

## Class 4, 10/22/20: The Martin Hypothesis; Stress I

### 1. Assignments

- Readings:
  - Pater, Joe (2000) Non-uniformity in English secondary stress : the role of ranked and lexically specific constraints. *Phonology* 17:237-274.
  - Posted on the course website
- I will put together a stress homework for next week.

### 2. Where are we in the course? Covered so far

- Synchronic patterns that have diachronic explanations
- Ambisyllabicity: allophones and phonotactics, marching in lockstep
- Crummy phonemes, of four origins (boundary effects, foreign languages, opaque phonology, incomplete sound change)
- The level system, ways it has been oversold (affix ordering), the phenomena

### 3. For today

- A followup on the ambisyllabic-phonotactics homework.
- A promised follow-up on Martinian leakage at Level 2.
- Start in on the stress system.

## FOLLOWUP ON THE AMBISYLLABICITY HOMEWORK

### 4. Review of the research question

- We seek to find out if the concept of ambisyllabicity extends to phonotactics of clusters.
  - We already have a couple of encouraging cases from singletons:
    - [ʒ], [ŋ] are legal only ambisyllabically (coda ok for [ŋ]).
    - [h] is legal only in strict onset.
- If we are to do this, we must adopt the Gussenhovian view of Left Capture applying in (a substantial subset of) the clusters.
  - *hamper* would have an ambisyllabic [p]
  - *empirical* would have a strict-onset [p]
  - This is only tacit in the exercise, which does not give syllabification but only provides the stress conditions on which ambisyllabicity depends.

## 5. A further methodological points on doing this sort of work

- It occurred to me that it would be good to have a table of *differences* in frequency between pretonic and ambisyllabic position.
- These differences should normalize against the substantial overall difference in frequency of pretonic vs. ambisyllabic clusters.
- My formula:
- $$=IF((B3/1838) - (B30/3801) = 0, "", 5639 * ((B3/1838) - (B30/3801)))$$
- where B3 is a pretonic count and B30 is the corresponding ambisyllabic count.
- Thus:

DIFFERENCE: positive prefers pretonic																									
	O	P	T	CH	K	B	D	JH	G	F	TH	S	SH	HH	V	DH	Z	ZH	M	N	NG	L	R	W	Y
P		<b>1)))</b>	-59									-19	-46						<b>3</b>			<b>53</b>	<b>108</b>		
T																			-6			-7	<b>1</b>	<b>9</b>	
CH																						-1			
K			-196	-25			<b>6</b>			-1		<b>24</b>	-194						-3	-1		<b>38</b>	<b>15</b>	<b>33</b>	-43
B							<b>17</b>					<b>36</b>		<b>9</b>			<b>28</b>			<b>2</b>		<b>7</b>	-1		-6
D					-3									<b>18</b>	<b>56</b>				<b>28</b>			-27	-5		
JH																									
G																	<b>132</b>		<b>1</b>	<b>95</b>		<b>2</b>	<b>64</b>	-4	-27
F			-30						<b>6</b>		<b>9</b>											<b>40</b>	<b>23</b>		<b>43</b>
TH																			<b>2</b>			<b>3</b>	<b>6</b>	<b>3</b>	
S	<b>154</b>	-187	-35	<b>27</b>	<b>6</b>	<b>9</b>			<b>3</b>	<b>11</b>	<b>14</b>								<b>8</b>			<b>23</b>	<b>9</b>	<b>15</b>	
SH																									
HH																									
V																							-31		<b>9</b>
DH																						-1			
Z						-6														-4	-6				
ZH																									
M	<b>155</b>					<b>16</b>				-1		<b>3</b>			<b>6</b>					-2					<b>26</b>
N		<b>99</b>	-78	<b>126</b>		-126	<b>30</b>	<b>6</b>	<b>144</b>	<b>4</b>	<b>133</b>	-66	<b>43</b>	<b>162</b>		<b>2</b>						<b>18</b>			-100
NG				-74					-44								<b>3</b>					-6			
L	<b>3</b>	-88	-9	-19	<b>0</b>	-28	-4	<b>2</b>	-6		-25	-13		-40					-12					-3	-118
R		-37	-19	-12	-15	-42	-25	-31	-19	-10	-17	-37		<b>12</b>					-47	-23		-31			

➤ 📖 Take a peek at this and comment for a minute.

## 6. Isolated positive outliers

- Here again are the ambisyllabic raw counts, with items over frequency 100 in bold:

AMBISYLLABIC																								
	P	T	CH	K	B	D	JH	G	F	TH	S	SH	HH	V	DH	Z	ZH	M	N	NG	L	R	W	Y
P		56									13	31									26	51		
T																		4			7	82		
CH																					1			
K		198	17						1		89	131						2	15		30	56	52	81
B						5					15								1		24	42		29
D				2										8				6			18	20		
JH																								
G																		16			13	52	3	22
F		20																			10	22		
TH																		1						
S	39	304	28	40					5	1								3			3			
SH																								
HH																								
V																						21		
DH																					1			
Z				4														21	4					
ZH																								
M	84				80				13										20					26
N		285	61			248	56			10	150	55		25		17								84
NG				52				48													4			
L		72	6	13	6	19	9	5	10		23	9		27				12					2	84
R		85	13	37	33	45	17	21	13	7	30	25						63	30		21			
W																								
Y																								

- What very small natural classes appear for the boldface patterns?
- A possible suggestion is that phonotactics has the analogue of syntactic idioms; out-of-pattern principles that have their own particular licence.
- This is perhaps one reason that bigram models can perform surprisingly well.

## 7. A possible confound emerged

- \*CLASH is not inviolable but typically:
  - In the ambisyllabic environment, the precluster syllable is stressed: *pity* more common than *vanity*.
  - In the pretonic environment, the precluster is stressless: *pe'tunia* more common than *fan'dango*.
- So what was planned to be a test of ambisyllabicity may be a test of the connection of weight and stress.

## 8. My favorite non-confounded constraint

- This is a traditional one I already mentioned: \*[n] + VELAR is
  - Inviolable for ambisyllabic
  - Gradient for pretonic.
- We can compare the (predicted to be) stricter fully-tautosyllabic environment:
  - \*[ænk], \*[ænktən] are totally bad.
  - \*[æng], \*[ængdən] are also bad, but so are \*[æŋg], \*[æŋgdən]

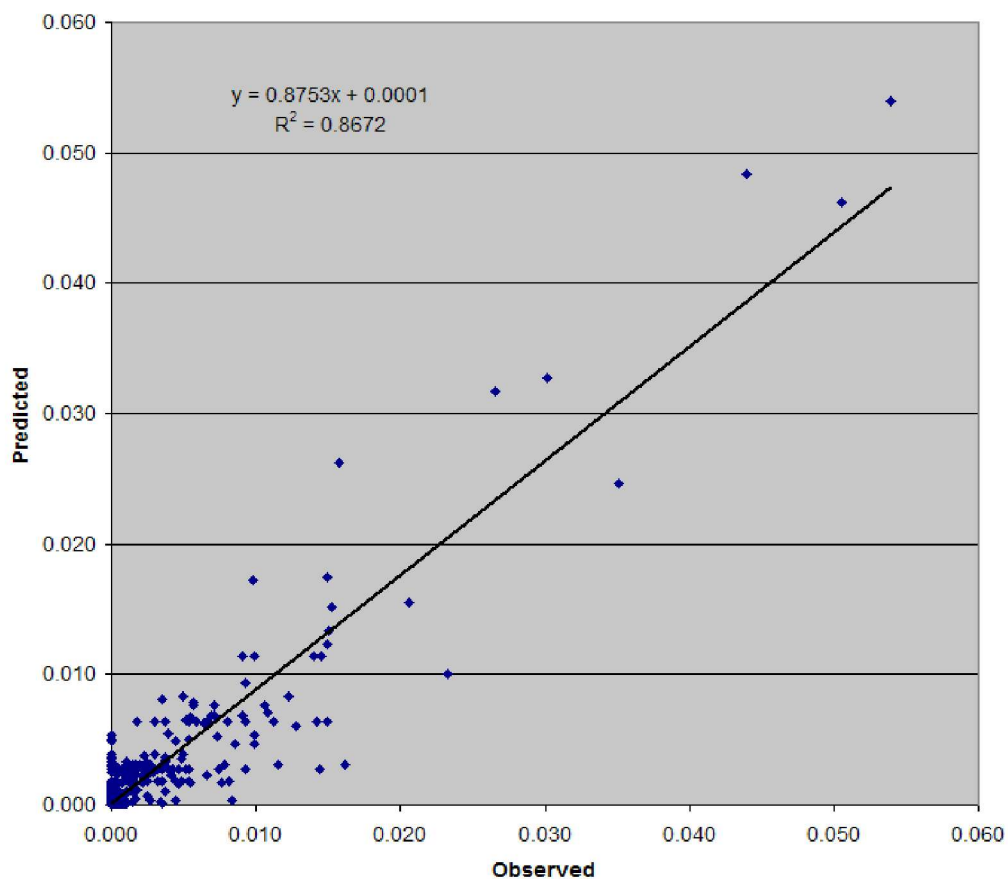
## 9. Quick review of the stats

- Correlation coefficients are nice for intuition but probably not for significance testing.

- Peril: the “shallow snake” of data points can have a great correlation coefficient but also a huge degree of error.
- Quick review of likelihood ratio testing for constraints split into strata:
  - to make the “smaller” model, add conditions forcing identity of weights between the two stratal versions
  - This removes a parameter from the grammar, hence is one degree of freedom less.

## 10. Dreams of grandeur: how good a fit might we get?

- I folded my answer together with all the homeworks, without taking the time to remove duplicates.



## 11. The crowd-sourced “grammar” (as it were) that created this:

Name	Viols	Weight
LICENSE Ambisyllabic S-STOP	383	-3.11
Ambi *N+{TD}	533	-2.34
Ambisyllabic *{P,T} + Nasal	4	-2.21
Ambisyllabic *CorSon + Y	168	-2.06
N Velar Pretonic	43	-1.69
Pretonic *N+{TD}	249	-1.62
LicenseS_Stop-Ambi	0	-1.60

*S-STOP-Pretonic	189	-1.58
Ambisyllabic *K + {TS}	287	-1.53
*{PTK} + R	321	-1.43
Ambi *ST	304	-1.33
Ambisyllabic *SH/C_	251	-1.31
*KW	88	-1.24
Pretonic *{P,T} + Nasal	1	-1.21
*V-IN-CLUSTER	177	-1.17
Str-to-W-Ambi	2055	-0.92
*N+S	266	-0.87
Pretonic *K + {TS}	83	-0.79
Voiceless alveolar 2nd	1870	-0.73
LICENSE Pretonic S-STOP	0	-0.70
*ORAL/_JH	29	-0.68
Str-toW pret	917	-0.60
Pretonic FricAffri + {Y,W}	23	-0.57
Ambisyllabic *CH/C_	125	-0.42
Ambisyllabic *{PF} + T	76	-0.42
PTCHK +SSH Ambi	264	-0.06
LICENCE APPROX as C2	1361	-0.06
Pretonic Obs + Voiced Obs	92	0.02
Pretonic *ST	86	0.13
PTCHK +SSH Pretonic	51	0.14
*PretonicCluster	1838	0.21
*HETERORGANIC NC	932	0.32
*[v]	0	0.33
License Approximant C2	0	0.33
VcdFric + C	63	0.38
Ambisyllabic *P + Obs	100	0.40
Pretonic H	23	0.41
Ambisyllabic Voiced Fri/_C	51	0.49
Pretonic *{SZ} + [+approx]	17	0.53
Ambisyllabic Liquid + PalAvl	79	0.59
Pretonic *CorSon + Y	10	0.64
Ambisyllabic OCP[+approx]	107	0.67
Ambisyllabic *L/_C	297	0.78
*StopStopPretonic	0	0.79
AGR NasalAmbi	133	0.79
Pretonic Agr Place NC	180	0.85
Pretonic Voiced Fri/_C	12	0.88
Ambisyllabic *Liquid + FricativeAffricate	189	0.98
Pretonic *{PF} + T	8	1.07
*HeteroN+obs	437	1.10
*VceFricLastInCoda	0	1.12
*[-nasal]_JH	0	1.20
*LiquidCodaPretonic	0	1.23
Pretonic Liquid + PalAvl	3	1.25
*VceInObstrCluster	0	1.66
*W/C_	0	1.76

Ambi Agr Place NC	49	1.77
Pretonic *Liquid + FricativeAffricate	22	1.77
Pretonic *P + Obs	8	1.85
Pretonic *L/_C	26	1.90
*Voiced Fric + Obs	4	1.95
Pretonic *CH/C_	6	2.06
Agr Voice	0	2.08
Ambisyllabic Obs + Voiced Obs	17	2.10
*S-STOP-ambisyllabic	383	2.12
*VclsFric_SonAmbi	0	2.24
*NG-Ambisyllabic	3	2.51
Pretonic OCP[+aprox]	2	2.55
*TH in Cluster	0	2.61
Ambisyllabic *{SZ} + [+approx]	3	2.64
Agr Voice	55	2.68
*{T,D} + StopAffricate	2	2.74
*[-vce, +dist] C2 Pretonic	0	2.75
*R + voiced fricative	4	2.85
OCP[Place] Obs+Nas	5	2.86
OCP[fricative]	20	2.87
*CorObs + {YW}	9	2.91
*Labial + Dorsal	2	3.32
*T + [-approximant]	4	4.10
*Liquid + P	1	4.28
*LabObs + Nas	3	4.43
*Dor+ Lab in Obs	1	4.62
*DH	1	4.76
PalAlv/_C	1	6.61
*Voiced stop + {CH,JH}	0	8.15
Ambisyllabic FricAffri + {Y,W}	0	8.78
*Labial + {CH,JH}	0	8.91
*R + {Y,W}	0	9.11
OCP Lab for Obs	0	9.43
*Labial + W	0	10.61
Pretonic H	0	16.07
N Velar Ambi	0	16.15
ZH in C2	0	20.68
*Geminate	0	20.83
*Onset NG	0	21.28
*ZHC2	0	25.62
*Sibilant Clash	0	50.00
*ZH-AS-C2	0	50.00
PseudoAffricate	0	50.00

- This is 99 constraints
- Perfection would be achieved with 1152 constraints, the number of candidates.

## 12. Ambisyllabicity cannot be a “surfacy” phenomenon

- Which is what OT would tell us about phonotactics in any event.
- We would need to say other things about Kahn’s putative level where people speak without ambisyllabicity.

## 13. English phonotactics is a widely pursued (and difficult) topic

- I won’t cover it but here is a tiny overview.

## 14. Traditional wisdom

- Some wise people: B. L. Whorf, Eric Fudge, George N. Clements and S. Jay Keyser xxx, Lisa Selkirk xxx, others
- Established the principle that you can get *most* (but not all) of the segment sequencing by defining legal onsets and rhymes. (Fails, e.g. on \*[pja], ?[jaɪ], ??[spɪp].)
  - Hence, there was a period where people said “syllable structure” almost as a synonym of phonotactics.<sup>1</sup>
- Established the idea of **rhyme-maximum**; e.g. long vowels tolerate fewer clusters after them than short: *wimp*, *Kemp*, AMP, swamp, dump, but \*[i:mp], \*[eɪmp], \*[aɪmp], \*[aʊmp], \*[oʊmp], \*[u:mp]
- Established the idea of a word-final **appendix**, containing alveolo-dental obstruents only (*sixths* [sɪksθs], *Christs* [kɹɪstθs])
- More generally, that word-final codas are richer than medial ones.
- Steriade xxx rebelled against the consensus, denying relevance of the syllable and deploying phonetic cue strength instead.

## 15. The stress system

- This was *not* considered phonotactics for a long time, but with increasing realization of how much is lexicalized in phonology, it plausibly is now.
  - See below.
- Stress has massive influences about where vowels can occur in English; for an overview, see my *Metrical Stress Theory* (1995, Chap. 2).
  - [ə] is the canonical stressless vowel, but it has contextually-limited friends: [ɪ], [o], [ɔ], [ɪ].
  - Unlike the others, [ə] is illegal under stress: \*['pək].

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<sup>11</sup> This is silly, of course, since long-distance processes like harmony, and all aspects of prosody, are also phonotactics.

## 16. Phonotactics as a path to pursue in computational phonological learning

- Phonotactics is a juicy target for learnability-oriented phonologists, as well as, perhaps, for babies.
  - The data are on, or near, the surface.
  - We don't have chicken-and-egg conundrums (like: UR's depend on the rules, which depend on the UR's)
- Hayes and Wilson (2008, *LI*) "A MaxEnt Model of phonotactics and phonotactic learning" was a first plunge.
- It now, thankfully, has many rival models some of which outperform it; efforts continue.
- So, to some extent, nowadays the grammars considered for English phonotactics are machine-created, not hand-crafted.

## 17. A hand-crafted grammar

- I was curious to try to use MaxEnt in combination with judgments, and devised a handcrafted MaxEnt grammar for English (<https://linguistics.ucla.edu/people/hayes/BLICK/index.htm>)
- Machine-crafted grammars tend to learn "crazy" constraints (Hayes and White 2013), and I was curious to see what could be done with constraints considered "normal" by phonologists.

## 18. A current hypothesis: bifurcated phonotactics

- Strong, general structural constraints, of the kind phonologists like, producing strong sense of ill-formedness when violated.
- Weak, low-scope, ad hoc constraints (e.g. "\*Segment X in syllable coda", or even \*3), which produce detectable effects of well-formedness difference.
- See, e.g., current work of Breiss and Sundara (yesterday's Phonology Seminar), making use of this idea.

### A FOLLOWUP ON THE LEVEL SYSTEM: IS THERE MARTINIAN LEAKAGE?

## 19. Quick Martin summary, with more detail

- Martin, Andrew. 2011. Grammars leak: Modeling how phonotactic generalizations interact within the grammar. *Language* 87.751–770
- Reviewing his English result:
  - Geminates are totally illegal at Level 1.
  - They exist at level 2, notably within compounds: *bookkeeper*
  - A study of compounds shows they are *underrepresented* statistically.
- His theory: language learners err slightly; overgeneralizing the Level 1 constraints to apply weakly at higher levels.



- His model:
  - each constraint is entertained by the language learner in multiple versions:
    - “I am violated at level 1”
    - “I am violated at level 1 or 2”
    - “I am violated at level 1 or 2 or 3”
  - a bias against high weights prevents all the weighting to be allocated to the Level 1 version — hence leakage higher up.

## 20. The traditional orthodoxy in non-probabilistic phonology

- The “#” boundary, or level membership, of the Level 2 affixes *cancels all obligations* to obey the rules or constraints of Level 1.
  - So no leakage is predicted.

## 21. Test #1: TRIPLE LAPSE (plus)

- \*TRIPLE LAPSE: three stressless syllables in a row
- Level 2 test:
  - Any word with antepenultimate stress ending in a sibilant will have a fourth lapsing syllable added if we can form a plural (etc.).
  - Schema: [ 'σ σ σS + əz ]
  - Example: plural of *chrysalis* [ 'kɹɪsələs ], [ 'kɹɪsələsəz ]

## 22. Operationalizing this a bit

- We are perhaps learning (Breiss and Hayes 2020) that phonological Markedness influences
  - not just how you say what you choose to say (repairs)
  - but also, what you choose to say (avoidance)
- So, I conjecture that English speakers are slightly reluctant to use the plural of antepenultimate stress words ending in a sibilant.
- ... and the conjectured cause is Martinian leakage of \*TRIPLE LAPSE.
- Usually, paraphrases are available when we want to avoid a forbidden word.
  - We divided up the work for our experiment in biology class, deciding that Alice would take care of the chrysalises (be responsible for chrysalis care, would be the chrysalis caretaker, etc.)

## 23. There might be more going on

- The sequence [Səz] created by pluralizing any sibilant stem may itself be marked.
- Kids can produce it only rather late.
- There is a dialect of Yiddish, related to English, in which sibilant stems take *null* instead of a sibilant ending. [ xxx where did I see this? Albright NLLT? ]
- Standard English avoids attaching both the plural and possessive endings: *the boys' dogs*

- English has curious haplological gaps, like *Brahms' lullaby* [bɹɑmz 'lʌləbaɪ], usually not [bɹɑmzəz 'lʌləbaɪ]
- So, are [Səz] plurals, even *faces*, *mazes*, *edges*, slightly bad in and of themselves?

## 24. More on [S ə S] avoidance

- The shortest schwas of English, I believe, occur in the context / 'V C \_\_\_\_ C ə.  
➤ This is the Syncope environment for English (Bybee), the “Opera Rule”; opera, camera, family, historical med' cine.
- So is it also bad to put sibilants surrounding a short schwa in this position?  
➤ No cases in my little searchable Level 1 dictionary.  
➤ I do know the word *dioscesan* [daɪ'əsəsən] ‘pertaining to a diocese’, but I find it a bit weird.

## 25. Pondering the Antepenultimate-stress words that end in sibilants: many have a learned-plural alternative

- I think people are particularly eager to employ a learned (Latin/Greek) plural when the alternative is violating TRIPLE LAPSE and SIB SCHWA SIB.

<i>analysis</i>	<i>analyses</i>	[si:z]	* <i>analyseses</i>
<i>antithesis</i>	<i>antitheses</i>	[si:z]	* <i>anthitheseses</i>
<i>emeritus</i>	<i>emeriti</i>	[aɪ]	* <i>emerituses</i>
<i>syllabus</i>	<i>syllabi</i>	[aɪ]	? <i>syllabuses</i>
<i>chrysalis</i>	either <i>chrysalises</i> or <i>chrysalides</i> [kɹɪ'sælɪdi:z]		

People love to guess (ahistorical) *octopi* for *octopus*.      ?*octopuses*

- Though I note that there are occasional cases for the disyllables that end in sibilants.  
➤ The regular plural in these cases sounds fairly good.

<i>thesis</i>	<i>theses</i>	? <i>thesises</i>
<i>focus</i>	<i>foci</i>	<i>focuses</i>
<i>stylus</i>	<i>styli</i>	<i>styluses</i>
<i>larynx</i>	<i>larynges</i>	<i>larynxes</i>

## 26. My baby pilot

- With my search utility, 20 nouns with:
  - antepenultimate stress
  - final sibilant (in the event, always [s])
  - don't usually take a learned plural
- Paired with 20 foils, chosen only to not have the configuration above, and be about the same familiarity and semantic field.

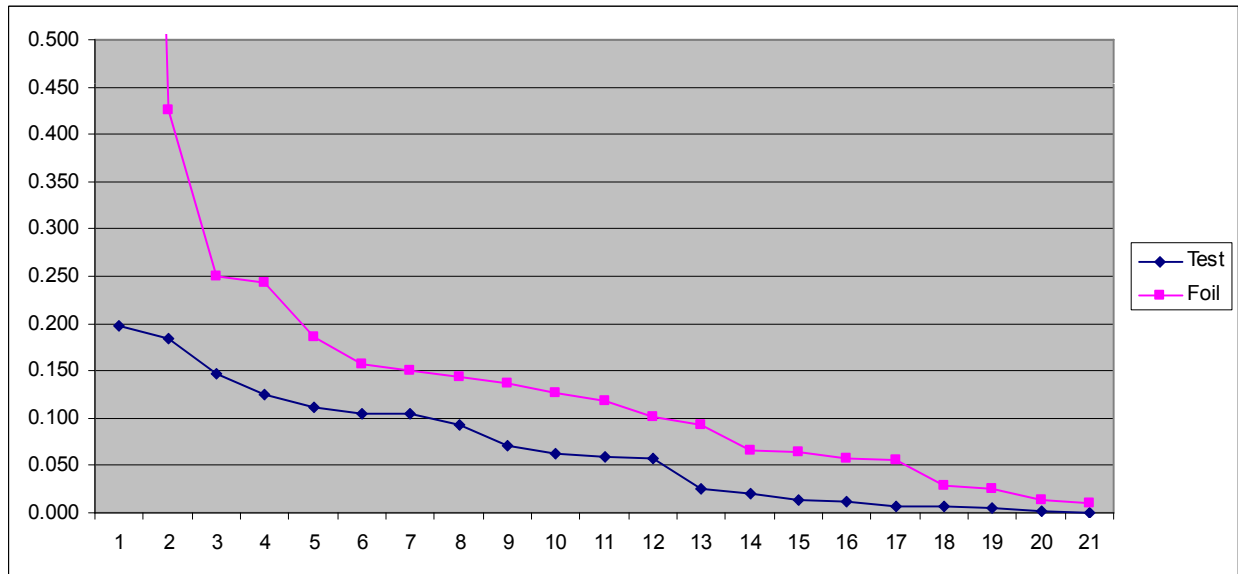
- I need some way to make the comparison more objective!
  - Doing *all* words of the target shape would be better, but auto-Googleing has not been possible since the early 21st century.

## 27. The data gathered

Word	Sing. Ghits	Plur. Ghits	Ratio	Foil	Sing. Ghits	Plur. Ghits	
Copernicus	18,500,000	1,930	0.000	Galileo	59,500,000	757,000	0.013
acropolis	20,600,000	49,100	0.002	Parthenon	12,700,000	132,000	0.010
ambadress	589,000	61,700	0.105	ambassador	262,000,000	63,900,000	0.244
baroness	15,500,000	102,000	0.007	baron	197,000,000	20,000,000	0.102
chrysalis	17,700,000	118,000	0.007	cocoon	67,400,000	4,430,000	0.066
armistice	14,600,000	161,000	0.011	cease-fire	7,380,000	217,000	0.029
Sagittarius	54,500,000	257,000	0.005	Gemini	156,000,000	10,100,000	0.065
deaconess	5,260,000	489,000	0.093	abbot	28,500,000	4,280,000	0.150
dalliance	2,970,000	546,000	0.184	affair	278,000,000	611,000,000	<b>2.198</b>
abacus	40,700,000	562,000	0.014	terminal	760,000,000	119,000,000	0.157
continuance	24,000,000	597,000	0.025	injunction	26,400,000	6,620,000	0.251
governess	6,020,000	889,000	0.148	nanny	101,000,000	9,450,000	0.094
dissonance	17,300,000	1,220,000	0.071	harmony	348,000,000	20,100,000	0.058
countenance	25,300,000	1,500,000	0.059	visage	251,000,000	34,500,000	0.137
anchorage	109,000,000	2,170,000	0.020	harbor	356,000,000	19,800,000	0.056
equivalence	37,300,000	2,340,000	0.063	equalities	194,000,000	5,070,000	0.026
edifice	40,900,000	4,300,000	0.105	building	4,090,000,000	758,000,000	0.185
coincidence	63,600,000	7,930,000	0.125	accident	524,000,000	223,000,000	0.426
brokerage	303,000,000	17,500,000	0.058	corporation	1,340,000,000	159,000,000	0.119
ambulance	160,000,000	17,800,000	0.111	hearse	10,200,000	1,470,000	0.144
audience	1,210,000,000	240,000,000	0.198	crowd	802,000,000	101,000,000	0.126
			<b>0.067</b>				<b>0.222</b>

## 28. Ratio of plural frequency to singular frequency

- Note that *affairs* is a lot more frequent than its singular; off the chart.



## 29. The difference is not significant

t-test:  $p = .119$

## 30. Intuitions

- I find *common* plurals with the TRIPLE LAPSE violation to be pretty good; see sort above:

*coincidences, brokerages, ambulances, audiences*

Modern experimental psycholinguistics tells us these are likely to be lexically listed.<sup>2</sup>

- I find rare plurals (probably nonce) to sound at least a bit awkward.
  - “Look! It’s Ma Copernicus, Pa Copernicus, and all the little ?Copernicuses.”
  - “We visited not just the Acropolis in Athens, but the one in Corinth, the one in Ithaca, the one in Ephesus — in fact, all ten ?Acropolises.”
  - “When I was became ambassadress I had no idea they would make all the ?ambassadors sit a separate table.”
  - “The museum has a fine collection of cocoons and ?chrysalises.”

<sup>2</sup> For a quick overview see Schreuder, Robert, Nivja de Jong, Andrea Krott, and Harald Baayen. “Rules and rote: Beyond the linguistic either-or fallacy.” *Behavioral and Brain Sciences* 22, no. 6 (1999): 1038-1039.

**31. Upshot**

- Still, at present this pilot has yielded nothing provable.
- I think having a *lot* of data might yield more than just the hints here.

**32. A quick evaluation of \*SIBILANT CLASH beyond Level 1**

- Fraction of words in my Level 1 list beginning with a sibilant:

$$2082/17744 = 0.117$$

- A sloppy web site (<http://www.english-for-students.com/Prefix-MIS.html>) lists 303 words that have the prefix *mis-*.
  - Let's compensate for their sloppiness by calling it 250.
  - I know of only three cases where *mis-* is attached to sibilant-initial stems: *misspell*, *misstep*, *misshapen*
- This is  $3/250 = 0.012$ , about ten times less
- Fisher's Exact Test gives a value  $< .00001$   
(<http://www.socscistatistics.com/tests/fisher/default2.aspx>)

## ENGLISH STRESS

**33. Some remarks on the framework of Liberman and Prince (1977)**

- This is early metrical stress theory, retaining:
  - a feature [+stress], instead of using foot-headship
  - a hybrid approach to foot parsing — things like feet get created when [+stress] is assigned<sup>3</sup>
  - a metrical grid separate from the trees, instead of combining them in the later “bracketed grid” (Halle and Vergnaud 1987, Hayes 1995)
  - Segmental assignment of stress is done without syllables, though Liberman and Prince were certainly aware of the issues.<sup>4</sup>
- Part of what we will do it to map their findings into more modern frameworks, notably OT.
  - Ideally, the same empirical insight becomes purer when viewed through two sets of assumptions.

<sup>3</sup> There is reason to think (a now-forgotten ms., Prince 1975) that Prince already had the modern foot-based theory in his head when he co-authored the 1977 paper.

<sup>4</sup> These are addressed frankly, citing Kahn (1975), in fn. 9.

### 34. Long and short vowels of American English, per L+P

divīne	pōunce	Bermūda
obscēne	mōon	pōint
vāne	vōte	

pit	put	impudent
pet	putt	pong
pat	pot	

= IPA:

aɪ	aʊ	ju:
i:	u:	ɔɪ
eɪ	oʊ	

ɪ	ʊ	jʊ
ɛ	ʌ	ɔ
æ	ɑ	

- If you were doing British English you would want to add
  - the short vowel [ɒ]
  - perhaps the extra diphthongs derived historically by [r]-dropping

### 35. The overall scheme of Liberman and Prince

- An iterative stress assignment rule, extending *SPE*, swoops right to left across the word, assigning stresses in accordance with syllable quantity.
- Here is the first sketch of the rule, given for expository clarity:

*English Stress Rule (ESR), Preliminary Version*

$V \rightarrow [+stress] / \text{--- } C_0 (\check{V}(C))(\check{V} C_0) \#$

### 36. Rule interpretation, carried over from SPE

- Apply the longest version of the rule you can, if you can match it up with the form.
- Else delete some material and see if you can apply that.
- Continue until you meet success (application) or final failure.

### 37. Some basic examples

- In words of sufficient length, stress is antepenultimate when the penult is light; else penultimate.

a.	b.	c.
América	aróma	deféctive
canónical	Cardóna	referéndum
Éverest	hormónal	amálgam
aspáragus	horízon	eréctor
polýgamous	desírous	anárthrous
élephant	adjácent	Charýbdis

### 38. I think this is better-formatted, per SPE

$$V \rightarrow [+stress] / \_\_\_ C_0 ( (\forall(C)) \forall C_0 ) \#$$

- ☞ try this on *America*, *aroma*, and *defective*
- ☞ try it on *discipline*

### 39. Ramping up the rule to full coverage

- This version has been simplified slightly with Microsoft Paint:

#### *English Stress Rule, Iterative Version*

$$V \rightarrow [+stress] / \_\_\_\_\_\_ C_0 (V(C))_a ( \quad V \quad C_0 )_b ( \quad V \quad X ) \#$$

$\langle -long \rangle_a \quad \langle -long \rangle_b \quad [+stress]$

Conditions: ~a, ~b under certain morphological and lexical circumstances.

- Lexical specification can force use of “shorter versions” of the rule.
- A main stress is selected by building the full metrical tree.
- Some stresses, in clashing positions, are trimmed back by “destressing” rules.

### 40. Examples of lexically selected shorter expansions

- Vanilla, which must be -a or -b.
- ☞ second iteration: what of *E\_pami'nondas* vs. *Attawa'piskat*? Which one is “normal”?

### 41. An intriguing aspect of the rule: particular suffixes are affiliated with suppression of a or b

**42. Think about Liberman and Prince from the constraint-based perspective**

- The English Stress rule establishes *maximum* distances from right word edge and between stresses.
- In more modern, structural terms, we might set up constraints that define the maximal size of a metrical foot: three syllables, no medial heavy, no weak long vowels (or something more sophisticated).
- When we add in the a and b exception feature, we have something very close to a modern system:
  - phonotactics absolute: \*'pæmələnə, pæmələnə'tɛpi, \*'poudəktəl, \*'panərəud.
  - phonotactics gradient: *antenna*, invoking the exception feature
  - the lexicon gets to have its say, within limits of the phonotactics
- So the system is in some ways well on the way to the OT system to be invented by Prince 16 years later.
- It also has the diacritic-based based system of gradient exceptions, to be introduced by Pater in 2000 (readings for this week).

**43. Another absolute of the system**

- Application of the English Stress Rule is obligatory — diacritics can repress a parenthesize element, but they cannot turn it off.
- Hence, forms like \*[pətə'tæməɹə] are totally illegal; and indeed they are totally absent.

**44. Avoiding feet that are too short**

- Liberman and Prince's method:
  - Let the iterative rule foot the entire word.
  - Let other rules decide which feet are strong or weak.
  - *Trim back*, using Destressing rules, some stressed that (i) are in Weak position; (ii) meet certain prosodic and/or morphological conditions.
- Derivation of *potato*

/pV'teto/

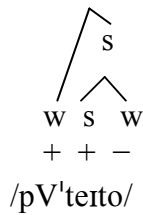
UR

$$\begin{array}{c} \diagup \quad \diagdown \\ s \quad w \\ + \quad - \end{array}$$

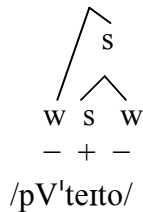
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English Stress Rule Iteration I

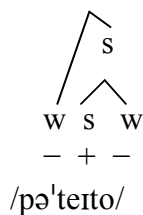




English Stress Rule Iteration II



Destressing Rule



Vowel Reduction

- Note: we don't know the UR of the first vowel of *potato*; in parallel cases like *medicinal* we do.

#### 45. An unnoticed (minor) failure of the Liberman/Prince system

- ☞ Is there a derivation that would yield the following form:

[<sub>l</sub>pætə'kɛ]

?

- The Destressing rule would not help here, since Destressing is always held to hold in Weak position.
- The same generalization that rules out \*[<sub>l</sub>pɛ'terto] is evident here, but it cannot be done in a unified fashion without constraints.
- Nowadays it is widely posited that there are *minima* on foot structure as well as maxima, something that parenthesis notation was not equipped to do.

#### THE TREATMENT OF FINAL SYLLABLES AND STRESS TENDENCIES (ROSS)

#### 46. Final syllables I

- When a final syllable contains a long vowel, it receives at least secondary stress, as the analysis predicts.

negate	anecdote	divine
repute	execrate	devote
erode	ballyhoo	mahout
balloon	complete	exploit

- We can divide these examples into secondary and final stress:

'anec,dote	ne'gate
'exe,crate	di'vine
'bally,hoo	re'pute
	de'vote
	e'rode
	ma'hout
	bal'loon
	com'plete
	ex'ploit

- Intriguingly, the generalization is about “some level of stress”, with the selection of main stress left to distinct principles (below).
  - This is needed in other languages, too, e.g. Old Odawa, with stress computed left to right (iambs), main stress right to left (antepenultimate).

#### 47. Two “funny” long vowels

- The vowels [i] and [ou] can be completely stressless, but only when word-final<sup>5</sup>
- We can tell this from Tapping:
  - *pity, vanity, tutti-frutti*
  - *motto, ditto, blotto*
- One approach
  - set up short tense /i/, /o/ as phonemes, let them be tensed finally (*not* lengthened, pace LP), reduce to schwa elsewhere
  - There are even alternations:
  - *happy* ['hæpi], *happily* ['hæpəli]
  - *photo* ['foulou], *photographic* [ˌfouɹə'gɪæfɪk], *photography* [fou'tɑgɪəfi]

<sup>5</sup> or prevocalic; more on this later

#### 48. Final syllables II: the details

- These are the subject of a long paper by John Robert Ross (1972), famous as the discoverer of syntactic island constraints.
  - Ross, J. R. (1972) *A Reanalysis of English Word Stress*. In Michael Brame, ed., *Contributions to Generative Phonology*, University of Texas Press, Austin & London.
- Ross notices a great number of idiosyncratic facts about English word stress — all statistical, for which he had no formal framework.
- Possibly we can be more systematic...

#### 49. An approximation of Ross's claims

- CC at end of word encourages stress.
- Non-coronal codas encourage stress.
- These patterns continue to be studied in modern times, notably by Michael Kelly, Matthew Gordon, and Kevin Ryan.
- These scholars find phonetic and typological support for such gradient factors in syllables weight and stress assignment.
- The Rossian patterns have mostly been swept under the rug for want of rigorous ways of assessing and analyzing them.

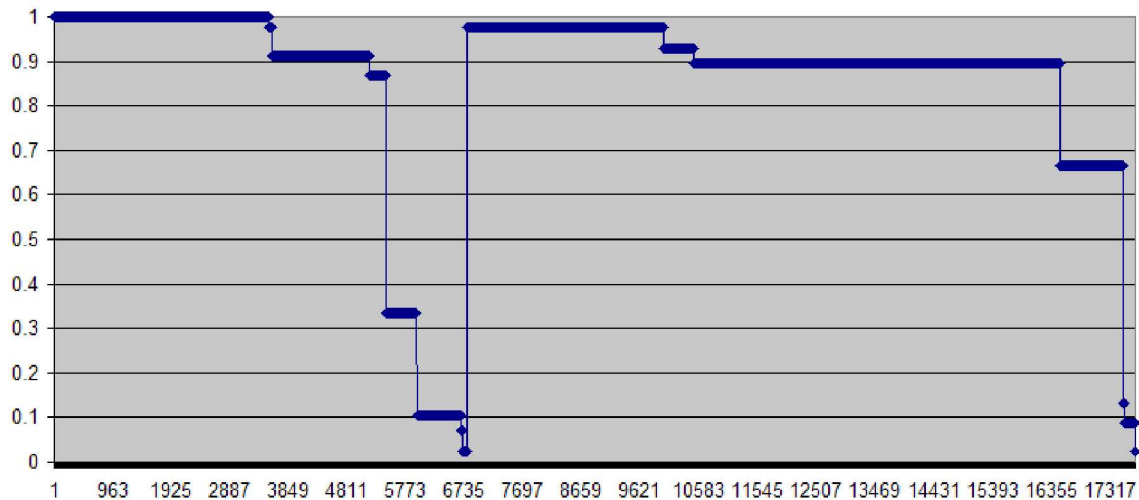
#### 50. A quick check of the Rossian Principles

- I used my little Search program to assign violations to all 17000 words of my little Level I corpus.
- Here are constraints I used, with commentary:

PreferStressed	-2.61	Simply a baseline term, giving preference here for stresslessness.
*Stressless Monosyllable	50	Blatantly true and gets a huge weight.
*Stressless Long Vowel	4.50	From Liberman and Prince, an absolute principle.
*StressedAmbiguousVowel	-5.66	This was meant to <i>compensate</i> for the final stressless vowels [i] and [o], described above. The weight should not be of greater magnitude than the previous and I'm not sure what is going on.
*Stressless final VC	0.40	It turns out that even <i>one</i> final consonant makes you heavier.
*Stressless final VCC	1.91	But two is more (esp. when you add in the ganging).
*Stressless with Final NoncoronalConsonant	0.32	A small effect, but confirming Ross (highly significant by Likelihood Ratio test)

## 51. Model fit

- Here is a sort; the stressed followed by the stressless, with their probabilities.



- This is the sort of “semipredictability” made clear in work by Bresnan and Baayen.
- Some of the data are full-predictability, like monosyllables and long vowels
- But plenty of work being done by the Russian gradient principles.

## 52. To come

- Destressing and its metrical basis
- Morphology and retraction
- The odd case of medial sonorants
- Cyclicity
- “Superimposed” constraints (Moore-Cantwell)