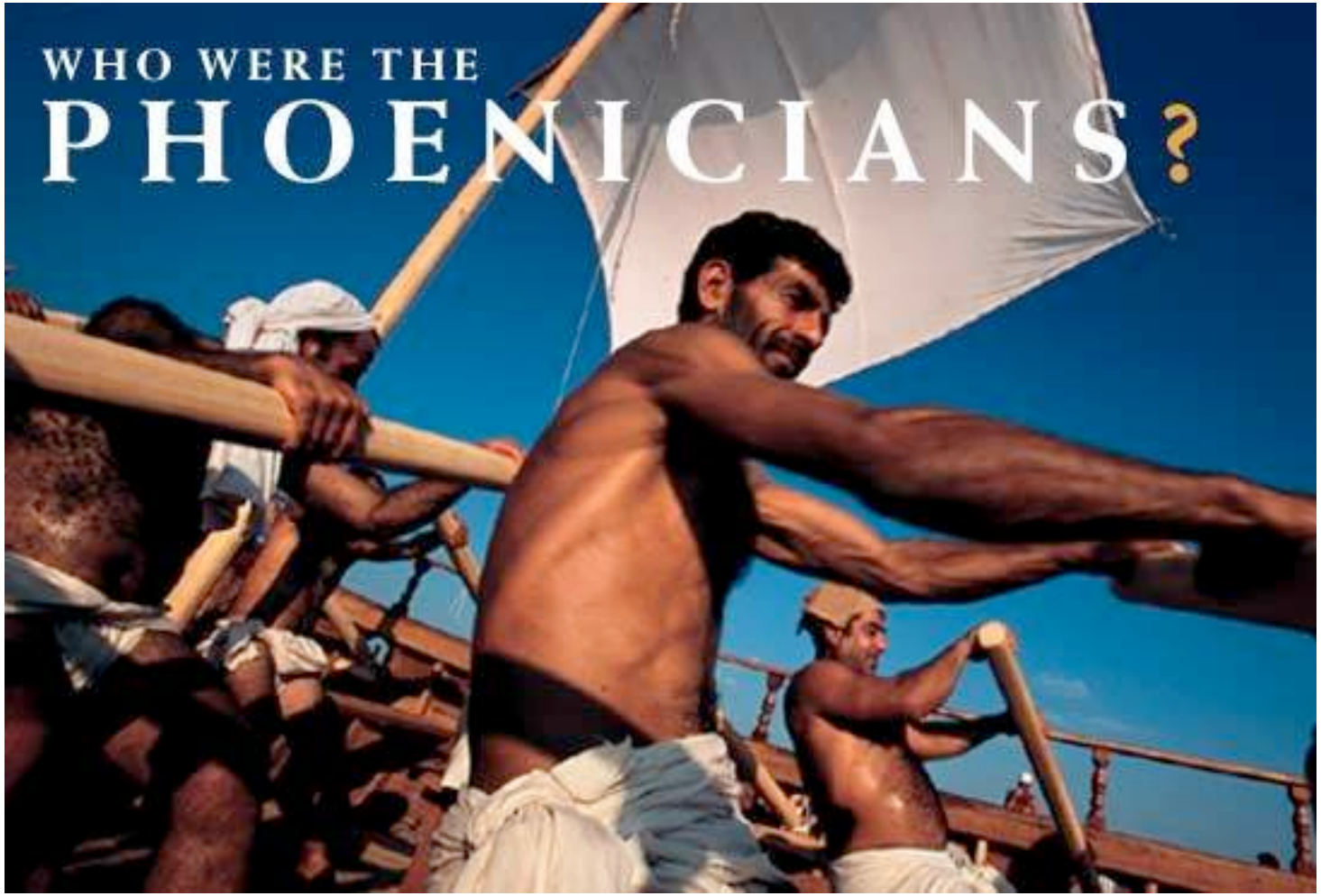


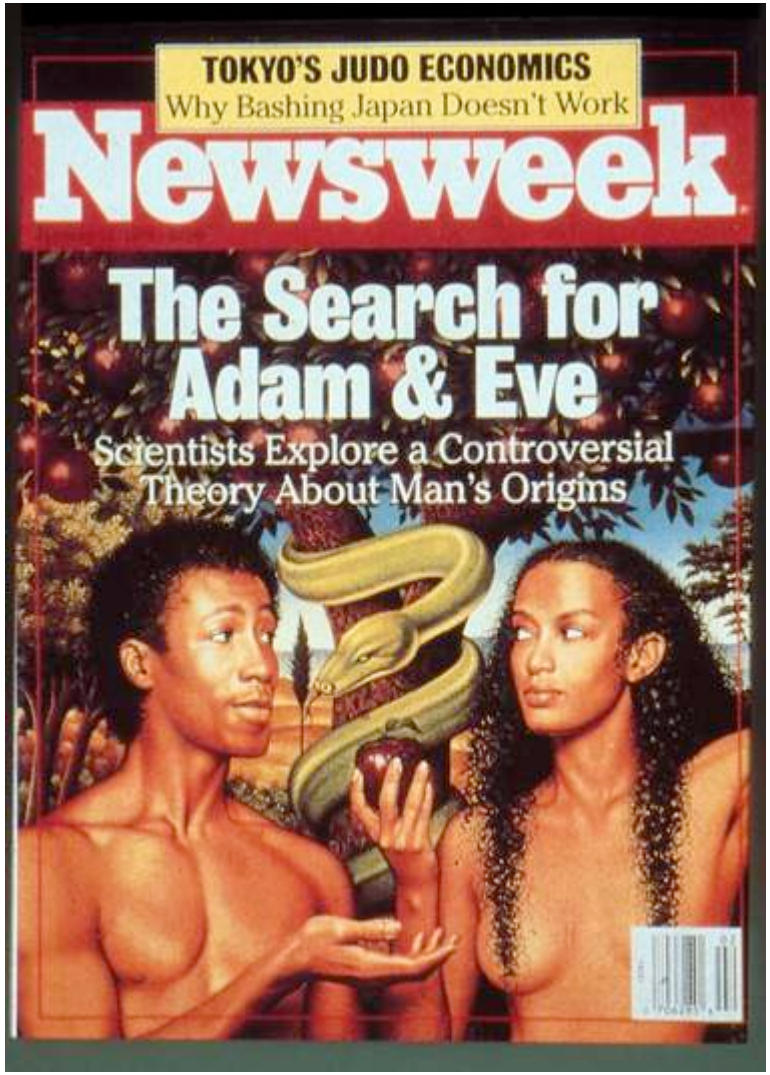
Lisa Matisoo-Smith
Dept of Anatomy, University of Otago

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
SAPERE AUDE

ANATOMY OTAGO

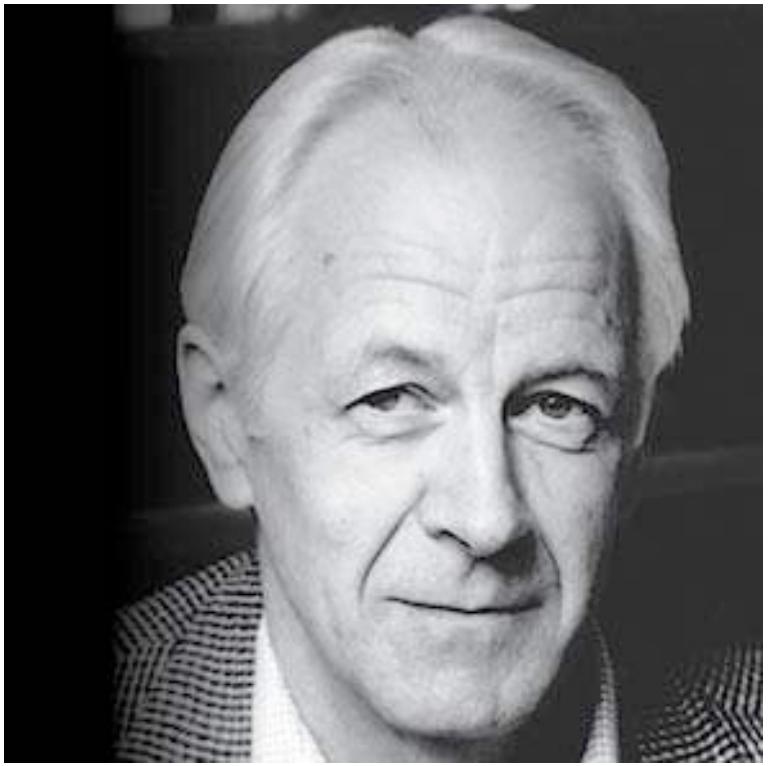
ALLAN WILSON AT OTAGO

Tracking human migrations through DNA

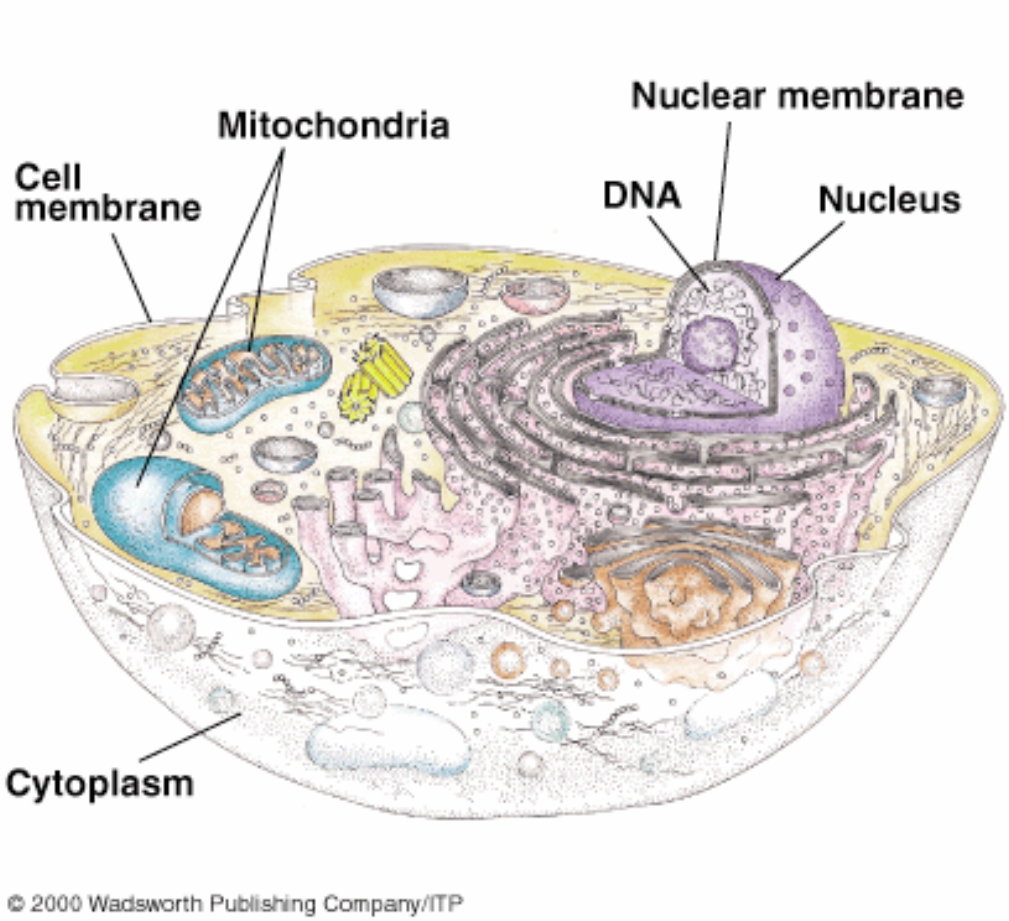


Allan Wilson (1934 - 1991)

- Born in Ngaruawahia
- BSc Otago
- PhD UC Berkeley
- The Wilson Lab
  - molecular evolution
  - molecular clock
  - mtDNA
  - ancient DNA



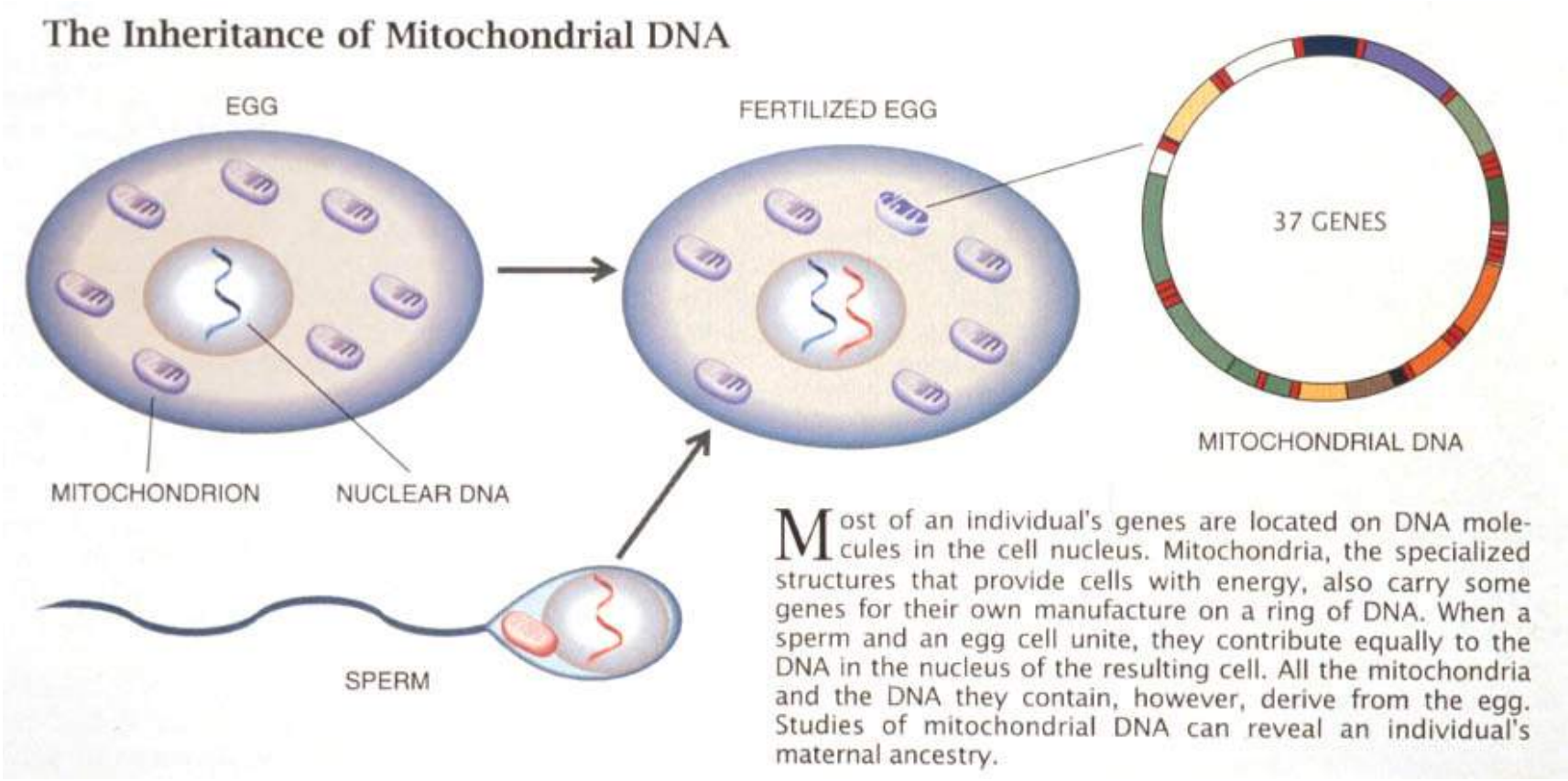
Structure of a Cell



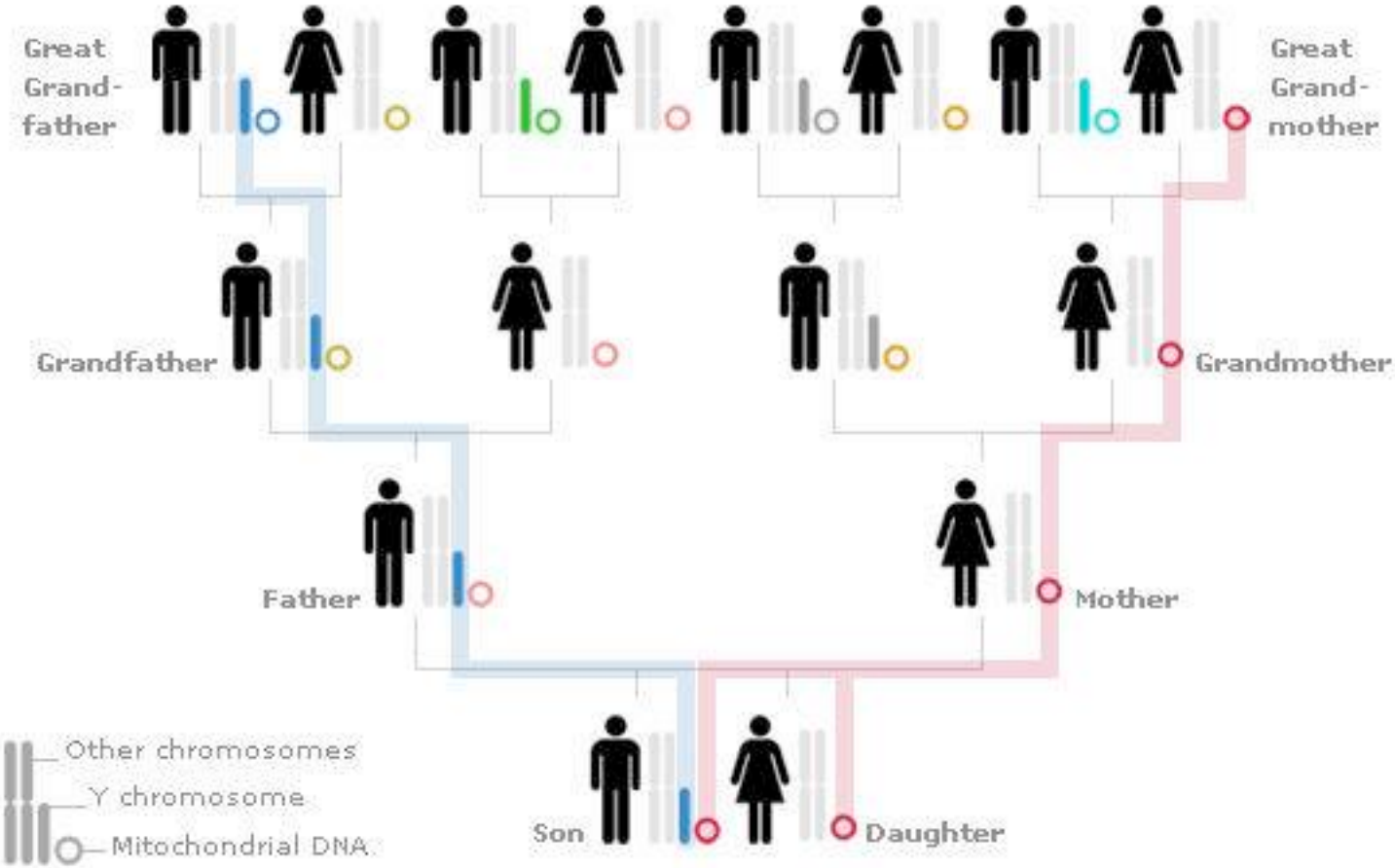
Mitochondrial DNA vs Nuclear DNA

You inherit your nuclear DNA from both of your parents – on average 50% from each

Inheritance of mtDNA

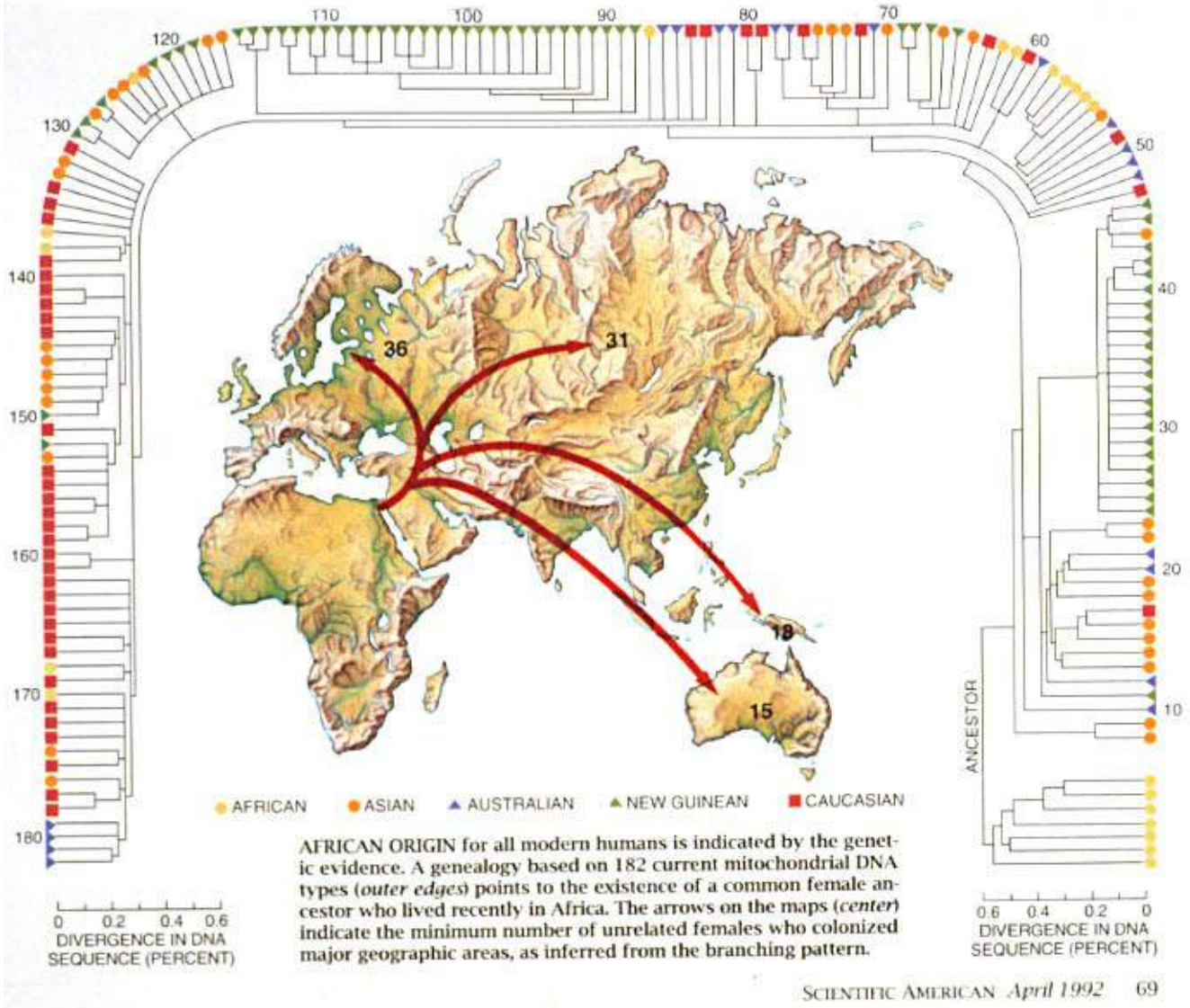


MtDNA is inherited only from your mother.
MtDNA does not recombine (or mix) with paternal DNA.


Great Grand-father
Great Grand-mother
Grandfather
Grandmother
Father
Mother
Son
Daughter
Other chromosomes
Y chromosome
Mitochondrial DNA

Mitochondrial “Eve”

based on Cann, Stoneking & Wilson 1987

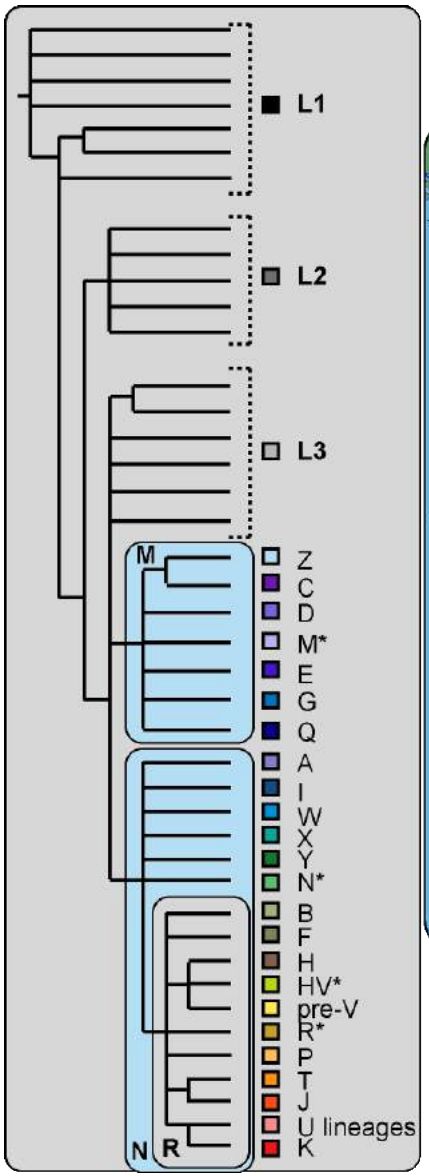


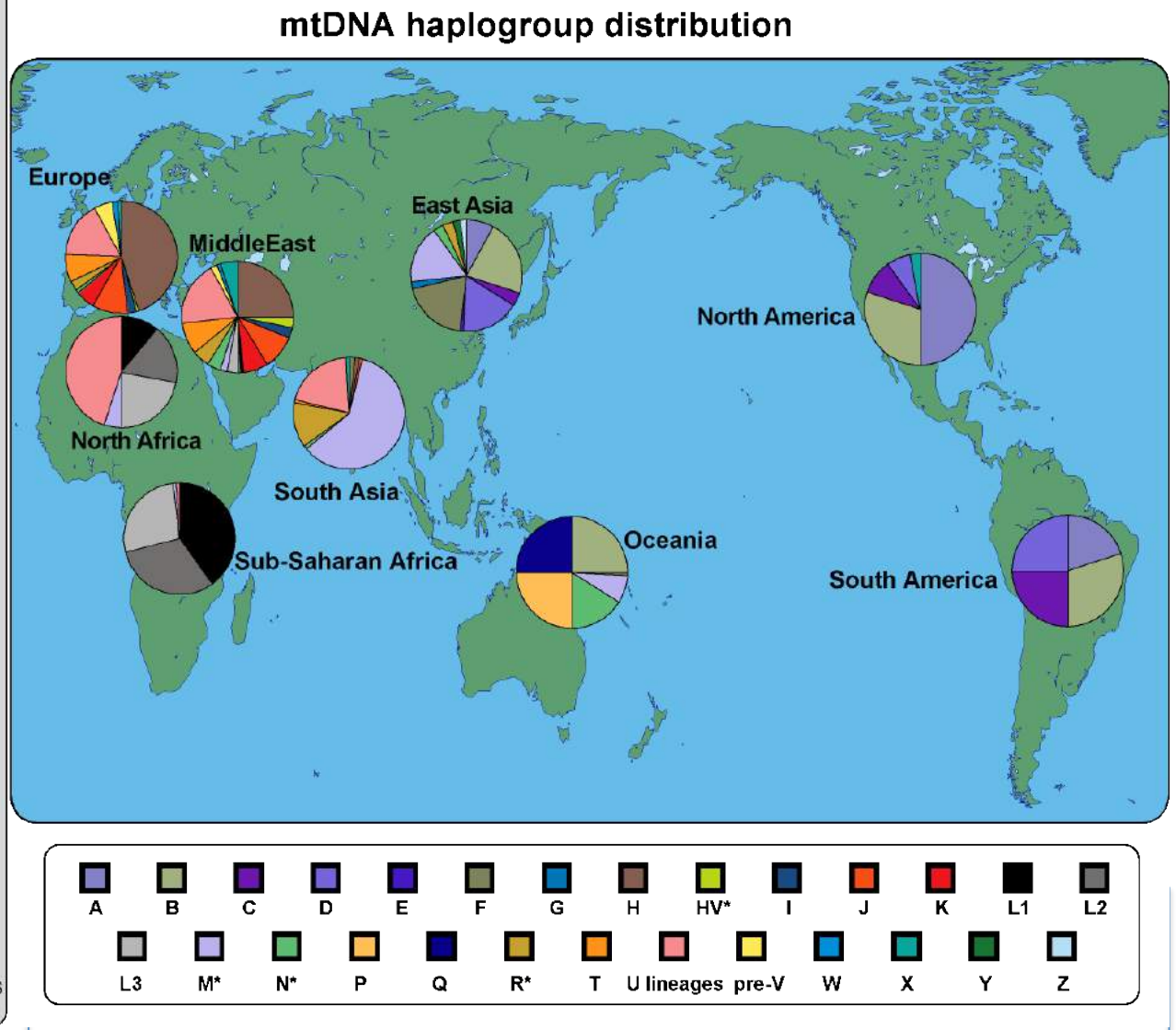
AFRICAN ORIGIN for all modern humans is indicated by the genetic evidence. A genealogy based on 182 current mitochondrial DNA types (*outer edges*) points to the existence of a common female ancestor who lived recently in Africa. The arrows on the maps (*center*) indicate the minimum number of unrelated females who colonized major geographic areas, as inferred from the branching pattern.

An evolutionary tree from populations around the world based on mtDNA differences.

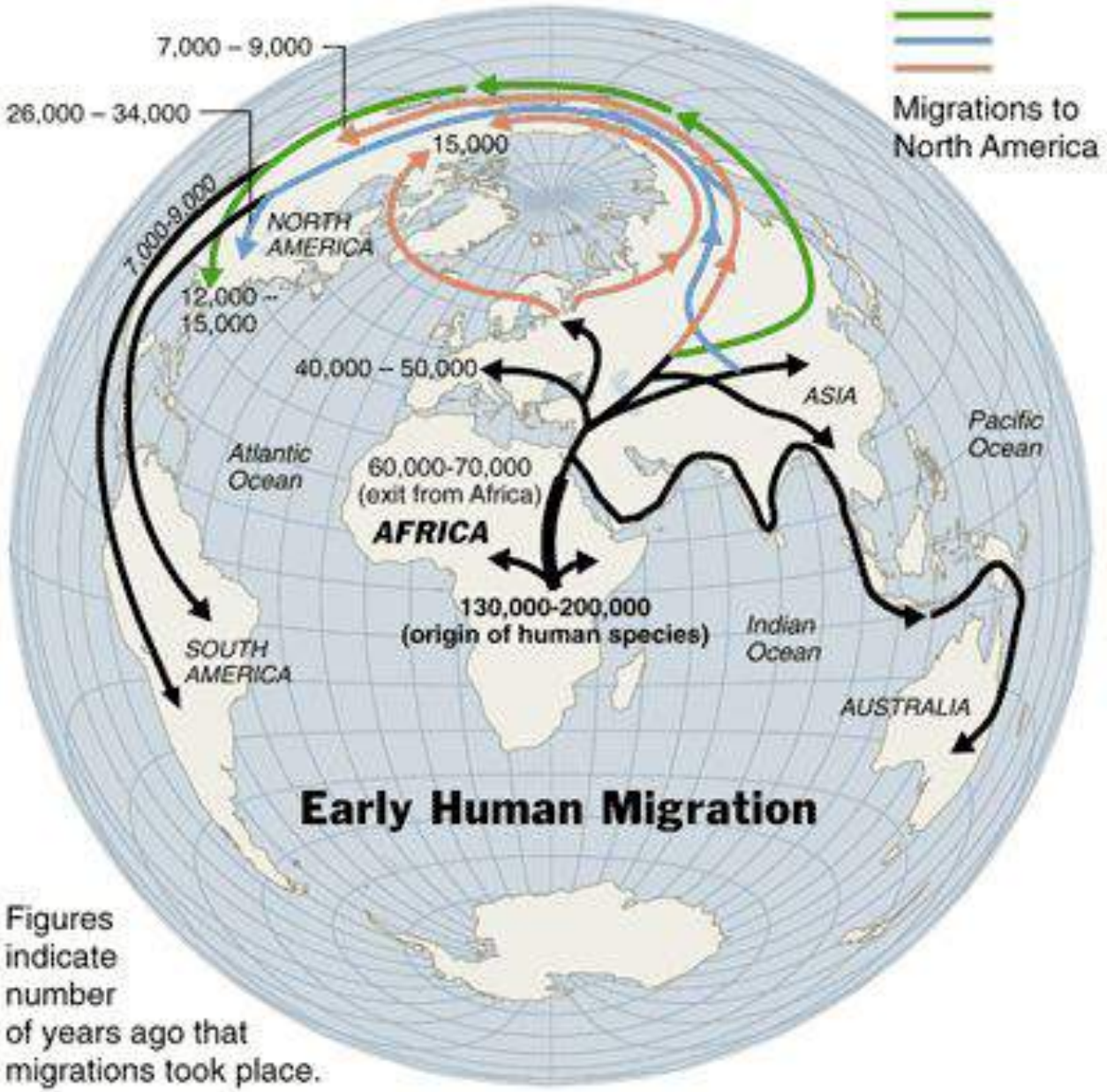
Traced all lineages to a single maternal line that existed in Africa over 150,000 years ago

Haplogroups

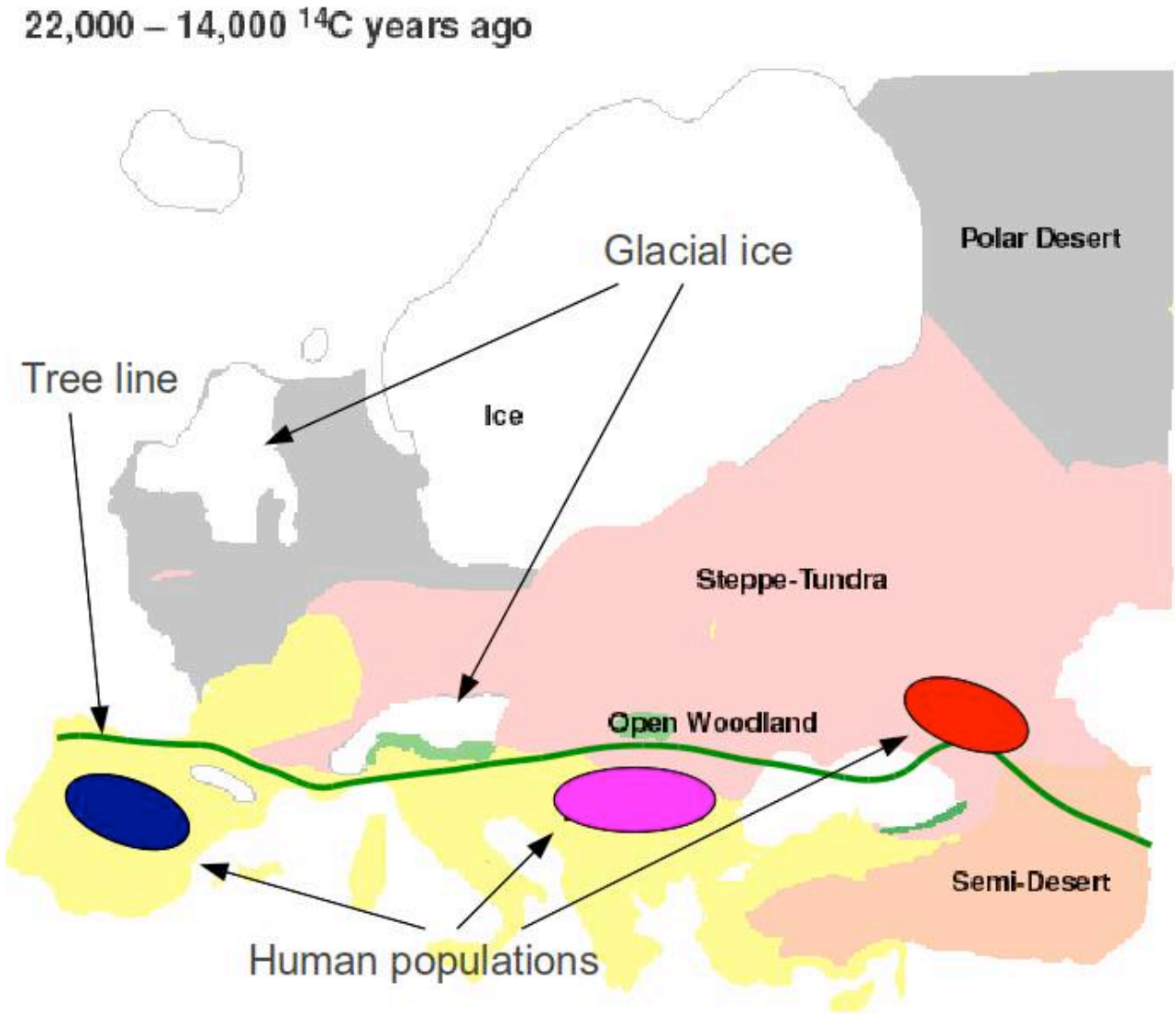


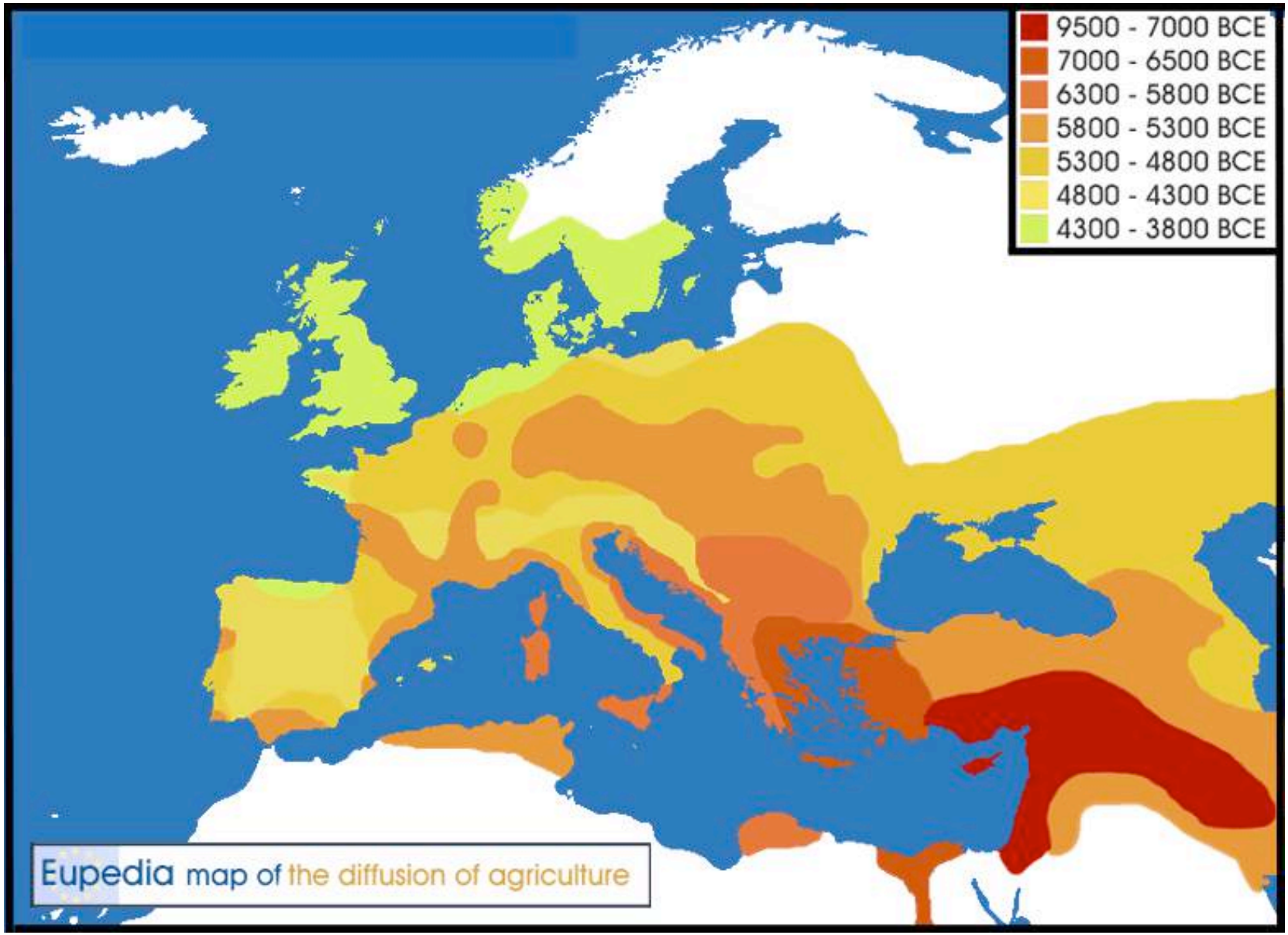


http://www.mcdonald.cam.ac.uk/genetics/links.html


7,000 – 9,000
26,000 – 34,000
15,000
7,000-9,000
NORTH AMERICA
12,000 – 15,000
40,000 – 50,000
ASIA
Pacific Ocean
Atlantic Ocean
60,000-70,000 (exit from Africa)
AFRICA
130,000-200,000 (origin of human species)
Indian Ocean
SOUTH AMERICA
AUSTRALIA
Migrations to North America
Early Human Migration
Figures indicate number of years ago that migrations took place.

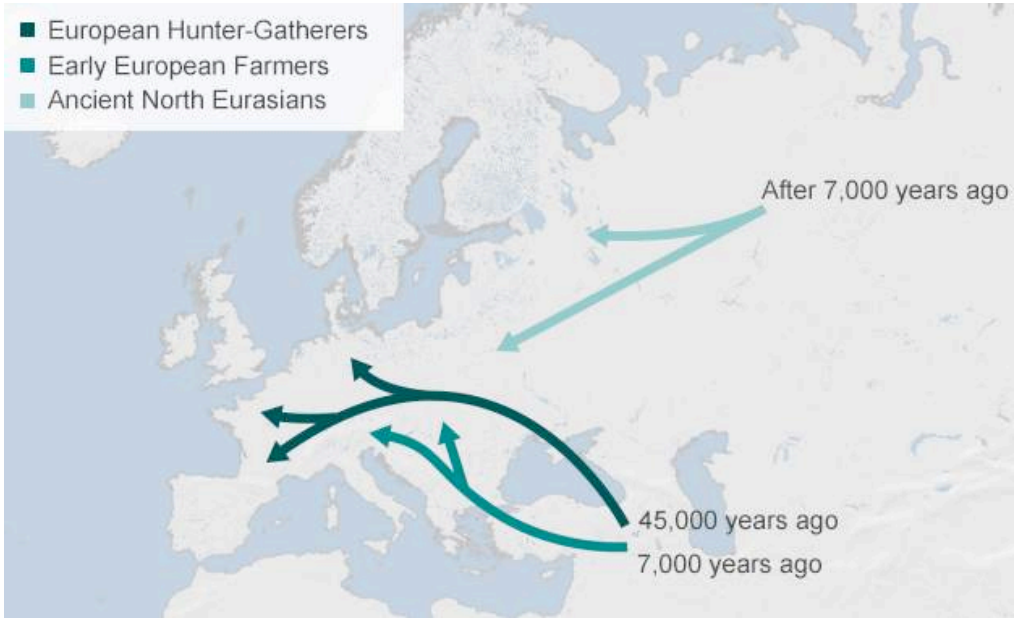
Last Glacial Maximum (Ice Age)




9500 - 7000 BCE
7000 - 6500 BCE
6300 - 5800 BCE
5800 - 5300 BCE
5300 - 4800 BCE
4800 - 4300 BCE
4300 - 3800 BCE
Eupedia map of the diffusion of agriculture

Ancient DNA Analyses

Neolithic Expansions & Replacements



http://ichef.bbci.co.uk/news/624/media/images/77640000/gif/_77640634_europe_ancient_farmers_20140917-01.gif

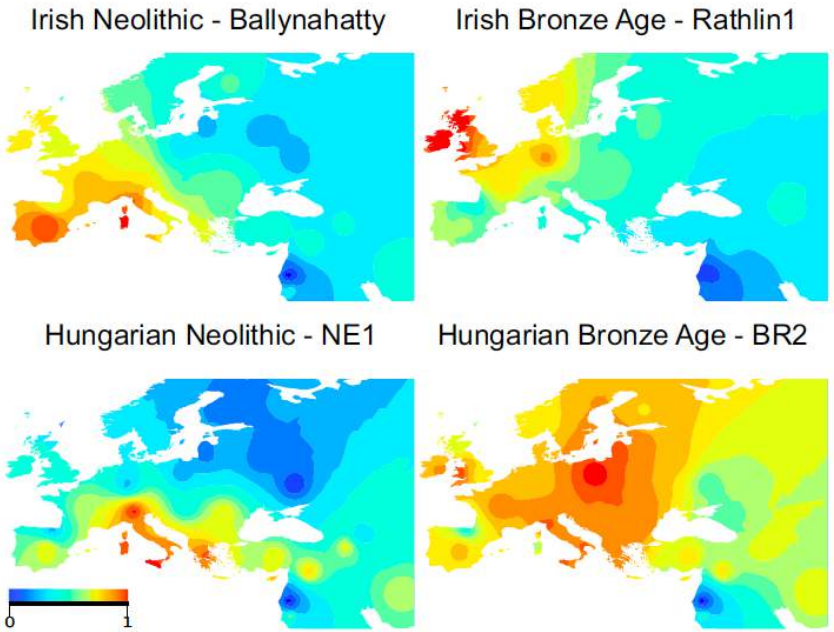
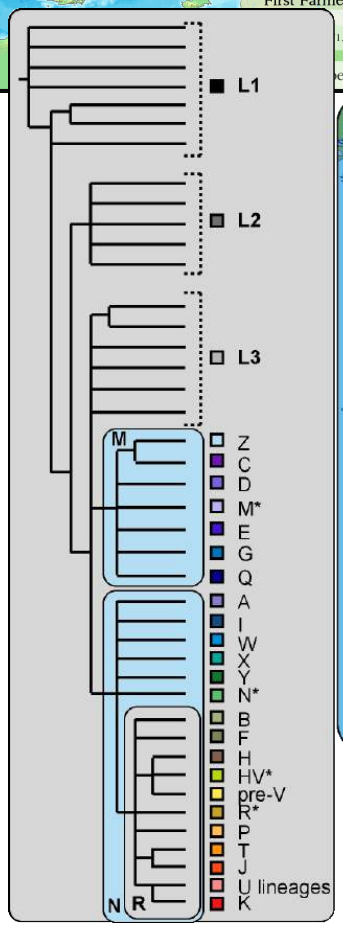


Fig. 3. Comparison of Irish and Central European ancient genomes for haplotype-based affinity to modern populations. Interpolated heatmaps comparing relative haplotype donations by two Irish (Ballynahatty, Rathlin1) and two Hungarian (NE1, BR2) ancient genomes.

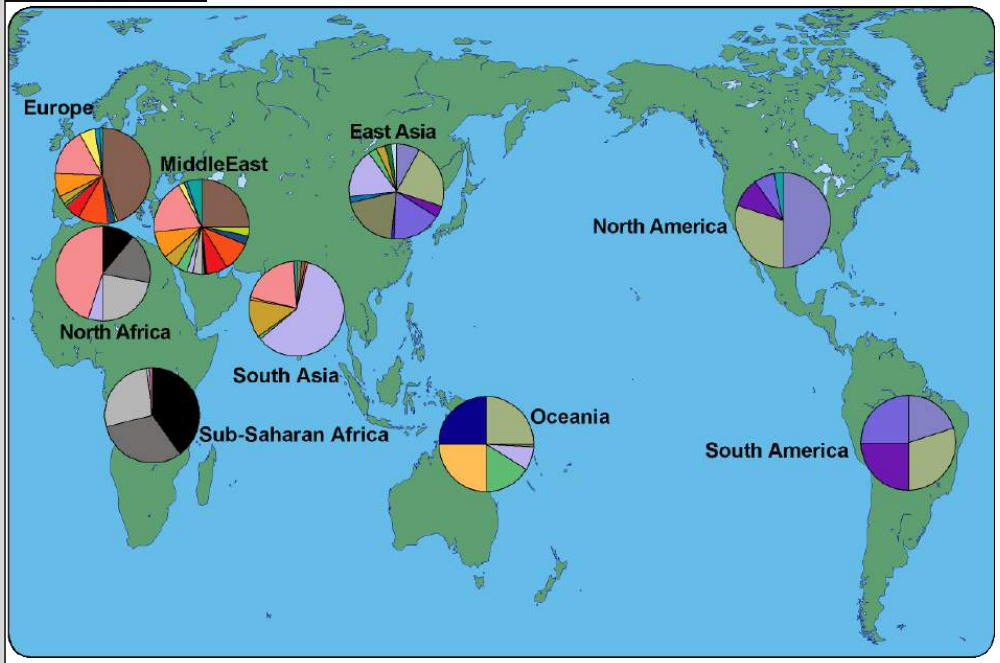
Mesolithic Western Europe
U5b is common

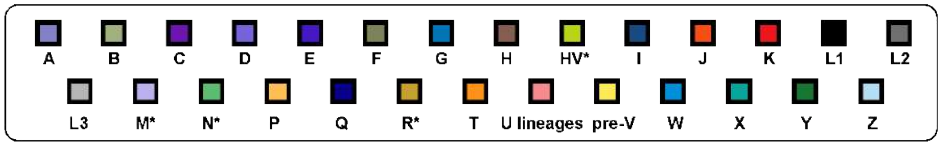


Modern populations

Result of replacement during Neolithic and later Bronze Age populations

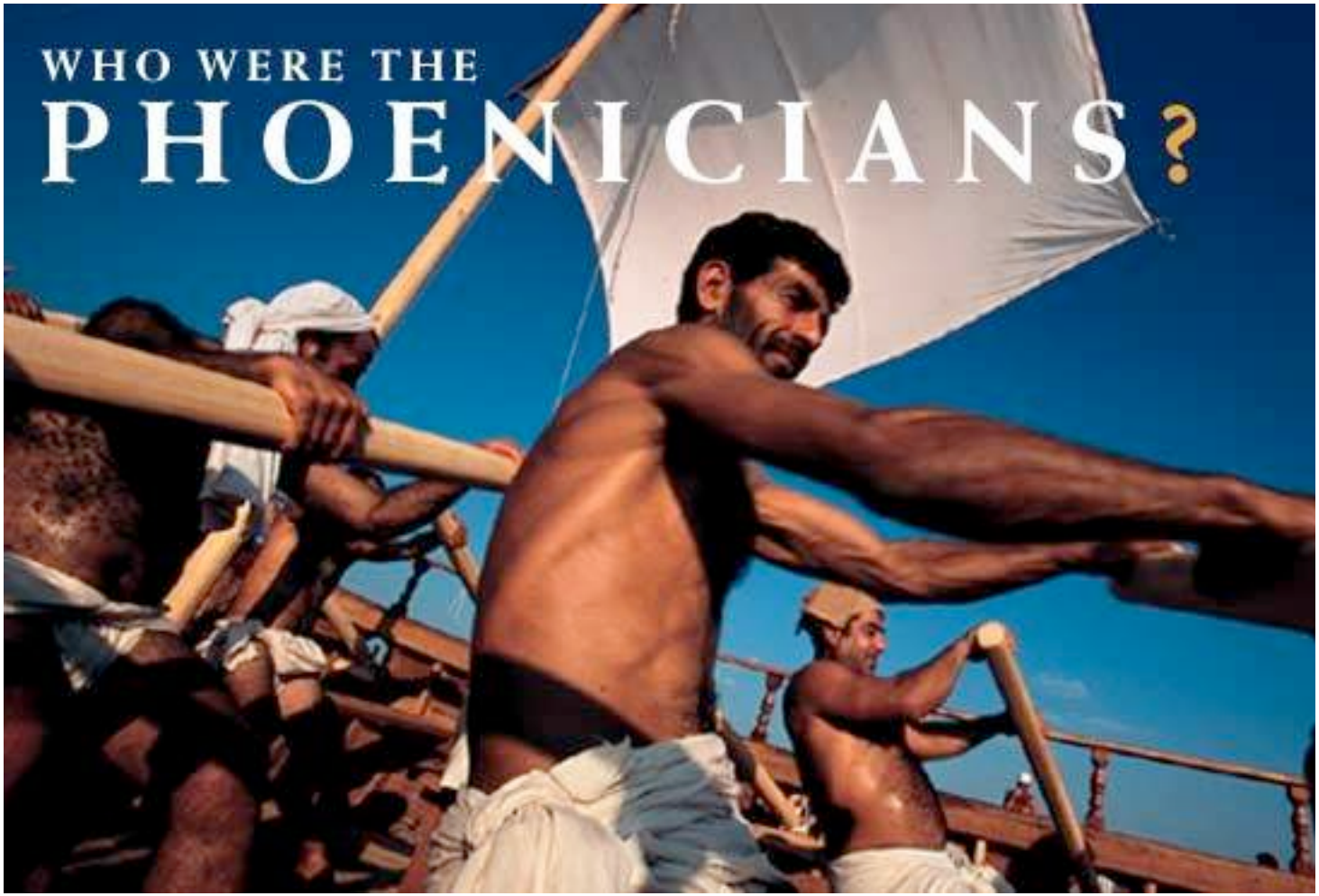
mtDNA haplogroup distribution





THE GENOGRAPHIC PROJECT CONSORTIUM

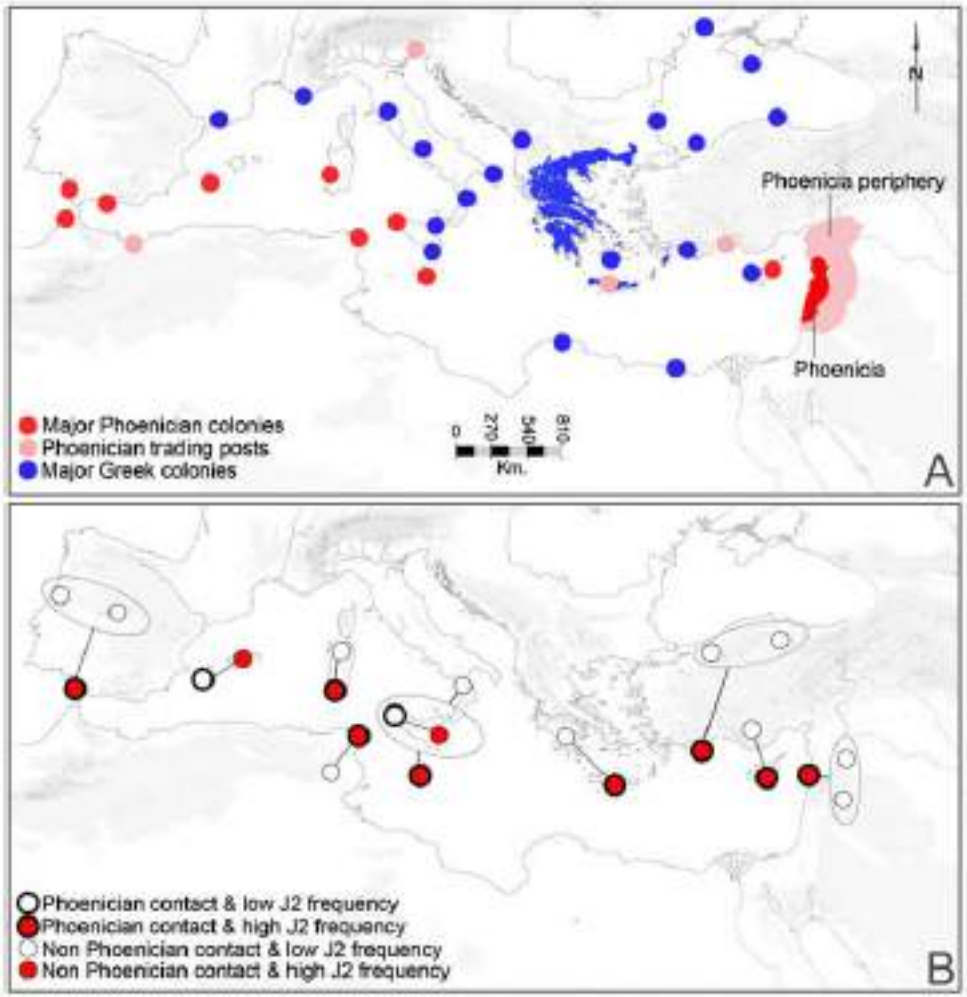
COLLABORATING WITH INDIGENOUS PEOPLES


WHO WERE THE
PHOENICIANS?

Prof Pierre Zalloua
Lebanese American University

Identifying Genetic Traces of Historical Expansions: Phoenician Footprints in the Mediterranean

Pierre A. Zalloua,[1,2,13] Daniel E. Platt,[3,13] Mirvat El Sibai,[1] Jade Khalife,[1] Nadine Makhoul,[1] Marc Haber,[1] Yali Xue,[4] Hassan Izaabel,[5] Elena Bosch,[6] Susan M. Adams,[7] Eduardo Arroyo,[8] Ana María López-Parra,[8] Mercedes Aler,[9] Antònia Picornell,[10] Misericordia Ramon,[10] Mark A. Jobling,[7] David Comas,[6] Jaume Bertranpetit,[6] R. Spencer Wells,[11] Chris Tyler-Smith,[4,*] and The Genographic Consortium[12]

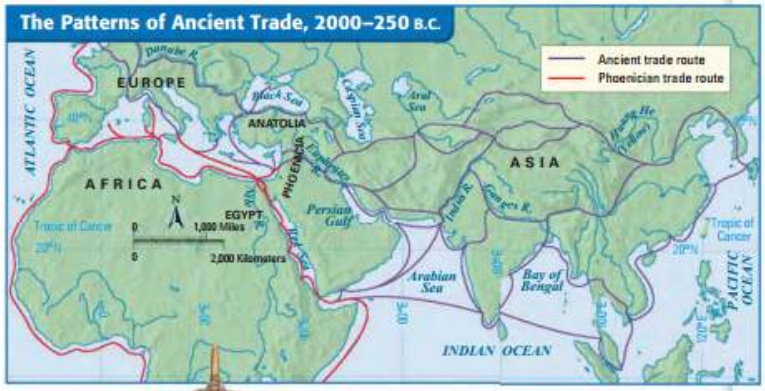


2008
Y chromosome analyses (paternally inherited)
Modern populations

J2 haplogroup markers associated with Phoenician contact

Phoenician Trade

Phoenicia was located in a great spot for trade because it lay along well-traveled routes between Egypt and Asia. However, the Phoenicians did more than just trade with merchants who happened to pass through their region. The Phoenicians became expert sailors and went looking for opportunities to make money.



Merchant Ships

Phoenician sailors developed the round boat, a ship that was very wide and had a rounded bottom. This shape created a large space for cargo.

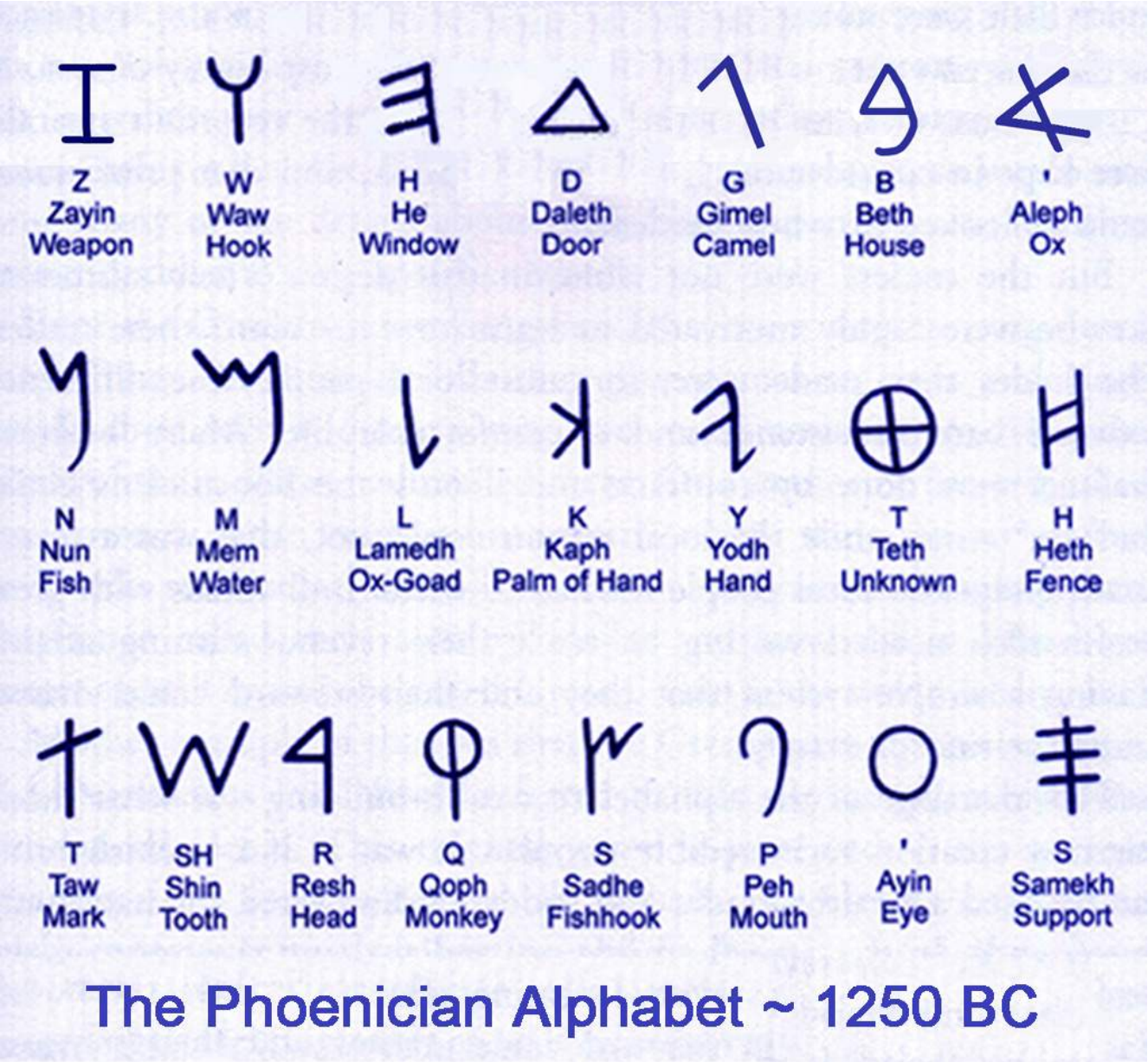
Foreigners wanted cedar, an aromatic wood that grew in Phoenicia.

Phoenician ships often were decorated with horse heads.

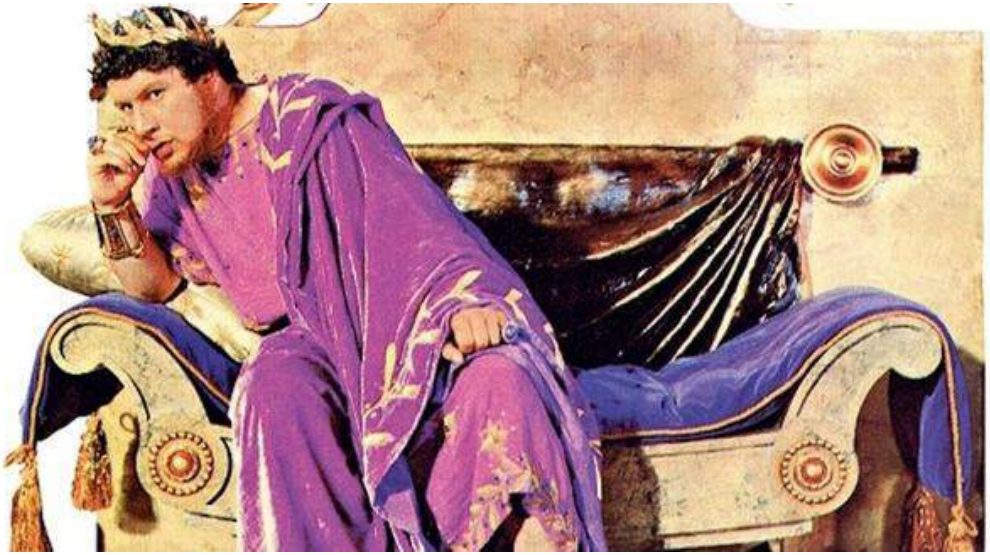
This wicker fence runs around the outer edge of the upper deck.

These pottery jars with pointed bottoms are called amphorae. They held oil or wine.

The most desired Phoenician trade item was dyed red-purple cloth.

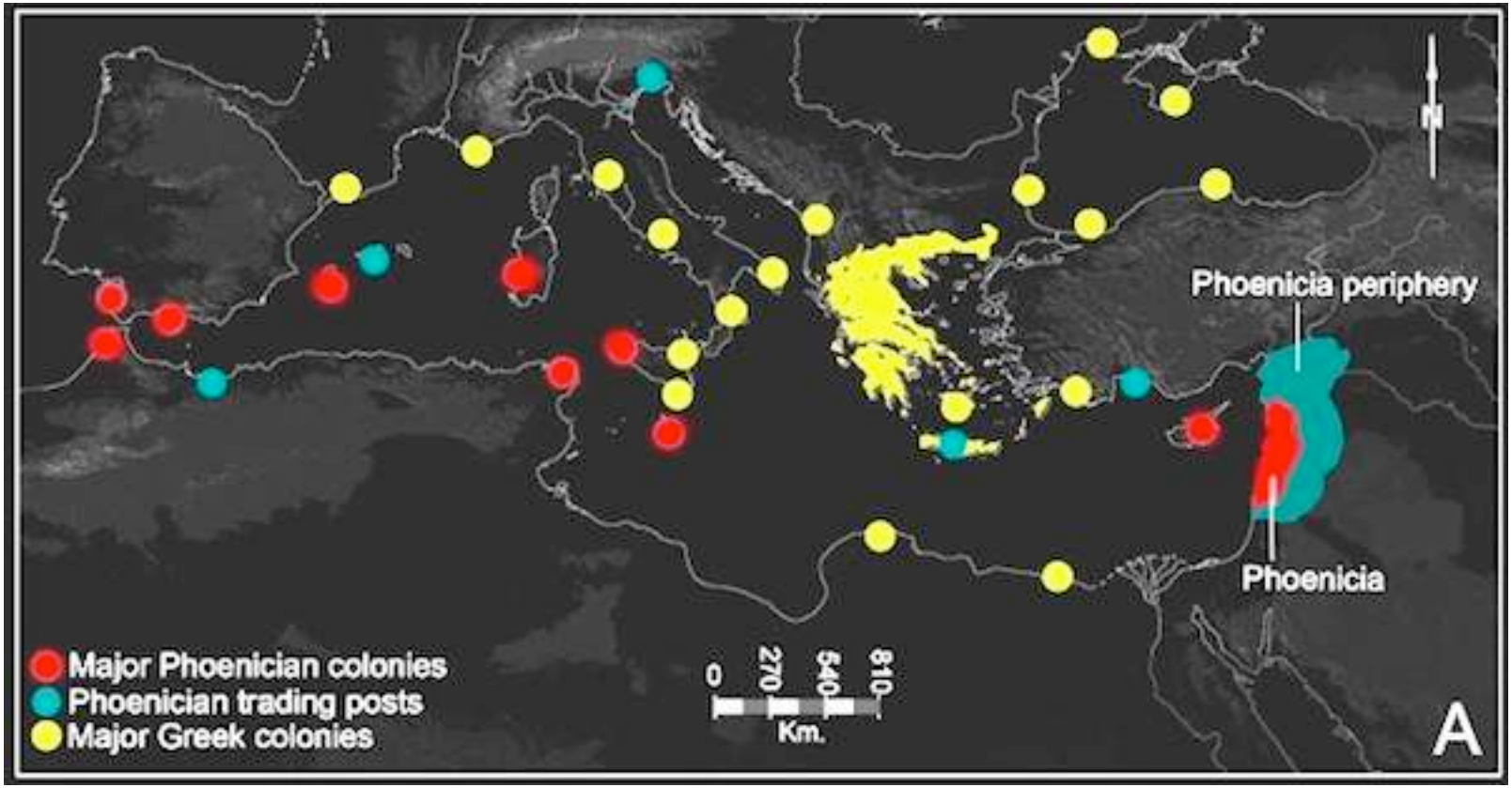

Z
Zayin
Weapon
W
Waw
Hook
H
He
Window
D
Daleth
Door
G
Gimel
Camel
B
Beth
House
'
Aleph
Ox
N
Nun
Fish
M
Mem
Water
L
Lamedh
Ox-Goad
K
Kaph
Palm of Hand
Y
Yodh
Hand
T
Teth
Unknown
H
Heth
Fence
T
Taw
Mark
SH
Shin
Tooth
R
Resh
Head
Q
Qoph
Monkey
S
Sadhe
Fishhook
P
Peh
Mouth
'
Ayin
Eye
S
Samekh
Support
The Phoenician Alphabet ~ 1250 BC

Tyrian purple



Cedar - Lebanon


Italy
Greece
ATHENS
CARTHAGE
SYDON
TYRE
Phoenicia
Phoenician
Colonies


N
Phoenicia periphery
Phoenicia
Major Phoenician colonies
Phoenician trading posts
Major Greek colonies
0
270
540
810
Km.
A

National Museum of Carthage
Byrsa Hill – site of Phoenician acropolis
Tunis
1994

Carthage
Established 813 BCE by Queen Elissa from Tyre (Lebanon)
Destroyed by the Romans during 3rd Punic war, (149-146 BCE)

Two carved sandstone sarcophagi

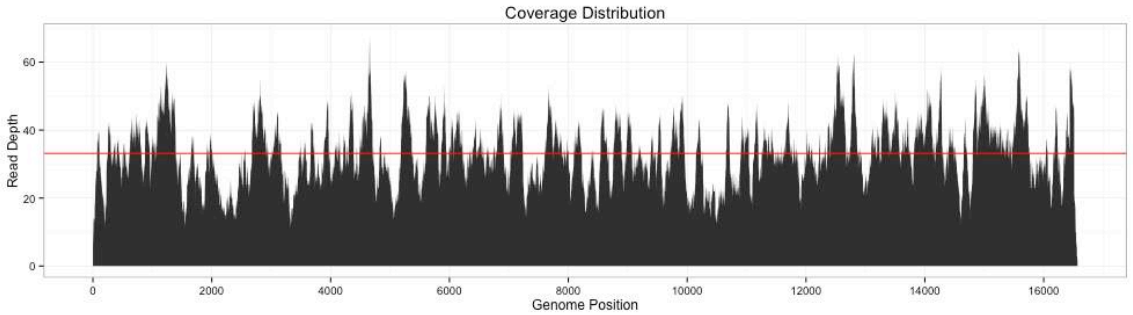
Amphorae

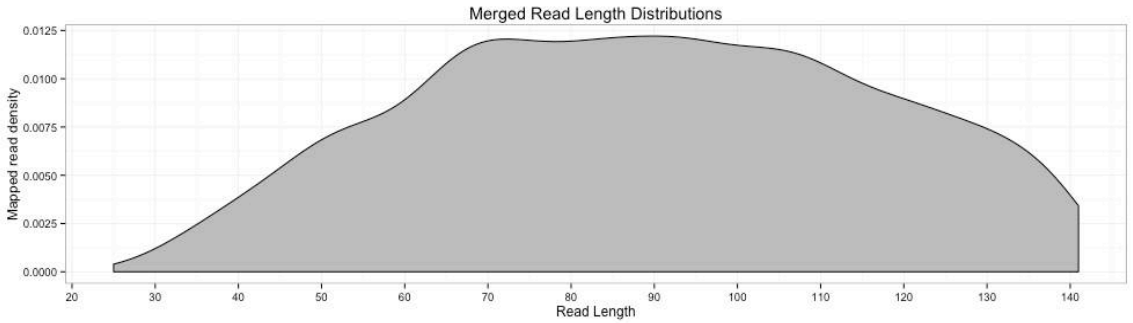
Punic lamp

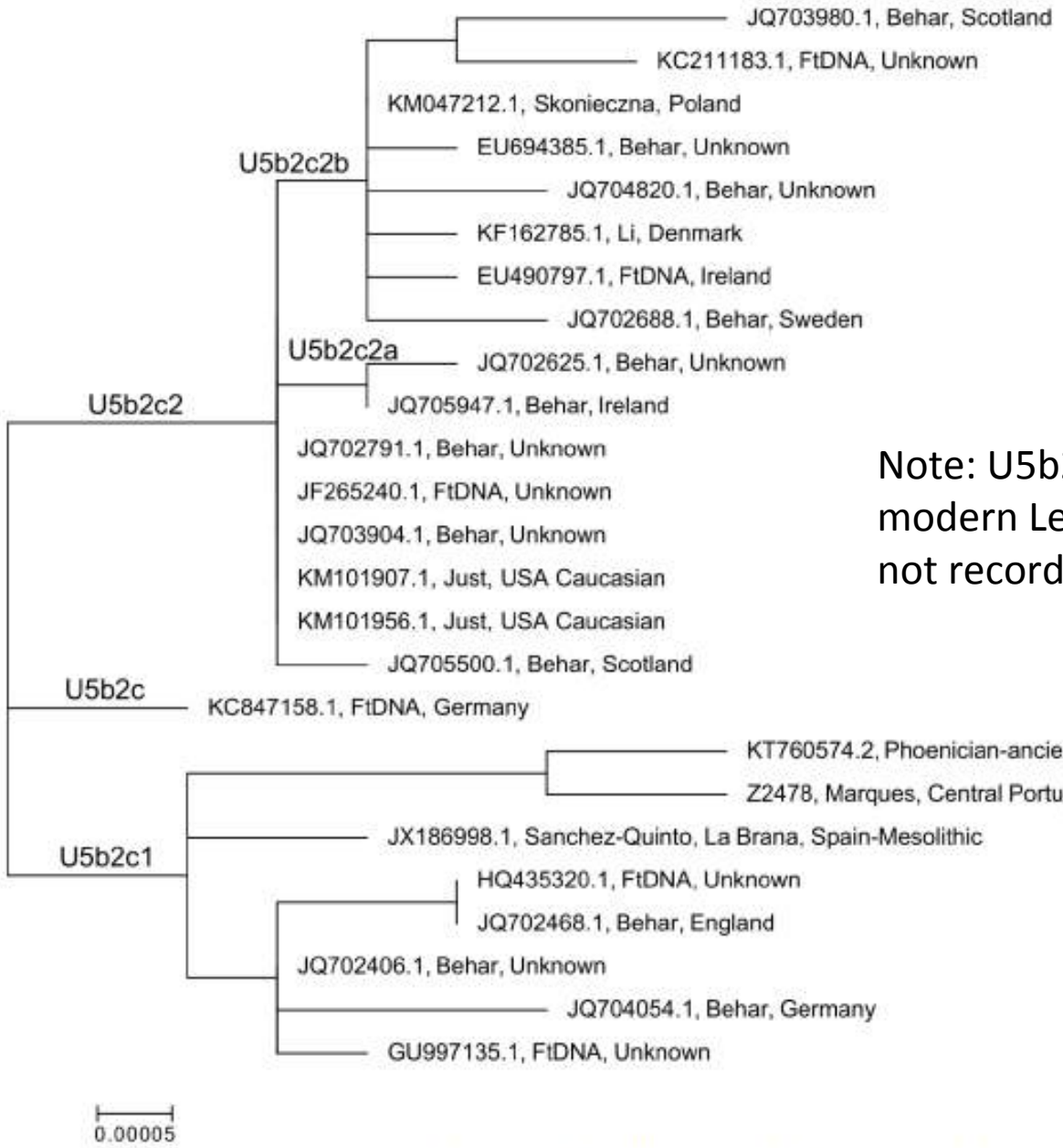
Ariche
1.7 m tall
Aged 19-24

6th c BCE

A European mitochondrial haplotype identified in ancient Phoenician remains from Carthage, North Africa
mtDNA haplotype U5b2c1





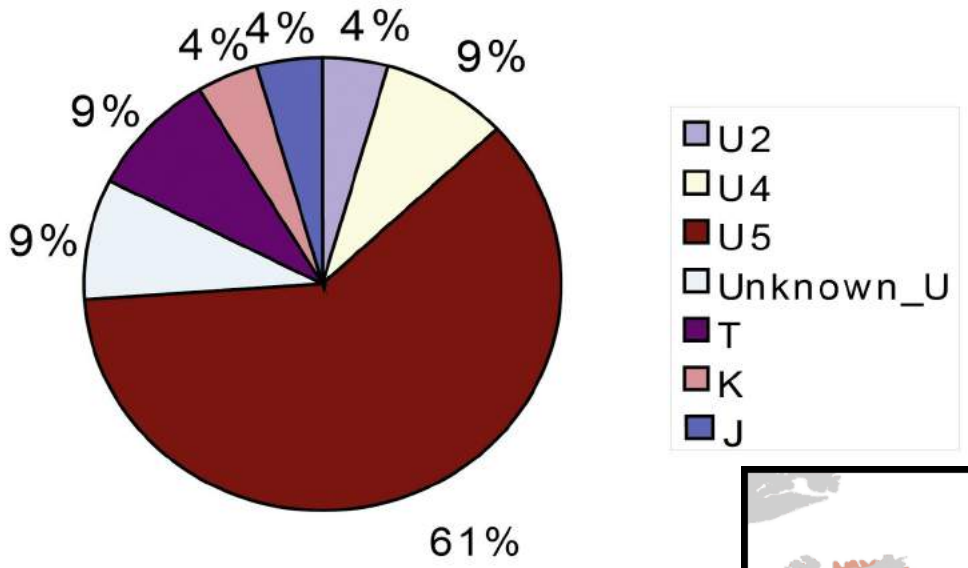


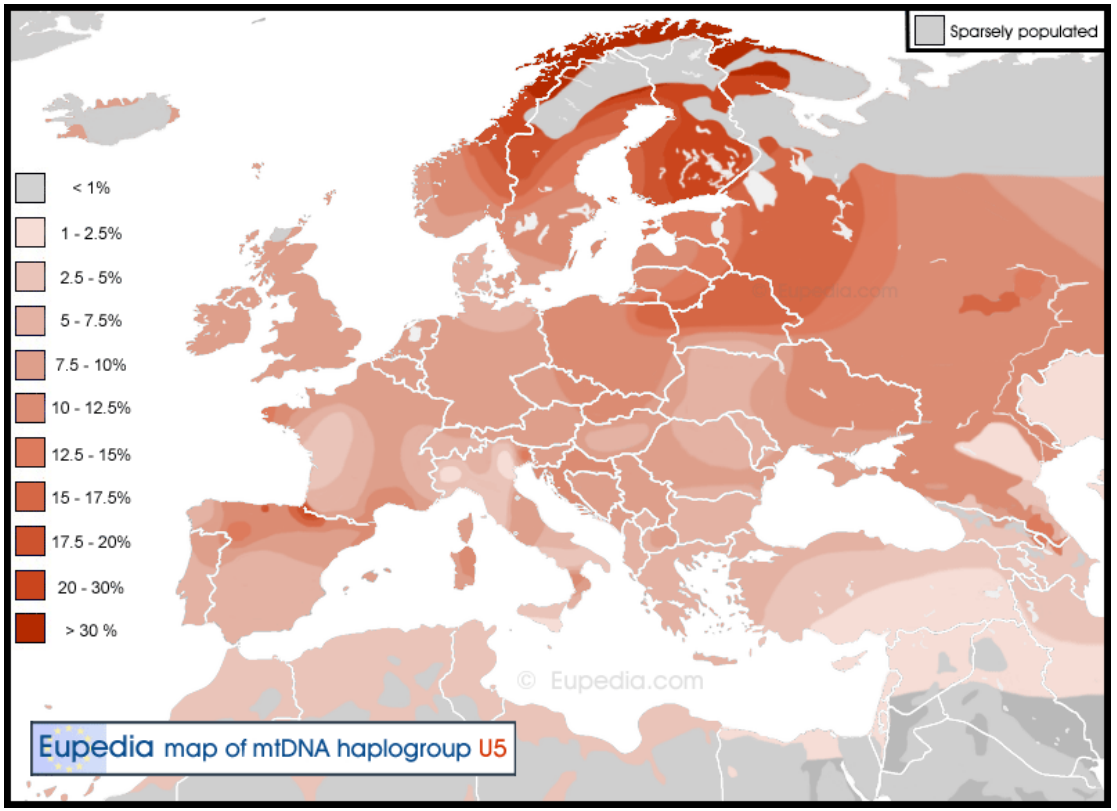
Note: U5b2c is not found in modern Lebanon or Syria, also not recorded in North Africa

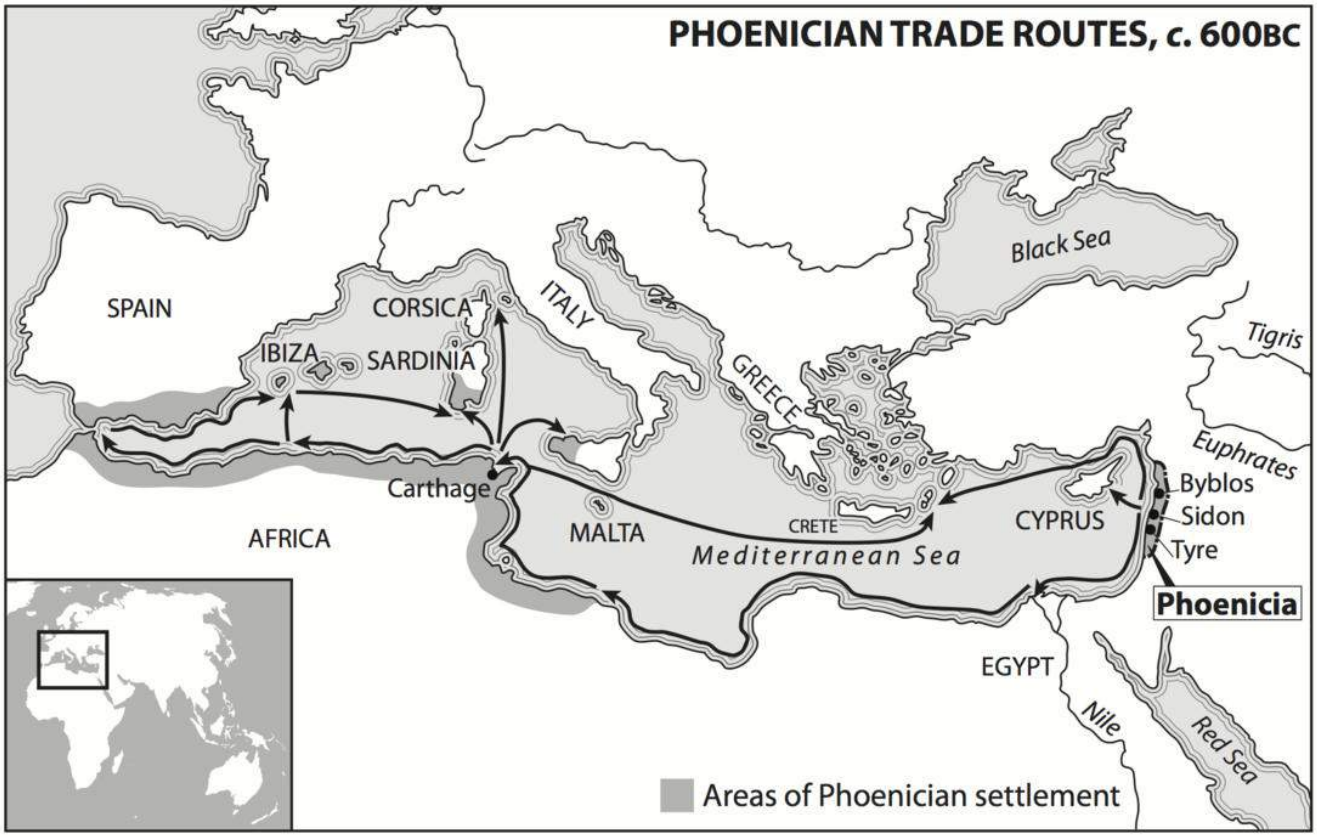
Ariche

Fig 5. A maximum likelihood (ML) tree for the ancient Phoenician (KT760574) and other publicly available U5b2c sequences. All samples other than our Phoenician and the La Braña sample are from modern populations. Each node is annotated with the GenBank accession number or sample identification (e.g. Z2478 from [33]), source or author if published, and the origin of the sample if recorded [33, 38–42].

Pre-Neolithic period (N=23)






PHOENICIAN TRADE ROUTES, c. 600BC
SPAIN
CORSICA
IBIZA
SARDINIA
ITALY
GREECE
Black Sea
Tigris
Euphrates
Carthage
AFRICA
MALTA
CRETE
Mediterranean Sea
CYPRUS
Byblos
Sidon
Tyre
Phoenicia
EGYPT
Nile
Red Sea
Areas of Phoenician settlement

PLOS ONE

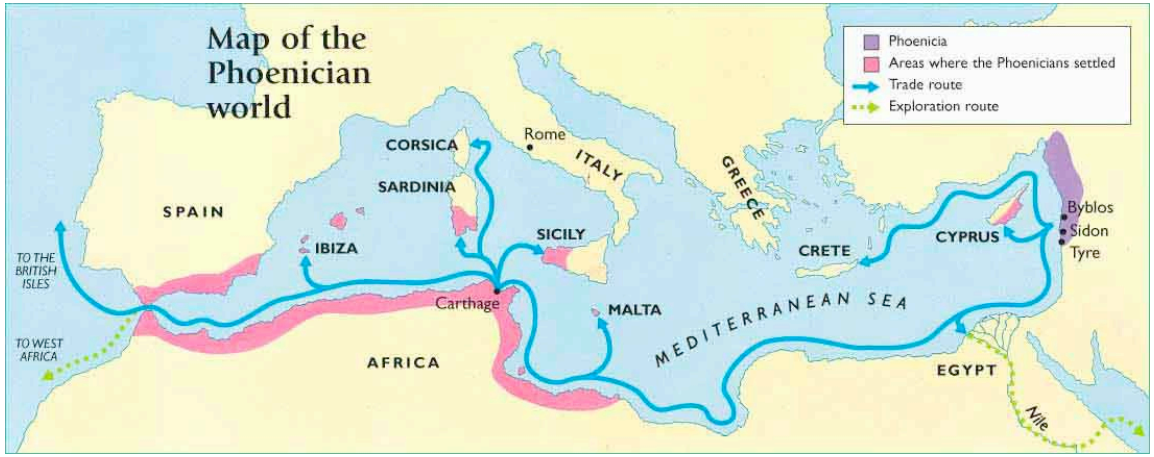
RESEARCH ARTICLE

A European Mitochondrial Haplotype Identified in Ancient Phoenician Remains from Carthage, North Africa

Elizabeth A. Matisoo-Smith[1]*, Anna L. Gosling[1,2], James Boocock[2], Olga Kardailsky[1], Yara Kurumilian[3], Sihem Roudesli-Chebbi[4], Leila Badre[5], Jean-Paul Morel[6], Leïla Ladjimi Sebaï[4], Pierre A. Zalloua[3]*

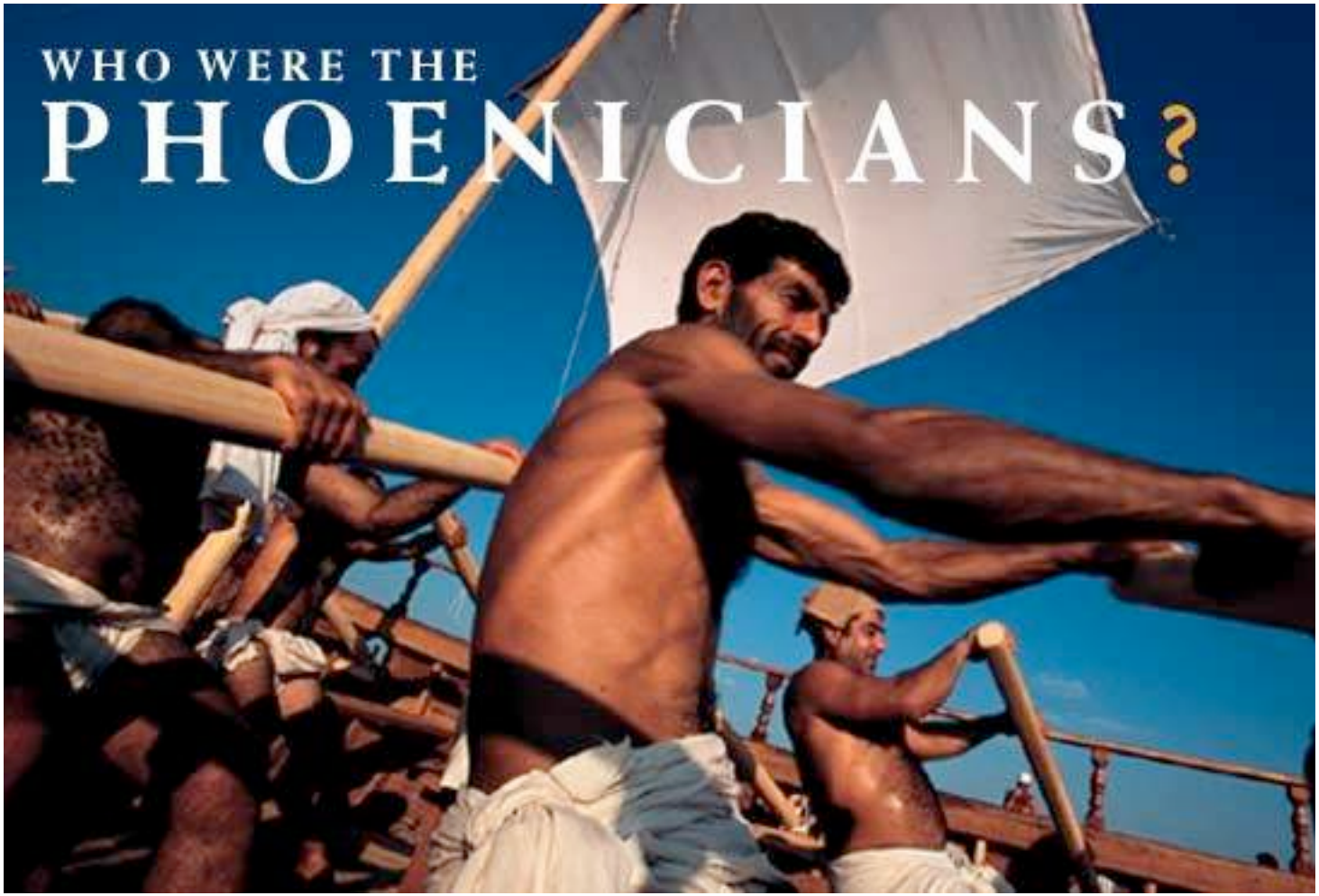
1 Department of Anatomy and Allan Wilson Centre, University of Otago, Dunedin, New Zealand, **2** Department of Biochemistry, University of Otago, Dunedin, New Zealand, **3** School of Medicine, Lebanese American University, Byblos, Lebanon, **4** National Heritage Institute, Tunis, Tunisia, **5** Archaeological Museum, American University of Beirut, Beirut, Lebanon, **6** Université d'Aix-Marseille, Centre Camille Jullian, Aix-en-Provence, France

* matisoo-smith@otago.ac.nz (EAM-S); pierre.zalloua@lau.edu.lb (PAZ)



Most recent results:
Phoenician & Punic aDNA samples from Beirut, Southern Sardinia and Ibiza
n=22

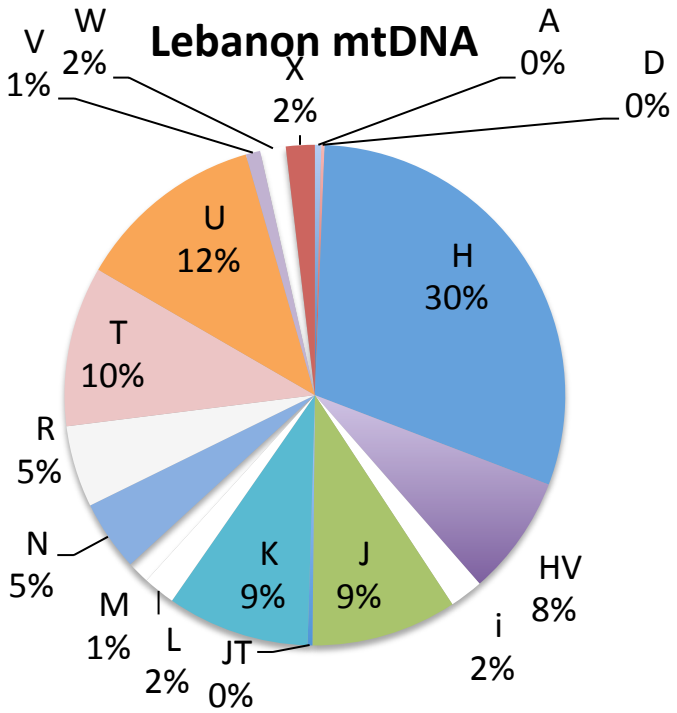
SampleID	Range	Haplogroup	Location	Site Info	Coverage	Mean DP
MS10560	56-16549 ;	T2b3+151	Beirut	Bey197 Cont	99.95	10.2921721
MS10562	56-16549 ;	H	Beirut	Bey198 Cxt 5	97.39	4.84694309
MS10564	56-16549 ;	H1c	Beirut	Bey198 Cxt6	100	45.4333394
MS10565	56-16549 ;	R0a2n	Beirut	Bey198 Cxt 5	99.6	8.56171163
MS10575	56-16549 ;	H34	Beirut	FAD10 290/3	100	19.4285714
MS10577	56-16549 ;	H5d	Sardinia	Sample num	100	66.6108999
MS10578	56-16549 ;	N1b1a5	Sardinia	Sample num	98.13	5.75436055
MS10579	56-16549 ;	J1c+16261+1	Sardinia	Sample num	99.96	10.1564971
MS10580	56-16549 ;	J1c+16261+1	Sardinia	Sample num	100	118.34649
MS10581	56-16549 ;	W5	Sardinia	Sample num	100	127.103446
MS10582	56-16549 ;	H3	Sardinia	Sample num	100	359.896675
MS10584	56-16549 ;	H+16311	Sardinia	Sample num	100	1225.79142
MS10585	56-16549 ;	H1e1a6	Sardinia	Sample num	100	42.4732331
MS10587	56-16549 ;	X2b+226	Sardinia	Sample num	100	21.848633
MS10588	56-16549 ;	H1bn	Sardinia	Sample num	96.78	4.93041222
MS10612	56-16549 ;	H3+152	Ibiza	Sample 3 Cal	100	59.3320056
MS10613	56-16549 ;	U4a	Ibiza	Sample 4 Cal	99.26	7.30647595
MS10614	56-16549 ;	T2b	Ibiza	Sample 5 Ma	100	399.036091

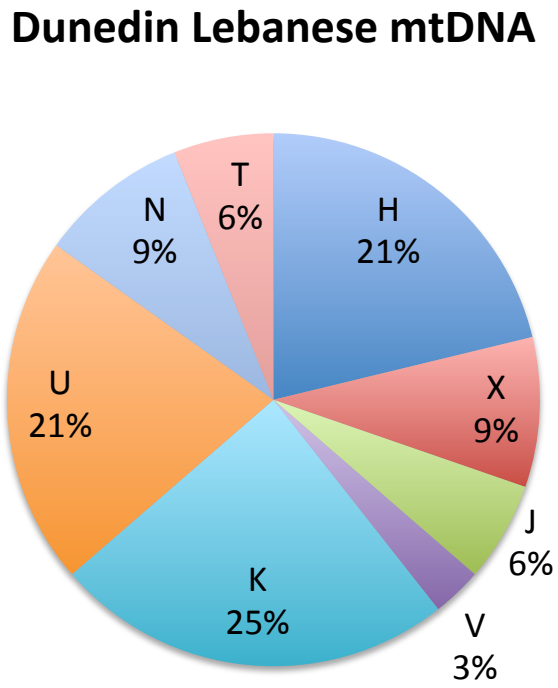

WHO WERE THE
PHOENICIANS?

From Africa to Aotearoa (via Lebanon)

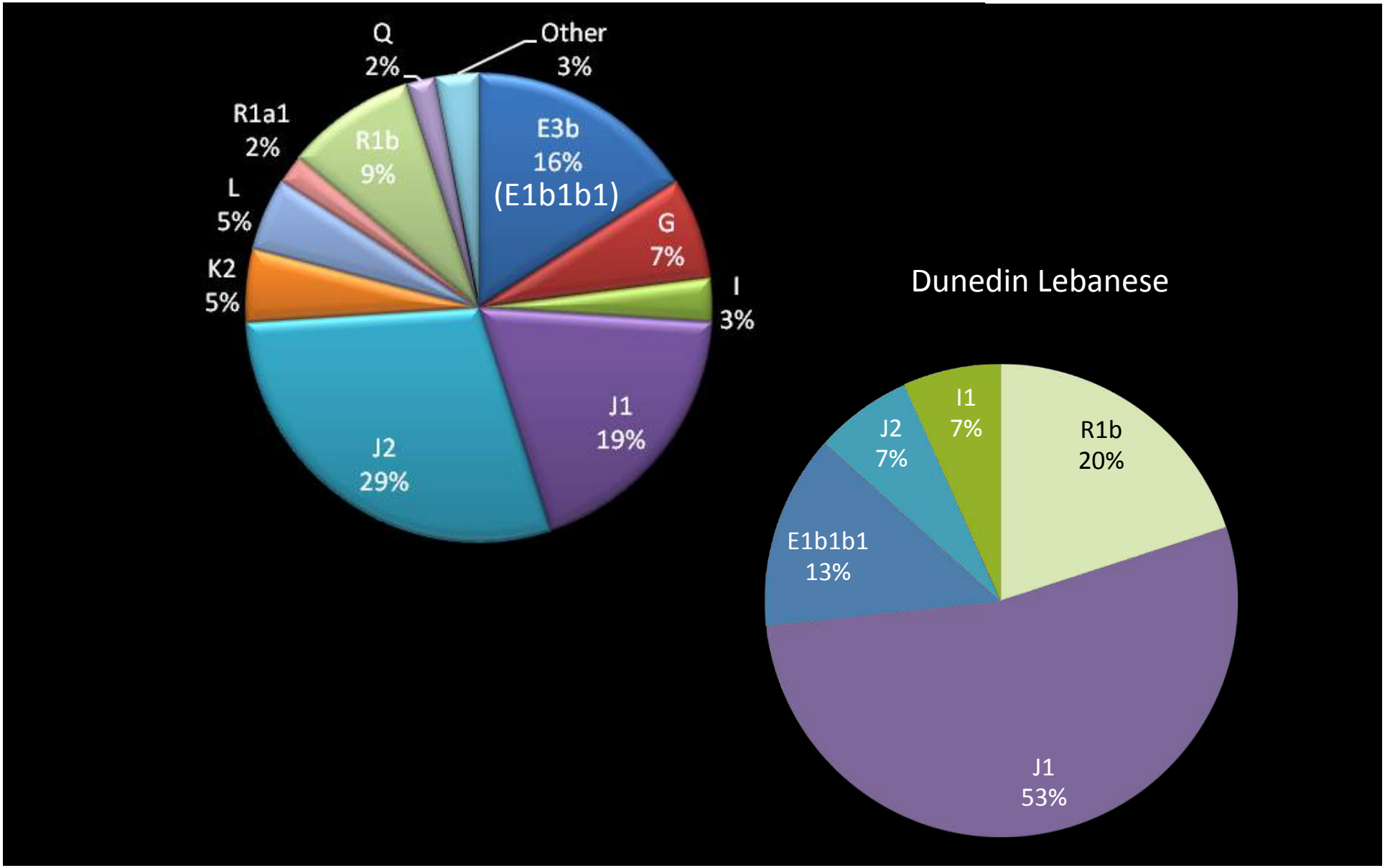
The bridal party of Gabriel Farry and Jamelie Coory
http://www.teara.govt.nz/en/photograph/2009/wedding-party

http://www.teara.govt.nz/en/photograph/
2005/the-lebanese-in-dunedin


Lebanon mtDNA
H 30%
HV 8%
i 2%
J 9%
K 9%
JT 0%
L 2%
M 1%
N 5%
R 5%
T 10%
U 12%
V 1%
W 2%
X 2%
A 0%
D 0%


Dunedin Lebanese mtDNA
H 21%
X 9%
J 6%
V 3%
K 25%
U 21%
N 9%
T 6%

The Levant Y chromosomes



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James Cook Fellowship Administered by