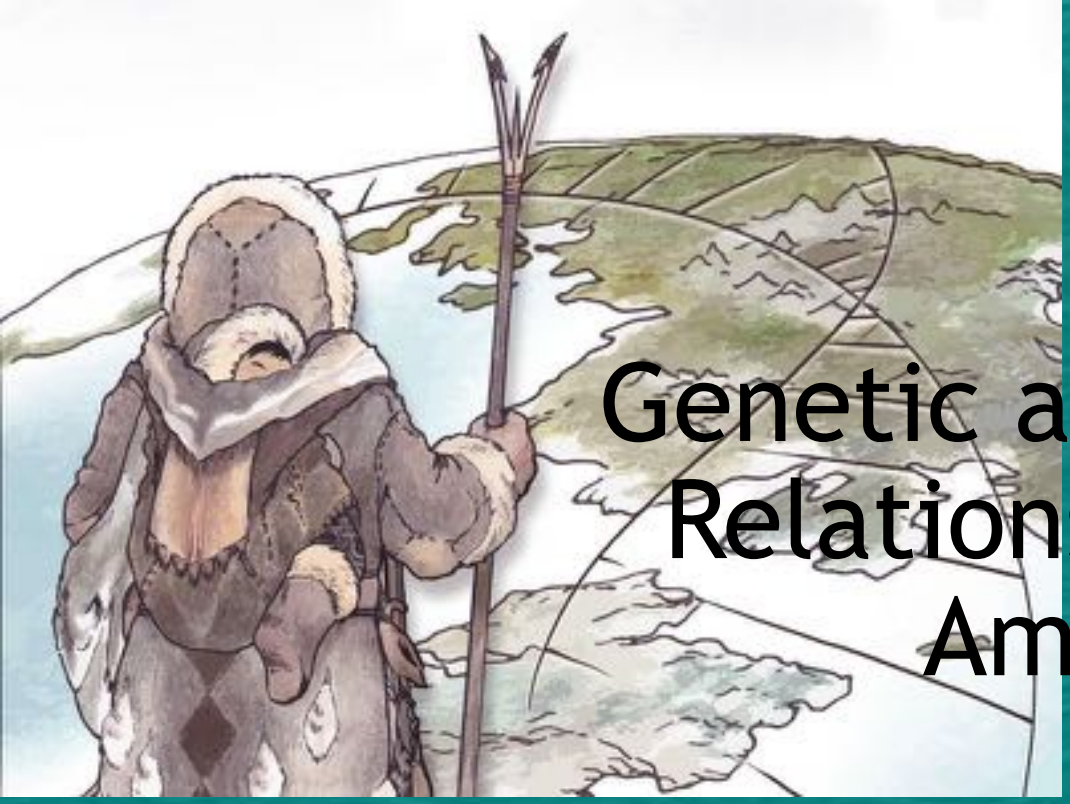


Genetic and Linguistic Relationships in the Americas

Rodrigo Barquera
Department of Archaeogenetics
MPI for the Science of Human History

Sandra Auderset
Dep. of Cultural and Linguistic Evolution
MPI for Evolutionary Anthropology &
Dep. of Linguistics
University of California Santa Barbara

MPI-SHH
SUMMER SCHOOL
2021

Doorway
to Human History

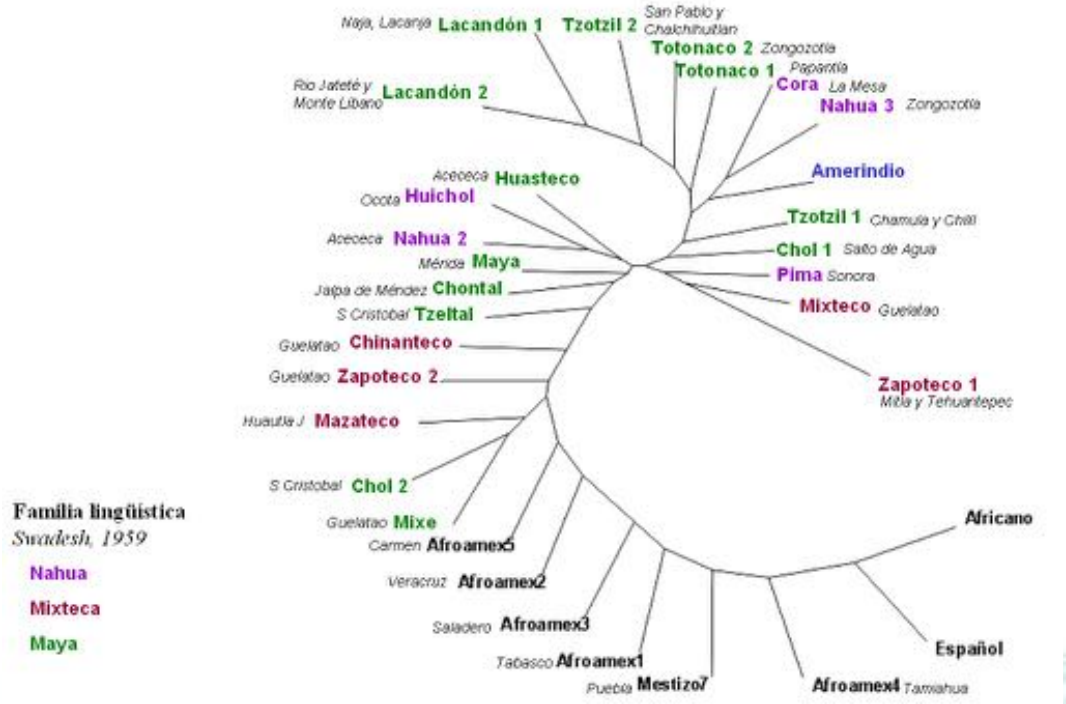
Roadmap

1. Genetic Relationship in the Americas (Rodrigo)
2. Linguistic Relationships in the Americas (Sandra)
   - Overview of language families in the Americas
   - Language endangerment
   - (Mis-)classifications and their implications for the settlement of the Americas
3. Case study: Exploring the human past in the Mixteca with archaeogenetics and historical linguistics (Rodrigo & Sandra)

Genetic Relationship in the Americas

How well does genetic and linguistic histories correlate?

Population	Community	State	A	B	O	CDE	CDe	cDE	C+de	M	Fya	Dia	Hp1	NatAm	Eur	Afr
Chontal	Jalpa de Méndez	Tabasco	0.0510	0.0160	0.9330	0.0490	0.4760	0.3660	0.1090	0.6930	0.6700	0.1010	0.5690	78.3	16.7	5
Chol 1	Salto de Agua	Chiapas	0.0540	0.0040	0.9420	0.0220	0.4720	0.4220	0.0840	0.7010	0.7160	0.0670	0.5480	81.51	18.49	
Chol 2	San Cristobal	Chiapas	0.0690	0.0000	0.9310	0.0750	0.3920	0.2910	0.2420	0.8670	0.4840	0.1440	0.6900	76.37	23.63	
Tzotzil 1	Chamula, Chilil	Chiapas	0.0000	0.0110	0.9890	0.0560	0.5100	0.3780	0.0560	0.7470	0.7040	0.0790	0.6000	100	0	
Tzotzil 2	San Pablo, Chalchihuitlan	Chiapas	0.0060	0.0000	0.9940	0.0140	0.4290	0.5050	0.0520	0.5690	0.7760	0.0990	0.6750	97.95	2.05	
Huasteco	Acececa	Veracruz	0.0000	0.0590	0.9410	0.0380	0.5100	0.3940	0.0580	0.7530	0.6740	0.0360	0.5190	100	0	
Maya	Merida	Yucatán	0.0690	0.0220	0.9090	0.0000	0.5150	0.3810	0.1040	0.6940	0.6540	0.1360	0.5200	76.37	23.63	
Tzeltal	San Cristobal Aguatenango	Chiapas	0.0040	0.0000	0.9960	0.0000	0.5140	0.4230	0.0580	0.7970	0.6080	0.0510	0.6000	98.63	1.37	
Lacandón 1	Naja, Lacanja	Chiapas	0.0000	0.0000	1.0000	0.0310	0.5020	0.4350	0.0320	0.5630	0.7760	0.0870	0.9220	100	0	
Lacandón 2	Rio Jateté y Monte Libano	Chiapas	0.0150	0.0000	0.9850	0.0000	0.3480	0.6520	0.0000	0.8180	0.8260	0.1840	0.9300	94.86	5.14	



The genetic complexity of Native Americans: an introduction

nature COMMUNICATIONS

ARTICLE

DOI: 10.1038/s41467-017-01194-z OPEN

Demographic history and biologically relevant genetic variation of Native Mexicans inferred from whole-genome sequencing

Sandra Romero-Hidalgo[1], Adrián Ochoa-Leyva[1,2], Alejandro Garcíarrubio[2], Victor Acuña-Alonzo[3], Erika Antúnez-Argüelles[1], Martha Balcazar-Quintero[4], Rodrigo Barquera-Lozano[3], Alessandra Carnevale[1], Fernanda Cornejo-Granados[2], Juan Carlos Fernández-López[1], Rodrigo García-Herrera[1]

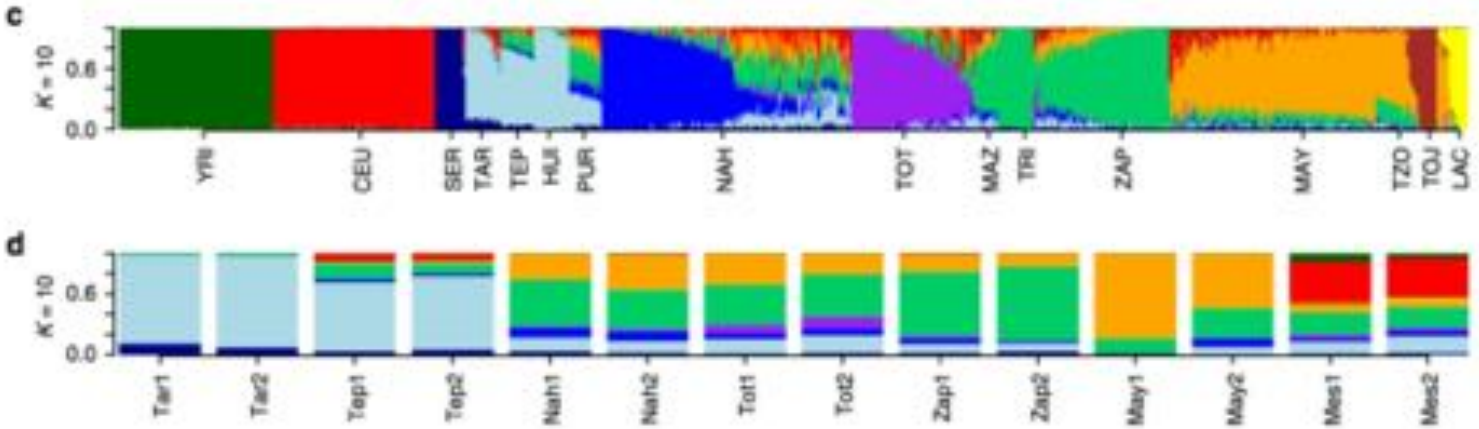


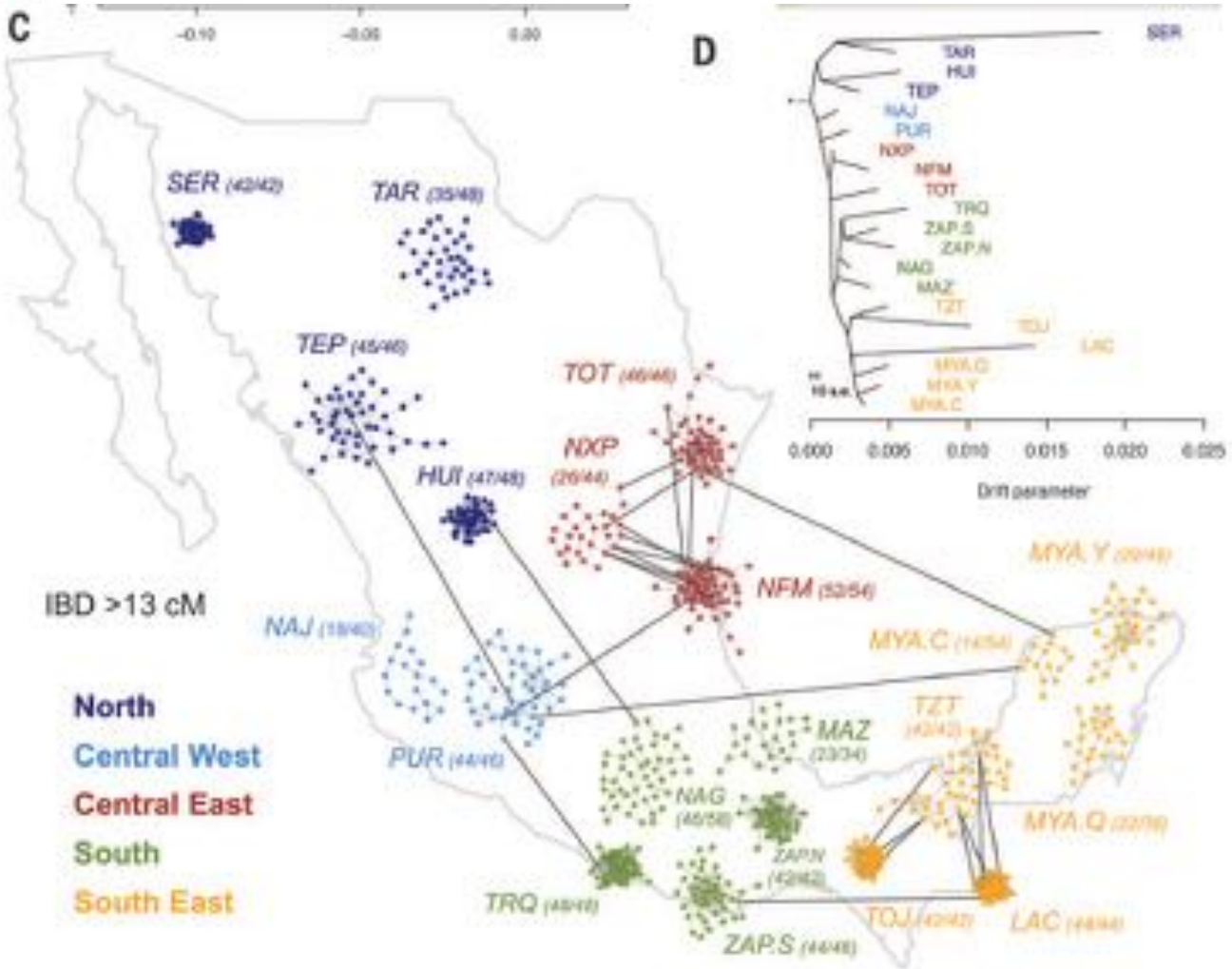
Fig. 2 Multidimensional scaling plots and admixture analysis. **a** MDS plot for components 1 and 2 of 12 Native Americans of Mexico combined with continental (CEU and YRI from HapMap) and NA reference populations. **b** MDS plot for components 1 and 3, separating the NA populations of Mexico. The 12 sequenced NA samples are shown in gray, and population labels are as described in Supplementary Table 8. **c** Global ancestry proportions of NA and continental reference populations assuming $K = 10$. **d** Global ancestry proportions of the 12 NA individuals assuming $K = 10$. The NA individuals are displayed North-to-South, and the Mestizo individuals are displayed at the far right. Tar1 and Tar2 (Tarahumara), Tep1 and Tep2 (Tepehuano), Nah1 and Nah2 (Nahua), Tot1 and Tot2 (Totonaca), Zap1 and Zap2 (Zapoteca), May1 and May2 (Maya), Mes1 and Mes2 (Mestizo)

Science
AAAS

The genetics of Mexico recapitulates Native American substructure and affects biomedical traits

Andrés Moreno-Estrada *et al.*

Science **344**, 1280 (2014);
DOI: 10.1126/science.1251688



Science
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The genetics of Mexico recapitulates Native American substructure and affects biomedical traits

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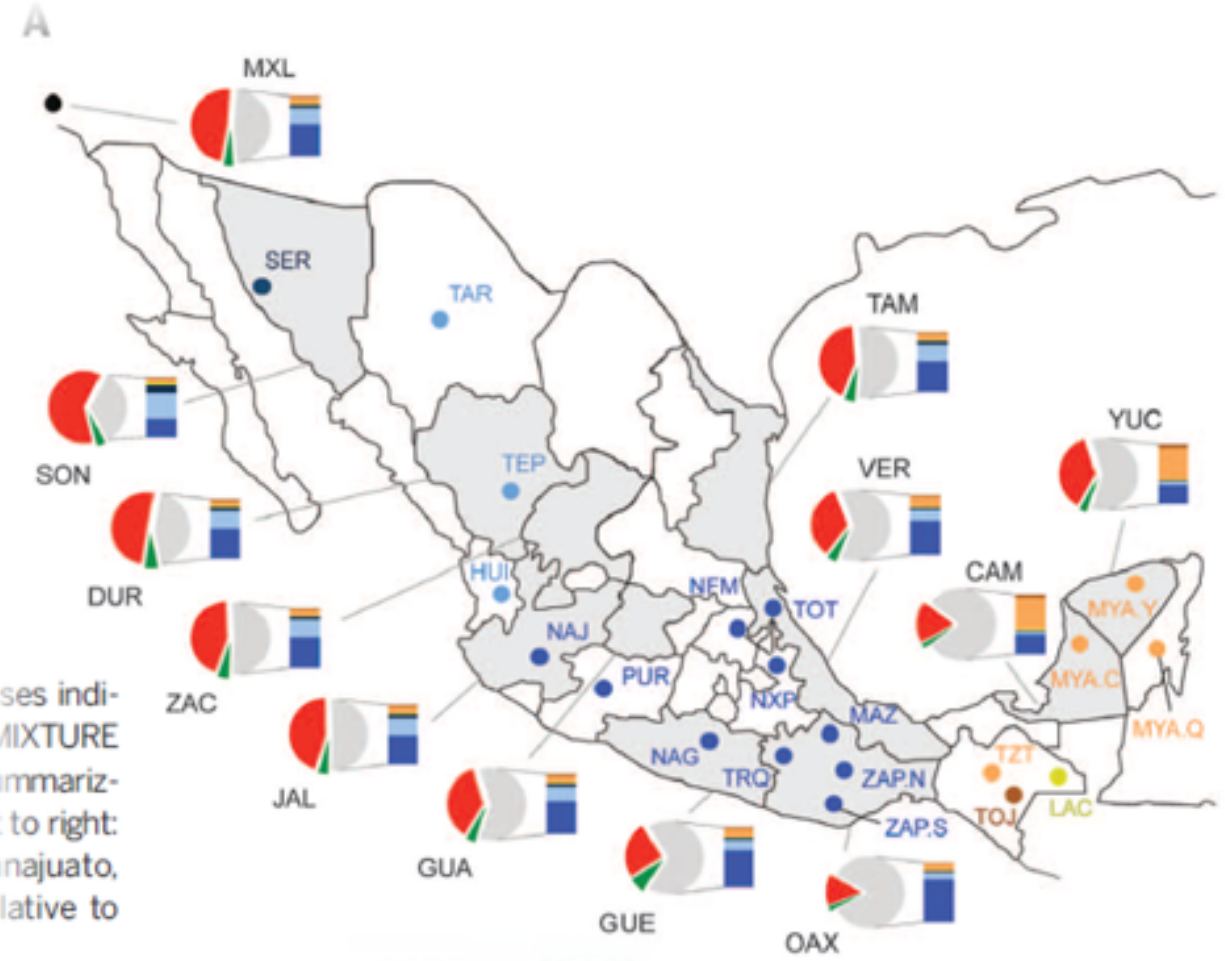

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Science
AAAS

The genetics of Mexico recapitulates Native American substructure and affects biomedical traits

Andrés Moreno-Estrada *et al.*

Science **344**, 1280 (2014);
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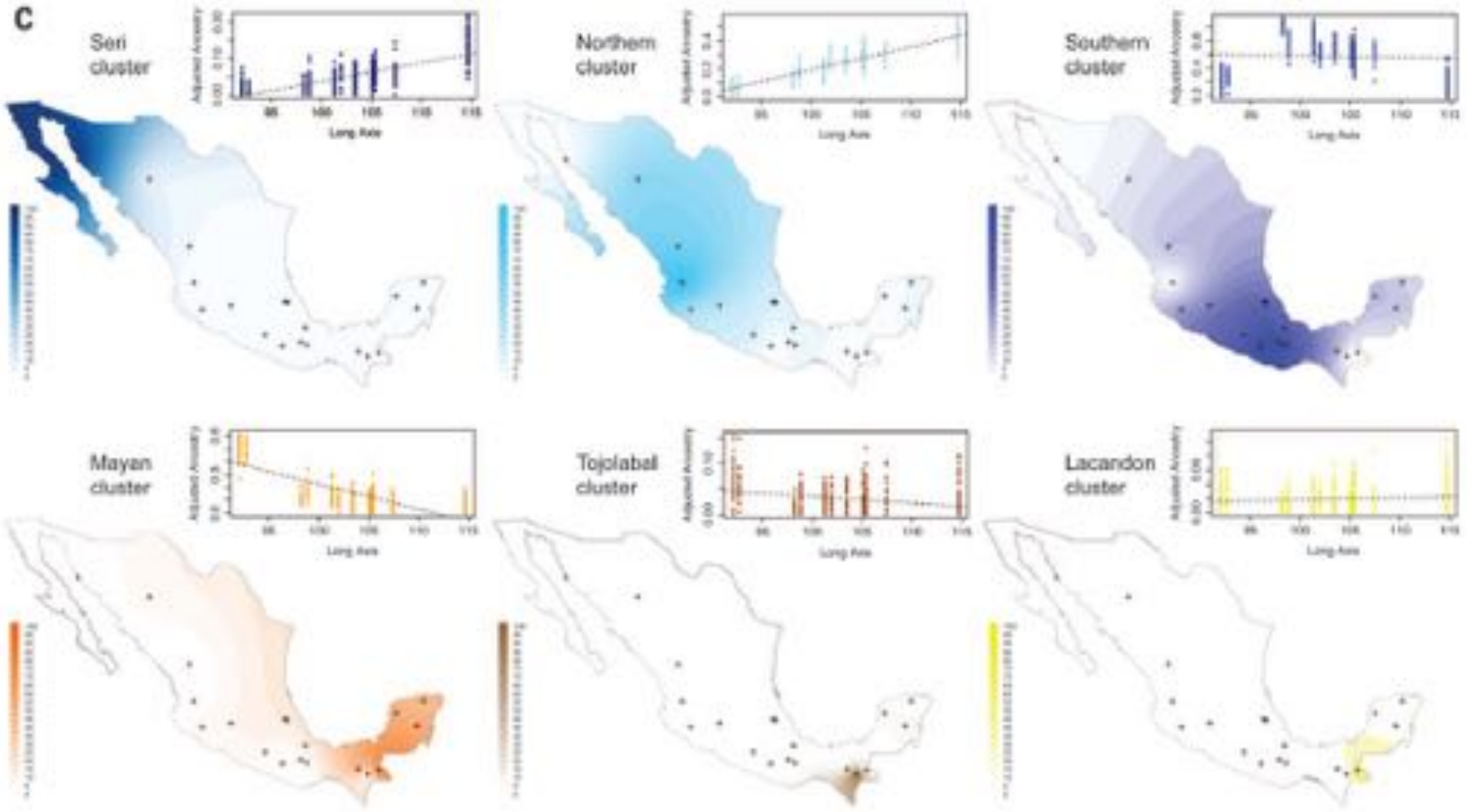


Human Immunology 80 (2019) 714–722

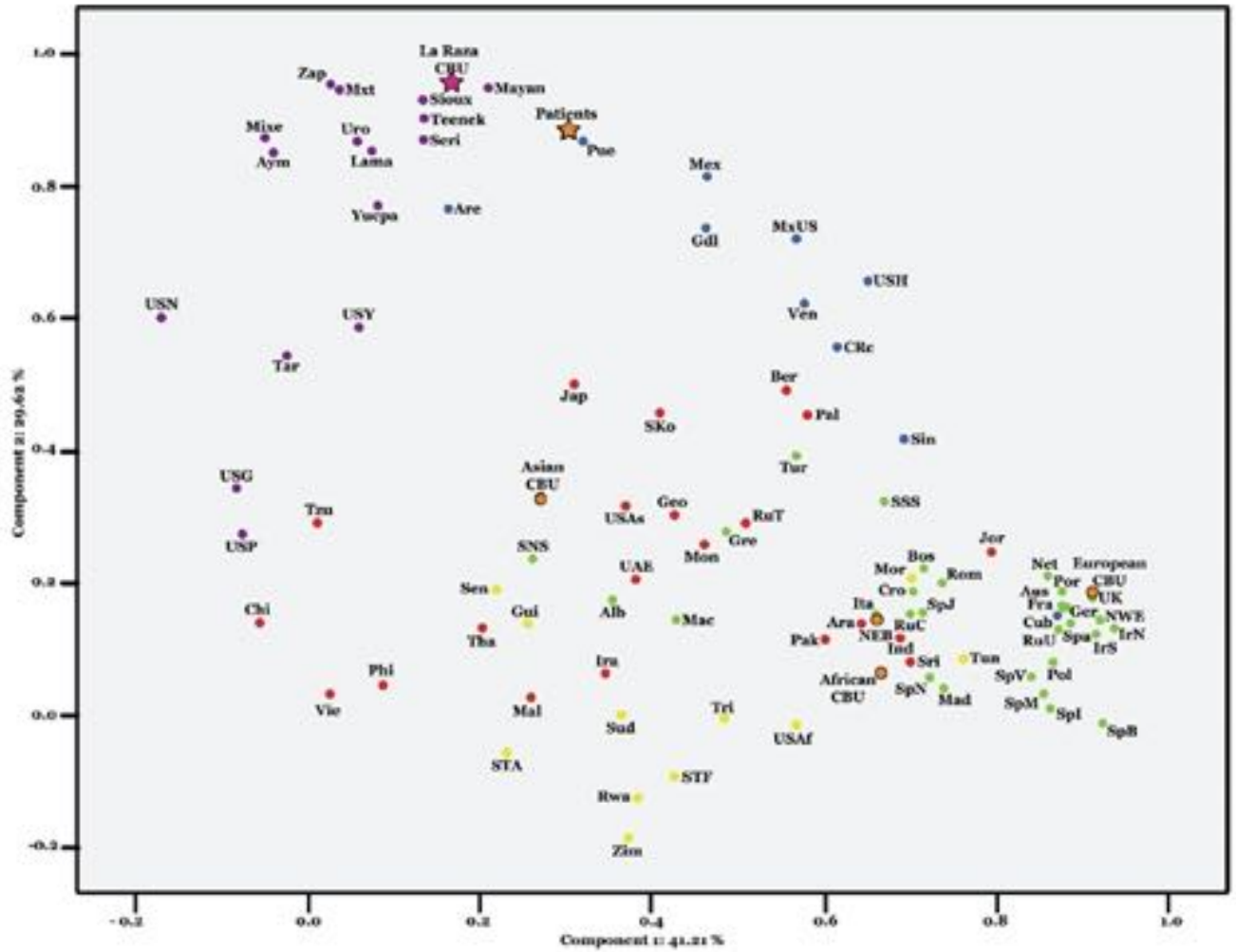
Contents lists available at ScienceDirect

Human Immunology

journal homepage: www.elsevier.com/locate/humimm

HLA concordance between hematopoietic stem cell transplantation patients and umbilical cord blood units: Implications for cord blood banking in admixed populations

Alicia Bravo-Acevedo[a,1], Rodrigo Barquera[b,c,1], Carolina Bekker-Méndez[d,*], Stephen Clayton[e], Diana Iraíz Hernández-Zaragoza[c,e], Gamaliel Benítez-Arvizu[f], Ángel Guerra-Márquez[g], Eva Dolores Juárez-Cortés[h], Agustín Jericó Arriaga-Perea[h], Bárbara Novelo-Garza[i]



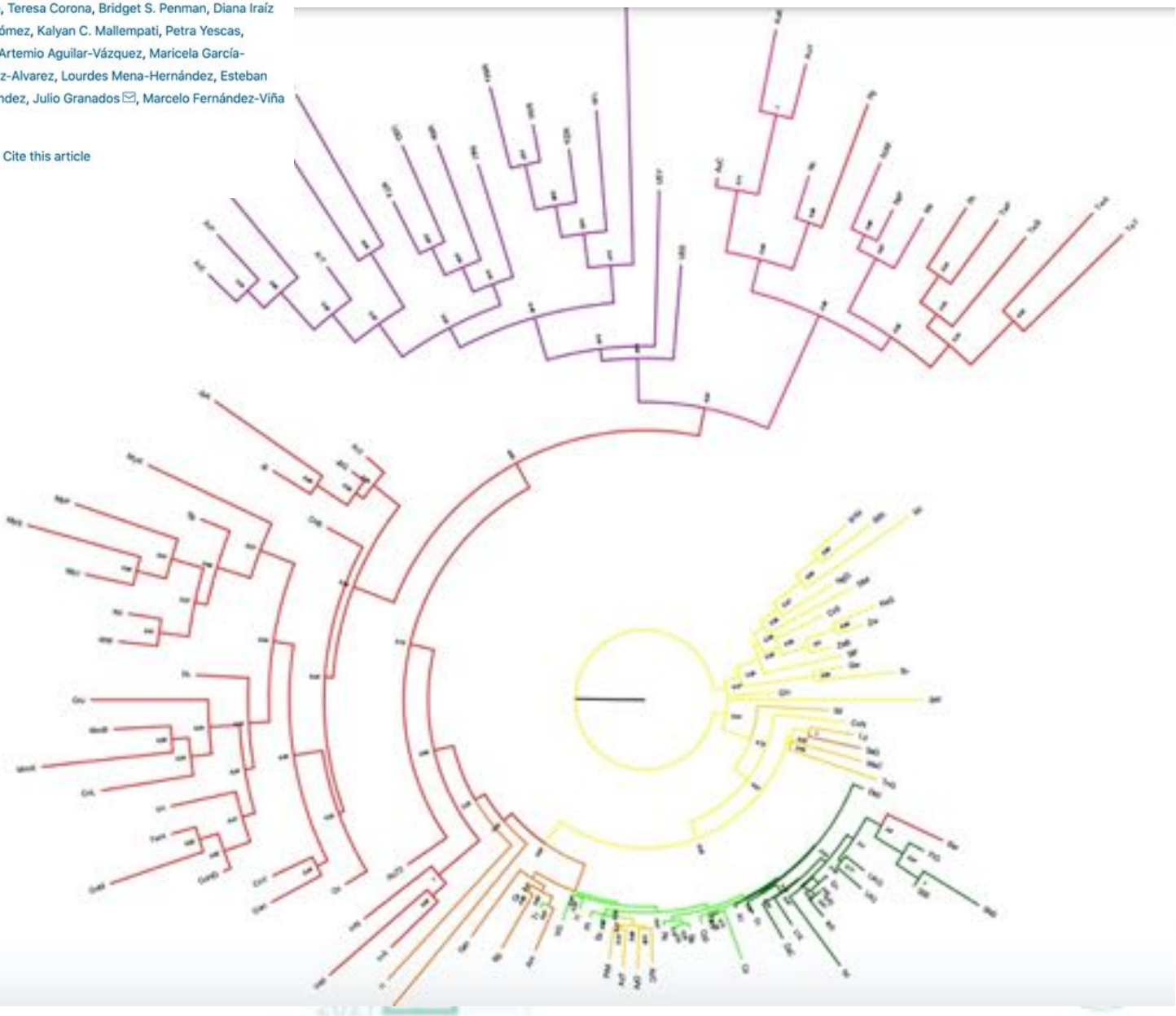
Article | Open Access | Published: 24 February 2020

Diversity of HLA Class I and Class II blocks and conserved extended haplotypes in Lacandon Mayans

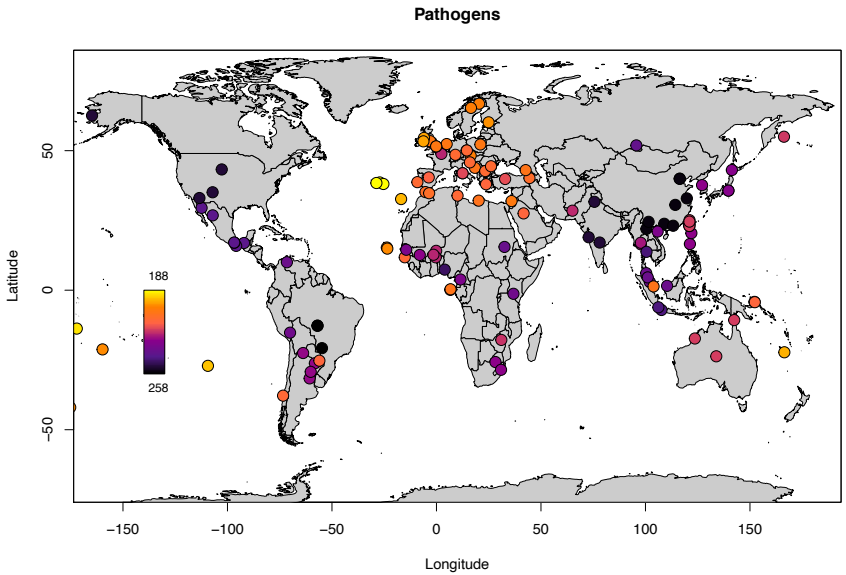
Rodrigo Barquera, Joaquin Zuniga, José Flores-Rivera, Teresa Corona, Bridget S. Penman, Diana Iraíz Hernández-Zaragoza, Manuel Soler, Letisia Jonapá-Gómez, Kalyan C. Mallempati, Petra Yescas, Adriana Ochoa-Morales, Konstantinos Barsakis, José Artemio Aguilar-Vázquez, Maricela García-Lechuga, Michael Mindrinos, María Yunis, Luis Jiménez-Alvarez, Lourdes Mena-Hernández, Esteban Ortega, Alfredo Cruz-Lagunas, Víctor Hugo Tovar-Méndez, Julio Granados ✉, Marcelo Fernández-Viña ✉ & Edmond Yunis ✉

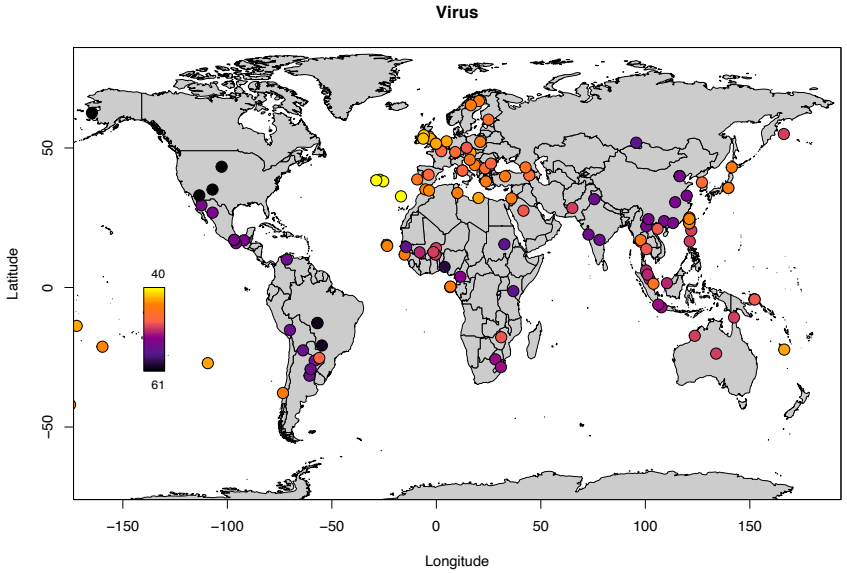
Scientific Reports **10**, Article number: 3248 (2020) | Cite this article

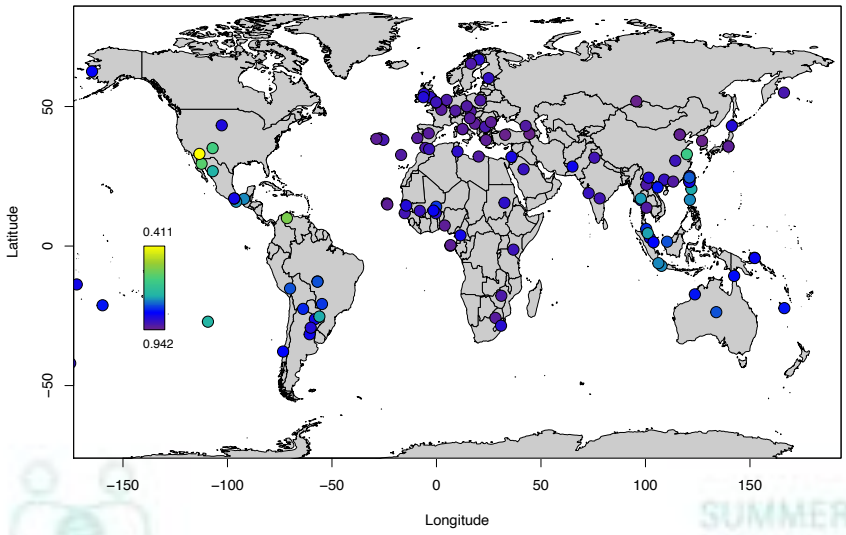
European populations are represented by green branches; African human groups correspond to yellow branches; red branches were assigned to Asian populations; Native American populations are represented by purple branches; populations from Oceania are indicated with pink branches. The complete list of abbreviations is included in Supplementary Table 1.

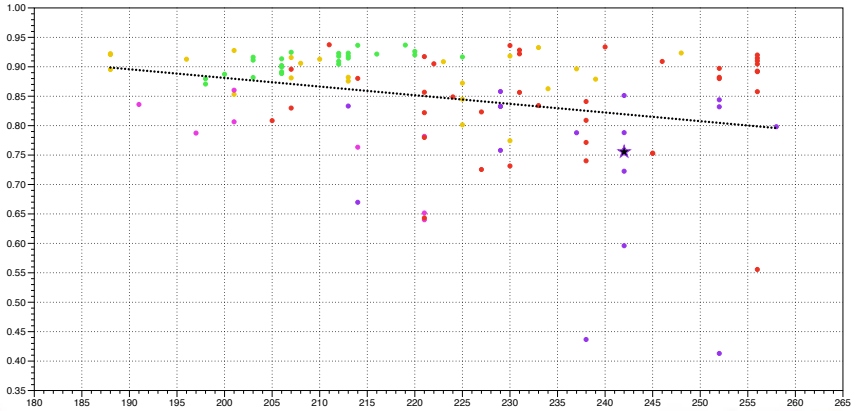


Selection in Native Americans







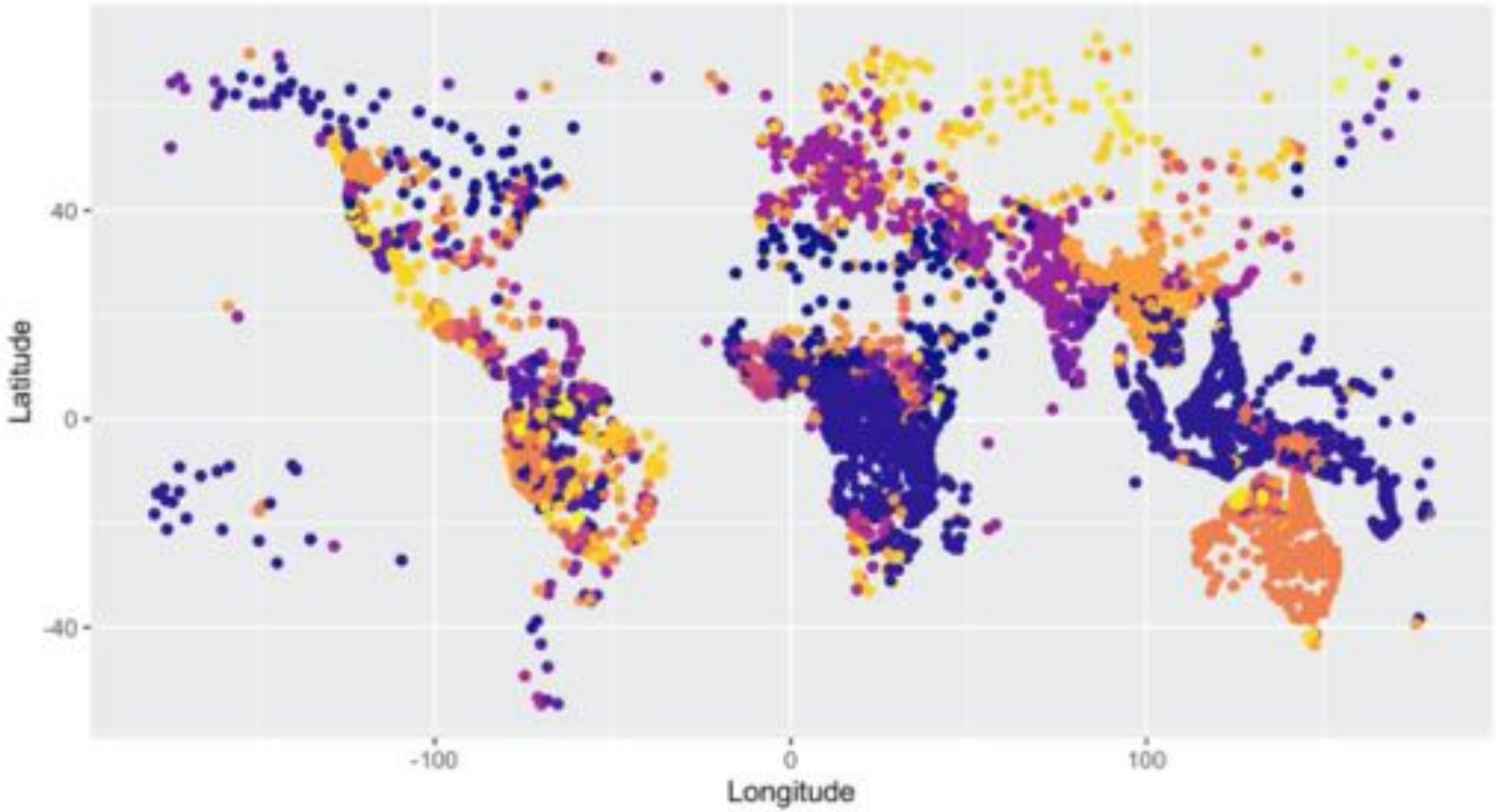


Barquera R et al., Sci Rep, 2020

Languages and Linguistic Relationships in the Americas

Language diversity, history, and the impact of colonization

Languages of the world colored by family membership (Glottolog)



Language families of North America

- ~ 700 languages (extinct and alive)
- ~ 48 language families + isolates + sign languages
- 5 biggest language families:
  1. Otomanguean (182)
  2. Uto-Aztecan (70)
  3. Algic (48)
  4. Athabaskan (47)
  5. Mayan (33)

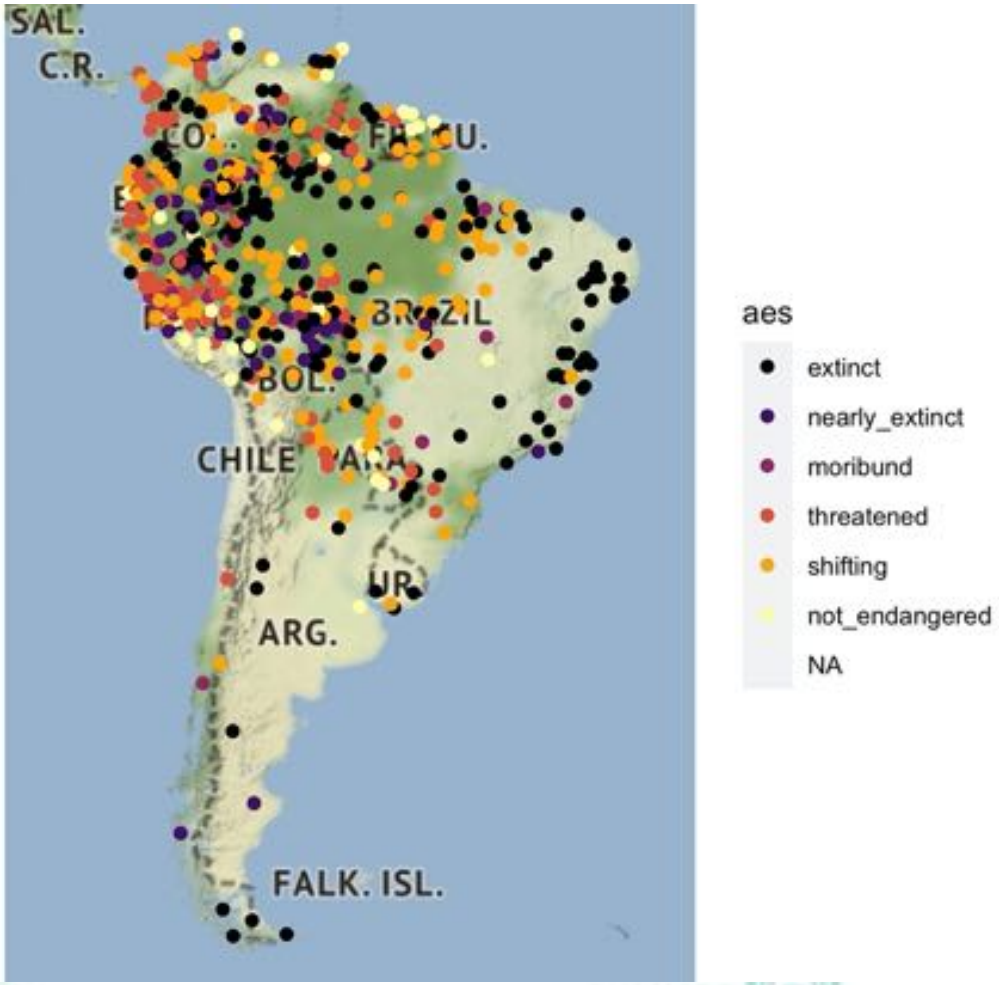
Language endangerment in North America

Endangerment Level	No. (%) of languages
extinct	178 (25)
moribund	43 (6)
nearly extinct	72 (10)
shifting	145 (20)
threatened	176 (25)
not endangered	69 (9)
NA	33 (5)

Language Families of South America

- ~ 600 languages (extinct and alive)
- ~ 50 language families + isolates + sign languages
- figure most likely below the actual numbers
- 5 biggest language families:
  1. Arawakan (74)
  2. Tupian (71)
  3. Quechuan (44)
  4. Cariban (42)
  5. Panoan (38)

Language Endangerment in South America



Endangerment Level	No. (%) of languages
extinct	233 (37)
moribund	29 (5)
nearly extinct	47 (8)
shifting	170 (27)
threatened	92 (15)
not endangered	33 (5)
NA	19 (3)

Languages of Mesoamerica around 1520

Languages of Mesoamerica today

Greenberg's (mis)classification

- proposed in 1987 book 'Language in the Americas'
- all languages in the Americas belong to just 3 families:
  - Amerind (first to enter continent; yellow)
  - Na-Dene (second to enter continent: orange)
  - Eskimo-Aleut (last to enter continent: purple)
- not accepted by linguists, but is still used in other fields (e.g. genetics)

The debate continues…

Linguistic Diversity and the First Settlement of the New World

Johanna Nichols

Language
Vol. 66, No. 3 (Sep., 1990), pp. 475-521 (47 pages)

PLOS ONE

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

Nonlinear diversification rates of linguistic phylogenies over the Holocene

Marcus J. Hamilton, Robert S. Walker

Published: July 17, 2019 • https://doi.org/10.1371/journal.pone.

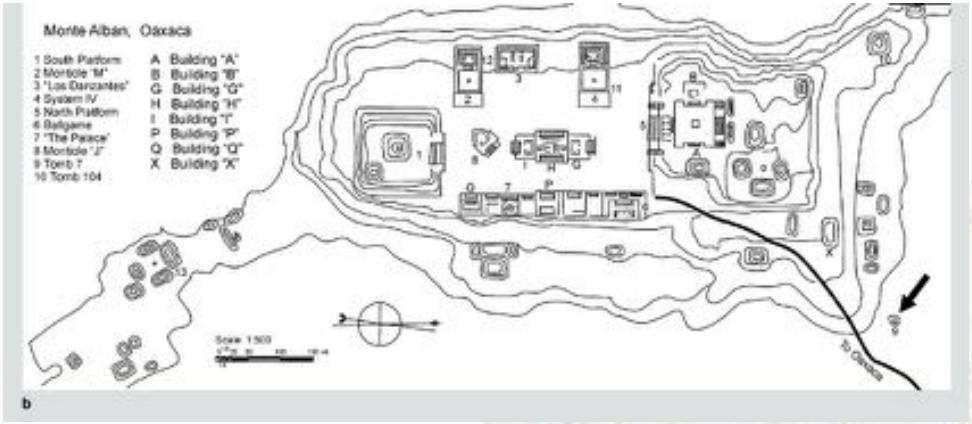
Proc Natl Acad Sci U S A. 1999 Mar 16; 96(6): 3325–3329. PMCID: PMC15941
doi: 10.1073/pnas.96.6.3325 PMID: 10077683
Anthropology

Linguistic diversity of the Americas can be reconciled with a recent colonization

Daniel Nettle*

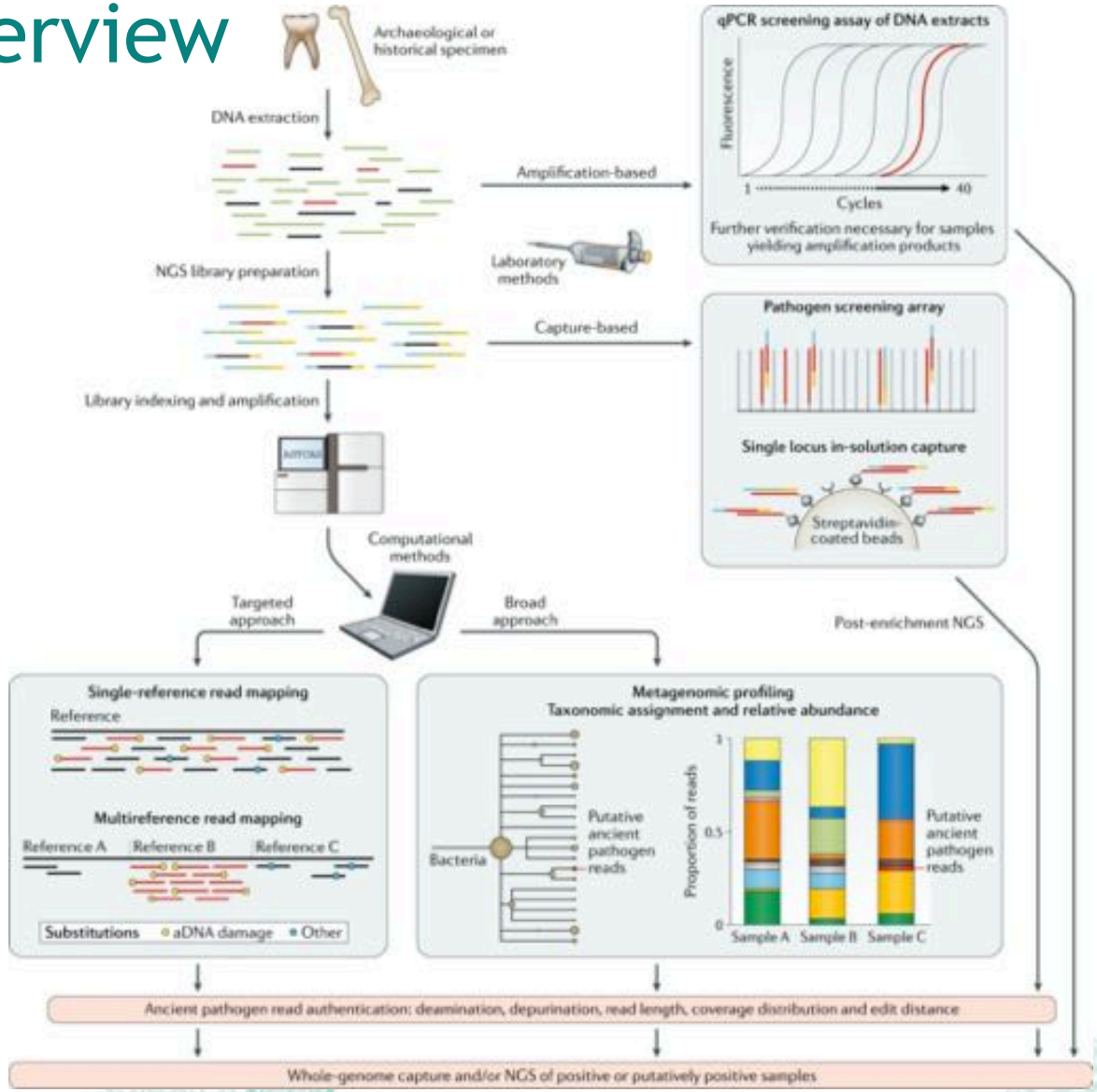
A case study in Archaeogenetics (beyond the peopling of the Americas) of Native Americans: Monte Albán

Monte Albán (Oaxaca, Mexico)



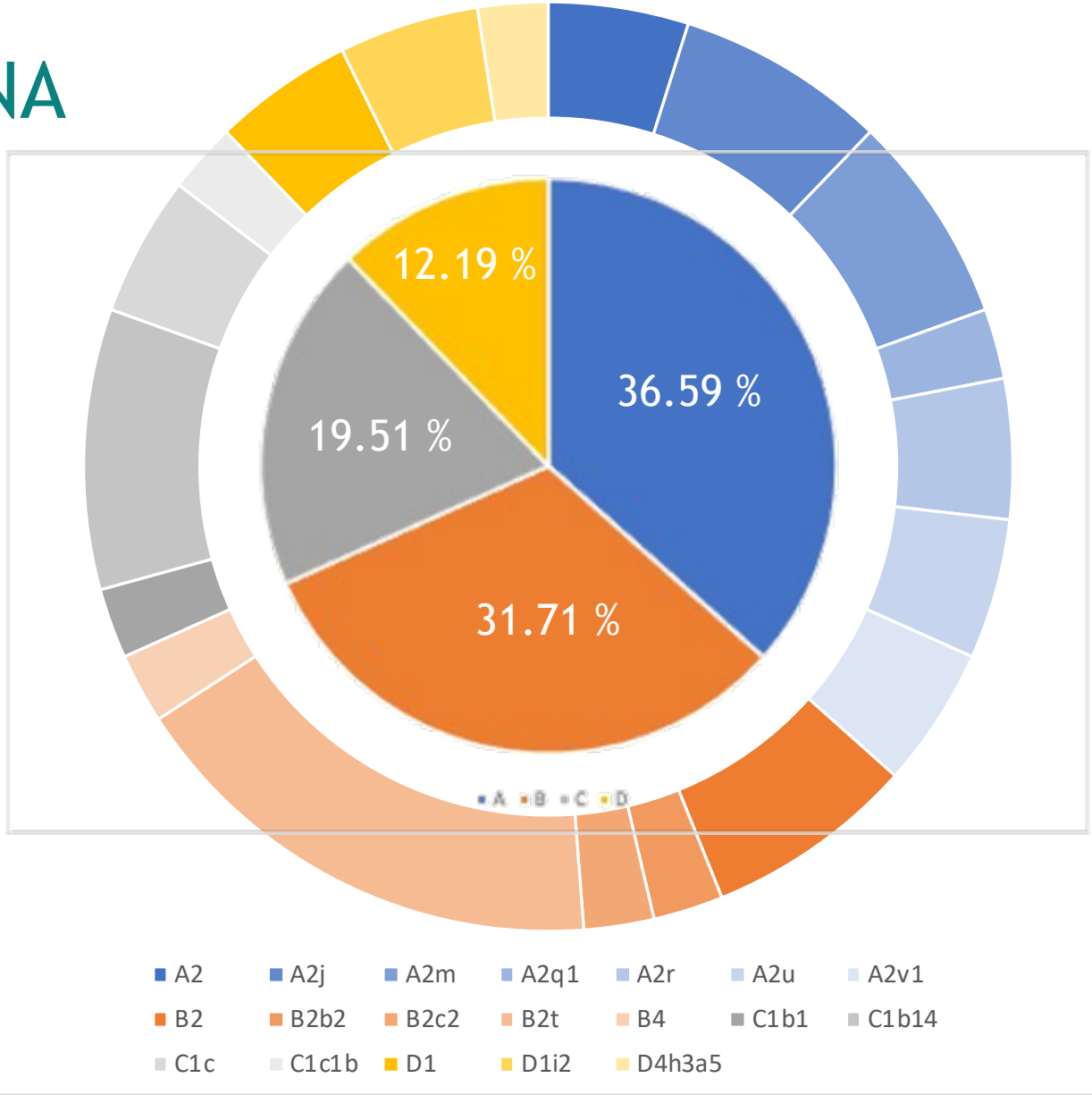
aDNA: an overview

General workflow

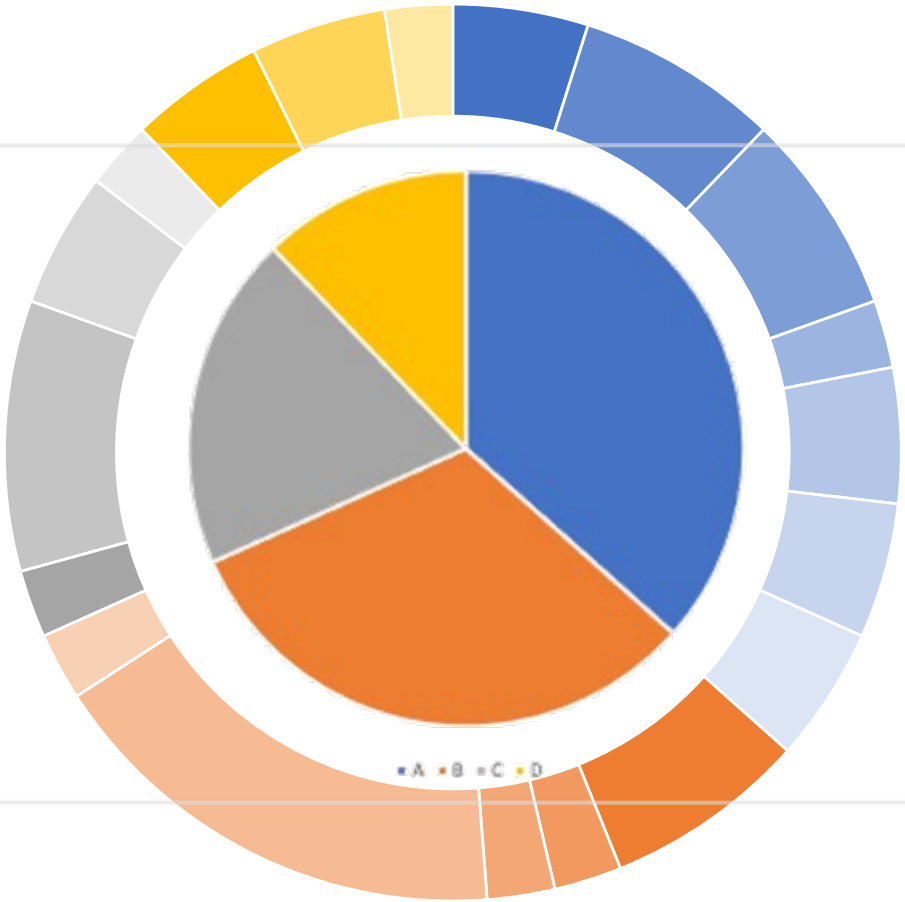


Spyrou et al., *Nat Rev Genet*, 2019

mtDNA


12.19 %
36.59 %
19.51 %
31.71 %
A
B
C
D
A2
A2j
A2m
A2q1
A2r
A2u
A2v1
B2
B2b2
B2c2
B2t
B4
C1b1
C1b14
C1c
C1c1b
D1
D1i2
D4h3a5

mtDNA



A2 A2j A2m A2q1 A2r A2u A2v1
B2 B2b2 B2c2 B2t B4 C1b1 C1b14
C1c C1c1b D1 D1i2 D4h3a5

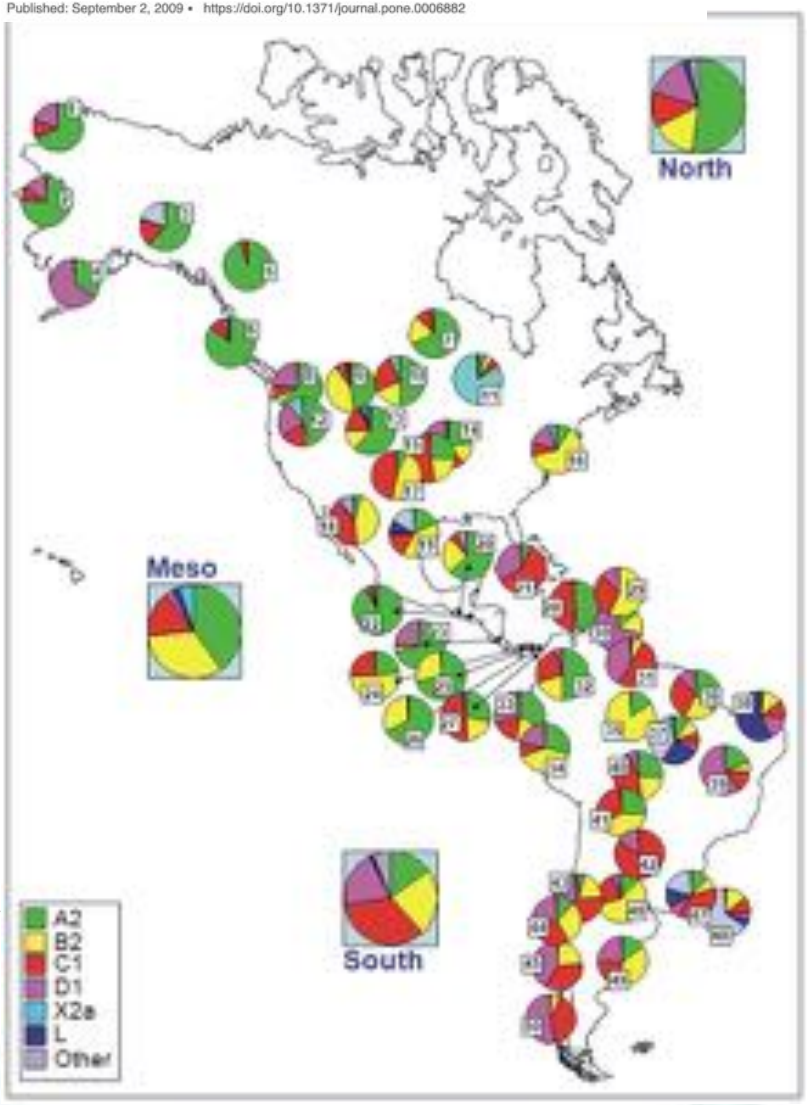
PLOS ONE

OPEN ACCESS PEER-REVIEWED
RESEARCH ARTICLE

Mitochondrial Echoes of First Settlement and Genetic Continuity in El Salvador

Antonio Salas, José Lovo-Gómez, Vanesa Álvarez-Iglesias, María Cerezo, María Victoria Lareu, Vincent Macaulay, Martin B. Richards, Ángel Carracedo

Published: September 2, 2009 • https://doi.org/10.1371/journal.pone.0006882



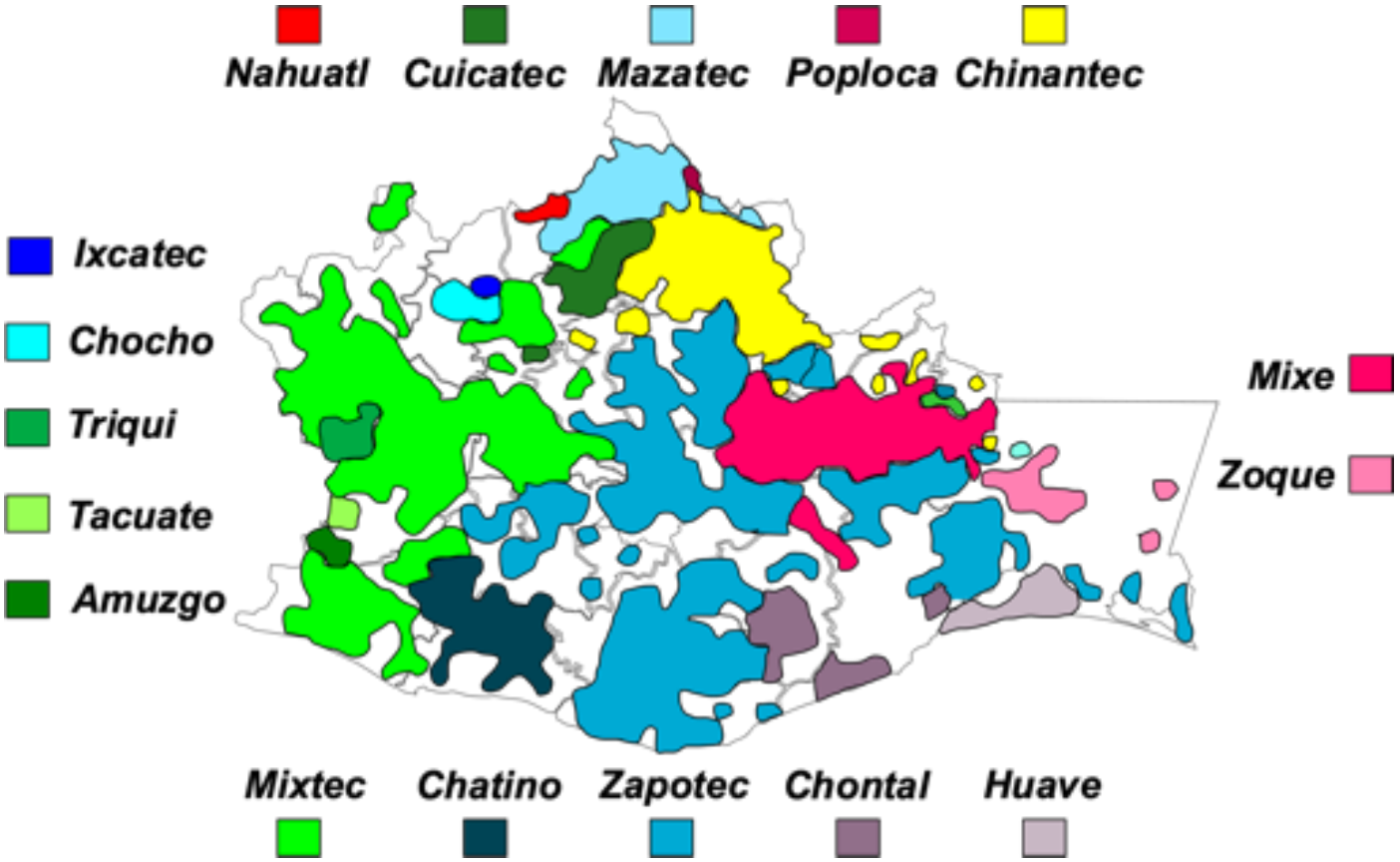
Exploring language history in the Mixteca

uncovering the (linguistic) past of the Mixtec people

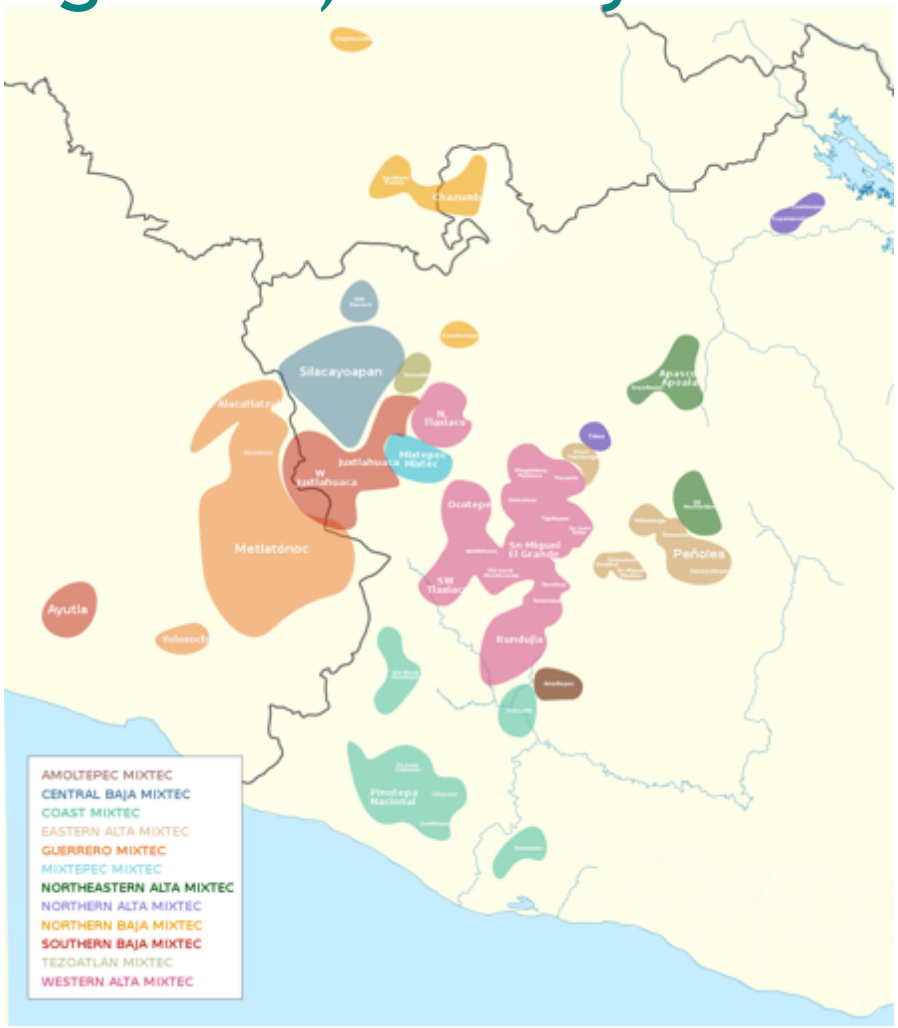
The Mixteca


La Mixteca: The Mixtec Region of Mexico
Morelos
Puebla
Veracruz
Guerrero
Chiapas
Huajuapan de León
San Juan Mixtepec
Asunción Nochixtlan
Tlaxiaco
Putla
Oaxaca
Oaxaca
Santiago Pinotepa Nacional
PACIFIC OCEAN
Golfo de Tehuantepec
0
50
100
Miles
Legend
Major Communities
Mixteca Baja
Mixteca Alta
Mixteca de la Costa

Linguistic and ethnic groups in the Mixteca



Mixtec (linguistic) history



Current Classifications

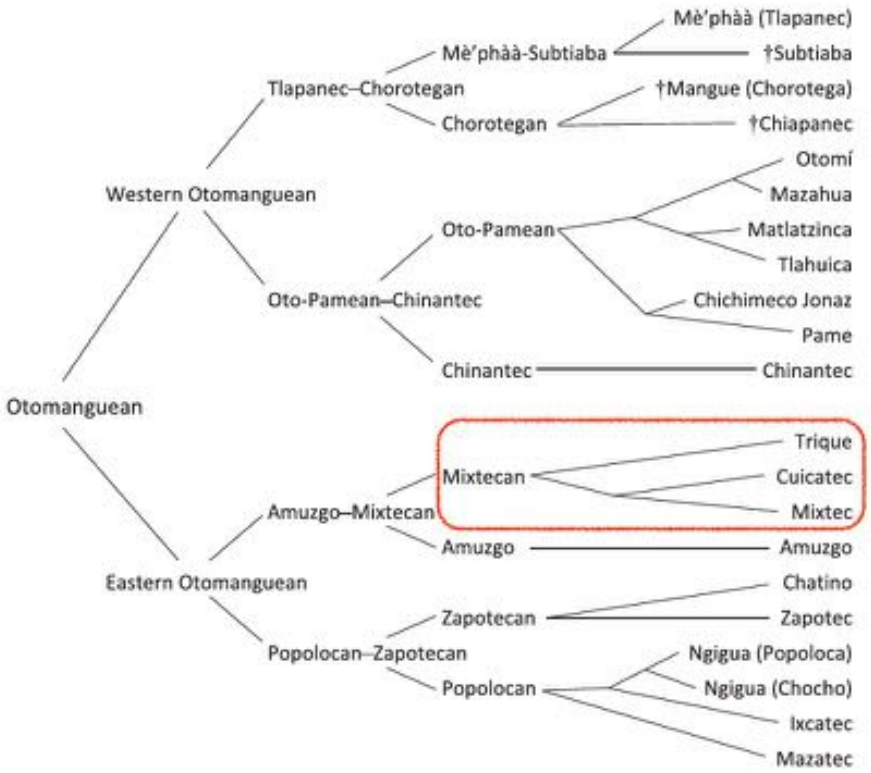
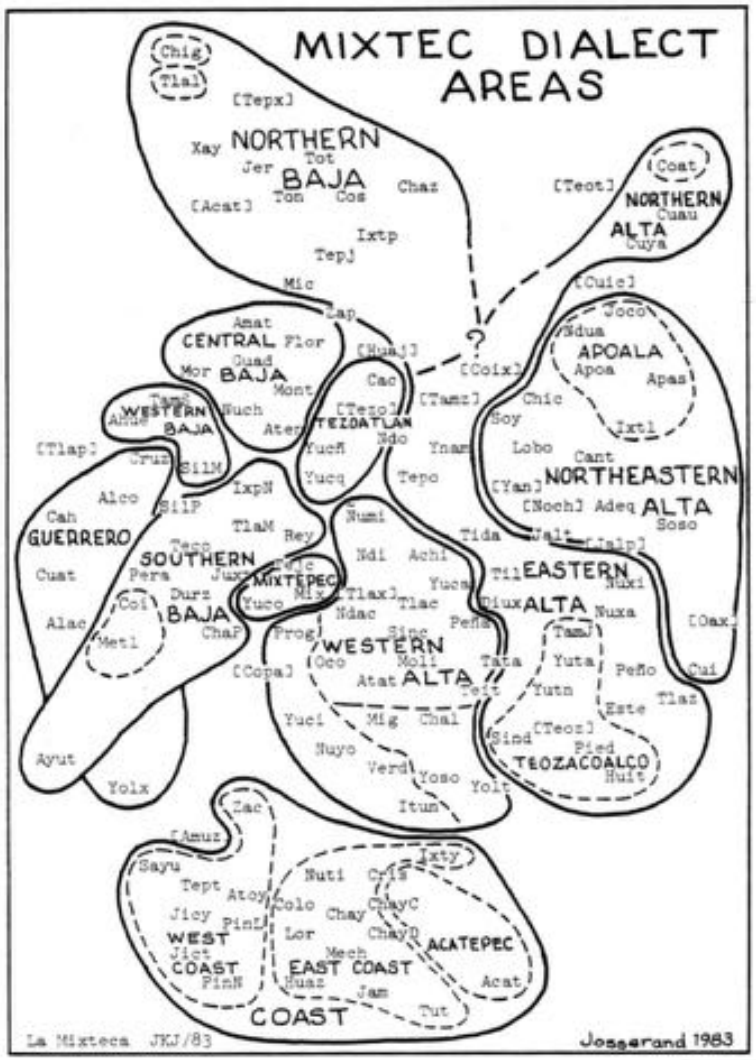


FIGURE 1 Otomanguean classification (based on Kaufman, 1988)



A Bayesian phyolgenetic analysis of Mixtecan subgrouping

Workflow

Step 1
- collect (lexical) data

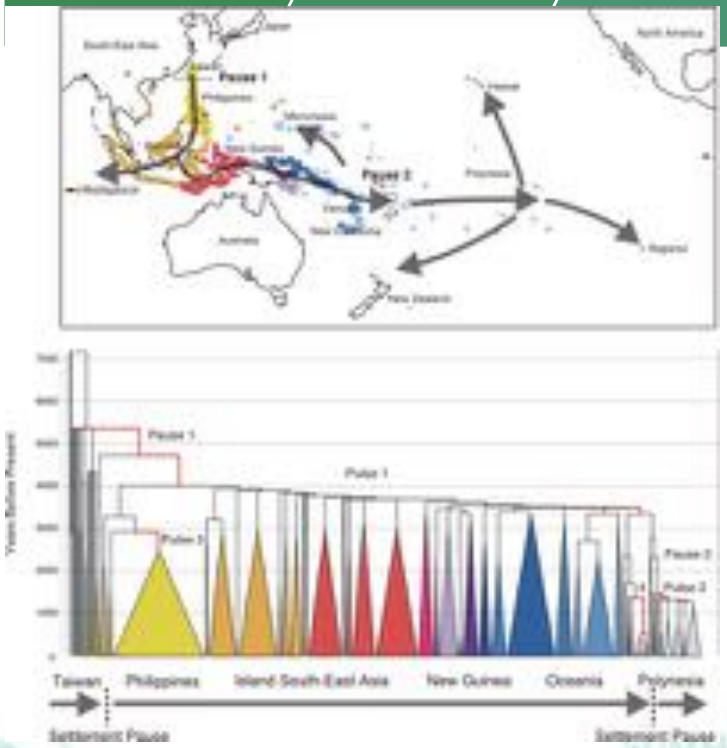
Step 2
- convert data to IPA (optional)

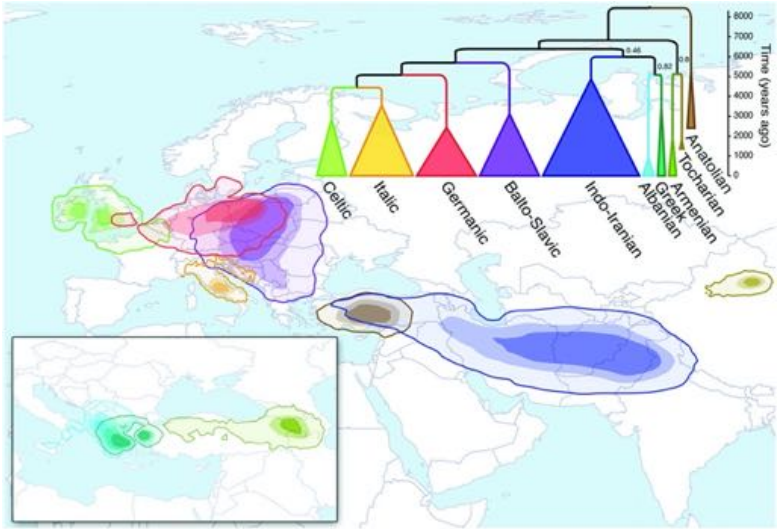
Step 3
- make cognate sets

Step 4
- look for calibration points

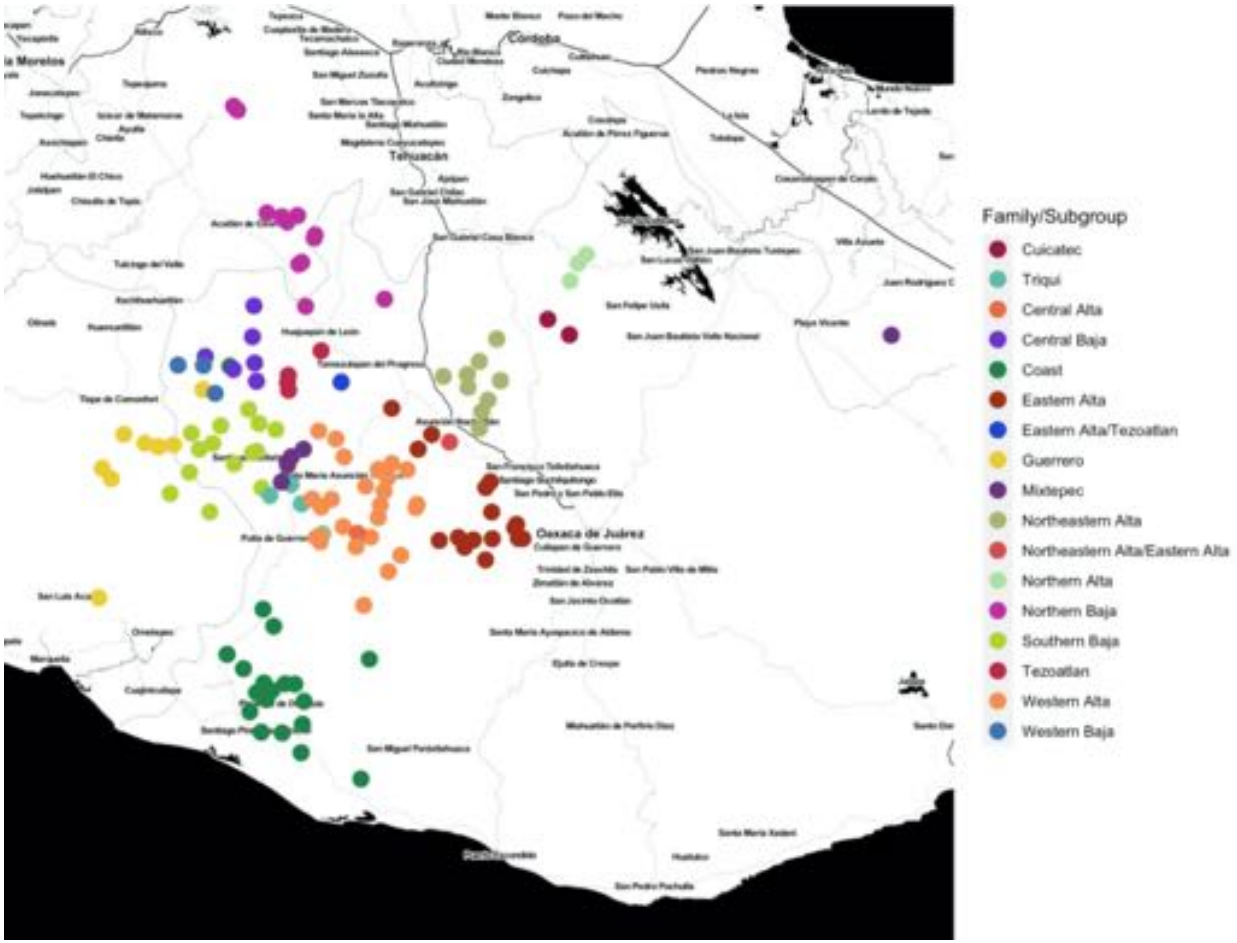
Step 5
- select, set up and run models

Step 6
- interpret output, i.e. the posterior distribution of trees





Geographical distribution



Historical documents

- Mixtec Codices
  - logographic writing system
  - records of genealogy, historic events, myths
- documents by Jesuits from the colonial period
  - Antonio de los Reyes: Arte en lengua mixteca (1593)
  - Francisco de Alvarado: Vocabulario en lengua misteca (1593)
- documents from around the 19th century
  - Francisco Belmar: Ensayo sobre la lengua trike (1897)
  - Francisco Belmar: El cuicateco (1902)

Summary and Discussion

Selected References - Linguistics

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Mithun, M., 2001. *The languages of native North America*. Cambridge University Press.

O'Connor, L. and Muysken, P. eds., 2014. *The native languages of South America: Origins, development, typology*. Cambridge University Press.

Sebeok, T. ed., 2013. *Native Languages of the Americas* (Vol. 1). Springer Science & Business Media.

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