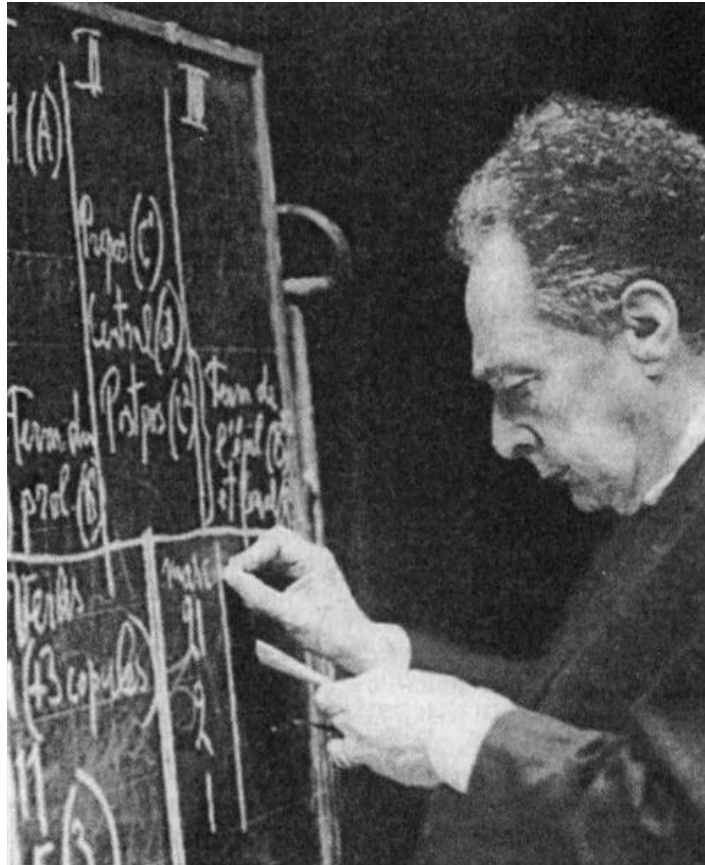


Competitive exclusion in linguistic morphology

Mark Aronoff
(with Mark Lindsay and Kristian Berg)
Stony Brook University
Workshop on Competition
LSA Summer Institute
Chicago, 12 July, 2015



Roman Jakobson

Linguista sum,
linguistici nihil a me alienum puto

Preamble

Language and grammar

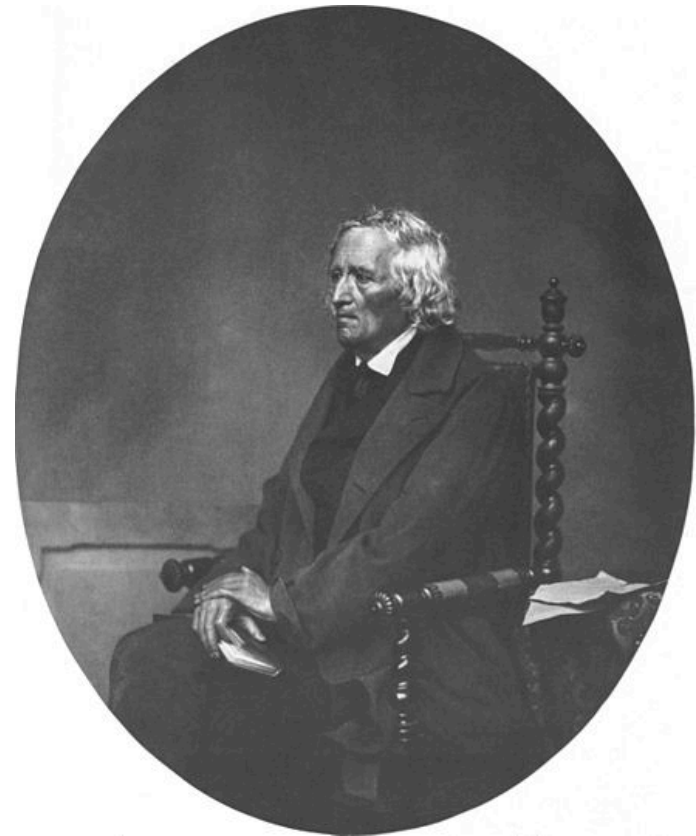
Linguists since ancient times have believed that languages have grammars



Sti2010

www.delcampe.net

Modern linguists continue to identify language and grammar



Linguistics and psychology



- The subtitle, 'A Chapter from Psychonetics', sounds somewhat pretentious; however, by this I merely wanted to indicate that I consider myself an adherent of the linguistic school which emphasizes the psychological factor in all linguistic phenomena
 - Baudouin de Courtenay, *An attempt at a theory of phonetic alternations*, 1895/1972, p. 146

Linguistics and psychology



- [Language] is at the same time physical, physiological, and psychological. It belongs both to the individual and to society.
 - Saussure, *Cours*
- The sound pattern is not actually a sound; for a sound is something physical. A sound pattern is the hearer's psychological impression of a sound, as given to him by the evidence of his senses.
 - Saussure, *Cours*

Sound systems as psychological



- Edward Sapir, 1933, La réalité psychologique des phonèmes
- It is exceedingly difficult, if not impossible, to teach a native to take account of purely mechanical phonetic variations which have no phonemic reality for him
- a naïve native's phonetic 'ignorance' proved phonologically more accurate than the scientist's "knowledge.'

Structuralist consensus on language, grammar, and psychology

- Both Sapir and Bloomfield viewed linguistics as a sister discipline to psychology
- By the end of the structuralist period, linguists had come to a general agreement about two points.
 1. Grammar encompasses all of language, sound as well as meaningful elements
 2. Linguistics is a psychological science

Generative grammar and psychology

- Generative grammar adopted structuralist definitions of the term *grammar*
- Generative grammar encompasses all of language, including sound, except pragmatics
- Generative grammar accepted the structuralist claim that linguistics is a psychological science
- Generative grammar saw as its goal the construction of a scientific grammar that corresponds in some way to the psychological grammar of the speaker

The generative linguist's grammar is the speaker's grammar



To summarize, then, we use the term “grammar” to refer both to the system of rules represented in the mind of the speaker-hearer . . . and to the theory that the linguist constructs as a hypothesis concerning the actual internalized grammar of the speaker-hearer. No confusion should result from this standard usage if the distinction is kept in mind.

- SPE, p. 4

method ≠ reality

There are those who are so convinced of the adequacy of purely objective methods of studying speech sounds that they do not hesitate to insert phonetic graphs into the body of their descriptive grammars. This is to confuse linguistic structure with a particular method of studying linguistic phenomena.

- Edward Sapir, 1925, Sound patterns in language, *Language*, p. 51

Linguistics ≠ Grammar

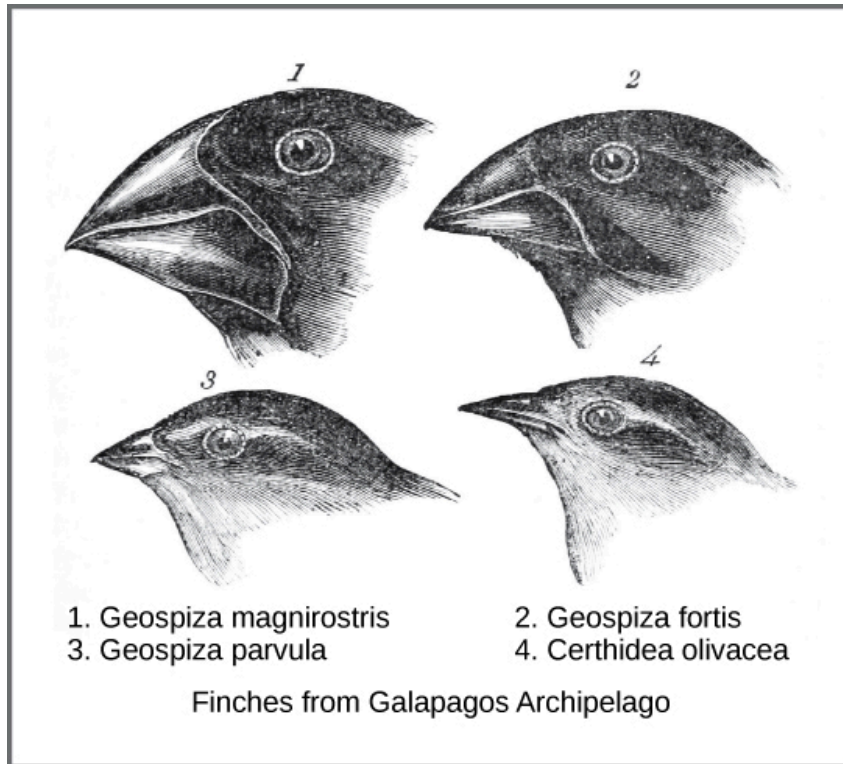
- In dictionaries, *linguistics* is defined as “the science of languages” (OED Online) or “the study of the nature, structure, and variation of language” (American Heritage Dictionary, 4th edn.)
- Dictionaries are silent on any necessary connection between linguistics and grammar or psychology
- It should be possible to do linguistics without doing grammar and without depending on psychological reality

Fuhgeddaboutit!



- We apply ideas and methods that have been successful outside linguistics and psychology
- We don't deny that grammar exists or that it is somehow psychologically real
- We simply want to think about language and languages in other ways
- These ideas and methods can shed light on long-standing problems of language that relate to both linguistics and psychology

The principle of competitive exclusion



- Explore a very general explanatory principle
- See if this principle can help us to understand language and languages
- The phenomena covered in this presentation will be restricted to morphology
- The principle has wider application in language
- I will not try to connect what I have to say with grammar or grammars or psychological reality

Four parts

- Part I: Synonymy and competition
- Part II: Blocking
- Part III: Competing for Distribution
- Part IV: Equilibrium

Part I

Synonymy and competition



L'Abbé Gabriel Girard (1677 – 1748)

23.139
LA JUSTESSE
DE LA
LANGUE FRANÇOISE.
O U
LES DIFFERENTES SIGNIFICATIONS
DES MOTS QUI PASSENT
POUR
SYNONIMES.

Par M. l'Abbé GIRARD C. D. M. D. D. F.



A PARIS,
Chez LAURENT D'HOURY, Imprimeur-
Libraire, au bas de la rue de la Harpe, vis-
à vis la rue S. Severin, au Saint Esprit.

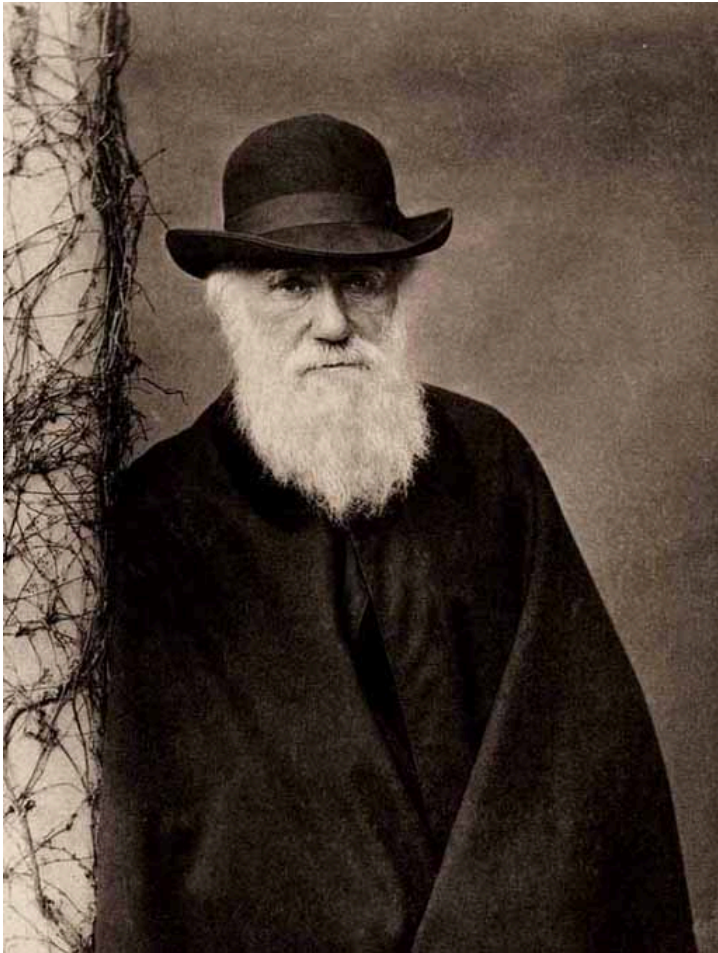
M DCC. XVIII.

Avec Approbation & Privilège du Roy.

Perfect Synonymy

- One can also mean by *synonymous* a resemblance in meaning so complete and so perfect that the meaning, taken in all its force and in all circumstances, should be always and absolutely the same; so that one of the synonyms signifies no more and no less than the other; that one can use them indifferently on all occasions; and that there is no more choice to make between them, for meaning, than between the drops of water from the same well, in taste. . . . **If one takes the term *synonymous* in the second sense; I do not believe that there is any synonymous word in any language.**
(Girard 1718, xviii – xx) [translation MA]

The struggle for life among words



We see variability in every tongue, and new words are continually cropping up; but as there is a limit to the powers of the memory, single words, like whole languages, gradually become extinct. As Max Müller has well remarked: “A struggle for life is constantly going on among the words and grammatical forms in each language. The better, the shorter, the easier forms are constantly gaining the upper hand, and they owe their success to their own inherent virtue.”

- Charles Darwin. 1872. *The Descent of Man and Selection in Relation to Sex* (p. 58)

Max Müller's actual words



A much more striking analogy, therefore, than the struggle for life among separate languages, is the struggle for life among words and grammatical forms which is constantly going on in each language. Here the better, the shorter, the easier forms are constantly gaining the upper hand, and they really owe their success to their own inherent virtue. Here if anywhere, we can learn that what is called the process of natural selection, is at the same time, from a higher point of view, a process of rational elimination; for what seems at first sight mere accident in the dropping of old and the rising of new words, can be shown in most cases to be due to intelligible and generally valid reasons.

- Max Müller, review of the English translation of *Darwinism Tested by the Science of Language*, by August Schleicher, in *Nature* 1:10, January 6 1870, p. 257.

Gause's Principle of Competitive Exclusion

- Georgii Frantsevich Gause (1910 – 1986)
- *The Struggle for Existence* (1934)
- The competitive exclusion principle:
 - **No two species with similar ecological niches can coexist in a stable equilibrium**
 - **When two species compete for exactly the same requirements, one will be slightly more efficient than the other and will reproduce at a higher rate**
 - **The fate of the less efficient species is local extinction**
 - **Adaptive change in one or more species is an alternate outcome**
- “No two species can indefinitely continue to occupy the same ecological niche” (Slobodkin 1961)
- Proven mathematically by Levin (1970): “Two species cannot coexist unless their limiting factors differ and are independent”

Classic ecological results

- Volterra (1926, 1931) demonstrated that, in theory, only one species can survive on a single resource, given certain assumptions
- Gause's (1934) experiments on competition between *Paramecium caudatum* and *P. aurelia* demonstrated this same point experimentally
- The result of competition need not be the elimination of one species, but instead adaptive changes in the competing species
 - MacArthur (1958) studied five species of warbler very similar in their ecological preferences, showing that the feeding habits of the five species were significantly different from one another, so that the species occupied distinct ecological niches
 - Grant and Grant on Darwin's finches

“You want competition, I give you planets”



Dwarf planets and competition

- 8 major planets
- A large number of dwarf planets
- Pluto
- The major criterion for distinguishing dwarf planets:
 - **dwarf planets are not able to clear their orbital path so there are similar objects at roughly the same distance from the Sun (NASA)**
- Clearing the orbital path is the resolution of competition for a particular orbit

Perfect synonyms and competition

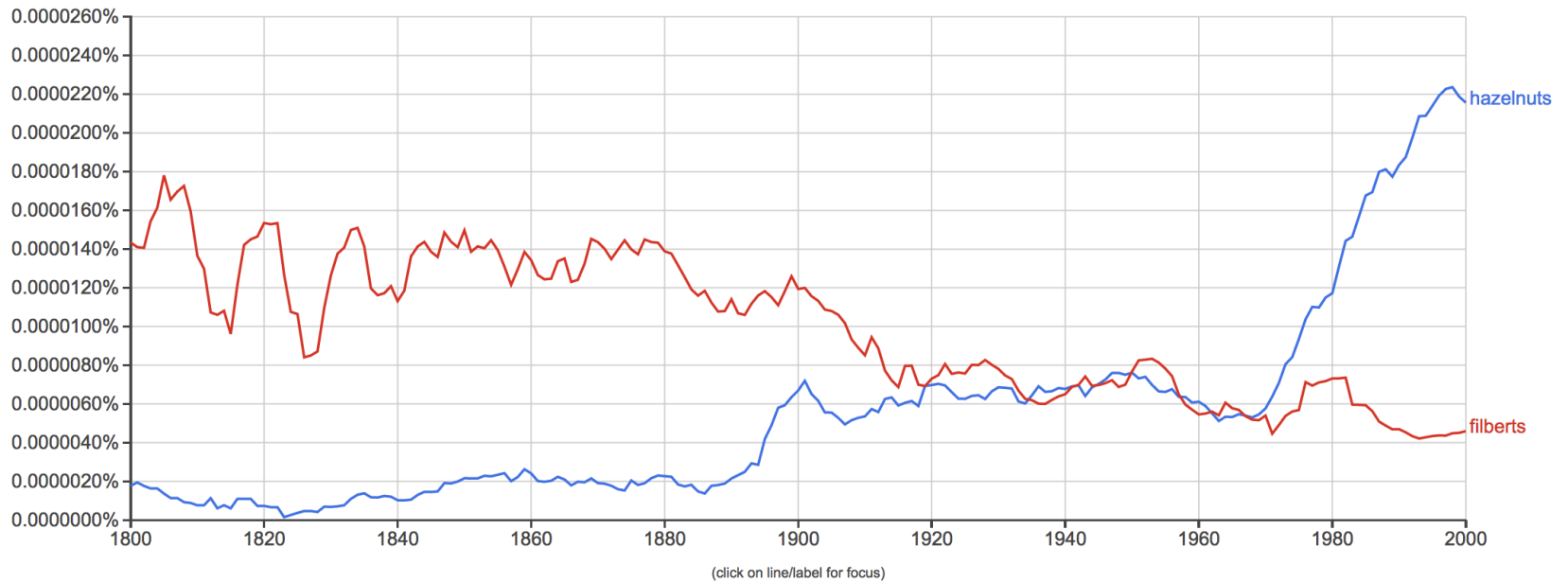
- Girard's first insight was to define synonymy as a **complete and perfect resemblance** in meaning in all circumstances
- Girard's second insight was to understand that perfect synonym candidates must be completely interchangeable
- The absence of perfect synonyms is a direct and simple consequence of Gause's Principle applied to words and meanings
 - Two words with the same meaning do not both survive because by definition they compete for exactly the same resource
 - Even near perfect synonyms are in fact very rare
 - *Hazelnut* and *filbert*
 - *Hazelnut spread* (374K Google ETM) vs. *?filbert spread* (11K)
 - *Hazelnut praline* (70K) vs. *?filbert praline* (2.5K)

Hazelnuts and filberts

Google books Ngram Viewer

Graph these comma-separated phrases: case-insensitive

between and from the corpus with smoothing of [Search lots of books](#)



Part II

Blocking



- I first used the term *blocking* in my 1974 dissertation and 1976 monograph, *Word Formation in Generative Grammar*
- At the time, I knew only rumors about “the French synonymists” of the 18th Century
- I defined blocking informally as follows:
 - the nonoccurrence of one form due to the simple existence of another (Aronoff 1976, p. 43)
 - Blocking is basically a constraint against listing synonyms in a given stem (Aronoff 1976, p. 55)
- *ran* blocks *runned*; *fought* blocks *fighted*
- Since 1976, an entire industry has grown up in linguistics and psychology around the phenomenon of blocking

Synonymy, competition, and word blocking

- Kiparsky's (1983) "avoid synonymy" principle
- No principle is needed
- The morphological blocking of individual words is a result of Gaussian competition for a single meaning between two potentially synonymous words
- Gause's principle predicts only **that** one word will win somehow, not **which one** wins or **why** or **how**

Synonymy avoidance by meaning differentiation

- Two potentially synonymous words **can co-exist** if they manage to **avoid synonymy by differentiation of meaning**
 - *Historic vs. historical*
 - *Economic vs. economical*
 - *Brothers vs. brethren*
 - *Hanged vs. hung*
- If individual word blocking results from competition for meaning, then meaning-differentiated words do not block each other, because they do not compete
- In ecological terms, each word has found its own niche

Pattern meets lexical word

- A morphological **pattern** may produce a word that maps onto the meaning/distribution of an existing word
- The results is a potential synonym pair
- In each pair, one is existing, the other productively formed
 - Existing *ran* vs. productively formed **runned*
 - Existing *fought* vs. productively formed **foughted*
- This phenomenon has preoccupied linguists and psycholinguists since the 1970s
- Gause's axiom predicts that one of the synonymous words will win in every pair
- Victory may be temporary: *shined, roofs*

Systematic synonymy

Rival patterns

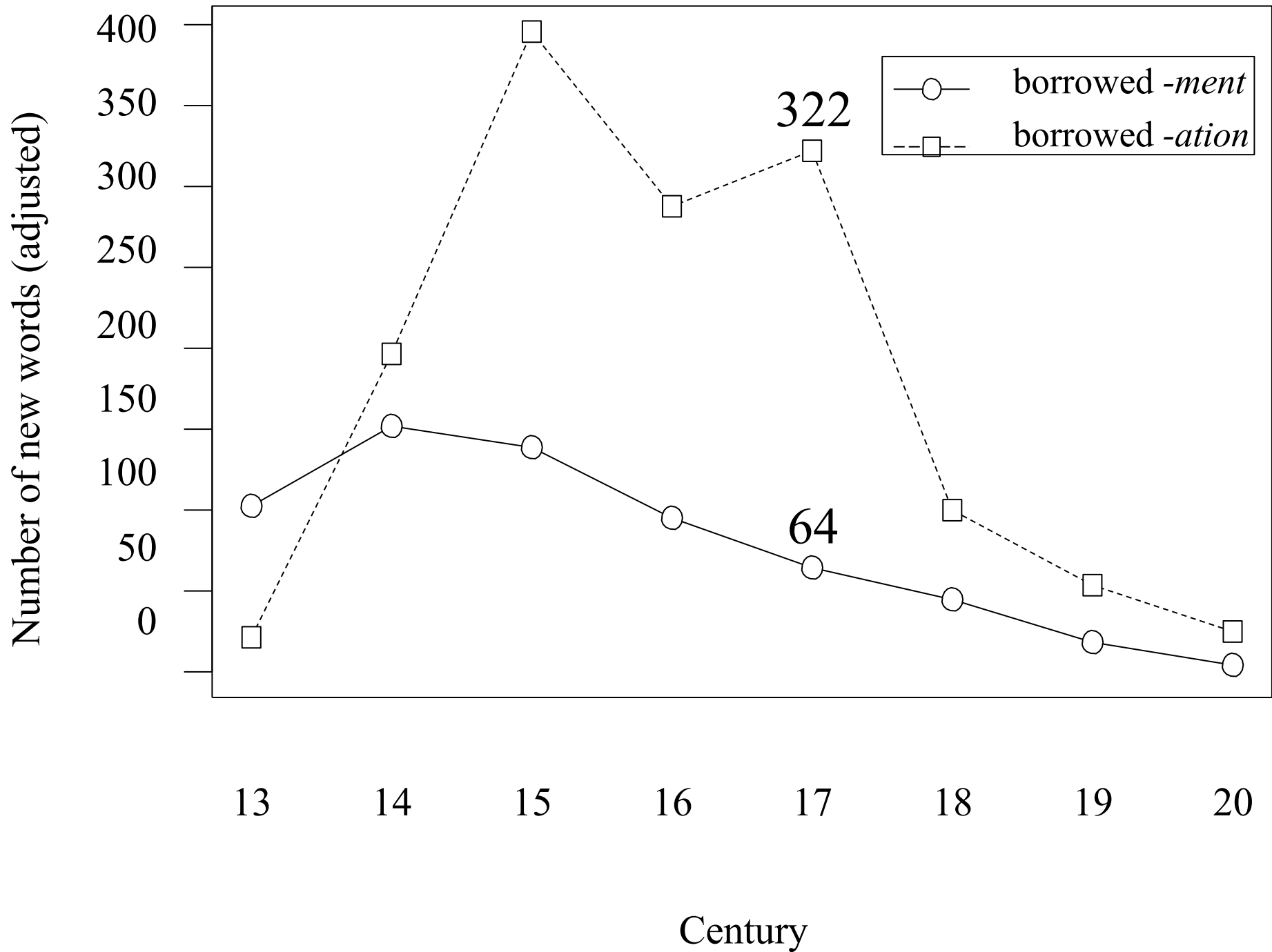
- The morphological **system** has the potential to create systematic synonymy
- Each morphological pattern in a language is a function from form/meaning inputs to form/meaning outputs
- **Rival morphological patterns** may emerge historically and converge on the same meaning/distribution output and thus produce potential synonym pairs
 - *-ness vs. -ity (receptiveness vs. receptivity)*
 - *-ic vs. -ical (cyclic vs. cyclical)*

The resolution of systematic synonymy

- The systematic synonymy of patterns can be resolved in two ways
 1. **(Local) Extinction:** the extinction of one affix/pattern in a particular environment or entirely
 2. **Differentiation:** specialization of one affix/pattern
- These are the same two resolutions as in individual word blocking but they operate between **types** rather than **tokens**
- This type/token distinction is directly analogous to individual vs. species competition in biology
- Word = individual
- Type = species

Total pattern extinction

- In the simplest cases, one pattern is overwhelmed and driven to extinction by the ascendance of another
- This happened to English *-ment* in the face of *-ation* (Lindsay and Aronoff 2013)
- Both *-ment* and *-ation* were borrowed into English from French
- *-ment* lost traction during the 17th century due to a dearth of new verbs
- A weakened *-ment* was driven to extinction by *-ation*, which drew strength from continued borrowing in the 17th century and later



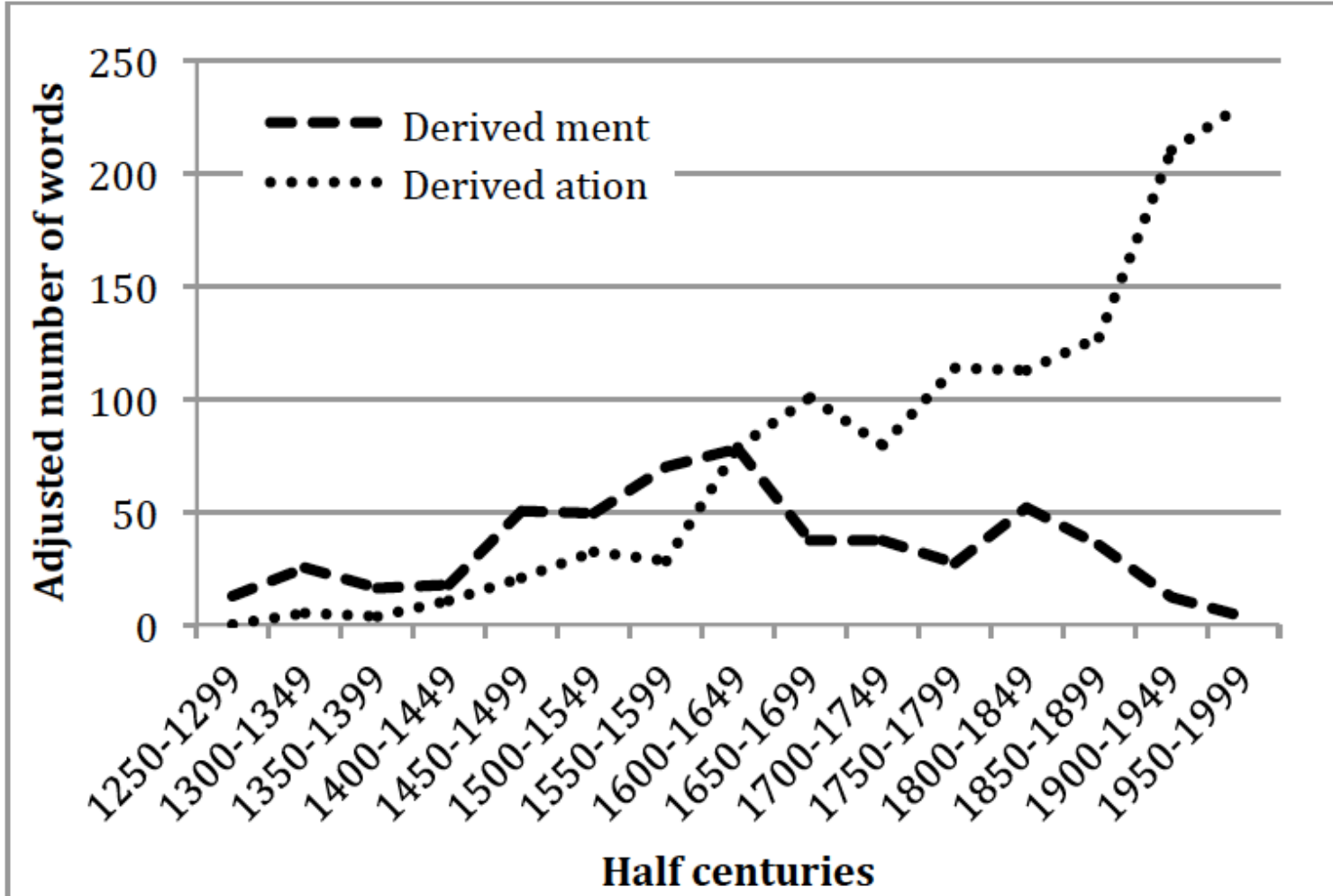


Figure 4: derived *-ation* vs. *-ment* per half-century (adjusted).

Part III

Competing for Distribution



Resources and Niches

- Gause's competitive exclusion principle is stated in terms of resources
- Slobodkin extended the principle to ecological niches: "No two species can indefinitely continue to occupy the same ecological niche"
- An ecological niche is defined as a multidimensional space that includes all properties of the environment, including not only resources, but also climate, predators, etc.

Word niches and distribution

- The niche of a word is the multidimensional space that includes all properties of its environment
- In other words, the niche of a word is its distribution
- Girard uses distributional criteria as diagnostic for synonymy
- The method is prescient of that of midcentury language theorists: e.g., Wittgenstein, Harris, Mates, Chomsky

Meaning and use

- Girard begins with meaning, but he is careful to include use: “a resemblance in meaning so complete and so perfect . . . that one can use them indifferently on all occasions.”
- Girard’s main criterion for judging whether two words are synonymous is use: perfect synonyms should be completely interchangeable.

Girard's distributional method

- AJOUTER. AUGMENTER.
- On Ajoute une chose différente: On Augmente la-même. 'one adds a different thing: one augments the same [thing]'
- Bien de gens, pour augmenter leur bien, ne font pas scrupule d'y ajouter le bien d'Autrui. 'Many people, to augment their property, have no qualm about adding to them the property of others.'

Girard's distributional method

- TROUPE. BANDE.
- Le mot de *Troupe* signifie précisément plusieurs personnes assemblées, qui vont de compagnie: Le mot de *Bande* marque plusieurs personnes séparées des autres, qui se suivent et qui ne se quittent point. 'The word *Troop* signifies precisely several people assembled, who are companions. The word *Band* marks several people separated from the others, who follow each other and never leave each other'.
- La Troupe peut se partager en plusieurs Bandes; mais la Bande ne se divise point en plusieurs Troupes. 'A Troop can be divided into several Bands, but a band can't ever be divided into several Troops'.
- On dit, une Troupe de comédiens, & une Bande de violons. 'We say, a Troop of actors, & a Band of violins'.
- Il n'est pas honnête de se séparer de la Troupe pour faire Bande à part. 'it is not fair to separate oneself from the Troop to make a Band apart'.

Modern views of distribution and meaning

- Wittgenstein: “For a large class of cases of the employment of the word ‘meaning’ —though not for all —this word can be explained in this way: the meaning of a word is its use in the language” (*Philosophical Investigations* 43).
- Benson Mates: “Accordingly, I propose the following statement as a condition of adequacy for definitions of “synonymity” and as a guide for conducting research to determine which expressions are in fact synonymous for given persons: *Two expressions are synonymous in a language L if and only if they may be exchanged in each sentence in L without altering the truth value of that sentence.* (*Synonymity*, p. 119)

Beyond synonymy:

The many facets of distribution

- The dimensions determining the space of an ecological niche comprise more than resources
- Similarly, many factors determine the distribution of linguistic elements
- The variety of factors becomes clear once we move beyond individual words to larger morphological **patterns**, where many factors besides 'meaning' rise to the surface

Differentiation: linguistic niches

- A weaker pattern may survive if it finds a linguistic niche that differentiates its distribution from that of the stronger pattern
- There is no way to know in advance what will constitute a niche
- All standard linguistic variables usually provide niches
- Differentiation proves that the driving factor is not always synonymy (pace Girard)
- The broad range of linguistic phenomena is closer to biology

-ize vs. -ify

- The suffix *-ify* is originally the Latin verb-forming suffix *-(i-)fic-a(re)*, a combining form of the verb *facere* ‘make’.
 - The Latin suffix becomes *-(i-)fi(er)* in French
 - Words in *-ify* are borrowed into English from about 1300 on
- The suffix *-ize* is originally Greek
 - The suffix is borrowed into Latin as *-iz-a(re)*
 - The earliest Latin attestations are Christian religious terms from the time of the Vulgate, ca. 400 CE (*baptizare, catechizare, etc.*)
 - The suffix becomes French *-is(er)*
 - French words in *-ize* are borrowed into English from about 1300
- Both become productive from about 1550
- The two suffixes have always been synonymous
- How do both survive?

Phonological niches

- In many European languages, the correspondents of suffixes *-ize* and *-ify* divide up their bases according to the number of syllables:
 - *-ify* attaches to bases with one syllable, sometimes two
 - *-ize* attaches to bases with two or more syllables
- The exact conditions vary slightly from one language to another but all have some sort of specialization of *-ify*, usually monosyllabic bases
- The conditions may have originated in the differences between Latin and Greek and to how Latin borrowed Greek words ending in *-iz*

Google results

suffix	-ize	-(i)fy
winners	2217	419
ratio	5.29	1

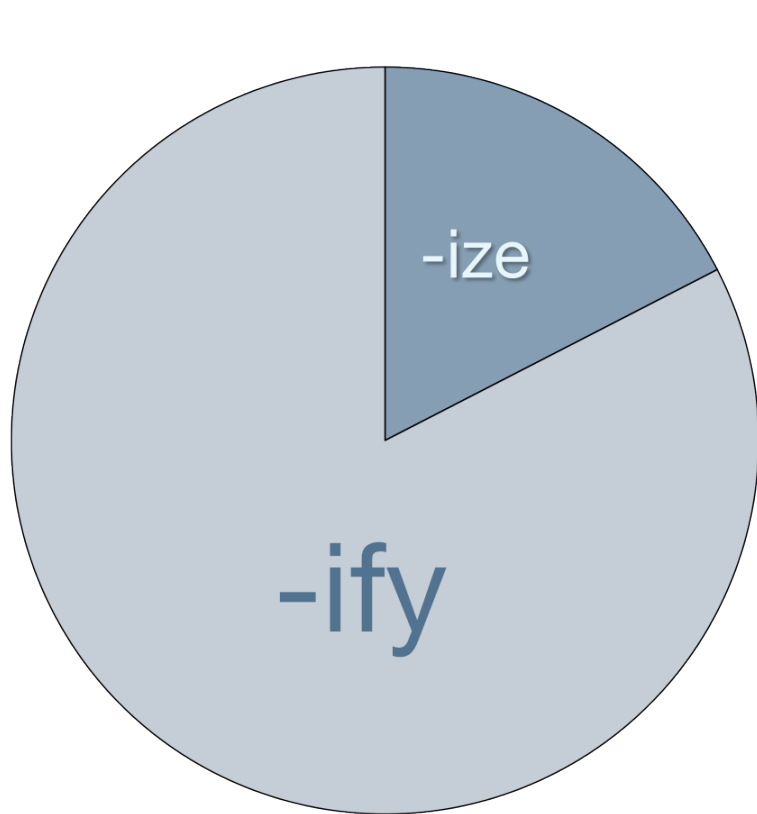
-ize is more likely than -ify (~5 to 1)

-ify has its place

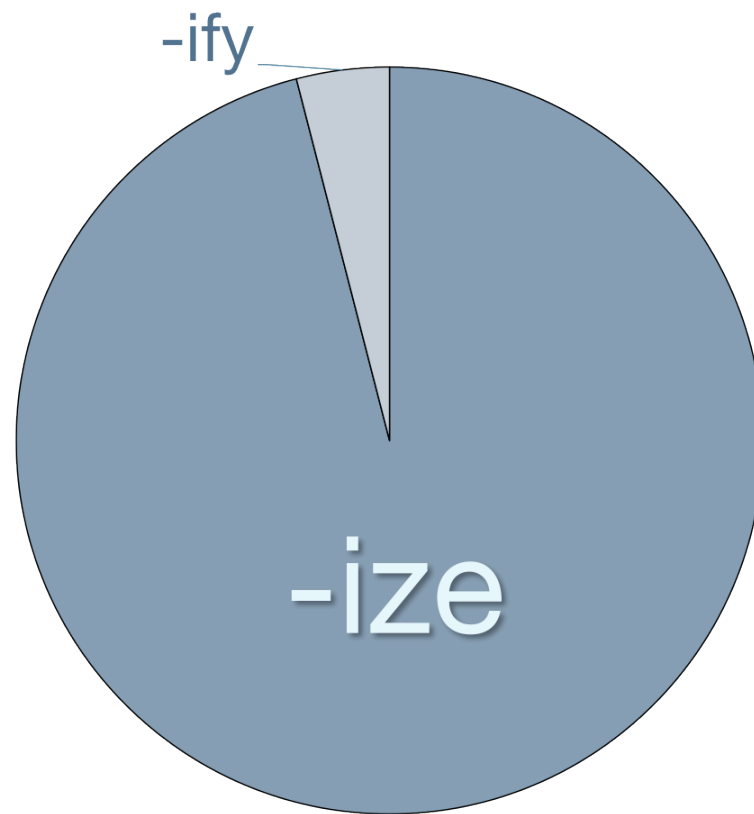
suffix	-ize	-(i)fy
monosyllabic stem	68	322
polysyllabic stem	2127	89

-ify is more likely in words with monosyllabic stems by almost the same ratio

-ize vs. -ify by stem syllables



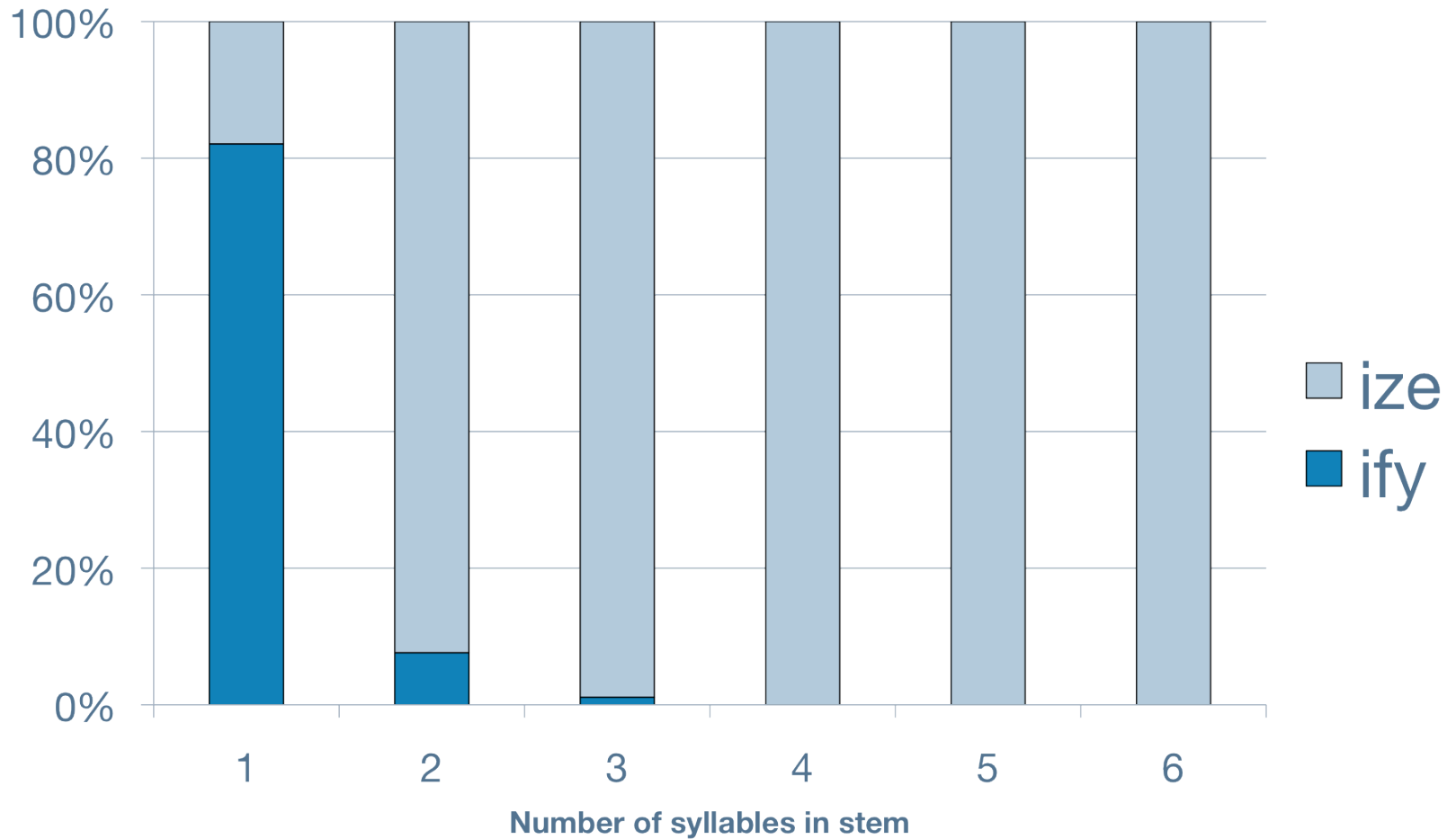
Monosyllabic Stems



Polysyllabic Stems

-ize vs. -ify

by stem syllables



Morphological niches

- There is a large literature on the morphological specialization of rival patterns
- The most studied example is *-ity* and *-ness* in English
- The most important finding is that the distribution is rarely simple
- In certain morphological environments, the pattern that is less viable overall is preferred

Morphological niches

Marchand on **-ic** vs. **-ical**

“There was, at the beginning, indiscriminate coexistence of two synonymous adjectives. But language does not like to have two words for one and the same notion, and competition was bound to come.”

– Marchand (1969, p. 241-242)

-ic vs. -ical

suffix	-ic	-ical
winners	10,613	1,353
ratio	7.84	1

-ic is more productive than -ical (~8 to 1)

-ologic(al) subset

Ratio of -ic to -ical

suffix	-ic	-ical
-ological	1	8.30
average	7.84	1

The ratio is **reversed** in the -ological set!

-ity vs. -ness

OED citation counts

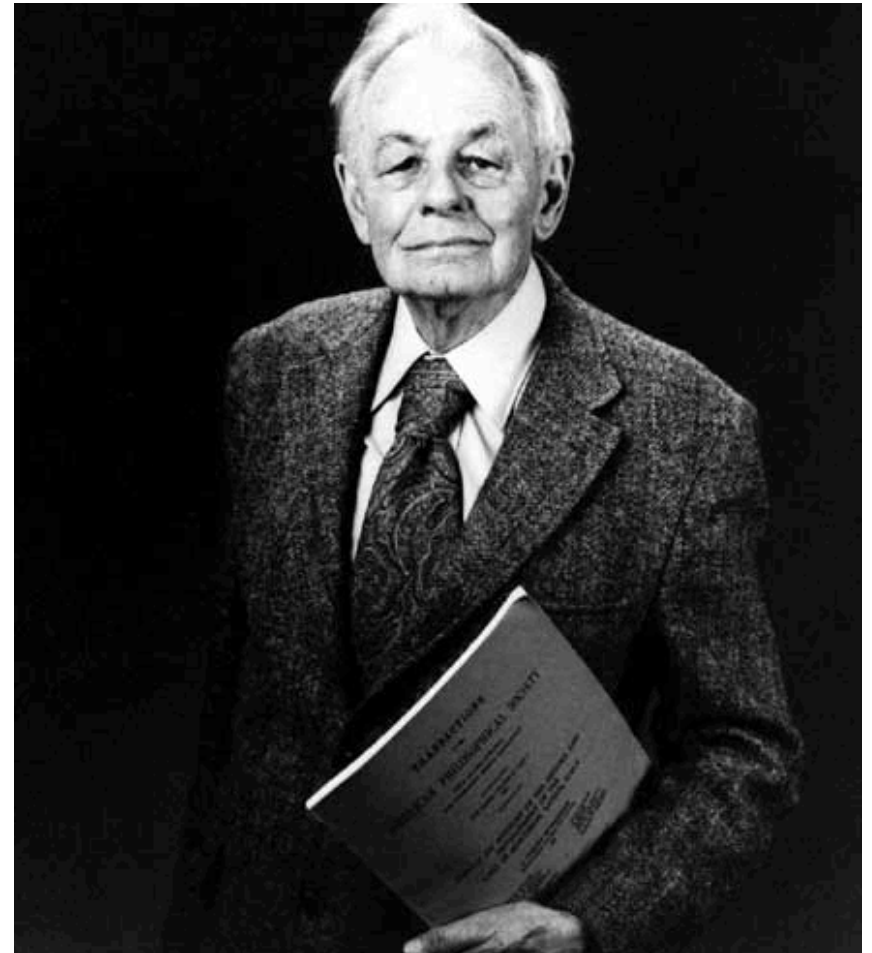
<i>-ity type</i>	<i>-ness type</i>	<i>-ity/-ness ratio</i>
All <i>-ity</i>	All <i>-ness</i>	.666
<i>-ivity</i>	<i>-iveness</i>	.626
<i>-ality</i>	<i>-alness</i>	2.260
<i>-bility</i>	<i>-bleness</i>	2.811
<i>-icity</i>	<i>-icness</i>	6.750

Part IV

Equilibrium

If the two species were almost equally efficient over a wide range of environmental variables, competitive exclusion would be a slow process. Both species then might oscillate in varying numbers, but persist almost indefinitely.

G. Evelyn Hutchinson 1964



Morphological equilibrium

The English comparative

- . . . The new allies of Hamas want a more quiet region.

International Herald Tribune 28/11/12

- The original *New York Times* version of the same sentence
 - Egypt, Qatar and Turkey all want a more quiet, stable Middle East.
- Microsoft Word flagged *more quiet* with the heading Comparative Use and suggested *quieter* instead

Traditionally claimed distribution of the two comparative forms

The two means of expressing comparison in English adjectives are usually said to be in the following stable distribution:

1. Words of one syllable generally take the suffix *-er*
2. Two-syllable words ending in *-y* take the suffix: *sillier*, *livelier*, but **foolisher*, **rampanter*
3. Predicate-only adjectives take only the periphrastic form *more*: **awarer*, **afraider*, **contenter*
4. Elsewhere, only periphrastic forms occur, notably with adjectives of more than two syllables

What is the actual distribution in the real language?

How long has this been going on?

- There are Old English examples of the periphrastic construction with the adverbs *ma*, *bet*, and *swiðor*:
 - *Ɗaet hi syn sylfe ma gode ðonne oðre men*
 - “that they themselves are *more good* than other men”
- There are even examples of double periphrastics in OE
- OE examples of these adverbs with participles (usually past) in predicate position are attested
- The periphrastic use of *more* increased in Middle English, with support from French and Medieval Latin
- The modern distribution developed gradually over a period of centuries (Kytö and Romaine (1997))

Victorina González-Díaz
*English Adjective Comparison: A
Historical Perspective*

- This 2008 corpus-based study is the most comprehensive synchronic and diachronic description of the rivalry between the two forms
- G-D concludes that, though one predominates in certain environments, the distribution is not discrete and has never been

Type	Adjective	Suffixed	Periphrastic
<i>-ly class</i>			
	lonely	11 (73%)	4 (27%)
	lively	55 (60%)	37 (40%)
	lowly	6 (46%)	7 (54%)
	friendly	47 (41%)	67 (59%)
<i>-y class</i>			
	shaky	7 (88%)	1 (22%)
	weighty	19 (76%)	6 (24%)
	clumsy	12 (75%)	4 (25%)
	glossy	7 (70%)	3 (30%)
	empty	11 (68%)	5 (32%)
	cozy	20 (59%)	14 (41%)
	scary	8 (57%)	6 (43%)
	angry	38 (57%)	29 (43%)
	risky	39 (49%)	41 (51%)
	sleepy	3 (33%)	6 (67%)
	ready	23 (31%)	52 (69%)
	cloudy	3 (27%)	8 (73%)
<i>Syllabic /l/ class</i>			
	noble	20 (65%)	11 (35%)
	feeble	11 (61%)	7 (39%)
Total		340 (53%)	308 (47%)

Distribution of two strategies for disyllables in BNC (from González-Dias)

Position	Inflectional	Periphrastic	Total
<i>Attributive</i>	152 (67.9%)	72 (32.1%)	224 (34.4%)
<i>Predicative</i>	179 (44.4%)	224 (55.6%)	403 (62.2%)
<i>Postpositive</i>	9 (42.9)	12 (57.1)	21 (3.2%)
<i>Overall distribution</i>	340 (52.5%)	308 (47.5%)	648 (100%)

Syntactic function and second term of comparison, cross-tabulation

		Predicative	Attributive	Postpositive	Total
<i>Without than-phrase</i>	Inflected	119 (40%)	148 (68%)	4 (29%)	271 (51%)
	Periphrastic	181 (60%)	70 (32%)	10 (71%)	261 (49%)
	Total	300	218	14	532
<i>With than-phrase</i>	Inflected	60 (58%)	4 (67%)	5 (71%)	69 (59%)
	Periphrastic	43 (42%)	2 (33%)	2 (29%)	47 (41%)
	Total	103	6	7	116
<i>Total</i>	Inflected	179 (44%)	152 (68%)	9 (43%)	340 (52%)
	Periphrastic	224 (56%)	72 (32%)	12 (57%)	308 (48%)
	Total	403	224	21	648

Google Books counts

- We compared pairs of suffixed and periphrastic comparative forms with the same base adjective using Google books
- We used a window of 1900 – present in order to control for any possible diachronic effects
- 3552 adjectives met our criterion
- We consider only the 972 pairs in which each member reaches at least 500 hits in the corpus

Balanced pairs

- We use the term *balanced* to describe pairs in which the two forms are nearly equal in numbers of tokens (in near equilibrium)
- We assume that balanced pairs provide clues to the environments in which two synonymous types are **most competitive**
- A single balanced pair provides only anecdotal evidence
- We need to find many balanced pairs

Balanced pairs

- Disyllables ending in *-y* tend to have the most balanced distribution
 - *Blocky, leaky, grainy, lonely, scaly, haughty* are among the 10 most balanced
- Many monosyllables are also among the most balanced
 - *Sour, lewd, sly, ripe, odd, cute, stark, mute, frank, deaf, blunt, lush, lame*

Conclusion on equilibrium

- The two patterns for forming the English comparative construction are in equilibrium in well-defined environments
- This equilibrium has persisted for over a millennium and almost certainly much longer
- States of equilibrium are predicted by Gause's law
- No other current theory can make any sense of such states

Culture and anarchy



- Matthew Arnold
- 1822-1888
- Culture and Anarchy (1869)
- Culture is then properly described not as having its origin in curiosity, but as having its origin in the love of perfection; it is a study of perfection. (p. 8)
- Culture is the most resolute enemy of anarchy (p.259)

General Conclusion

Culture out of anarchy

- the history of English derivational morphology provides numerous examples of culture growing out of anarchy
- As the system evolves, it becomes more organized
- A major force in the organization these systems is Gause's principle of competition
- Organization emerges through competition
- The competitive principle is independent of what is being organized
- Language becomes systematic by means of the principle of competition

Thank you
Thanks to the
John Simon Guggenheim Memorial Foundation

