collapse the contrast?**
  - Under increasing specification view, **how do you learn a feature is contrastive?**

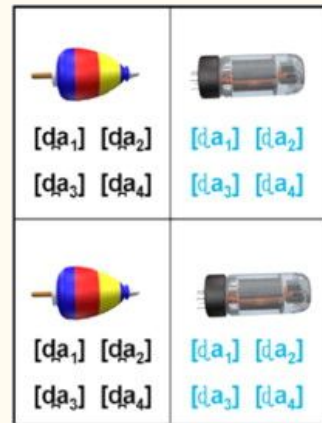# 3. Should *contrast* be considered an ontological notion of phonology? (2/2)

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EXPERIMENTAL EVIDENCE:

- Yeung & Werker 2009: infants **use contrastive pairings** of nonce words to objects to **learn nonnative sound contrasts**
  - **Contrast ⇒ learn phonological distinction**

Yeung, Henny and Janet Werker (2009). "Learning Words' Sounds Before Learning How Words Sound: 9-month-olds use Distinct Objects as Cues to Categorize Speech Information." *Cognition*.

4. Should phonactics be part of phonology? (1/3)

CLAIM #1: SFP ignores phonotactic judgments because they are influenced by external factors like orthography, frequency effects, exposure to other languages and accents, etc.

EMPIRICAL EVIDENCE:

- Many English speakers don't believe that the middle consonants in *writer/rider* are both flaps.
- Many English speakers don't believe that a word could begin with the consonant cluster [pt] even though *potato* does.

- Both of these would be solved by **doing phonotactics on URs** rather than SFs:
  - Flap not available as UR in English
  - UR of "potato" has a vowel
- Where is the **experimental evidence** for exposure effects?
  - I'd believe it, but a citation would be nice!
- Even if judgments don't directly reflect the phonological grammar, they are **robust and interesting in their own right**

REISS

CLAIM #2: People sometimes have accurate phonotactic judgments in the *absence* of grammatical knowledge. Therefore, phonotactics should not be a part of the phonological grammar.

EMPIRICAL EVIDENCE:

- If you ask speakers to match the words [pumehana] and [bɛzvzɡlɛndniɪ] with Hawaiian and Polish, most would guess correctly, proving that they could arrive at the correct answer without any knowledge of either phonological grammar.

PHONOTACTIC ENJOYERS

- The Hawaiian-Polish task could be solved by knowing only that **CC is licit in Polish and not Hawaiian**
  - This is **NOT complete phonotactic knowledge** of either language
  - What about **marginal sequences?** (e.g. #sf)
- Reiss admits that participants would do **worse on more closely-related languages**
  - These languages still have **different phonologies and phonotactics**
- This whole task is **hypothetical**
  - Reiss claims that "this is what we find" with **zero experimental citations**

4. Should phonactics be part of phonology? (3/3)

REISS

PREMISES:

1. Phonotactic judgements are gradient (Frisch et al, 2000).
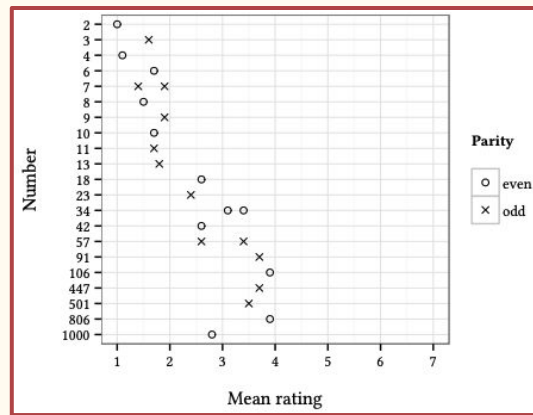2. Phonological grammar is not gradient.

CONCLUSION:

Given (1) and (2), it follows that phototactics cannot be a part of the phonological grammar.

Armstrong, Sharon Lee and Gleitman, Lila, and Gleitman, Henry (1983). "What Some Concepts Might Not Be." *Cognition.*
Gorman, Kyle (2013). *Generative Phonotactics.* PhD Dissertation, University of Pennsylvania.

PHONOTACTIC ENJOYERS (GORMAN 2013)

- Gradience = a **well-established task effect:**
  - Armstrong, Gleitman & Gleitman 1983: asked participants to rate **"evenness" or "oddness" on a Likert scale**

1 = most exemplary

- Gradient results reflect **poor experimental design, NOT a gradient grammar**

7.1 Is phonology epistemologically prior to phonetics?

REISS

CLAIM: Segments do not exist outside the human mind.

- Phonological categories like /k/ can't be learned from phonetics, since there can't be any phonetics without a pre-existing phonology.

REAL EXAMPLE AS SUPPORT: E.g. We would not be able to compare [+rounded lip] k in *coup* and [spread-lipped] k of *keep* if we did not have a pre-existing UR of /k/ in our minds.

ACQUISITION (CUI 2020)

- If we were allowed to use contrast in acquisition, **we could learn /k/ from phonetics**
  - Bottom-up view: only add features when there is evidence for them (contrasts)
  - Will get evidence for e.g. /k/ vs. /g/
  - Will **never see evidence for rounded-lip k vs. spread-lipped k** being contrastive: **no minimal pair**

Cui, Alethea (2020). *The Emergence of Phonological Categories*. PhD Dissertation, University of Pennsylvania.

7.2 Are features innate? (1/4)

REISS

CLAIM: "Features are innate and universal, and have substantive phonetic content" (p. 19)

EXPERIMENTAL EVIDENCE:

- **Fodor & Jackendoff:** learning can consist only of creating novel feature combinations of innately-available primitives
- **Poverty of the stimulus** would lead to huge variability otherwise

ARCHANGELI, PULLEYBLANK, MIELKE

- **Archangeli & Pulleyblank (2015):** there is no need for innate features because these can be discovered via induction with enough input
- **Mielke (2004, 2008):** many rules don't refer to phonetically natural classes
  - Features could be learned that would group the "unnatural" segments into a class for rule application

7.2 Are features innate? (2/4)

REISS

- Dresher's theory would be better than SFP if there weren't a lack of invariance, as well as "vast acoustic differences among speakers when saying 'the same thing'" (p. 19).
- Plus, it also appears to be at odds the results of infant speech perception which prove that infants have to parse input into representations before they can learn. (p. 19)

DRESHER

- Innate features problematic on empirical grounds
    - How did they become innate?
    - How closely linked are they to phonetic realizations?
- Innate mental mechanism for creating distinctive features rather than innate features
    - Allows learner to posit features in the grammar as needed

7.2 Are features innate? (3/4)

REISS

- Acquisition findings support innate features
  - Early discrimination of contrasts (Werker 1995)
- Loss-of-contrast account of acquisition
  - Children start off being able to make all contrasts
  - Lose ability to make non-native ones during acquisition

SARAH'S SOAPBOX :)

- Children make discriminations as newborns that chinchillas can make (Cui 2020)
  - Not reflective of **phonological** grammar
- Extensive evidence for early underspecification in perception tasks (e.g. Werker et al 2002)
  - Not losing contrast!
  - **Werker 1995:** no phonological claims
- Loss of contrast ⇒ **indirect negative evidence**
- **Adults can still make non-native contrasts** in non-linguistic tasks (Cui 2020)

Cherry-picking & advantageously interpreting experimental evidence

Werker, Janet, Christopher Fennell, Kathleen Corcoran, and Christine Stager (2002). "Infants' Ability to Learn Phonetically Similar Words." *Infancy*.

7.3 Can rules tell us what features are? (1/3)

Hall 2014 SAYS: "Featural representations are assigned on the basis of [phonological rules], not acoustic or articulatory substance" (p. 20)

Reiss COUNTERARGUMENT #1: "There is no way to induce patterns from [phonological rules] without an innate feature system to parse the input" (p. 20)

ACQUISITION (AGAIN)

- You don't need innate features to parse the grammar if you allow for learning via contrast (as Cui 2020 demonstrates)

7.3 Can rules tell us what features are? (2/3)

Hall 2014 SAYS: "Featural representations are assigned on the basis of phonological behavior [i.e. rules], not acoustic or articulatory substance" (p. 20)

Reiss COUNTERARGUMENT #2: It is not obvious what a rule is, so we can't use rules to tell us what features are.

E.g.

- Suppose that the input provides evidence for alternations that delete word-final /a/ and word final /t/.
- We can't expect the learner to posit a feature that makes {a,t} a natural class.
- Instead, we have to posit two separate deletion rules.

You can't induce features from rules without a theory of rules, and a theory of rules can't exist without natural classes.

POTENTIAL COUNTER:

- You wouldn't use rule participation in isolation to learn features – you'd also have to consider some sense of naturalness once the features are determined

7.3 Can rules tell us what features are? (3/3)

Hall 2014 SAYS: "Featural representations are assigned on the basis of [phonological rules], not acoustic or articulatory substance" (p. 20)

Reiss CONCLUSION: In total, SFP assumes that an innate set of phonological primitives allows us to parse input, from which we induce natural classes. We are then able to determine what the rules are (p. 20-21).

7.4 Rejecting a Particular Model of Features

REISS (MORE RECENT VIEW)

- Only a small number of possible contrasts are actually distinctive features
- Basic set-theoretic notions for phonological behaviours
- Innate features come with innate link (complex transduction) to phonetics

SARAH'S SOAPBOX, PART 2 :)

- Isn't using the first fact to argue for a theory of features **substance abuse?**
- If we accept innate link to phonetics, have to say e.g. **Spanish voicing is phonologically different than English voicing**
  - Spanish: negative vs. short lag
  - English: short vs. long lag
  - If transduction not innate, could learn two **phonetic correlates of VOICE**

7.5 How Rich is Phonological UG?

REISS

- Combinatorial explosion: small number of features $\Rightarrow$ massive inventory of possible segments
  - e.g. 25 distinctive features $\Rightarrow 2^{25} >$ 33,000,000 possible segments
  - (if we rule out ones with e.g. $+$HI $+$LO, will be less, but still a ton)

POTENTIAL COUNTER

- If acquisition $=$ learning what features aren't contrastive, have to collapse from **10^7 to 10^2 or fewer segments**
  - Non-trivial problem for acquisition
  - Need **indirect evidence**
  - What about **allophony & coarticulation?** Remember, we can't use contrast

Conclusion

This paper aims to show the reader that a model of phonology disregarding many factors considered central to the study. Substance Free Phonology is not a reactionary theory, The intention of the theory is follow good practice in regards to generative linguistics. Substance free phonology is a theory of formal universals without intrinsic content.

Reiss's ideas in regards to Well Formedness, Contrast, Markedness and Child language acquisition are not without their critics, as seen by the earlier debate.

EXTRA SLIDES

1. Is SPE substance free?

REISS

EVIDENCE: In *SPE*, one could systematically interchange features, or replace [αF] with [-αF], throughout the description of English structure.

E.g. The model could easily be used to describe a language with word-final *voicing*.

CONCLUSION: Any system where features can be interchanged is not descriptive, but formal and abstract. Therefore, SPE is substance-free.