Phonology

Part I:
Introduction, theoretical foundations and concepts

Tobias Weber

toweb@spw.uzh.ch

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Course Outline

Part I: Introduction, theoretical foundations and concepts

- basic principles of phonology and its relation to phonetics; structure and complexity of phoneme inventories; syllable structure and complexity

- Theories: structuralism, generative phonology, complexity theory

Part II: Phonological processes in synchrony and diachrony

- Content: synchronic approaches to phonological processes; change of sound patterns

- Theories: derivational phonology and Optimality Theory; Evolutionary Phonology

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Course Outline (cont'd)

Part III: Nonlinear phonology (with a focus on tone)

- Content: principles of nonlinear phonology, nature and analysis of tone systems
- Theory to be illustrated: autosegmental phonology

Part IV: Interactive discussion session

You are invited to bring your own phonological data for discussion and analysis

Why phonology?

Ontological reasons

- Phonology is an essential part of any given language
- Fundament of the structure of any grammar

Theoretical and practical reasons for us linguists

- Phonology is a good start to understand how the grammar of a language works
- If we don't understand the phonological structure of a language, it is likely that we don't understand other parts of the grammar either or that we misunderstand them

What is phonology?

Definition by Nathan (2008:1):

"Phonology is the study of the organization and structure of the sounds of language. Like most areas of grammar it deals both with universal and language-specific principles. All spoken human languages make all (or virtually all) their words with combinations of consonants and vowels, and all (or virtually all) languages group those sounds into units called syllables, and generally, group the syllables into larger groups called feet."

Excursus: What is phonetics?

Definition by Ladefoged (2005:1):

"Phonetics is concerned with describing speech. There are many different reasons for wanting to describe speech, which means that there are many different kinds of phoneticians. Some are concerned with the sounds that occur in the languages of the world. Others are more concerned with helping people speak a particular form of English. Yet others are looking for ways to make computers talk more intelligibly, or to recognize whatever is said to them. For all these purposes phoneticians need to find out what people are doing when they are talking and how the sounds of speech can be described."

Subdisciplines of phonetics

- **Articulatory phonetics: Human sound production**

  Brain of the speaker: controls the transmission of an idea of speech and initiates speech production

  Speech apparatus: contains the "tools" necessary for speech production

- **Acoustic phonetics: Physical aspects of human sounds**
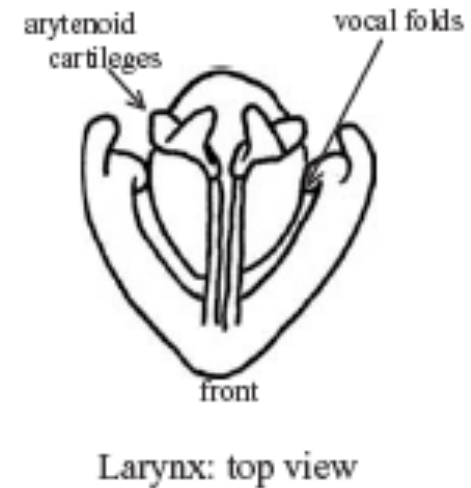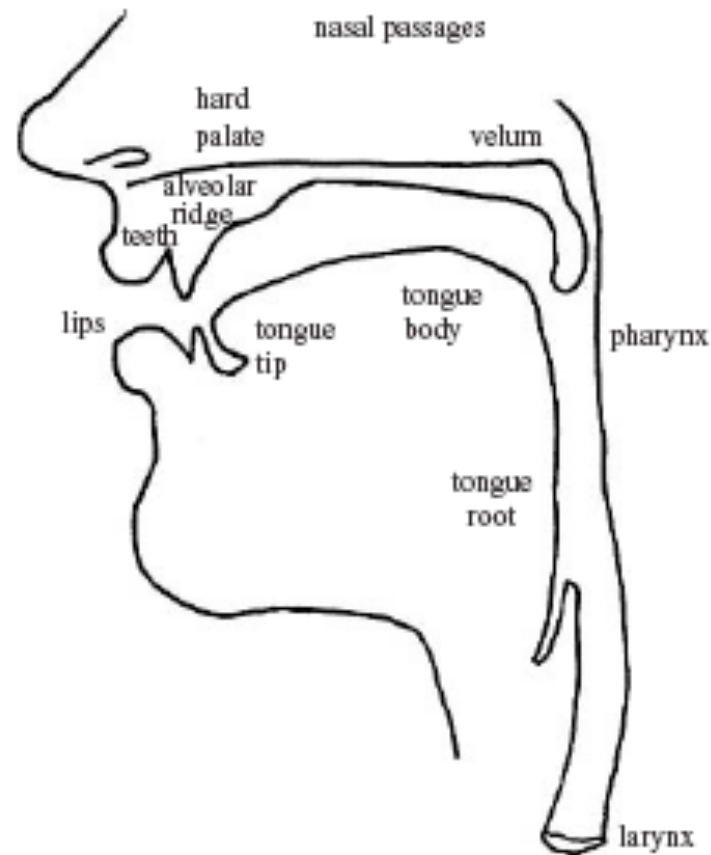
  Sound is transferred as acoustic energy from the speaker the hearer

- **Auditory phonetics: Perception of human sounds**

  Ear: receives the sound and tranfers the information to the brain

  Brain: decodes and interpretes the information it received from the ear.

Our speech production tools

taken from
Odden
(2005)

The International Phonetic Alphabet (IPA)

CONSONANTS (PULMONIC)   © 2005 IPA

	Bilabial	Labiodental	Dental	Alveolar	Post alveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

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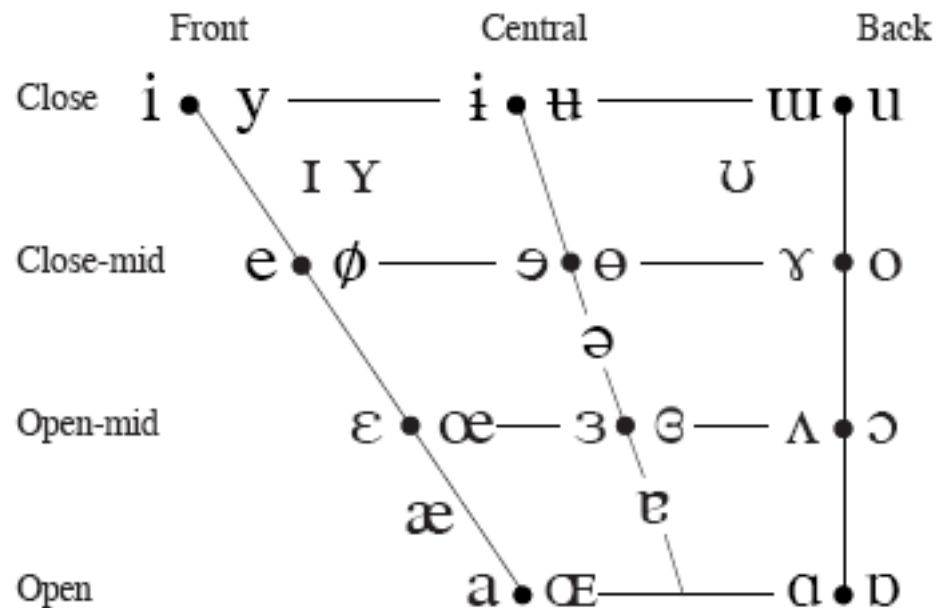# The International Phonetic Alphabet (IPA)

CONSONANTS (NON-PULMONIC)

Clicks		Voiced implosives		Ejectives	
ʘ	Bilabial	ɓ	Bilabial	ʼ	Examples:
ǀ	Dental	ɗ	Dental/alveolar	pʼ	Bilabial
ǃ	(Post)alveolar	ʄ	Palatal	tʼ	Dental/alveolar
ǂ	Palatoalveolar	ɠ	Velar	kʼ	Velar
ǁ	Alveolar lateral	ʛ	Uvular	sʼ	Alveolar fricative

OTHER SYMBOLS

ʍ   Voiceless labial-velar fricative

w   Voiced labial-velar approximant

ɥ   Voiced labial-palatal approximant

ʜ   Voiceless epiglottal fricative

ʢ   Voiced epiglottal fricative

ʡ   Epiglottal plosive

ɕ ʑ   Alveolo-palatal fricatives

ɺ   Voiced alveolar lateral flap

ɧ   Simultaneous ∫ and X

Affricates and double articulations
can be represented by two symbols
joined by a tie bar if necessary.

The International Phonetic Alphabet (IPA)

VOWELS

Where symbols appear in pairs, the one to the right represents a rounded vowel.

The International Phonetic Alphabet (IPA)

DIACRITICS   Diacritics may be placed above a symbol with a descender, e.g. ŋ̊

̥	Voiceless	n̥ d̥	̤	Breathy voiced	b̤ a̤	̪	Dental	t̪ d̪
̬	Voiced	s̬ t̬	̰	Creaky voiced	b̰ a̰	̺	Apical	t̺ d̺
ʰ	Aspirated	tʰ dʰ	̼	Linguolabial	t̼ d̼	̻	Laminal	t̻ d̻
̹	More rounded	ɔ̹	ʷ	Labialized	tʷ dʷ	̃	Nasalized	ẽ
̜	Less rounded	ɔ̜	ʲ	Palatalized	tʲ dʲ	ⁿ	Nasal release	dⁿ
̟	Advanced	u̟	ˠ	Velarized	tˠ dˠ	ˡ	Lateral release	dˡ
̠	Retracted	e̠	ˤ	Pharyngealized	tˤ dˤ	̚	No audible release	d̚
̈	Centralized	ë	̴	Velarized or pharyngealized	ɫ			
̽	Mid-centralized	e̽	̝	Raised	e̝ (ɹ̝ = voiced alveolar fricative)			
̩	Syllabic	n̩	̞	Lowered	e̞ (β̞ = voiced bilabial approximant)			
̯	Non-syllabic	e̯	̘	Advanced Tongue Root	e̘			
˞	Rhoticity	ɚ a˞	̙	Retracted Tongue Root	e̙			

The International Phonetic Alphabet (IPA)

SUPRASEGMENTALS

ˈ	Primary stress
ˌ	Secondary stress
	ˌfoʊnəˈtɪʃən
ː	Long eː
ˑ	Half-long eˑ
̆	Extra-short ĕ
|	Minor (foot) group
‖	Major (intonation) group
.	Syllable break ɹi.ækt
‿	Linking (absence of a break)

TONES AND WORD ACCENTS

LEVEL

e̋ or	˥	Extra high
é	˦	High
ē	˧	Mid
è	˨	Low
ȅ	˩	Extra low
↓		Downstep
↑		Upstep

CONTOUR

ě or	˅	Rising
ê	ˆ	Falling
e̗	ˈ	High rising
e̖	ˈ	Low rising
e᷈	ˤ	Rising-falling
↗		Global rise
↘		Global fall

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The International Phonetic Alphabet (IPA)

Listen to the sounds of the world's languages!

UCLA phonetics lab data:

http://www.phonetics.ucla.edu/

Electronic tools for phonetics/phonology

- *Praat*
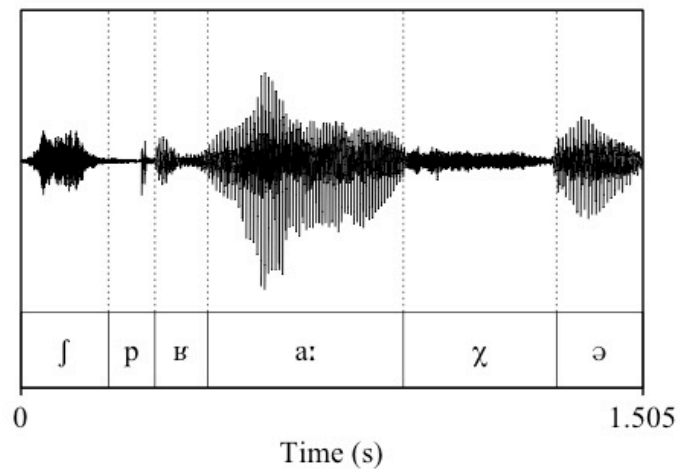- *Transcriber*
- *Audacity*
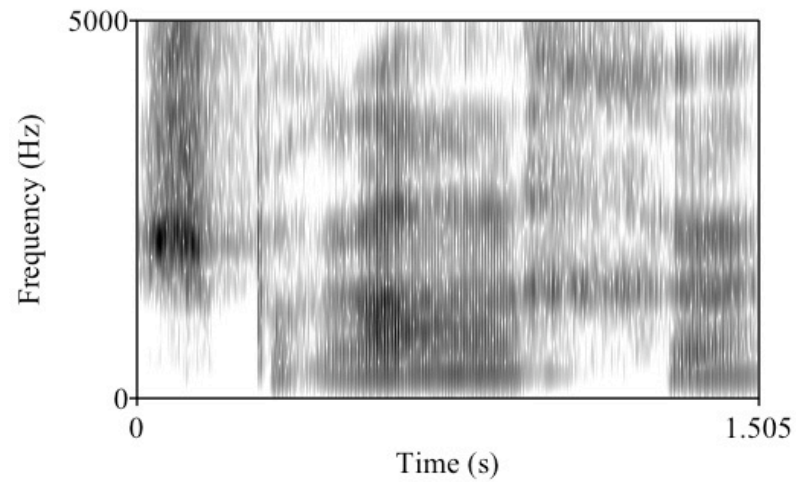
pictures:

above: *spectrogram*

below: *waveform*

Relation phonetics/phonology

Phonetics

- physical aspects of human speech
- "concrete", material perspective
- unit: phone: human speech sound

Phonology

- systemacity and organization of human sound patterns
- "abstract", functional perspective
- unit: phoneme: smallest unit differentiating meaning

Relation phonetics/phonology

Conventions

[..]   phonetic representation

/.../   phonological representation

<...>   orthographic representation

1 phoneme can be represented by 1 or more allophones

1 (allo)phone can represent 1 or more phonemes

Types of allophony

- Complementary distribution: choice determined by the phonological environment

- Free variation: choice of the allophones is free

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Fieldwork: How to find the phonemes

1st step: write down all the sounds and organize them in a table

2nd step: determine sounds that might constitute phonemes together
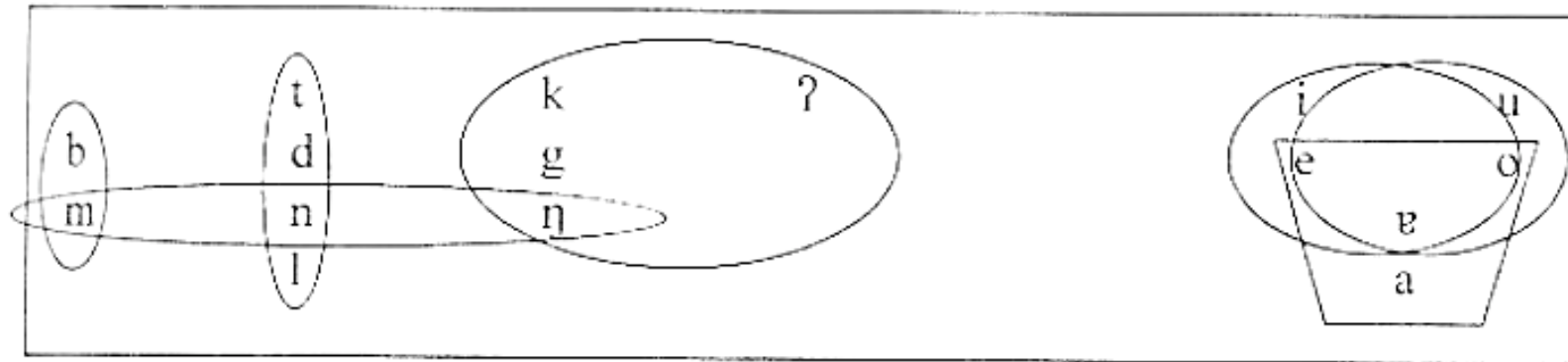
Fieldwork: How to find the phonemes

3rd step: establish lists for those sounds

		k	
1.	#	'k	ogol
4.	#	'k	abaŋ
5.	ʔɐg'bɐ	k	ol
6.	ʔɐg'ʔɐli	k	#
8.	#	'k	iłat
12.	ʔɐg'lu	k	ub

		g	
1.	'ko	g	ol
5.	ʔɐ	g	'bakol
6.	ʔɐ	g	'ʔɐlik
7.	#	'g	etan
9.	ʔɐ	g	'bulig
9.	ʔɐg'buli	g	#
10.	#	'g	ulom
11.	#	'g	itaʔ
12.	ʔɐ	g	'lukub

Fieldwork: How to find the phonemes

4th step: determine the distribution of the examined sounds:

- they can be in contrast in identical environment (e.g. English [led] vs. [red])
- they can be in contrast in analogical environment (e.g. both sounds occur word-initially before a vowel)
- ➢ separate phonemes
- they can be in complementary distribution
- they can be in free variation
- ➢ allophones of one single phoneme

5th step: establish the phoneme inventory and phonological rules

e.g. /r/   vs.   /l/ -> [ɫ] / _ #

                                                        [l] elsewhere

History of phonology: structuralism

Structuralism

- foundations: sign, relation of elements to each other

- origin: de Saussure (1916)

- not only in linguistics, but also in other disciplines (anthropology, sociology, literary theory)

- replaced by Generative Grammar in the fifties

Relevance for phonology

- Inventory of sounds can be analyzed in terms of a series of contrasts

- Nikolai Trubetzkoy (1939): *Principles of Phonology*: definition of the phoneme; phonology separated from phonetics

- many aspects still standard today

History of phonology: generative phonology

Generative grammar

- as of Chomsky (1957)
- influenced by structuralism
- underlying vs surface structure
- various versions, very influential in the seventies and eighties
- decreasing popularity since the nineties

Generative phonology

- influential work: Chomsky and Halle (1968): *The Sound Pattern of English*
- phonological representations are sequences of segments which can be characterized by distinctive features
- still influential today to some degree

Taken from

Odden (2005)

	p	t	č	k	b	d	ǰ	g	f	v	θ	ð
syl	−	−	−	−	−	−	−	−	−	−	−	−
son	−	−	−	−	−	−	−	−	−	−	−	−
cons	+	+	+	+	+	+	+	+	+	+	+	+
cont	−	−	−	−	−	−	−	−	+	+	+	+
del.rel	−	−	+	−	−	−	+	−	−	−	−	−
lat	−	−	−	−	−	−	−	−	−	−	−	−
nas	−	−	−	−	−	−	−	−	−	−	−	−
voi	−	−	−	−	+	+	+	+	−	+	−	+
c.g.	−	−	−	−	−	−	−	−	−	−	−	−
s.g.	(−	−	−	−)	−	−	−	−	−	−	−	−
ant	+	+	−	−	+	+	−	−	+	+	+	+
cor	−	+	+	−	−	+	+	−	−	−	+	+
distr		−	+			−	+				+	+
hi	−	−	−	+	−	−	−	+	−	−	−	−
lo	−	−	−	−	−	−	−	−	−	−	−	−
back	−	−	−	+	−	−	−	+	−	−	−	−
round	−	−	−	−	−	−	−	−	−	−	−	−

Phoneme systems: complexity

Number of consonants

- Rotokas (West Bougainville, Papua New Guinea): 6
- English: 24 (average)
- !Xóõ (South Khoisan, Botswana): 122 (debated)

Number of vowels

- Yimas (Lower Sepik; Papua New Guinea): 2
- Swahili: 5 (average)
- !Xũ (North Khoisan; Namibia): 24

Total

- Rotokas: 11 phonemes
- !Xũ (North Khoisan; Namibia): 141 phonemes (debated)
- average: ca. 30 phonemes

Complexity of consonant systems

Small systems

- few places of articulation
- usually (bi)labial, dental/alveolar, velar, (glottal), (palatal)
- few types of consonants:
- voiceless obstruents (plosives, fricatives)
- voiced nasals, approximants, "liquids" (l, r)

Frequency of consonantal phonemes

- plosives: t > p, k >…
- fricatives: s > ʃ, f, z, x, v, ʒ >…
- nasals: n, m > ŋ > ɲ > …
- liquids: l > r

Consonant systems worldwide: WALS

WALS (The World Atlas of Language Structures)

- large typological database of structural properties of languages
- edited by M. Haspelmath, D. Gil, M.S. Dryer, B. Comrie
- 55 contributors
- > 140 maps
- first (printed) edition 2005 (Oxford University Press)
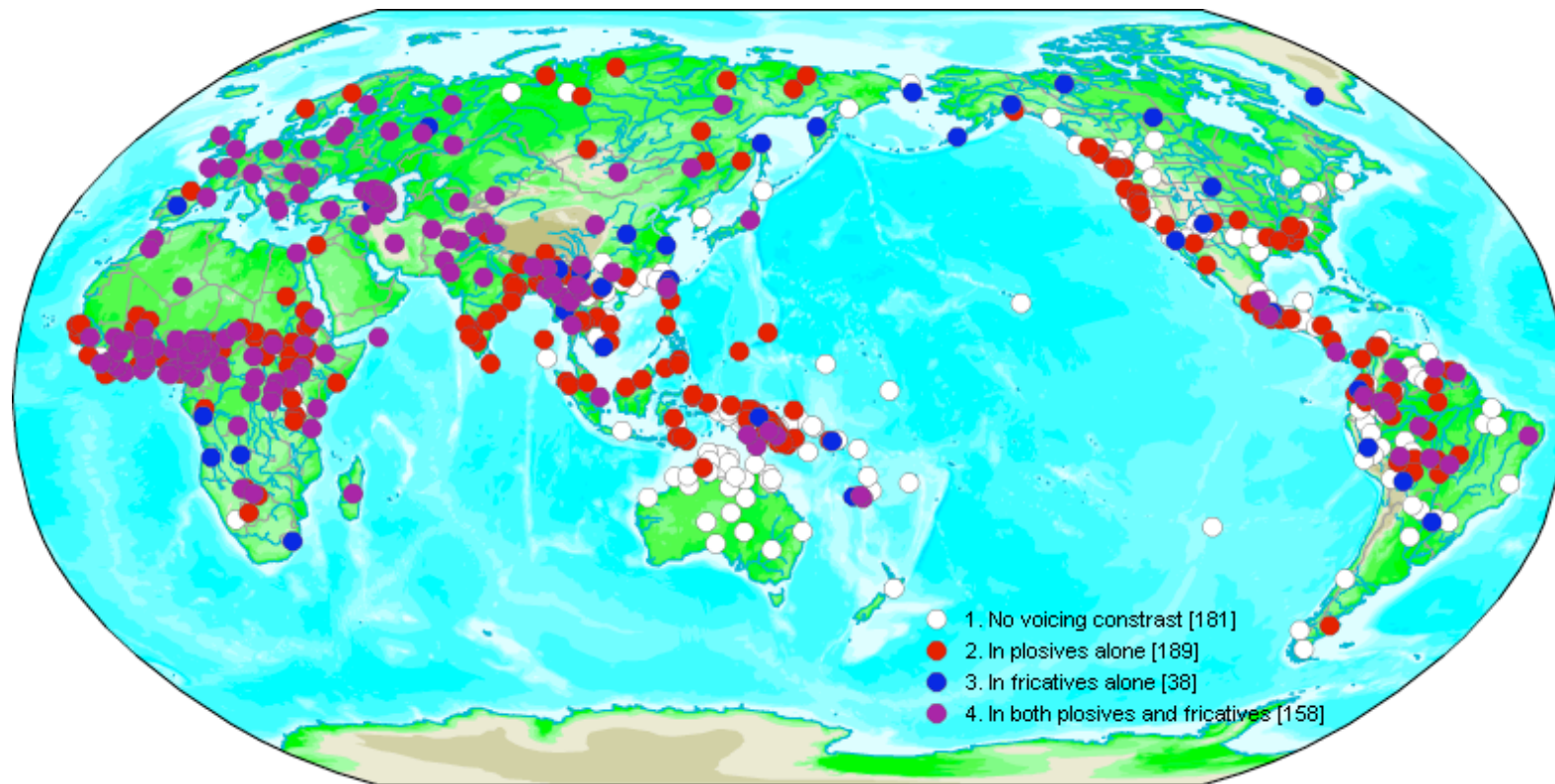- second edition 2008, third edition 2011: wals.info
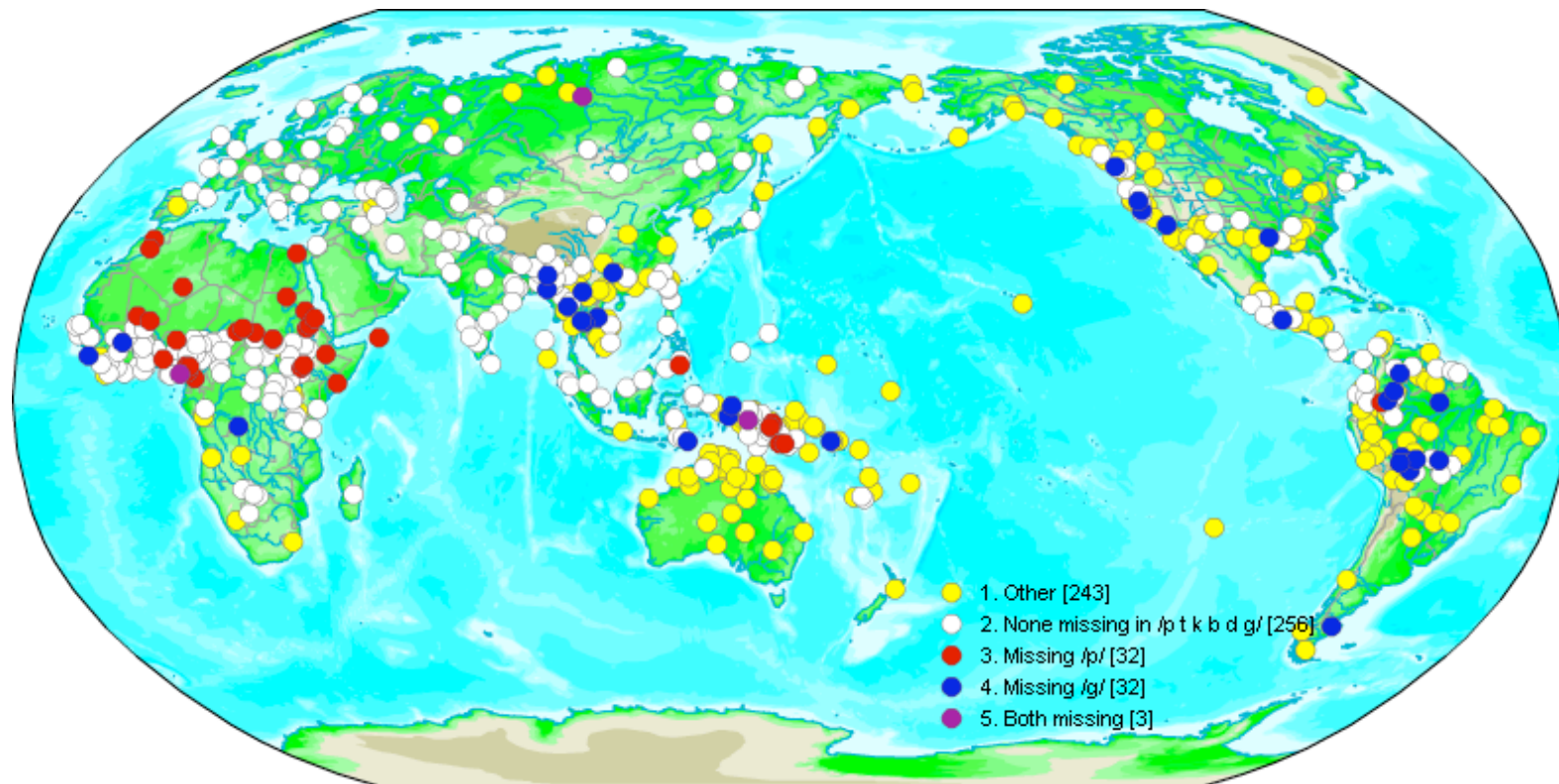
Consonant inventories

WALS map 1: Maddieson (2005)

Legend:
- 1. Small [91]
- 2. Moderately small [121]
- 3. Average [181]
- 4. Moderately large [116]
- 5. Large [53]

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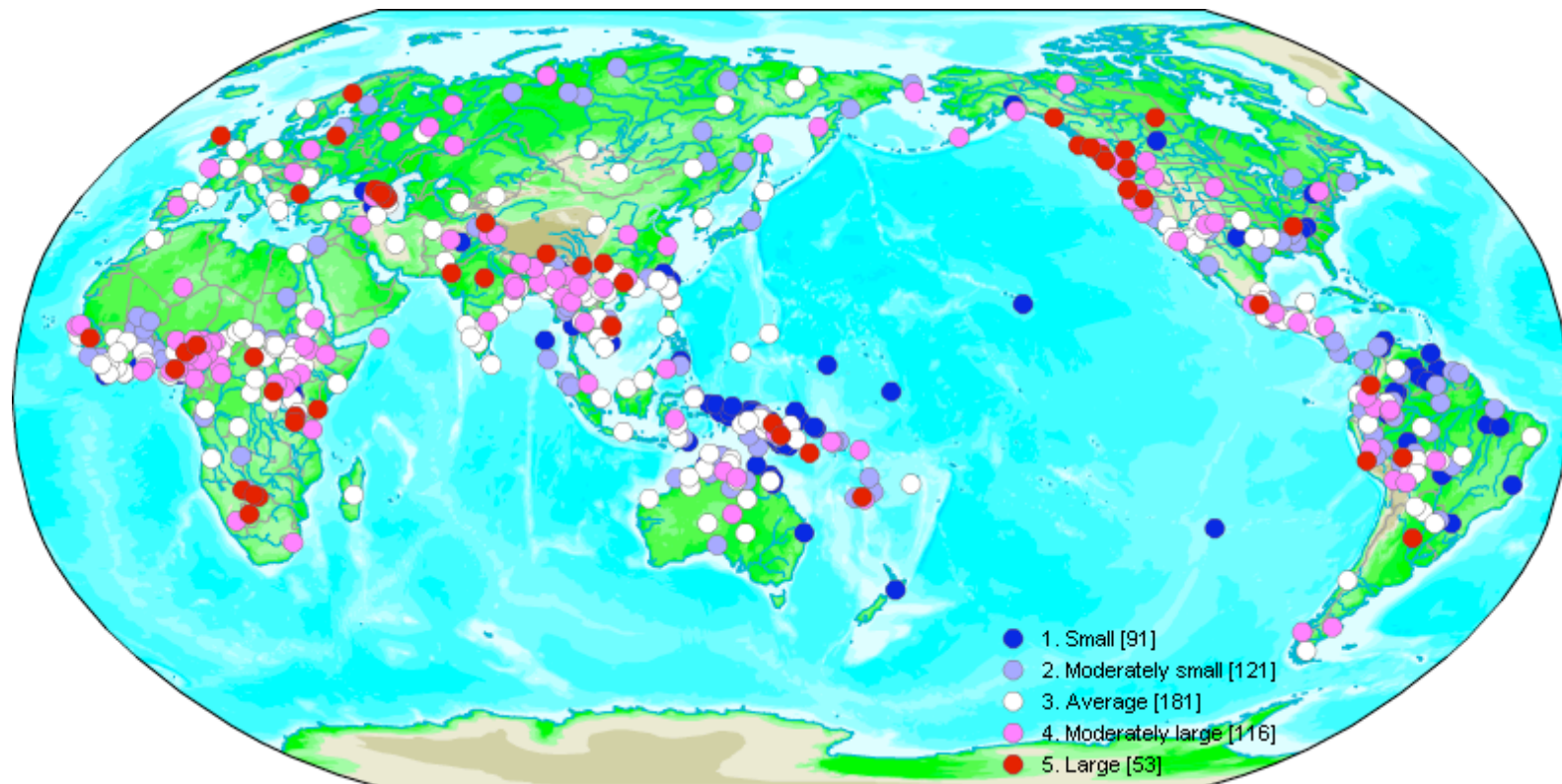
Voicing in plosives and fricatives

WALS map 4: Maddieson (2005)

1. No voicing constrast [181]
2. In plosives alone [189]
3. In fricatives alone [38]
4. In both plosives and fricatives [158]

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Gaps in plosive systems

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Presence of uncommon consonants

Legend:
- 1. None [448]
- 2. Clicks [9]
- 3. Labial-velars [45]
- 4. Pharyngeals [21]
- 5. 'Th' sounds [40]
- 6. Clicks, pharyngeals, and 'th' [1]
- 7. Pharyngeals and 'th' [2]
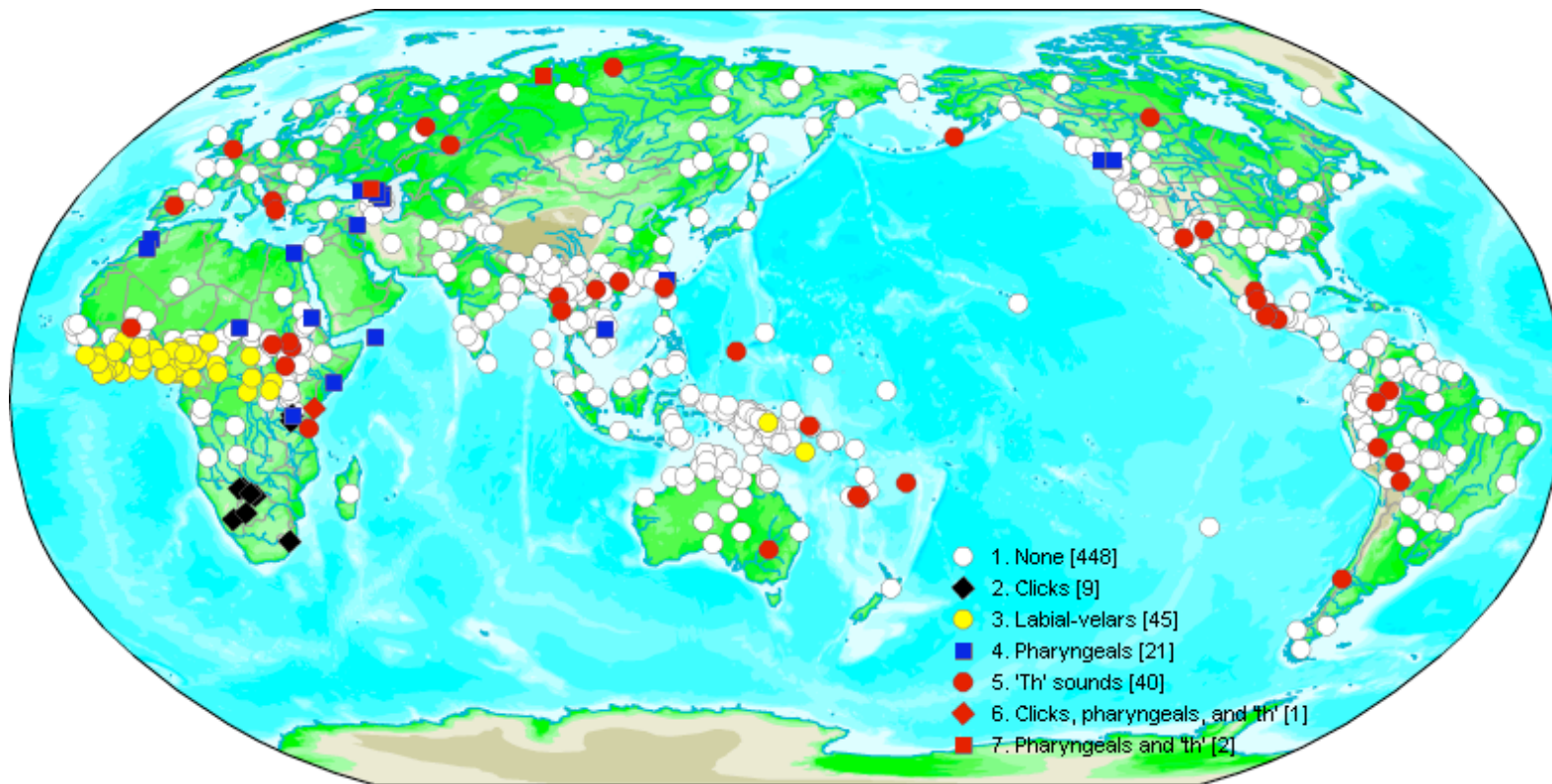
# Para-linguistic usages of clicks

WALS map 142: Gil (2005)
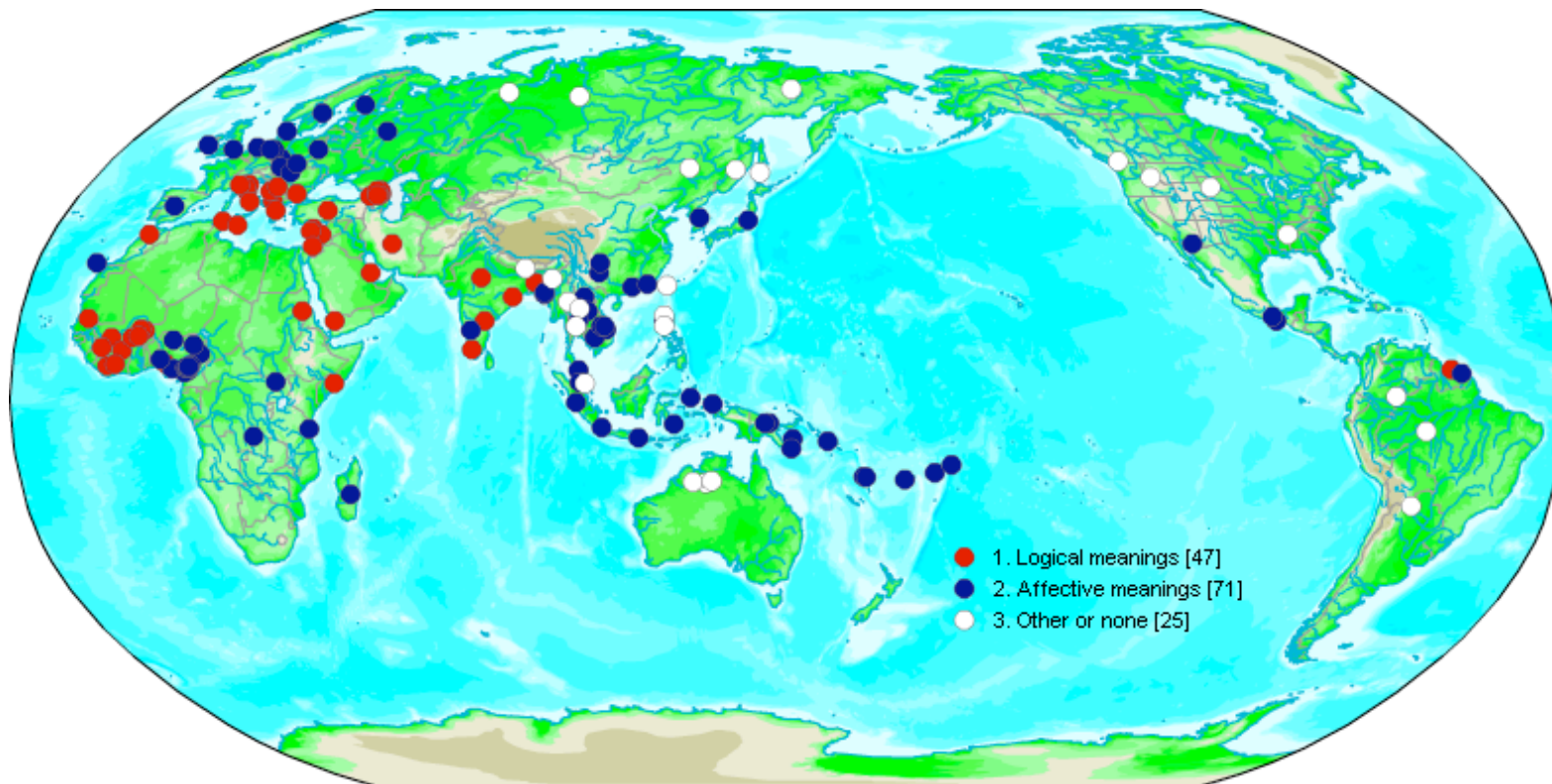
Vowel quality inventories

The complexity of vowel inventories

- 2 vowels: only central (e.g. /a ə/
- 3 vowels: often /a i u/, sometimes central vowels only
- 5 vowels: very common, often /i e a o u/
- >5 vowels: further vowel qualities, e.g.
    - nasalized vowels
    - front rounded vowels (/ø y/, common in northern Eurasia)
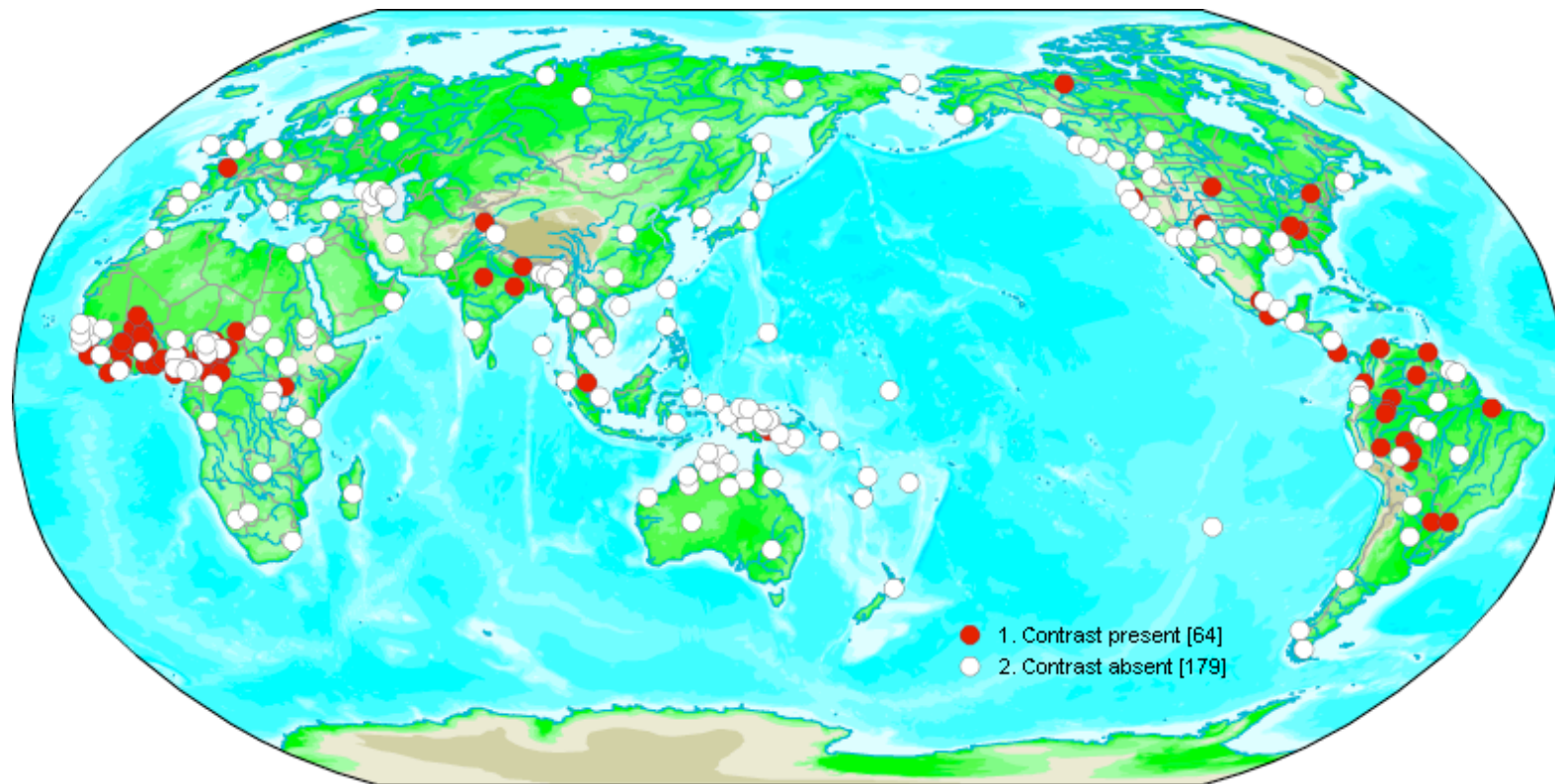   - +/-ATR (advanced tongue root)(common in Africa)

Vowel quality inventories

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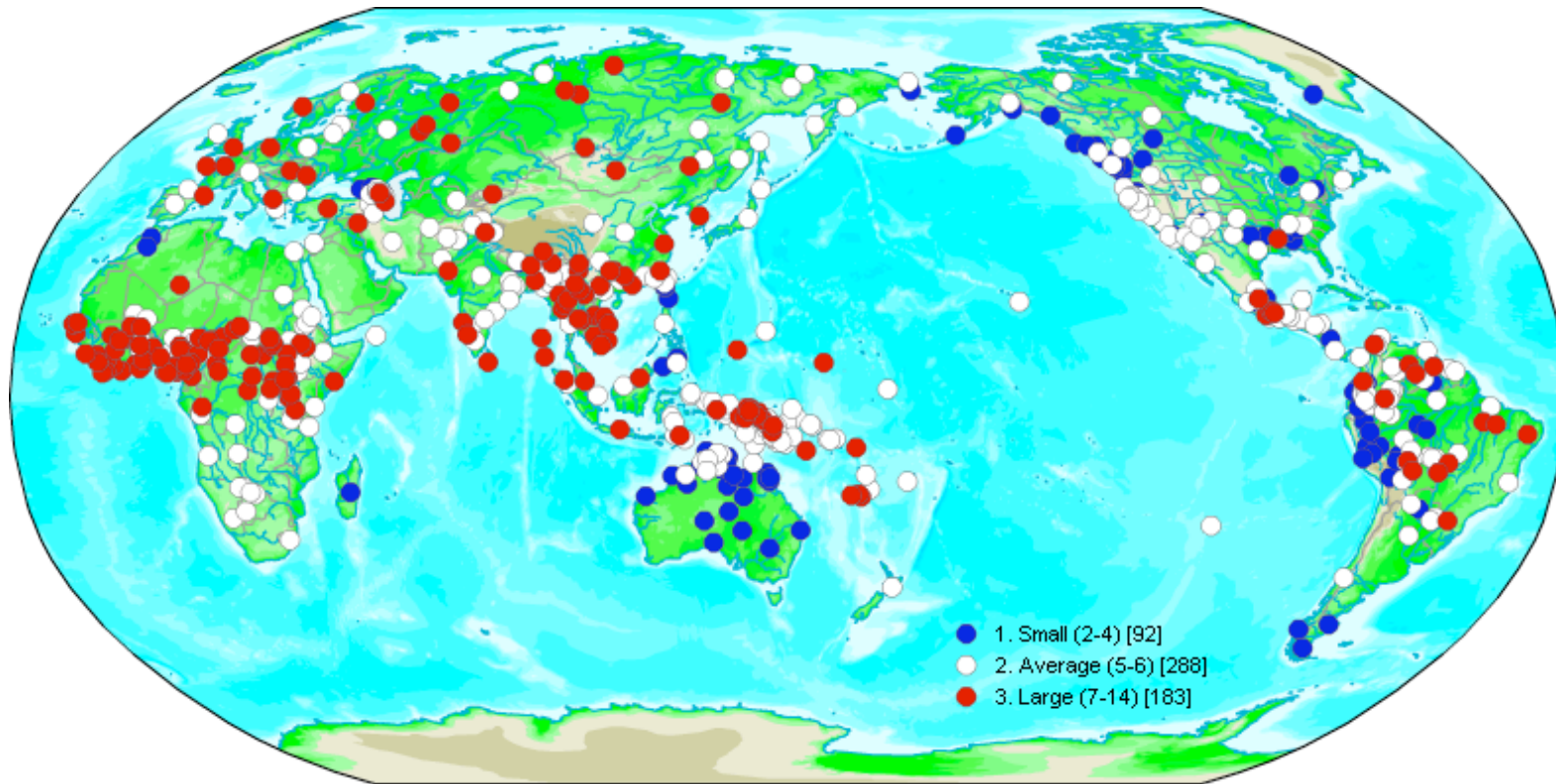
Vowel nasalization
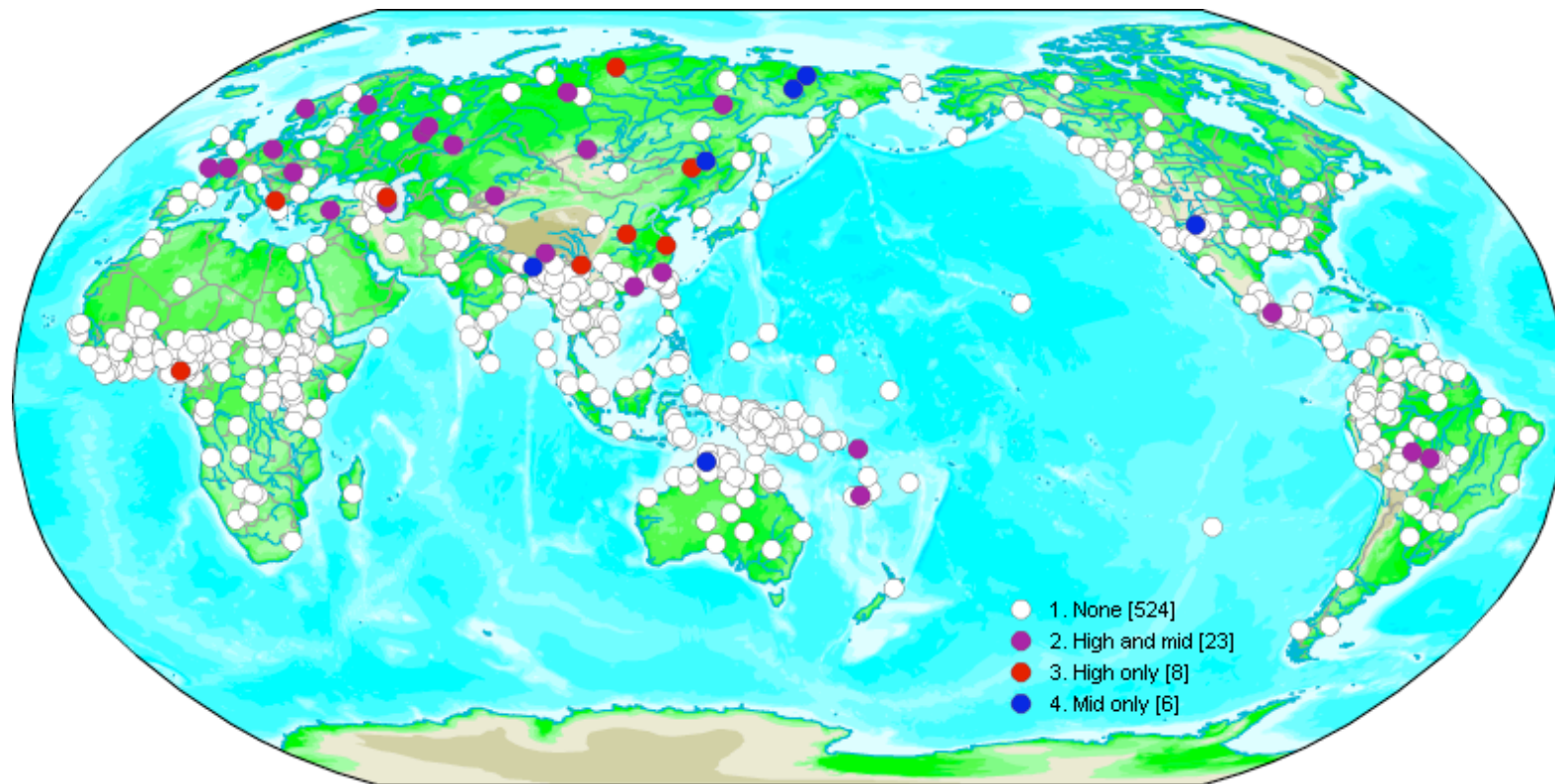
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Front rounded vowels

1. None [524]
2. High and mid [23]
3. High only [8]
4. Mid only [6]

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Combining the sounds: phonotactics

Phonotactics: "order of sounds"

- \>Ancient Greek *phoné* 'voice' + *táksis* 'order'

- phonotactic constraints: finding phonotactic regularities, e.g. English /#pl/ OK, but /#lp/ not OK

- systematic gap: sound sequence not permitted due to phonotactic constraints, e.g. English /zbktl/

- accidental gap: sound sequence permitted but not attested, e.g. English /golk/
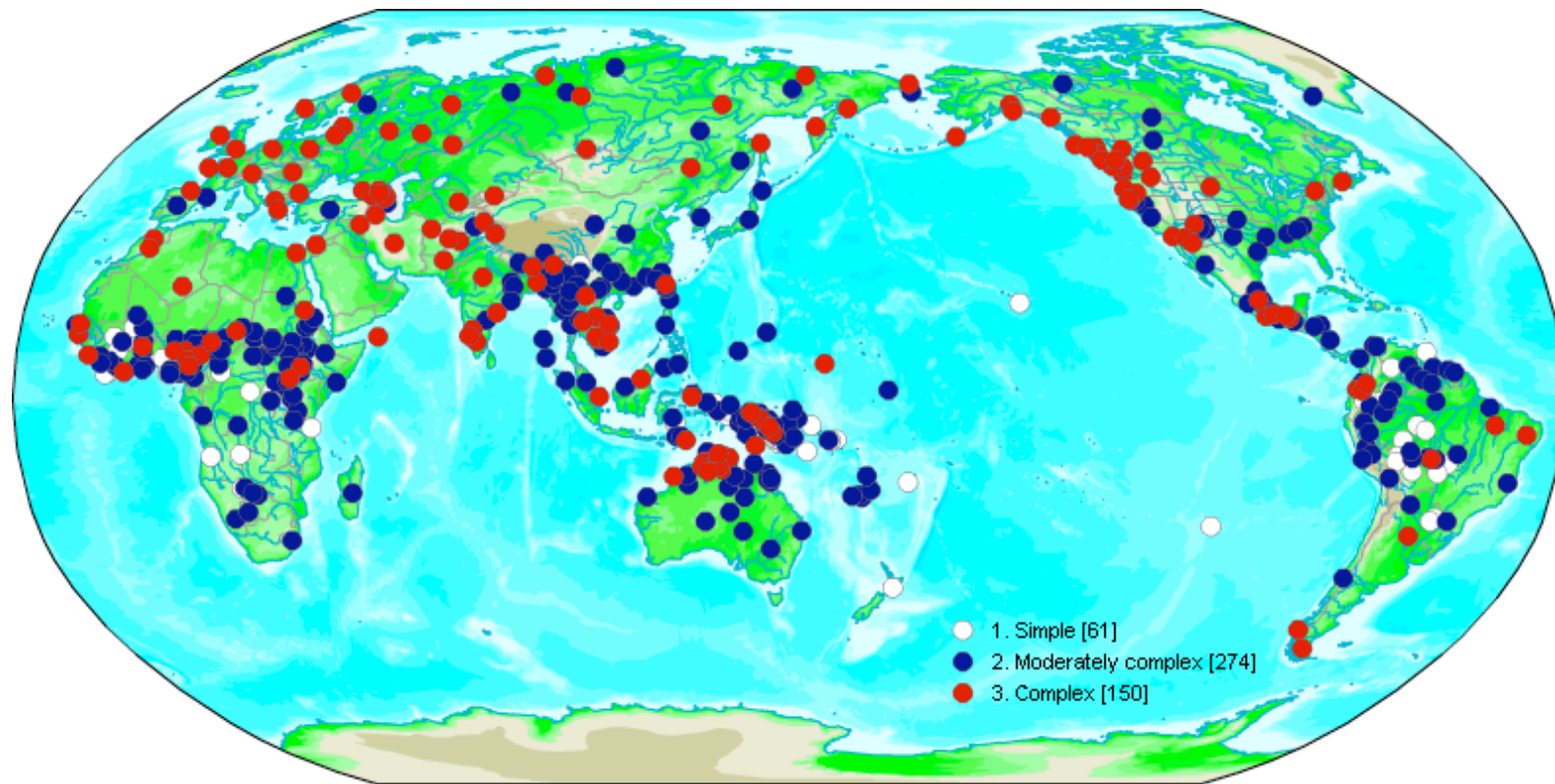
Syllables

- phonological unit, needs a language-specific definition

- present in virtually all languages

- relevant unit for many phonological rules

- consonant + vowel (CV): least marked syllable type, occurs in (virtually) all language (possible exception: Arrernte in Australia)

- syllable structure: onset + nucleus + coda

Syllables

- onset
    - C allowed in (virtually) all languages
    - no C allowed in some languages
    - record: 8C allowed in Georgian, e.g. /gvbrdɣvnis/ 'he is plucking us'
- nucleus
    - consists of only one segment, usually a vowel
    - other permitted sounds also tend to be high on the sonority hierarchy
    - sonority hierarchy: vowels > approximants > liquids > nasals > fricatives > plosives/affricates
- coda
    - no C: permitted in (virtually) all languages (=open syllables)
    - record: 5C in German, e.g. /hɛrpsts/ 'autumn (GEN)'

Syllable structure

1. Simple [61]
2. Moderately complex [274]
3. Complex [150]

Prosodic constituents

- syllable

- foot: relevant for stress patterns

- phonological word: not necessarily the same as a grammatical word or an orthographic word

- phonological phrase: contains one or more phonological words

- intonation phrase: delimited by speech pauses, not necessarily the same as a grammatical sentence

- phonological utterance

Foot, rhythm types

- distinctions
  - stress accent vs pitch accent
  - primary vs secondary accent
- foot: strong vs weak
- foot types
  - trochee: strong syllable + weak syllable
  - iamb: weak syllable + strong syllable
- stress assignment: from right to left vs. from left to right
- unit for the syllable weight: mora: (C)V: 1 mora; (C)V:, (C)VC: 2 moras
- weight-sensitive stress vs stress not sensitive to weight
- fixed vs. not fixed stress

Phonological word

Definition (Dixon & Aikhenvald 2002: 13)

"A phonological unit larger than the syllable (in some languages it may minimally be just one syllable) which has at least one (and generally more than one) phonological defining property chosen from the following areas:

- *Segmental features* – internal syllabic and segmental structure; phonetic realisations in terms of this; word boundary phenomena; pause phenomena.

- *Prosodic features* – stress (or accent and/or tone assignment; prosodic features such as nasalisation, retroflexion, vowel harmony.

- *Phonological rules* – some rules apply only within a phonological word; others (external sandhi rules) apply specifically across a phonological word boundary."

Thank you!