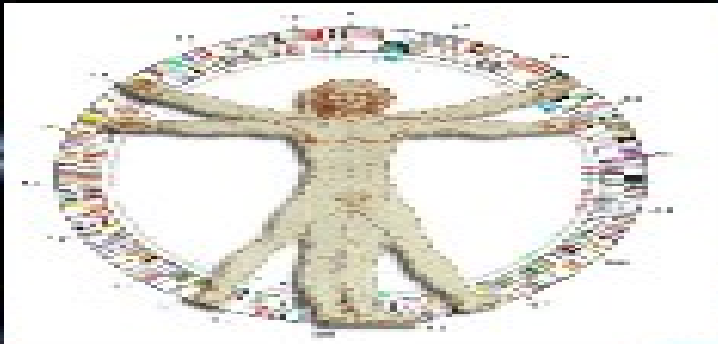


ATHENS
SCIENCE
FESTIVAL

#asf



Τα ίχνη του DNA φωτίζουν το παρελθόν

Δρ. Χρήστος Γιαπιτζάκης, DMD, BS, MS, PhD



Επίκουρος Καθηγητής Βιολογίας-Νευρογενετικής

Α΄ Παιδιατρική Κλινική, Ιατρική Σχολή
Εθνικό Καποδιστριακό Πανεπιστήμιο Αθηνών
Νοσοκομείο Παιδων “Αγία Σοφία”, Αθήνα

Διευθυντής

Κέντρο “Κεφαλογενετική”, Αθήνα





Τα ίχνη του DNA φωτίζουν το παρελθόν



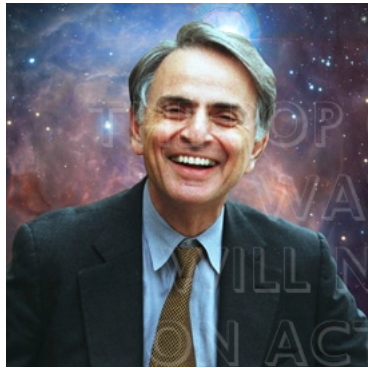
- Ποια είναι η θέση του ανθρώπου στην Ιστορία του Σύμπαντος;
- Ποια ήταν τα σημαντικότερα βήματα της ανθρωπότητας προς την κατεύθυνση της κατανόησης της φύσης της;
- Τι ιδιαίτερες ιδιότητες έχει το “μόριο της ζωής” DNA;
- Τι είναι οι γενετικοί δείκτες του DNA;
- Ποια είναι η σχέση του σύγχρονου ανθρώπου με άλλα συγγενικά είδη (πχ με τους Νεάντερταλ);
- Πώς οι μετακινήσεις των ανθρώπων επηρέασαν την γενετική των πληθυσμών;
- Πώς μελετούνται οι αρχαίες επιδημίες;
- Ποιοι μύθοι καταρρίπτονται από την μελέτη του DNA;





Η Ιστορία ως τώρα

Τηλεοπτική σειρά
“Cosmos” (ΗΠΑ)
(13.8 δισ. Έτη/1 Έτος)



Carl Sagan



Neil deGrasse Tyson

January	February	March	April	May	June	July	August	September	October	November
										
New Year's Day: The Big Bang		Milky Way forms			Sun and planets form		Oldest known life (single celled).		First multi-cellular organisms	
December										
1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31		
Cambrian Explosion (burst of new life forms)		Emergence of first vertebrates		Early land plants		First four-limbed animals		Variety of insects begin to flourish		
		First dinosaurs appear		First mammalian ancestors appear		First known birds				
Dinosaurs wiped out by asteroid or comet				10:15am Apes appear		9:24pm First human ancestors to walk upright		10:48pm Homo erectus appears		
						11:54pm Anatomically modern humans appear		11:59:45pm Invention of writing		
						11:59:50pm Pyramids built in Egypt		1 second before midnight: Voyage of Christopher Columbus		



Η Ιστορία ως τώρα

The Cosmic Calendar

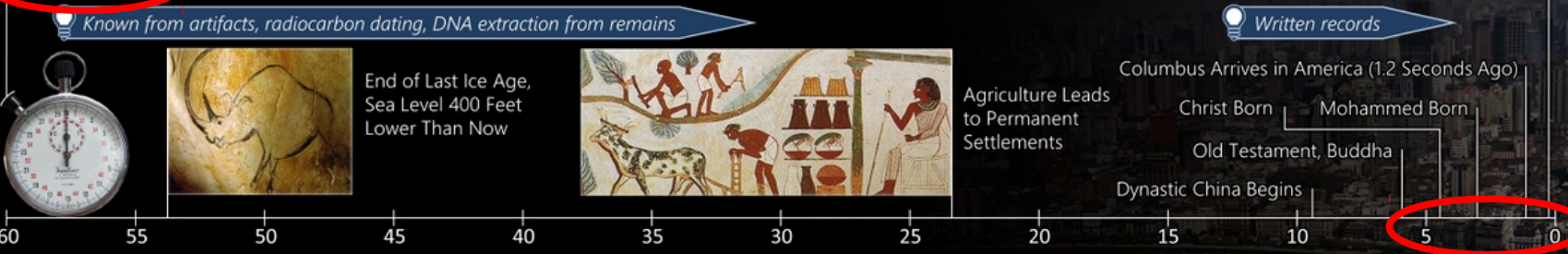
The 13.8 billion year history of the universe scaled down to a single year, where the Big Bang is January 1st at midnight, and right now is midnight 1 year later

January	February	March	April	May	June	July	August	September	October	November	December		
Known from telescopes looking back in time, physical models					Known from geologic record, fossils, genetic drift								
The Big Bang, Stars First Appear					Thin Disk of the Milky Way				The Solar System, Life		Oxygen from Photosynthesis	Eukaryotic Cells	Multicellular Life

The Month of December...

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15 Trace Fossils Only		16		17 Bones and Shells		18 Vertebrates		19 Land Plants		20 Fish with Jaws		21 Insects	
22 Amphibians		23 Reptiles		24 Pangaea Forms		25 Dinosaurs		26 Mammals		27 Birds		28 Flowers	
29 Tyrannosaurids		30 Dinosaurs Extinct, Mammals Take Over on Land and in Sea		31 The Final Day...		Dawn: Apes and Monkeys Split		8 PM: Humans and Chimpanzees Split		9:25: Humans First Walk Upright		10:30: Human Brain Size Begins Tripling	
										11:52: Modern Humans Evolve		11:56 to 11:59: Human Migration	

The Final Minute... A human life only lasts for the blink of an eye on the Cosmic Calendar: $100 \text{ years} * 365 * 24 * 60 * 60 / 13,800,000,000 = 0.23 \text{ Cosmic Seconds}$



Ιστορικά Βήματα Κατανόησης της Φύσης



Θαλής (624-546 πΧ)

- Φιλοσοφία

Ιπποκράτης (460-377 πΧ)

- Ιατρική

Δημόκριτος (π460-π370 πΧ)

- Ατομική Φυσική

Αριστοτέλης (384-322 πΧ)

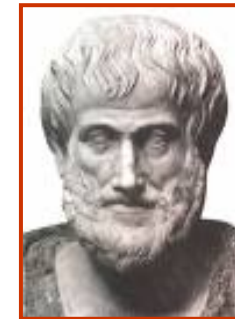
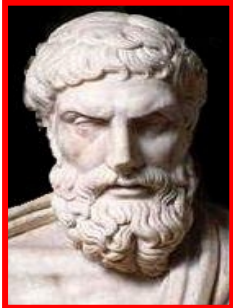
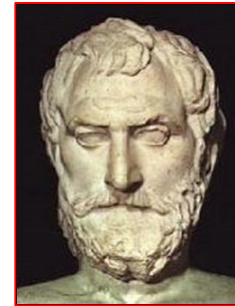
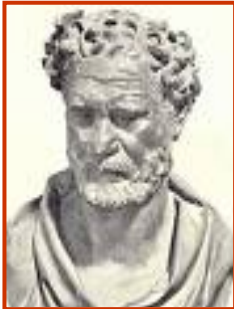
- Ζωολογία, Βιολογική Ηθική

Επίκουρος (341-270 πΧ)

- Χημεία, Γενετική, Εξέλιξη

Ασκληπιάδης ο Βιθυνός (124-40 πΧ)

- Μοριακή Ιατρική



Yarujakis C. Hippocrates the father of clinical medicine, Asclepiades the father of molecular medicine. *In Vivo* 23: 507-514, 2009.

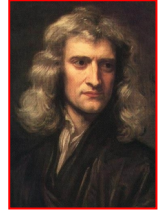
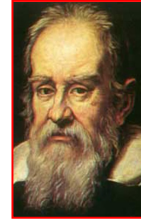
Yarujakis C. Ancestral Concepts of Human Genetics and Molecular Medicine in Epicurean Philosophy. In: *History of Human Genetics*, Petermann, Harper (Eds), Springer 2017

Ιστορικά Βήματα Κατανόησης της Φύσης



Αναγέννηση (1600-1700)

- Γαλιλαίος, Γκασσαντί, Λοκ, Νεύτων



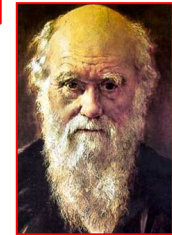
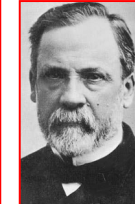
Διαφωτισμός (1700-1800)

- ΛαΜετρί, Ντιντερό, Λαβουαζιέ



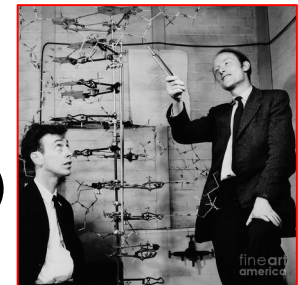
Αρχές Επιστήμης (1800-1900)

- Ντάλτον, Παστέρ, Μέντελ, Δαρβίνος

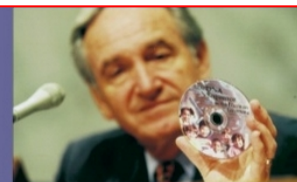


Ενηλικίωση Επιστήμης (1900-2000)

- Κβαντική Φυσική, Δομή DNA (Γουάτσον-Κρικ)
- Γενετική Ανθρώπου, Μοριακή Ιατρική
- Πρόγραμμα Ανθρώπινου Γονιδιώματος (“γνώθι σαυτόν”)
Σινσάιμερ, Πρύτανης University of California Santa Cruz (1985)



UCSC put the human genome sequence on CD in October 2000, with varying results..

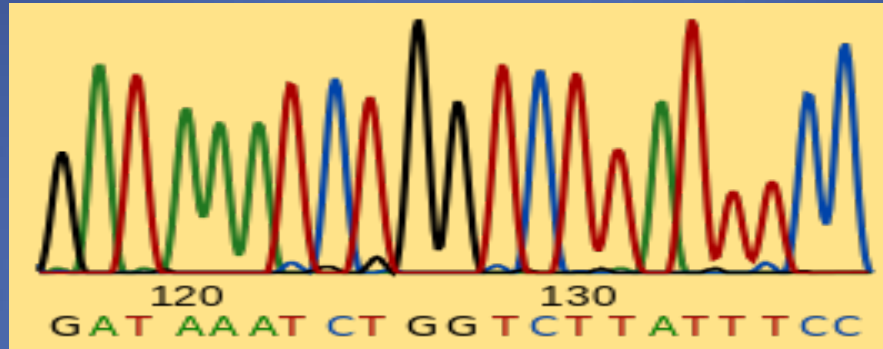


Sinsheimer R. **The Santa Cruz Workshop, May 1985**. *Genomics*. 5:954–956, 1989.
Harper PS. **A Short History of Medical Genetics**. Oxford University Press, 2008.

Μοριακή Βιολογία - Γενετική

DNA - Το μόριο της ζωής

1. Μεταφέρει πληροφορίες

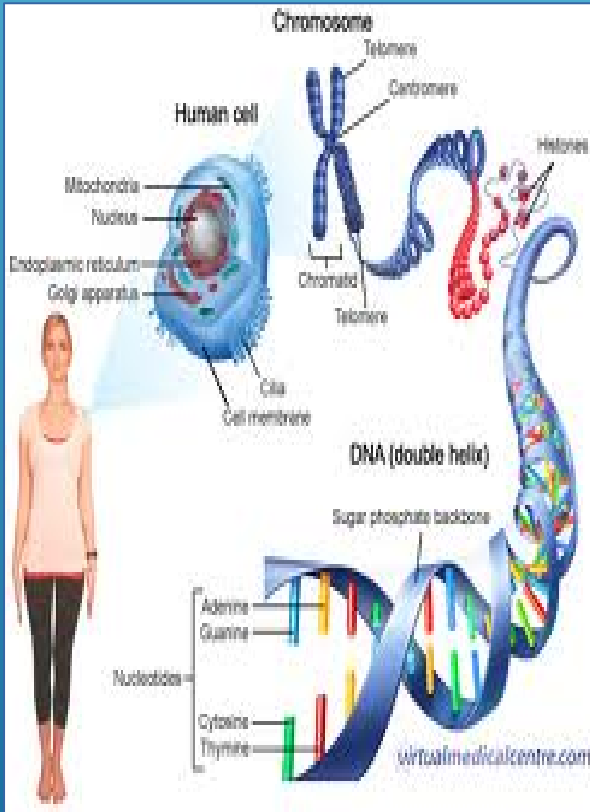


2. Αποκτά πανομοιότυπους απογόνους

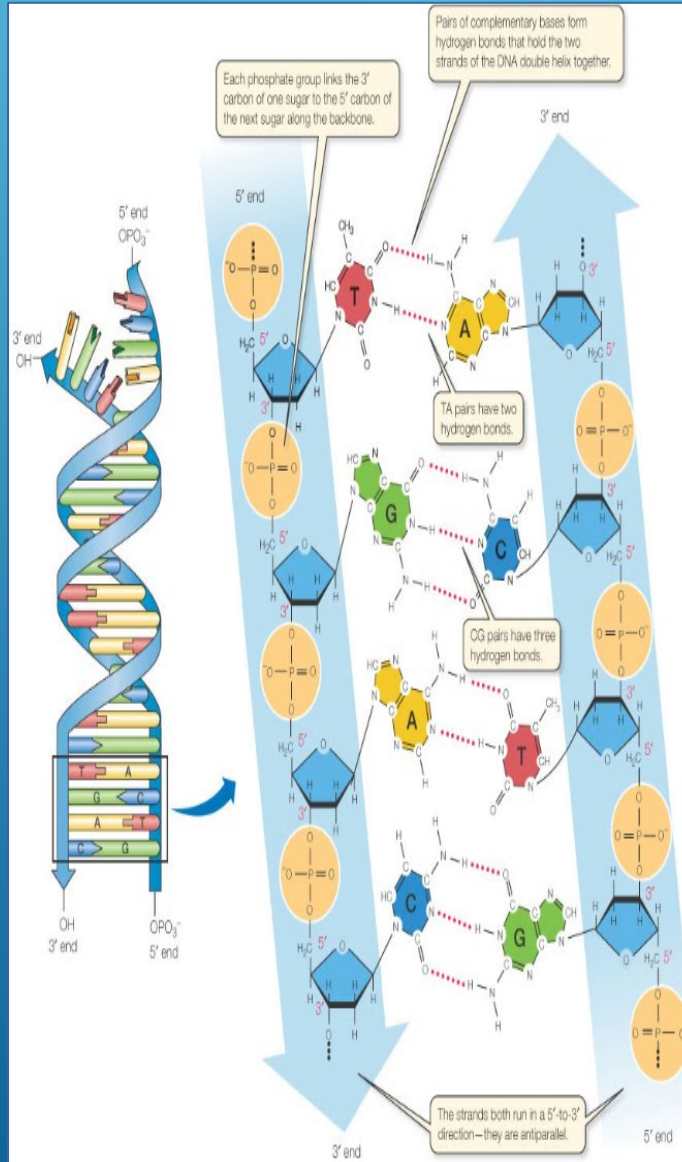




Μοριακή Βιολογία

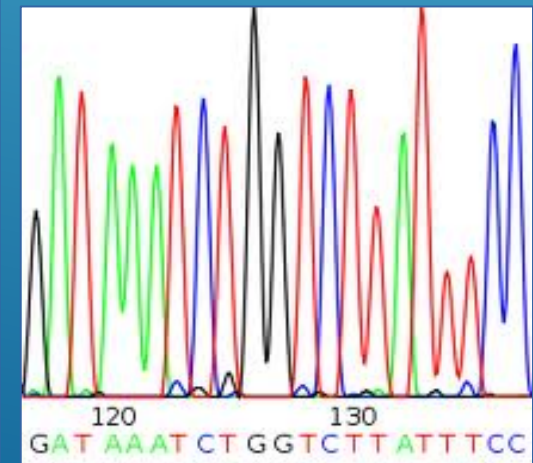


- 1 μόριο DNA περιελιγμένο σε 1 χρωμόσωμα
- Γενετικός Κώδικας (G,A,T,C)
- Ανάλυση αλληλουχίας DNA



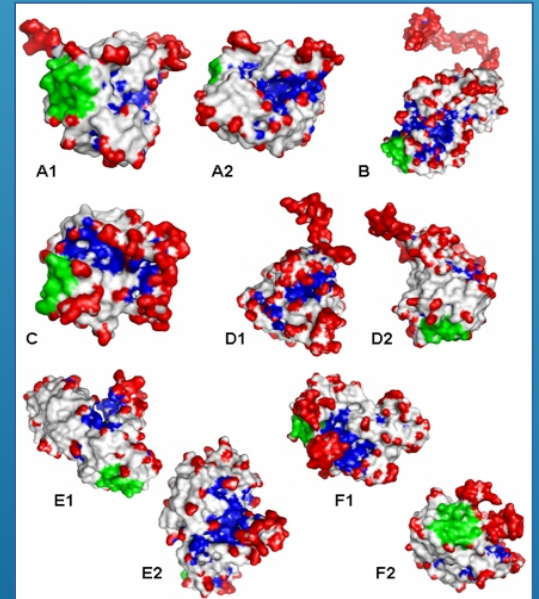
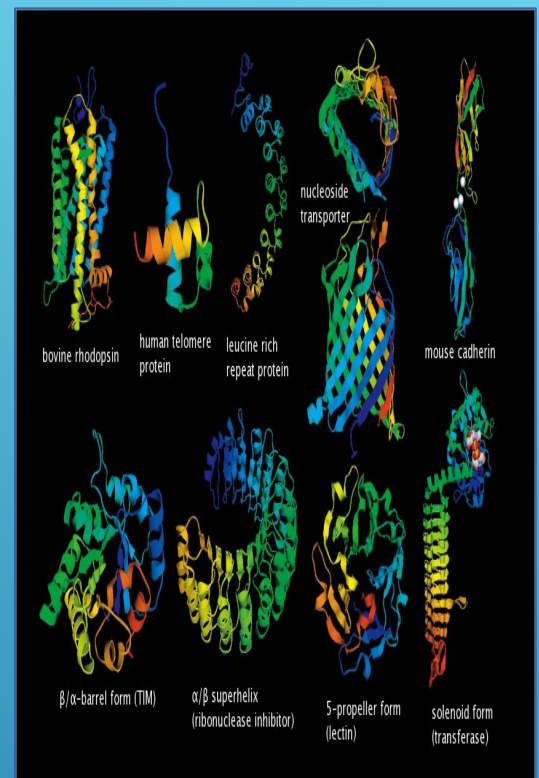
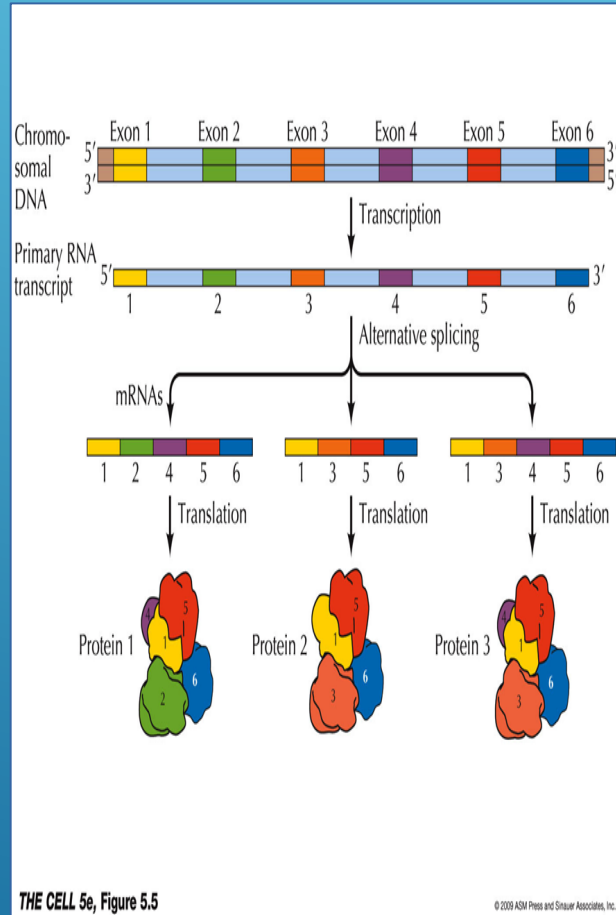
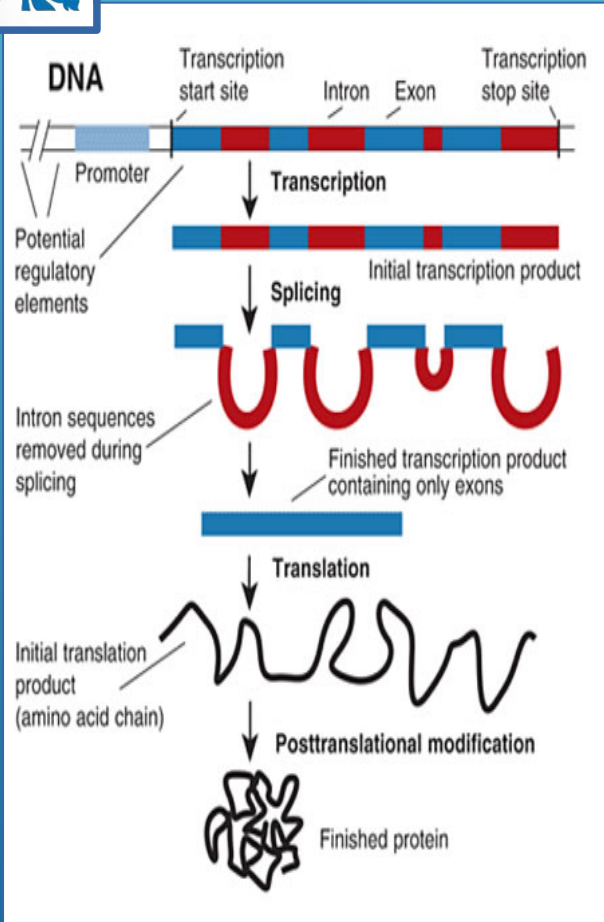
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241  TCCAAAGGA  GGCACACT  TTTTGAAT  TTTAGACAC  GCTGCACAA  AGCAGATTTA
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361  GAACCTGCA  AAGATCTA  AGATAAAAC  AACATTCAG  AACCAACT  ATTAAACT
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1141  GAGATAGT  TTTCTATG  TTTTCTAA  TATAGACA  AAATCTGA  AAAGTAGA
1201  ACTAGACA  CTAGAAAA  AATTTTCT  GAGCAACG  CTATATAT  TGAATATCT
1261  AAAACCA  TGAAGAAA  ATACTCTT  GTATCTAG  TGAACCAA  TATCTATG
1321  CATTAGTT  CAATATAG  ACTCTGAG  CCTTTGAA  GTGAGTGA  CAAATCTCC
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1441  GGAGCCCA  TCGAAAA  ACCCTATG  CATATCTT  CAGTGA  AAATTTCA
1501  GAAAGAC  TATAGACA  AGACAAA  AAGAGAG  ATTTCTAC  TTAGAAT
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Μοριακή Βιολογία

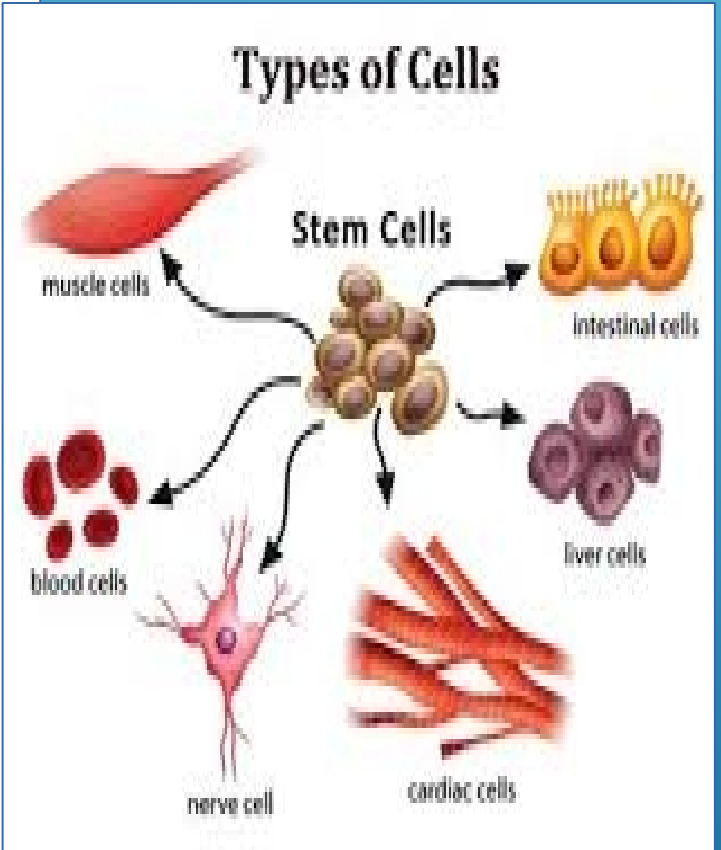
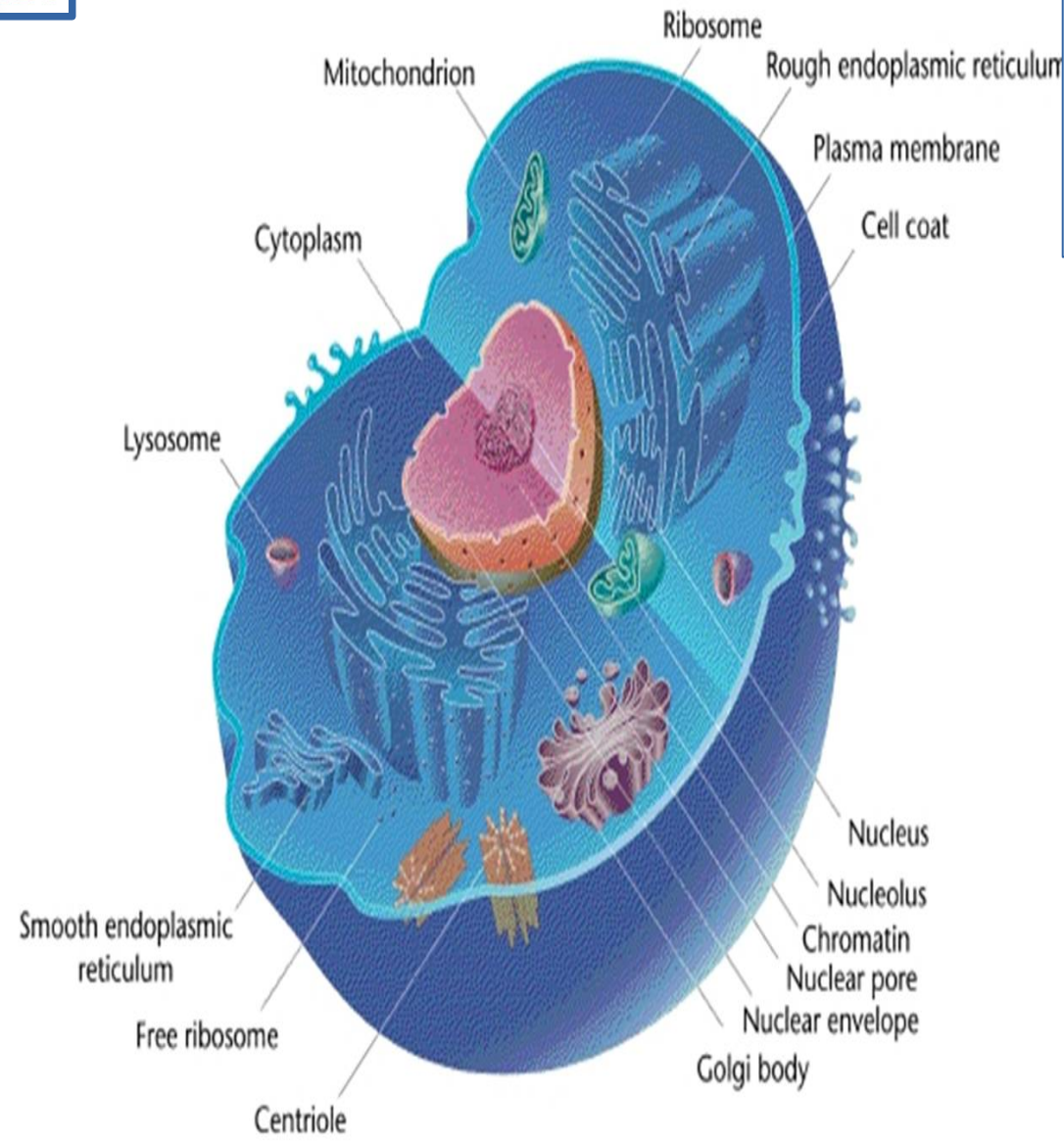


- Γονίδιο με κωδικοποιούσες περιοχές (εξόνια)
- Μεταγραφή mRNA - Αποκοπή ιντρονίων
- Μετάφραση σε Πρωτεΐνη (**ΔΟΜΗ=ΛΕΙΤΟΥΡΓΙΑ**)



Κυτταρική Βιολογία

- 37 τρισεκατομμύρια κύτταρα στο ανθρώπινο σώμα (Bianconi et al. *Ann Hum Biol* 2013)
- >200 τύποι κυττάρων (McCarthy, Enquist *Evol Ecol Res* 2005)





Γενετική Ανάλυση DNA

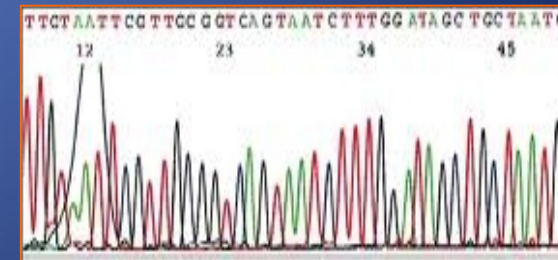
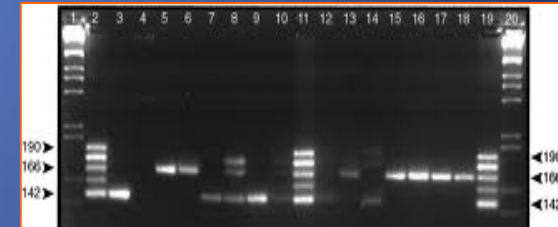
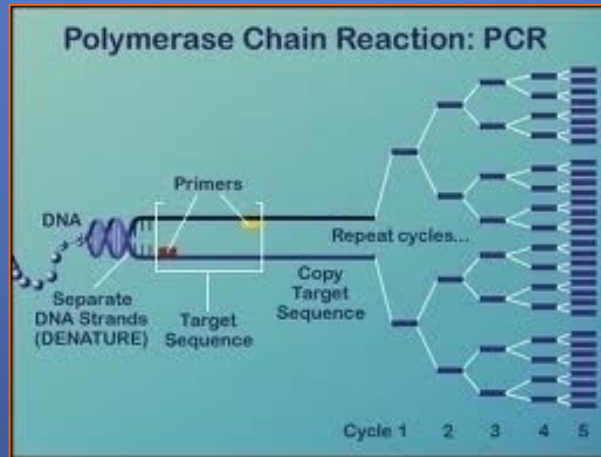
αίμα



σάλιο



βιοψία





Γενετική Ανάλυση Αρχαίου DNA

δείγμα μούμιας



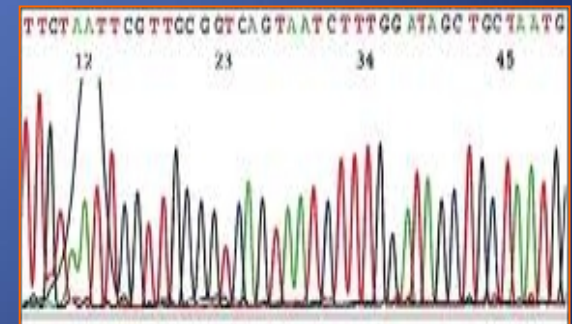
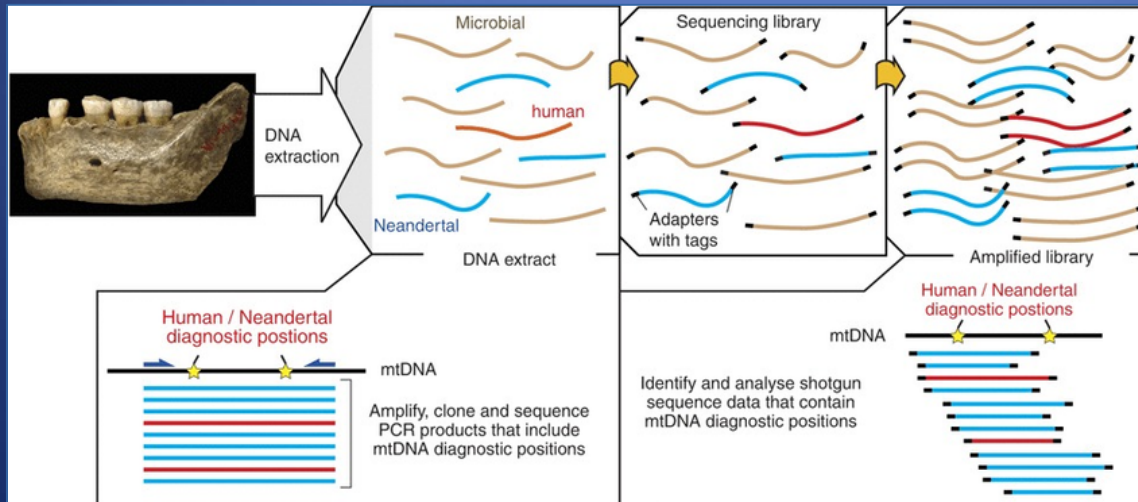
οστούν



δόντι



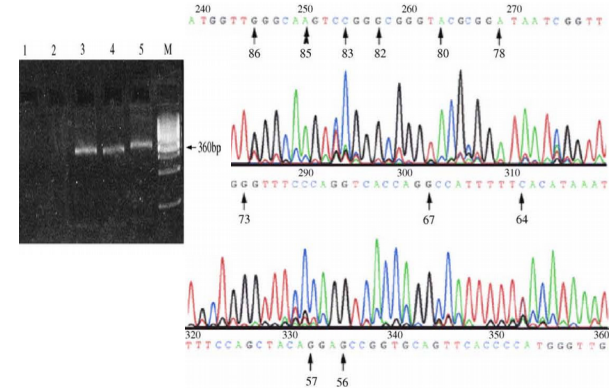
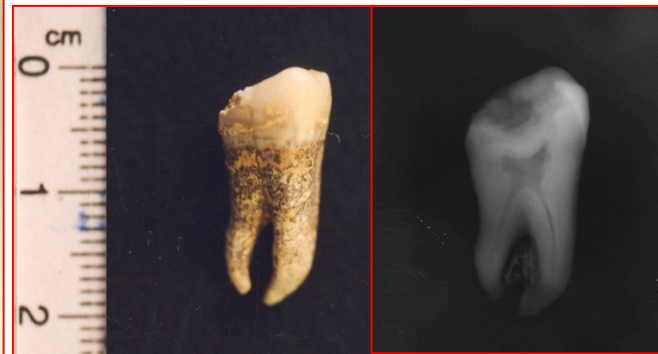
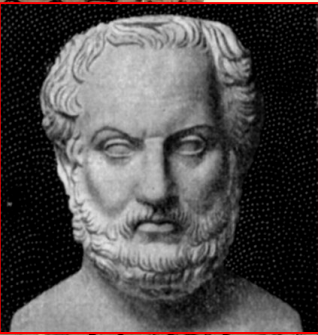
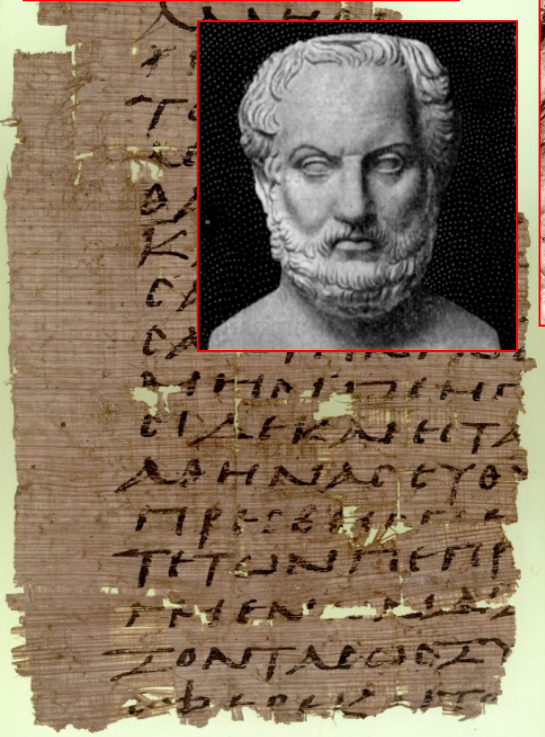
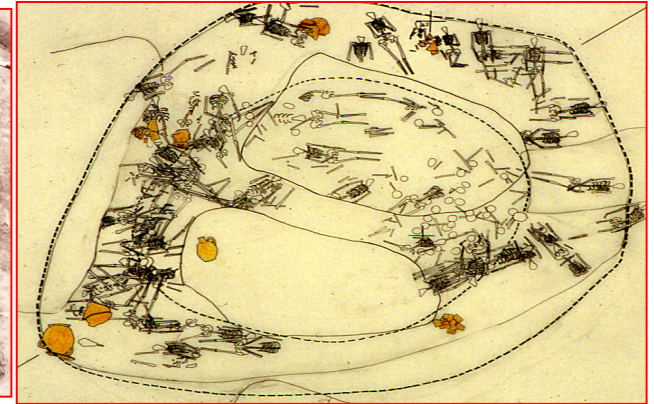
κεχριμπάρι





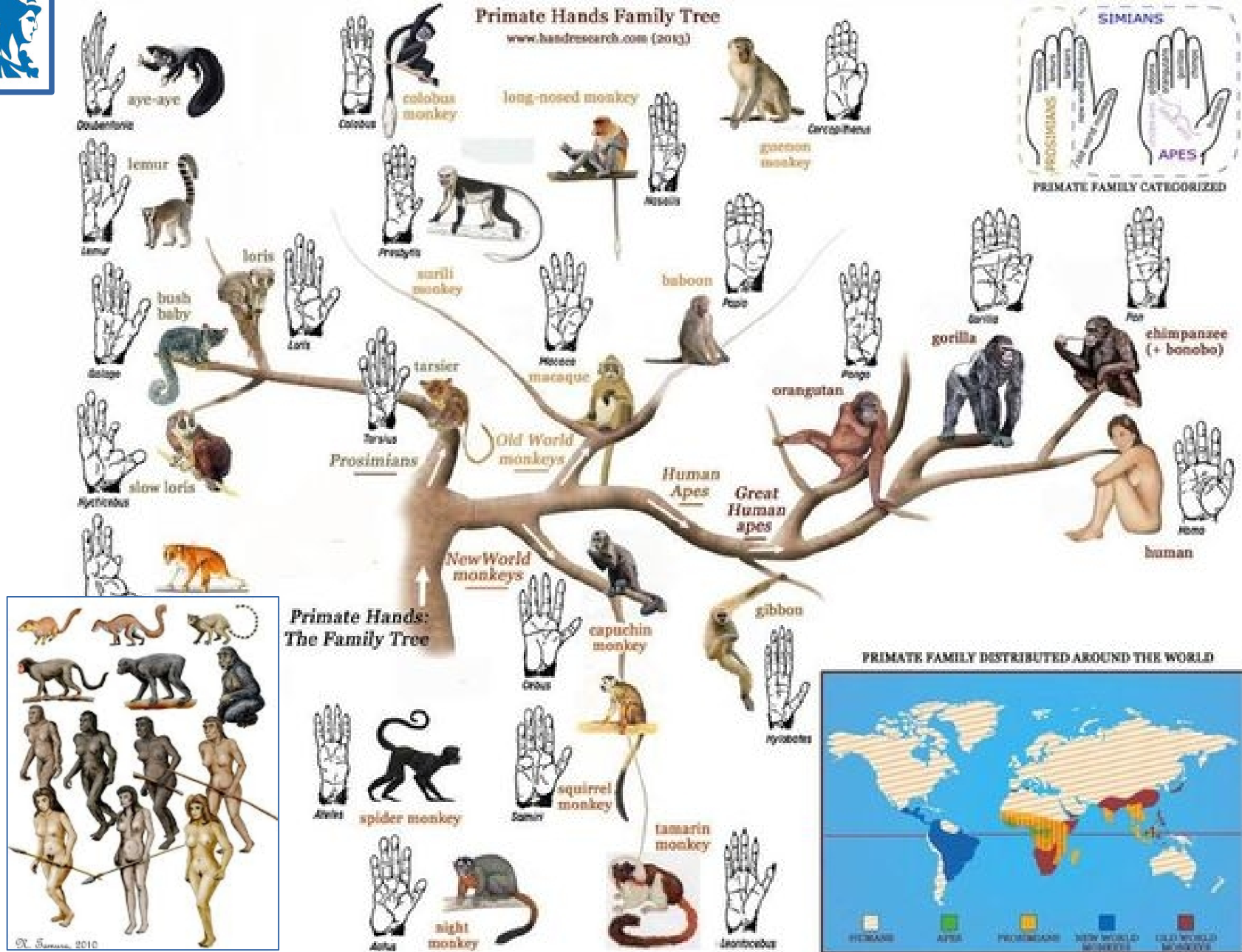
Αρχαίο DNA – Λοιμός των Αθηνών

Papagrigrorakis, Yapijakis, Synodinos, Baziotopoulou *Int J Infect Dis* 2006





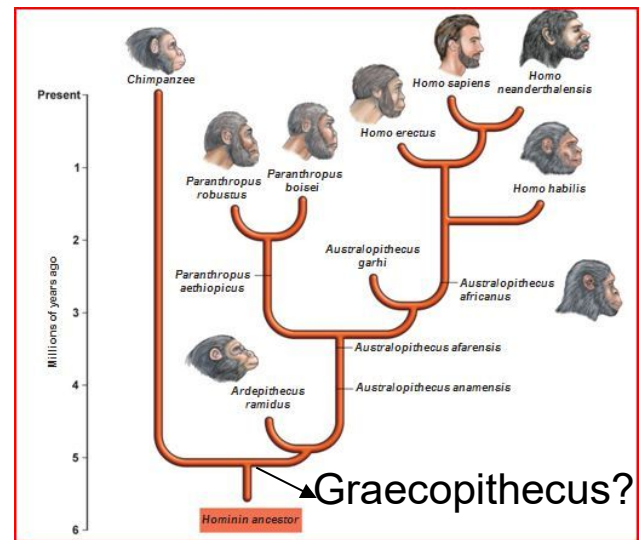
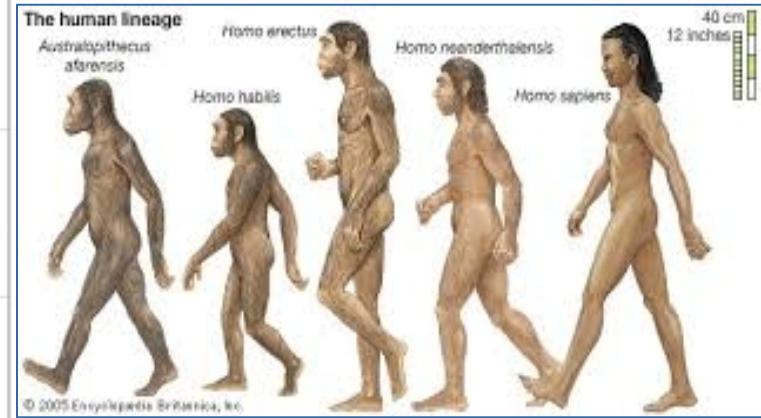
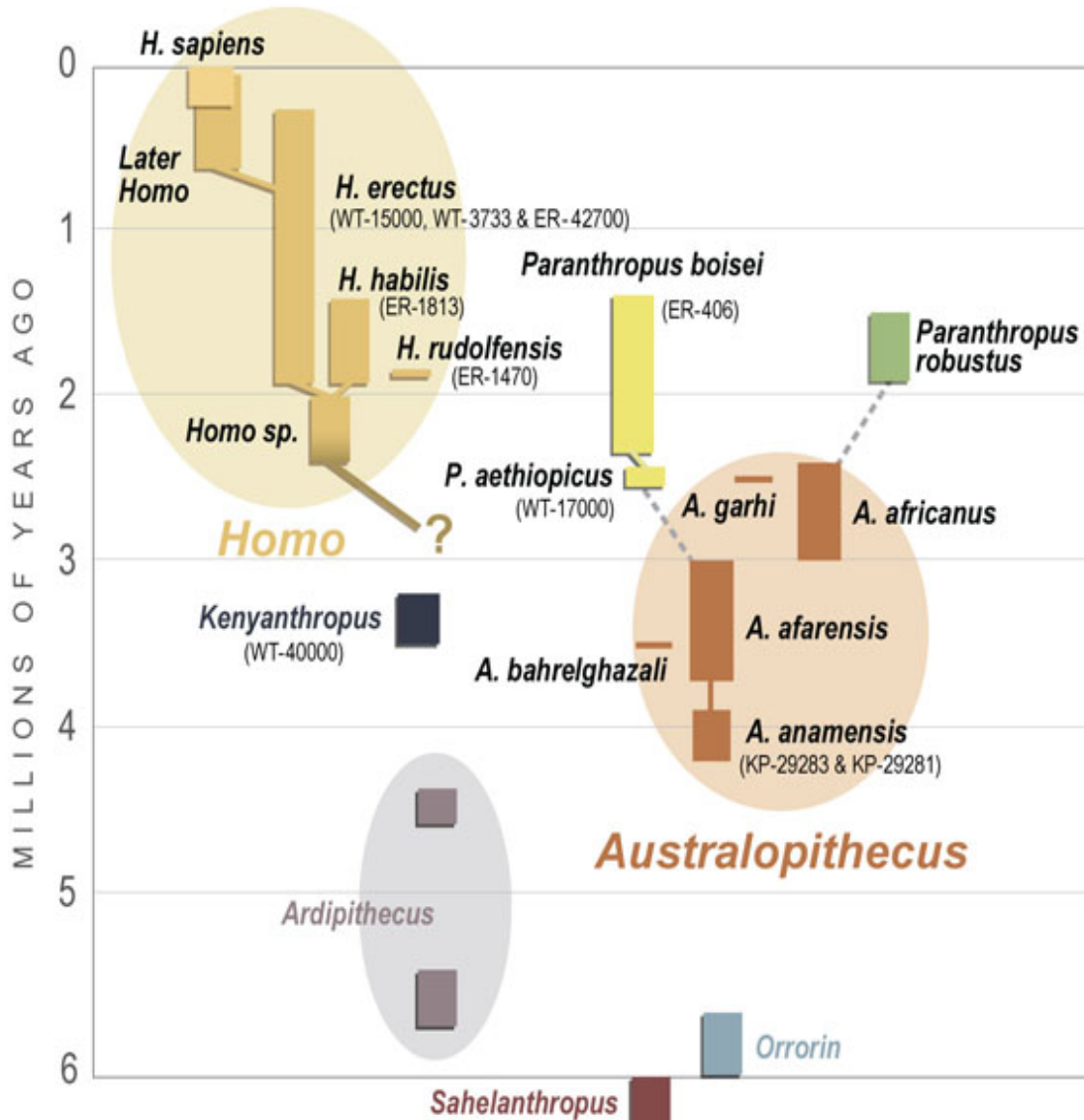
Πρωτεύοντα – Φυλογενετικό Δένδρο





Hominin Phylogeny

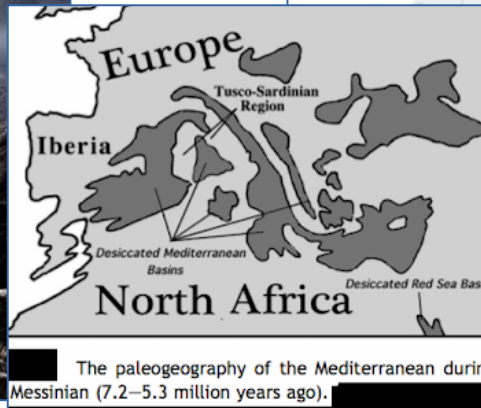
A Perspective View





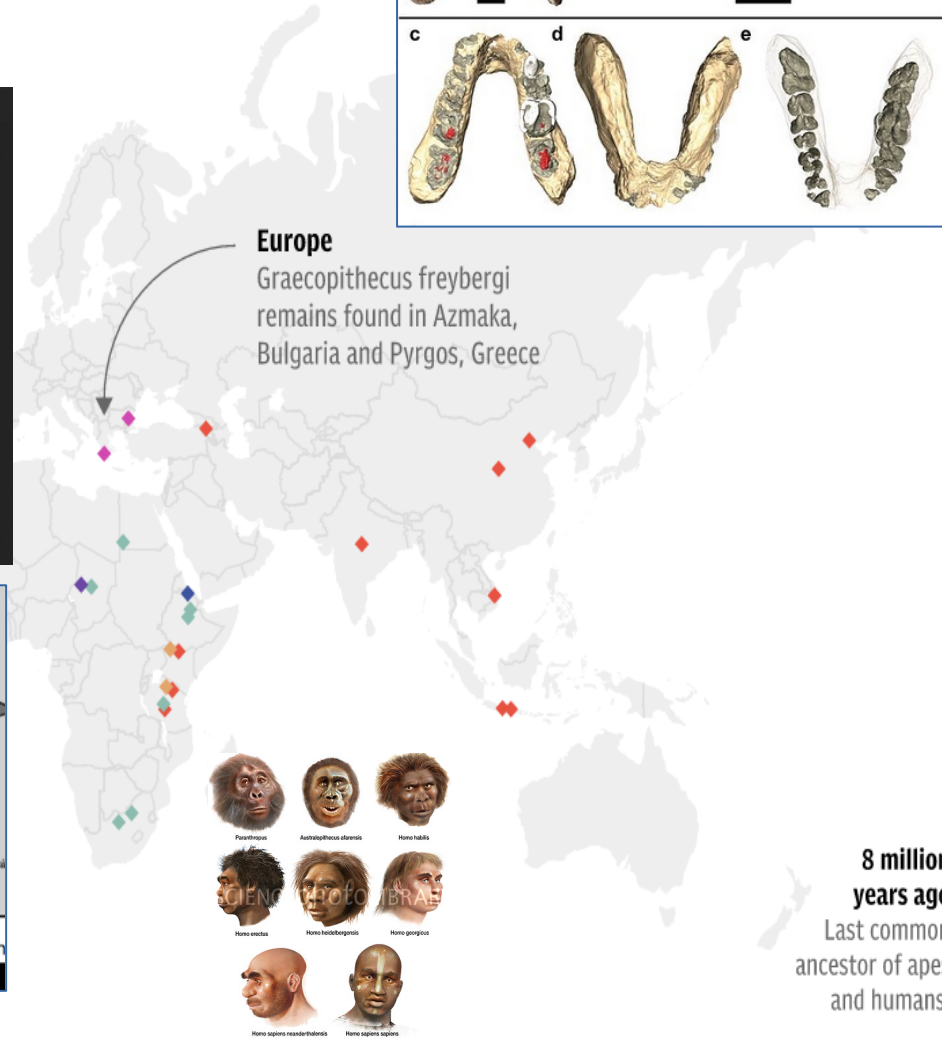
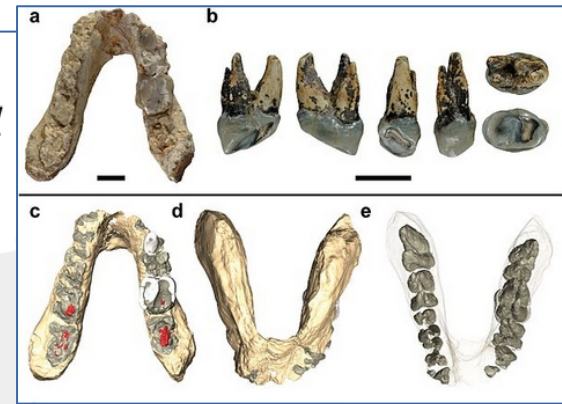
Graecopithecus

Πύργος Βασιλίσσης
Ίλιον



Human evolution

Where remains have been discovered



Now

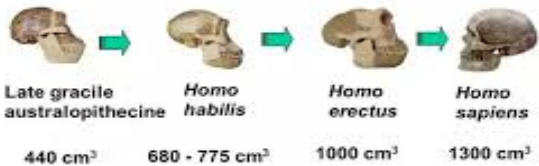


Fuss et al. PLOS 2017

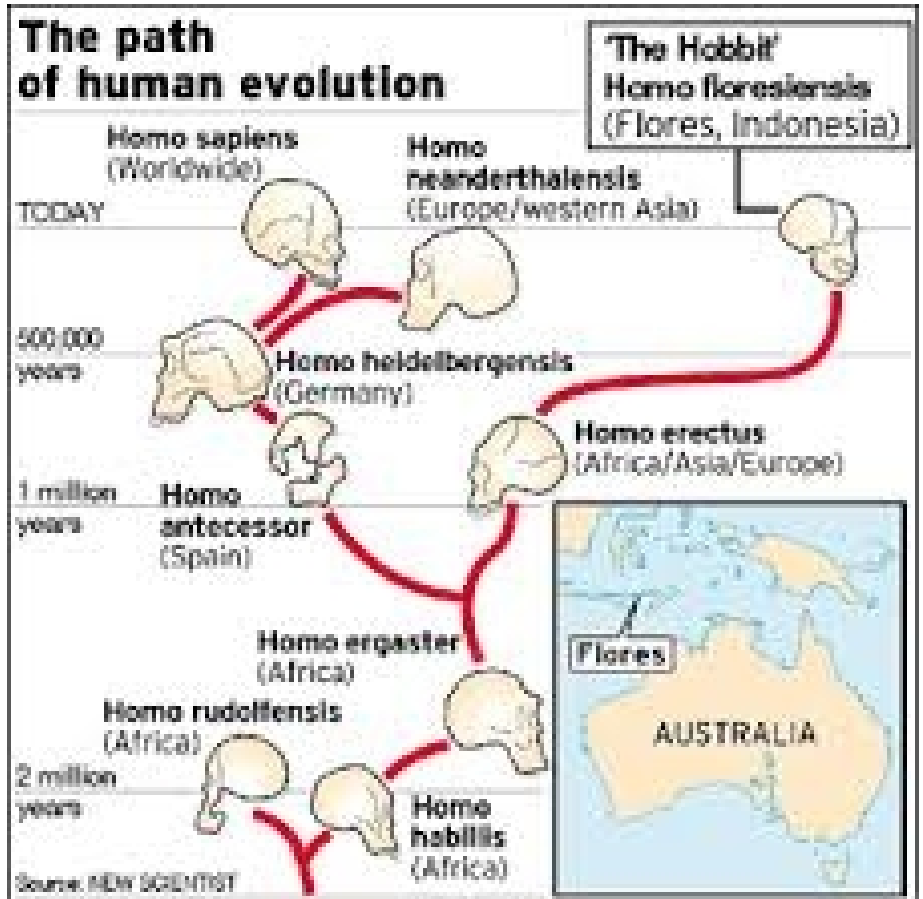
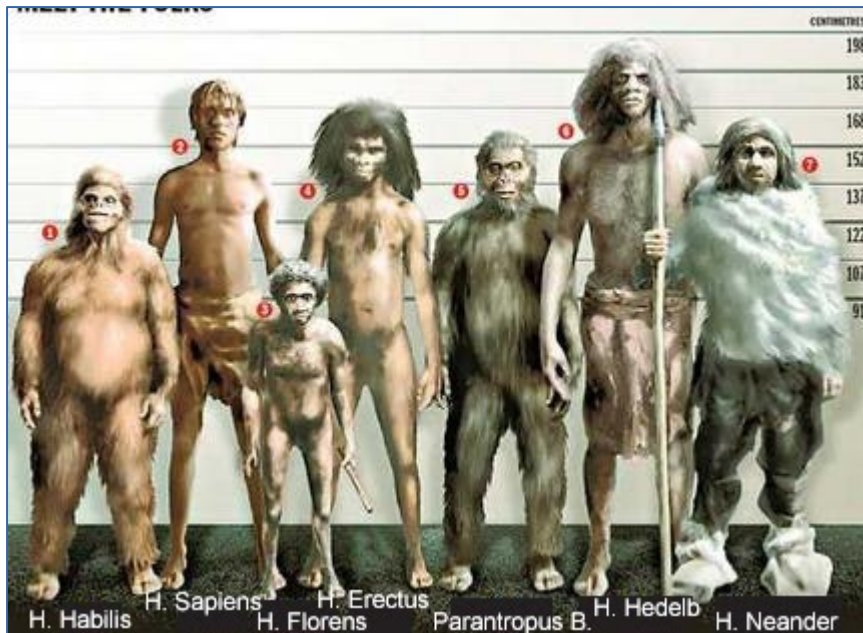
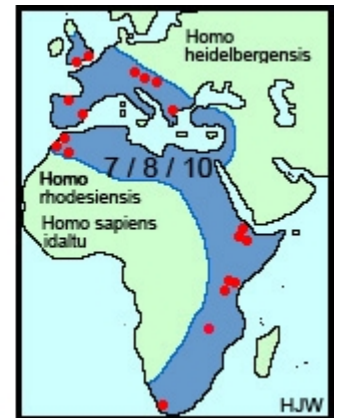
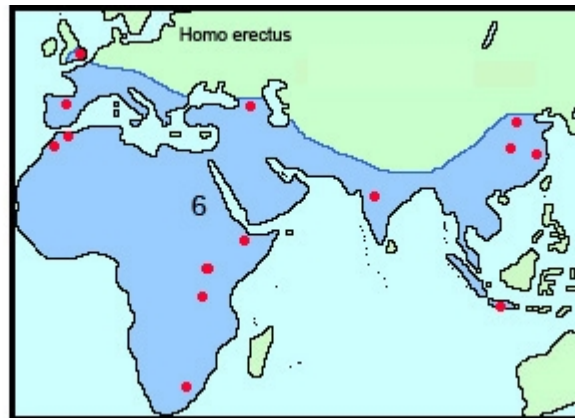


Slatkin, Racimo
PNAS 2016

Change in Brain Size



Increase in volume of the brain vault.





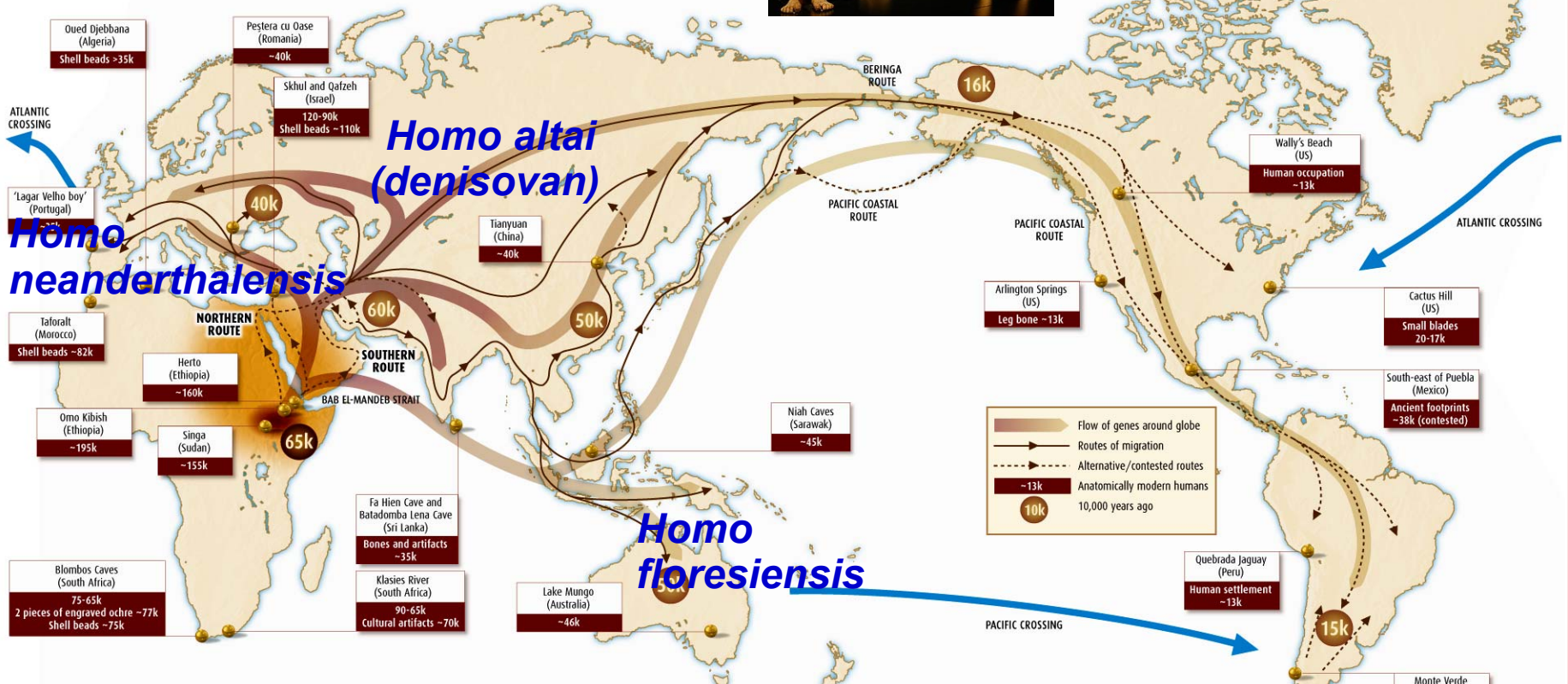
Homo sapiens

Slatkin, Racimo
PNAS 2016



THE MIGRATION OF ANATOMICALLY MODERN HUMANS

Evidence from fossils, ancient artefacts and genetic analyses combine to tell a compelling story



Two routes jump out as prime candidates for the human exodus out of Africa. A northern route would have taken our ancestors from their base in eastern sub-Saharan Africa across the Sahara desert, then through Sinai and into the Levant. An alternative southern route may have charted a path from Djibouti or Eritrea in the Horn of Africa across the Bab el-Mandeb strait and into Yemen and around the Arabian peninsula. The plausibility of these two routes as gateways out of Africa has been studied as part of the UK's Natural Environment Research Council's

programme "Environmental Factors in the Chronology of Human Evolution & Dispersal" (EFCHED). During the last ice age, from about 80,000 to 11,000 years ago, sea levels dropped as the ice sheets grew, exposing large swathes of land now submerged under water and connecting regions now separated by the sea. By reconstructing ancient shorelines, the EFCHED team found that the Bab el-Mandeb strait, now around 30 kilometres wide and one of the world's busiest shipping lanes, was then a narrow, shallow channel.

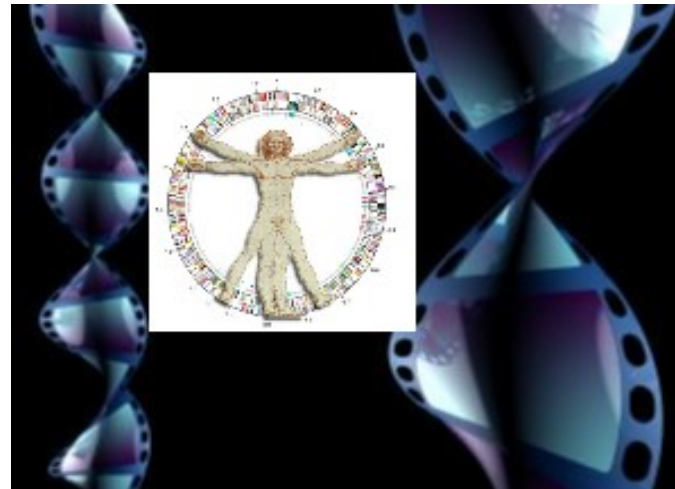
Early humans may have taken this southern route out of Africa. The northern route appears easier, especially given the team's finding that the Suez basin was dry during the last ice age. But crossing the Sahara desert is no small matter. EFCHED scientist Simon Armitage of the Royal Holloway University of London has found some clues as to how this might have been possible. During the past 150,000 years, North Africa has experienced abrupt switches between dry, arid conditions and a humid climate. During the longer wetter periods huge lakes existed in both Chad and Libya, which would have

provided a "humid corridor" across the Sahara. Armitage has discovered that these lakes were present around 10,000 years ago, when there is abundant evidence for human occupation of the Sahara, as well as around 115,000 years ago, when our ancestors first made forays into Israel. It is unknown whether another humid corridor appeared between about 65,000 and 50,000 years ago, the most likely time frame for the human exodus. Moreover, accumulating evidence is pointing to the southern route as the most likely jumping-off point.



Γενετική Ποικιλομορφία

- Φάσμα γονοτύπων
- Πλούσια κληρονομιά





DNA Ανθρώπου

99.9% ίδιο DNA
0.1% διαφορετικό

Μεταλλαγές

Πολυμορφισμοί DNA
(Μονοκλεοτιδιακοί SNPs
90% γενετικών παραλλαγών)

Διαφορές με Νεάντερταλ

- 99.5% ίδιο DNA
- 0.8-1.6% γονίδια στους *H.s.*

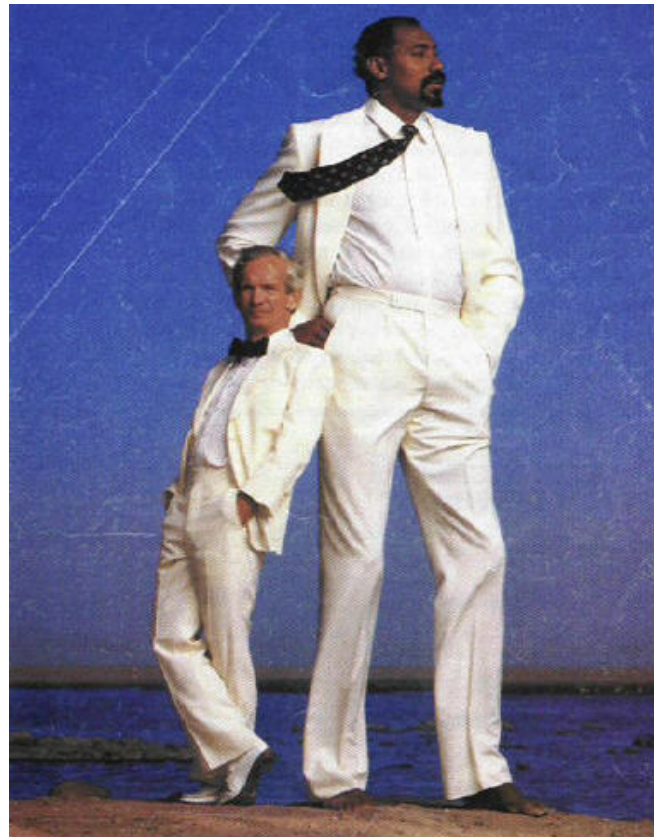
Διαφορές με χιμπατζή

- 99% ίδιο DNA
- 200 γονίδια (ΚΝΣ)

Ιστορία

GATTTAGATC**G**CGATAGAG

GATTTAGATC**T**CGATAGAG



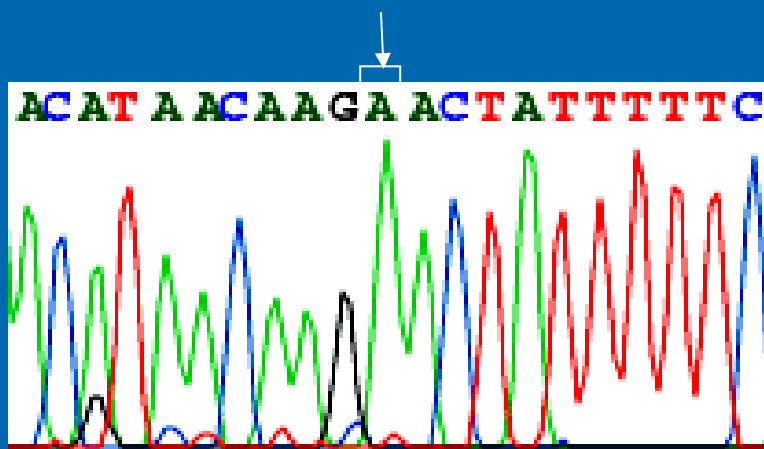
Wilt Chamberlain,
διάσημος
μπασκετμπολίστας
(216 cm; 125 κιλά)

Willie Shoemaker,
διάσημος
τζόκεϋ ιπποδρομιών
(149 cm; 45 κιλά)

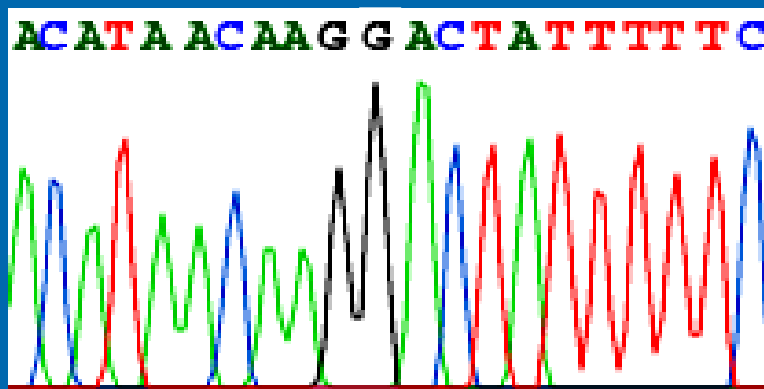


ΑΠΛΌΤΥΠΟΙ

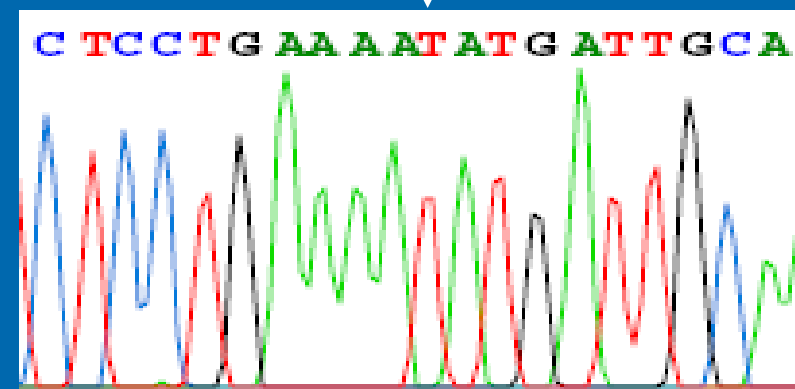
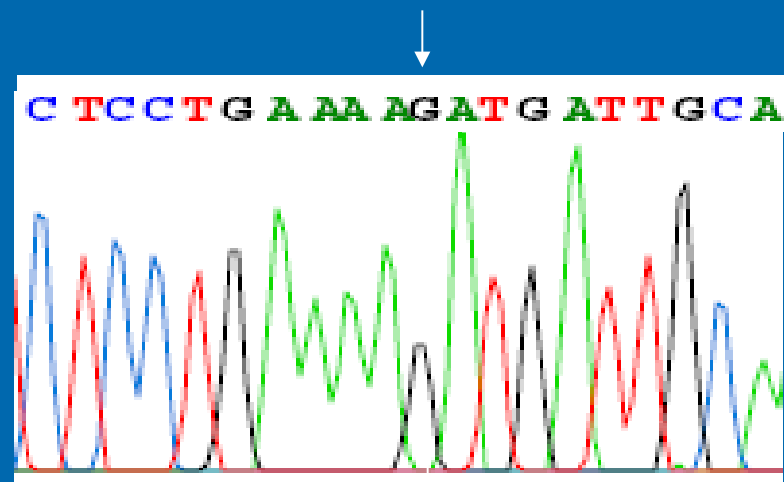
A-G ALPHA
G-T BETA

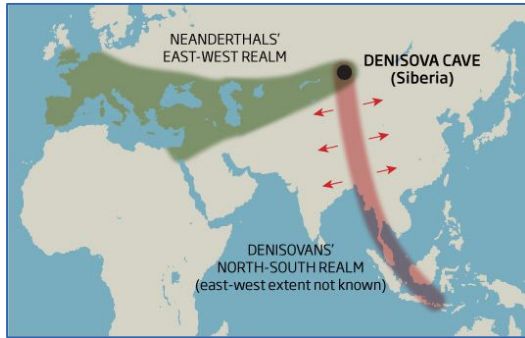


ALPHA



BETA

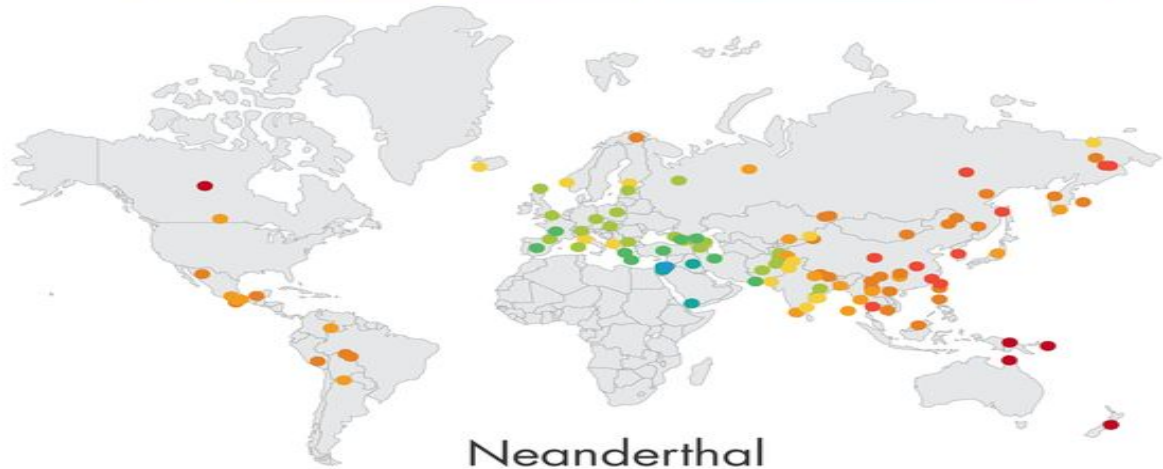
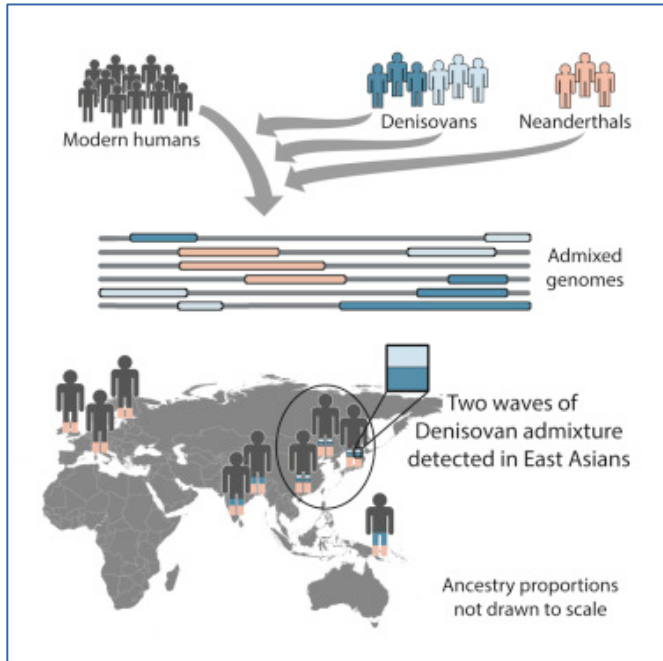
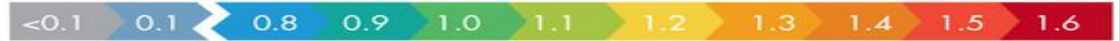




WHERE THE HOMININS ROAMED

As modern humans spread out of Africa, they interbred with Neanderthals and Denisovans. Traces of DNA from those archaic humans remains in our genomes, though some populations tend to have higher concentrations of our extinct ancestors' DNA than others.

Percentage of archaic DNA



Neanderthal



Denisovan

Slatkin, Racimo
PNAS 2016



Homo sapiens

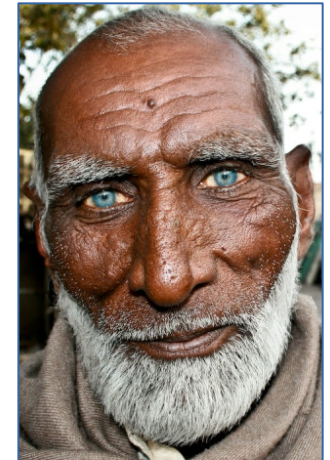
**Cheddar man
Somerset,
SW England**

8,000 y

**10% of
modern
Britons
are related
to him**



**Brace et al.
BioRxiv 2018**

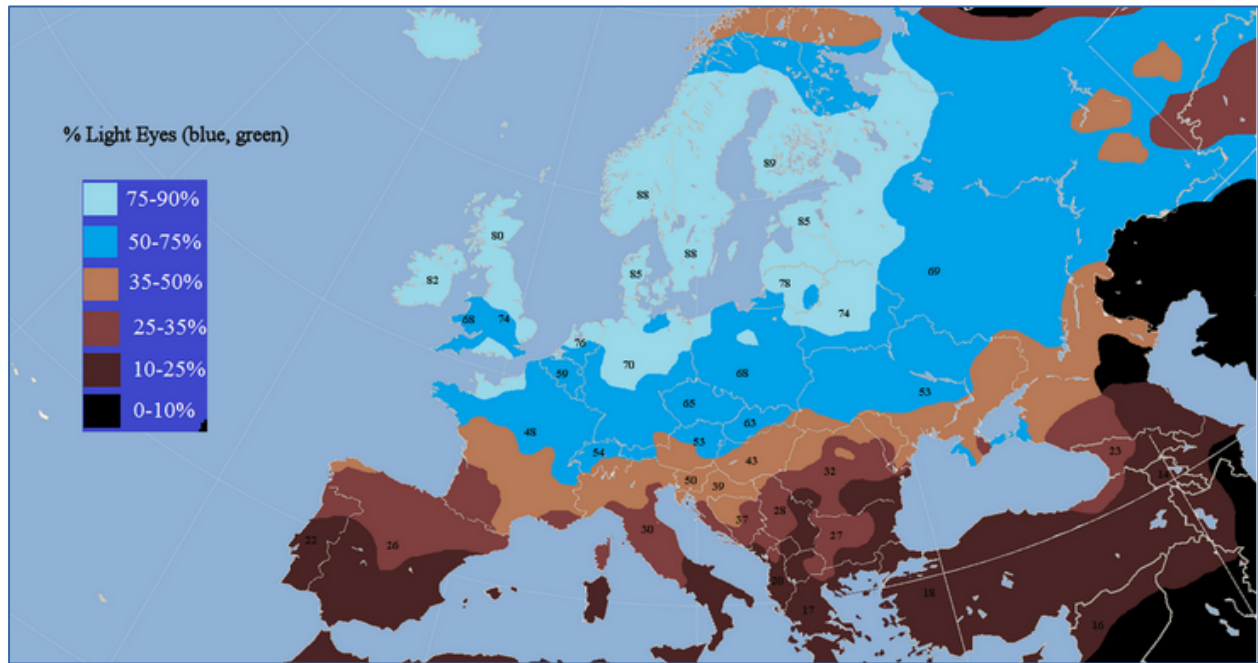


Modern Indian



Γαλάζια Μάτια

Πριν 8000 έτη
Βόρεια Ευρώπη



Geneticists compared mitochondrial DNA from blue-eyed individuals in countries as diverse as Jordan, Denmark, and Turkey, concluding that people with blue eyes have a single common ancestor that lived by the Black sea around 8,000 years ago, spreading out with agriculture.

Blue-eyed natives of Afghanistan



Blue-eyed natives of Iran



Blue-eyed natives of Pakistan



Blue-eyed natives of India



Eiberg et al.
Human Genetics
2008



Homo sapiens

**Πατρική Κληρονομικότητα
(Y chr. DNA)**

**Μητρική Κληρονομικότητα
(mt DNA)**



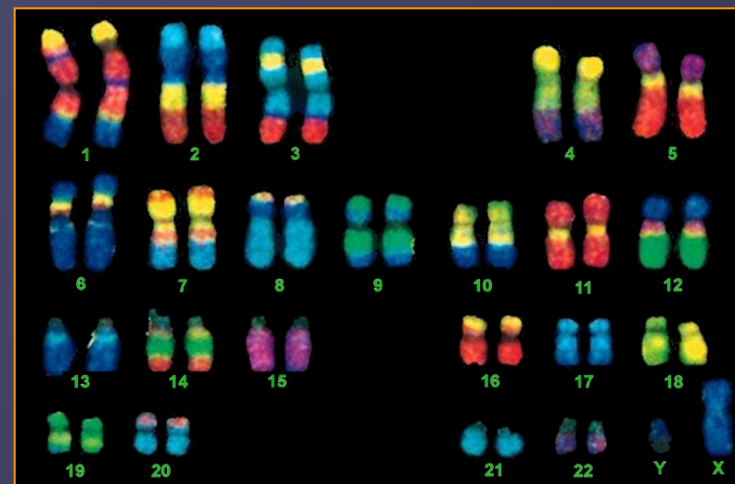
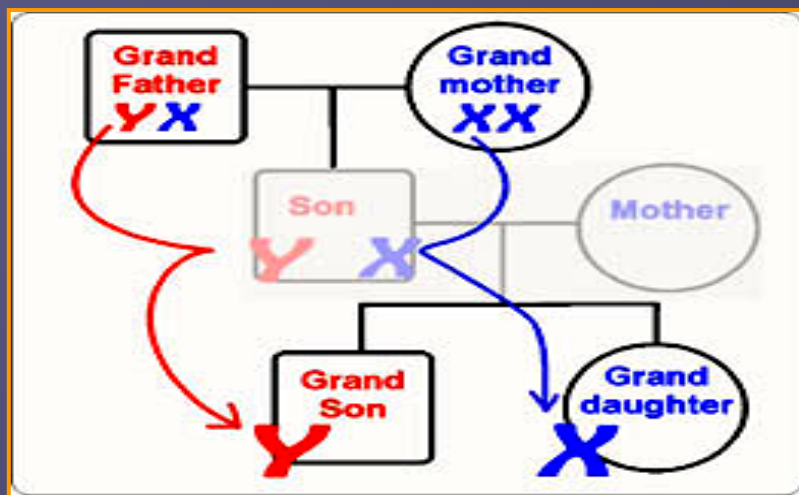
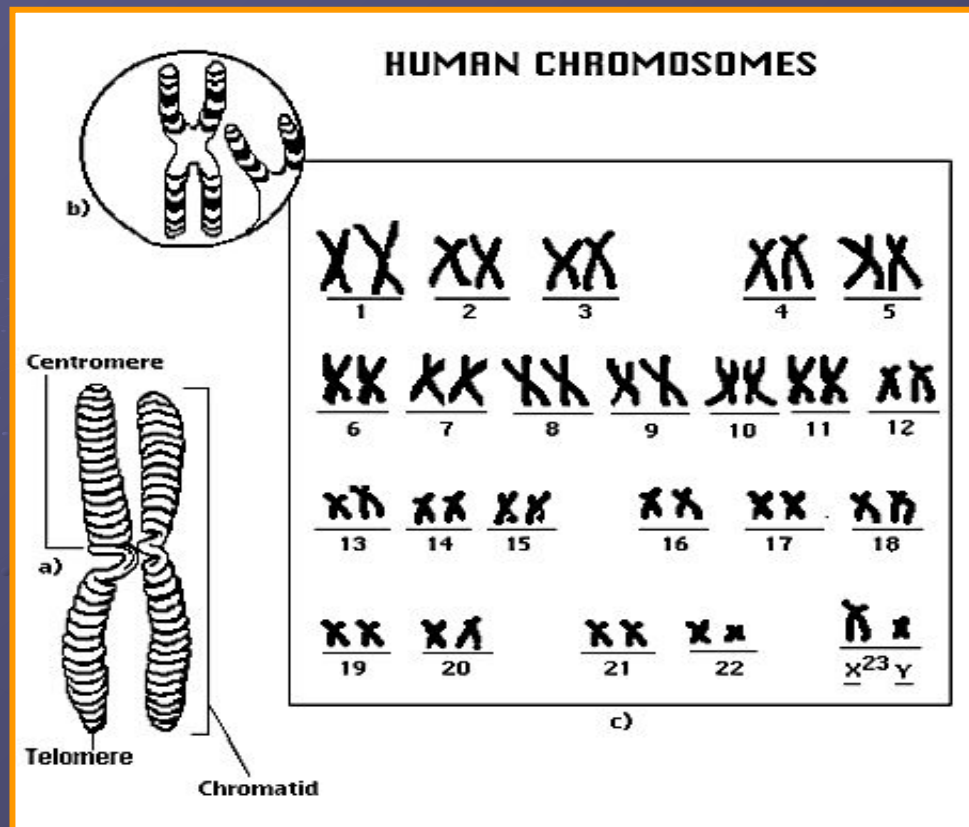


46
χρωμοσώματα
(23 ζεύγη)

44 αυτοσώματα
+ 2 φύλου X,Y



XY άνδρας
XX γυναίκα

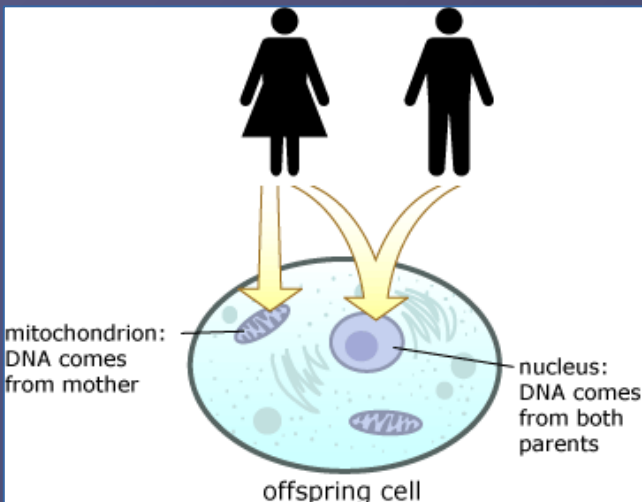
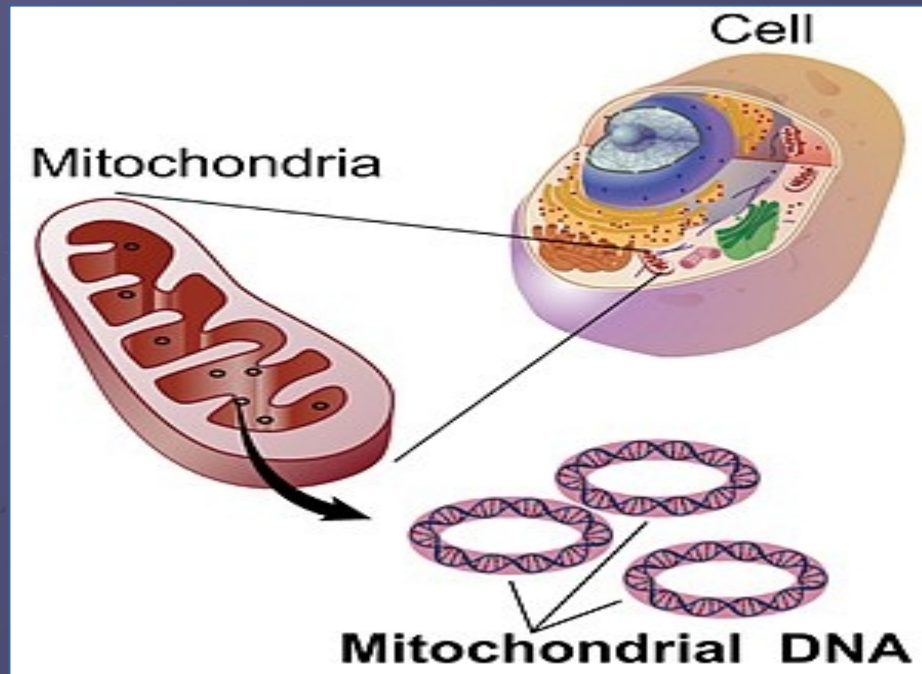




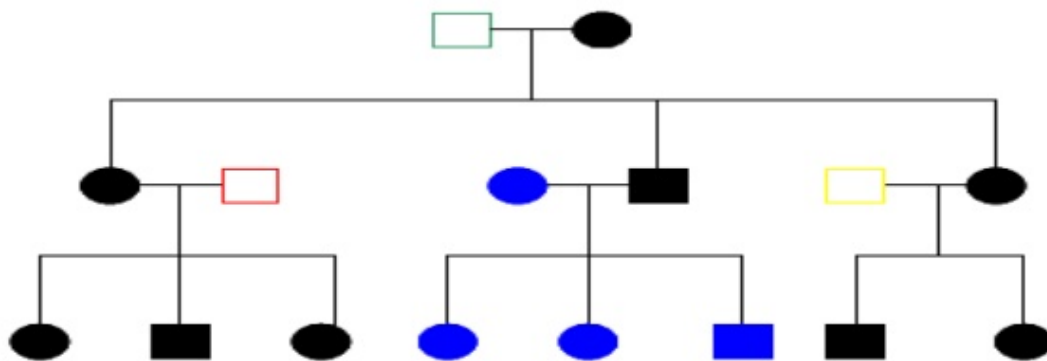
Μιτοχονδριακό DNA



Ωάριο γυναίκας



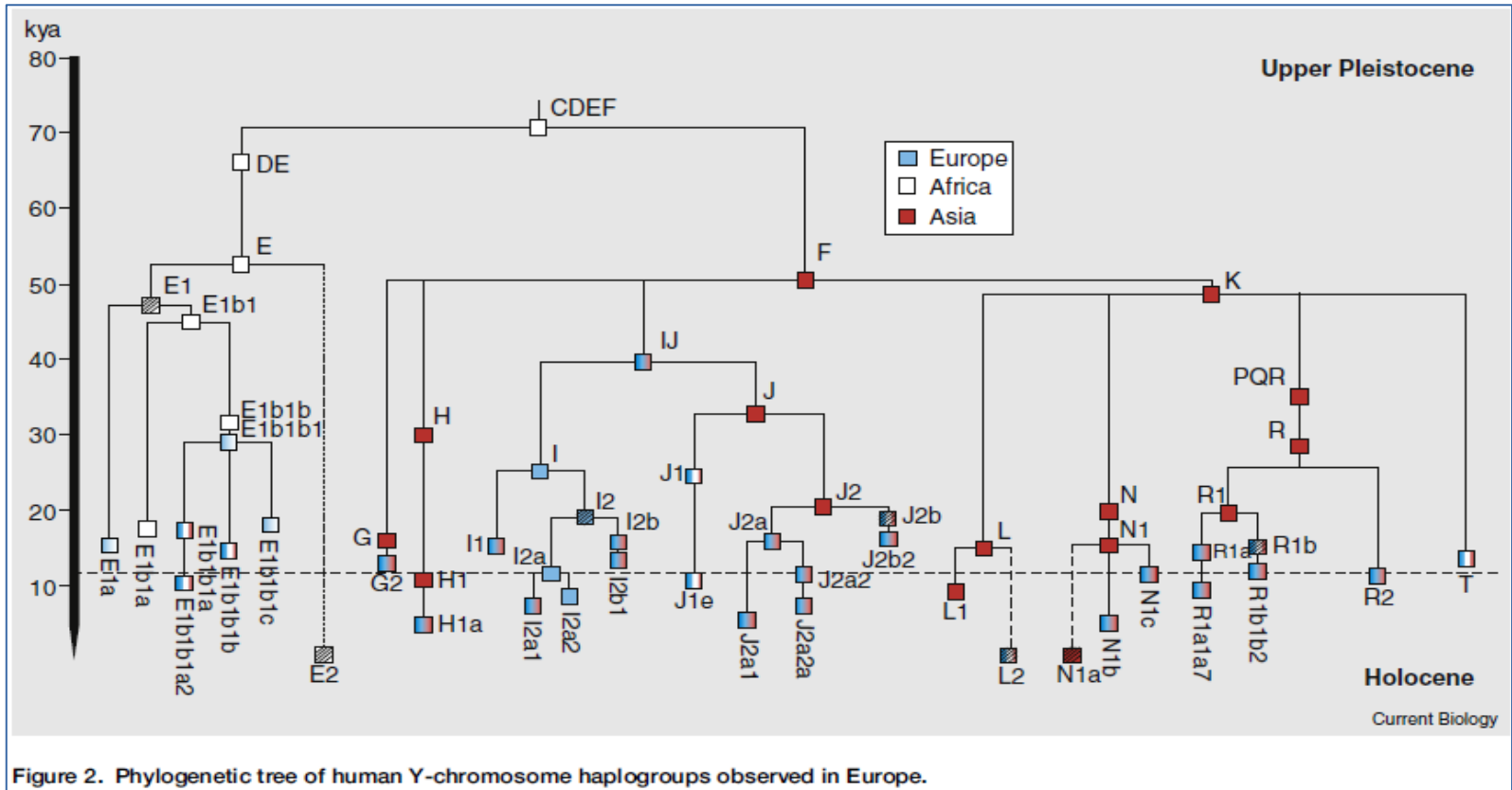
Inheritance of mitochondrial DNA





Homo sapiens

Paternal Y chromosome inheritance



Soares et al.
Current Biology 2010



Homo sapiens

Soares et al.
Current Biology 2010

Maternal mitochondrial inheritance

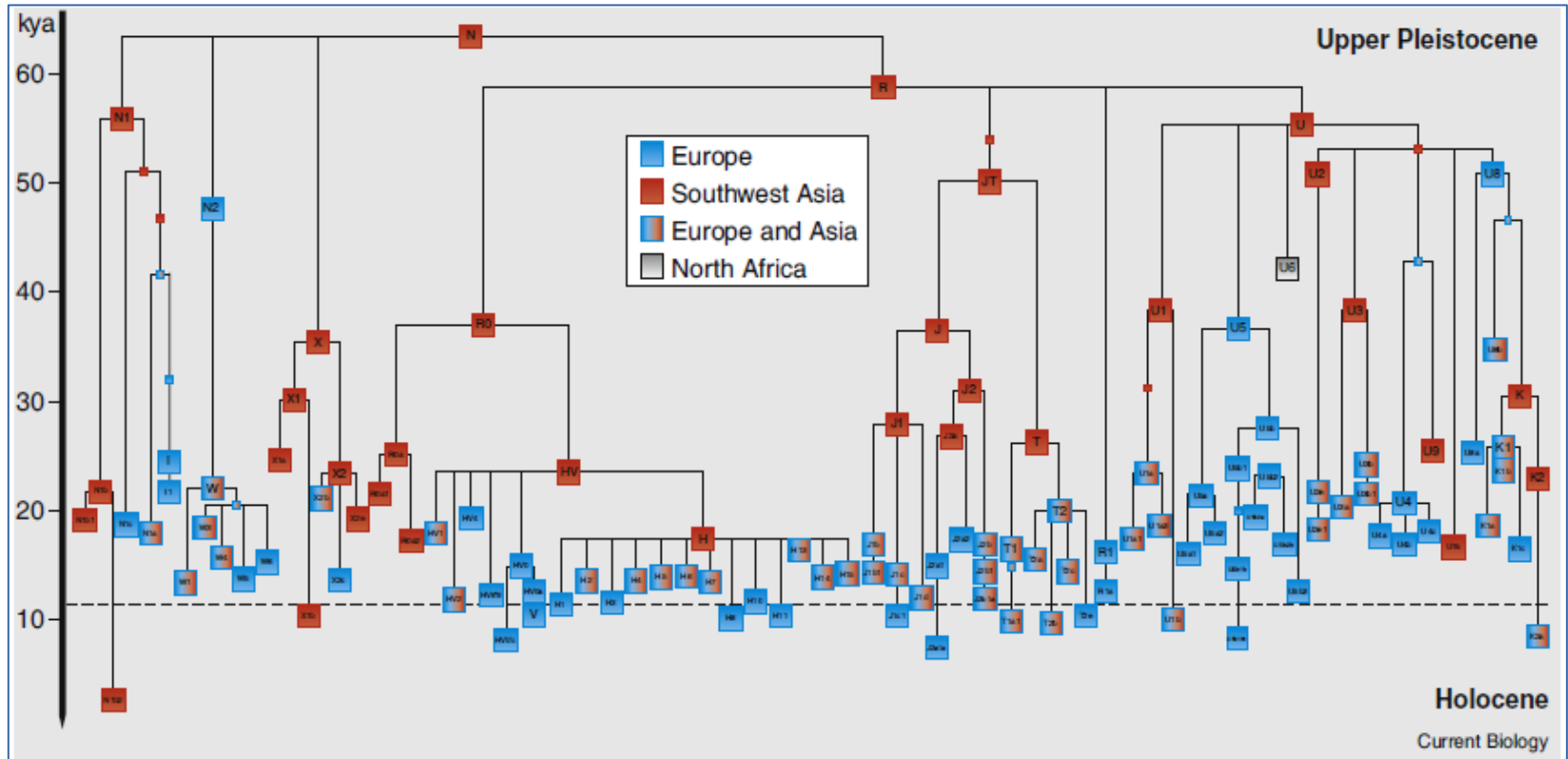


Figure 1. Phylogenetic tree of human mitochondrial DNA haplogroups commonly observed in Europeans, southwest Asians and North Africans.



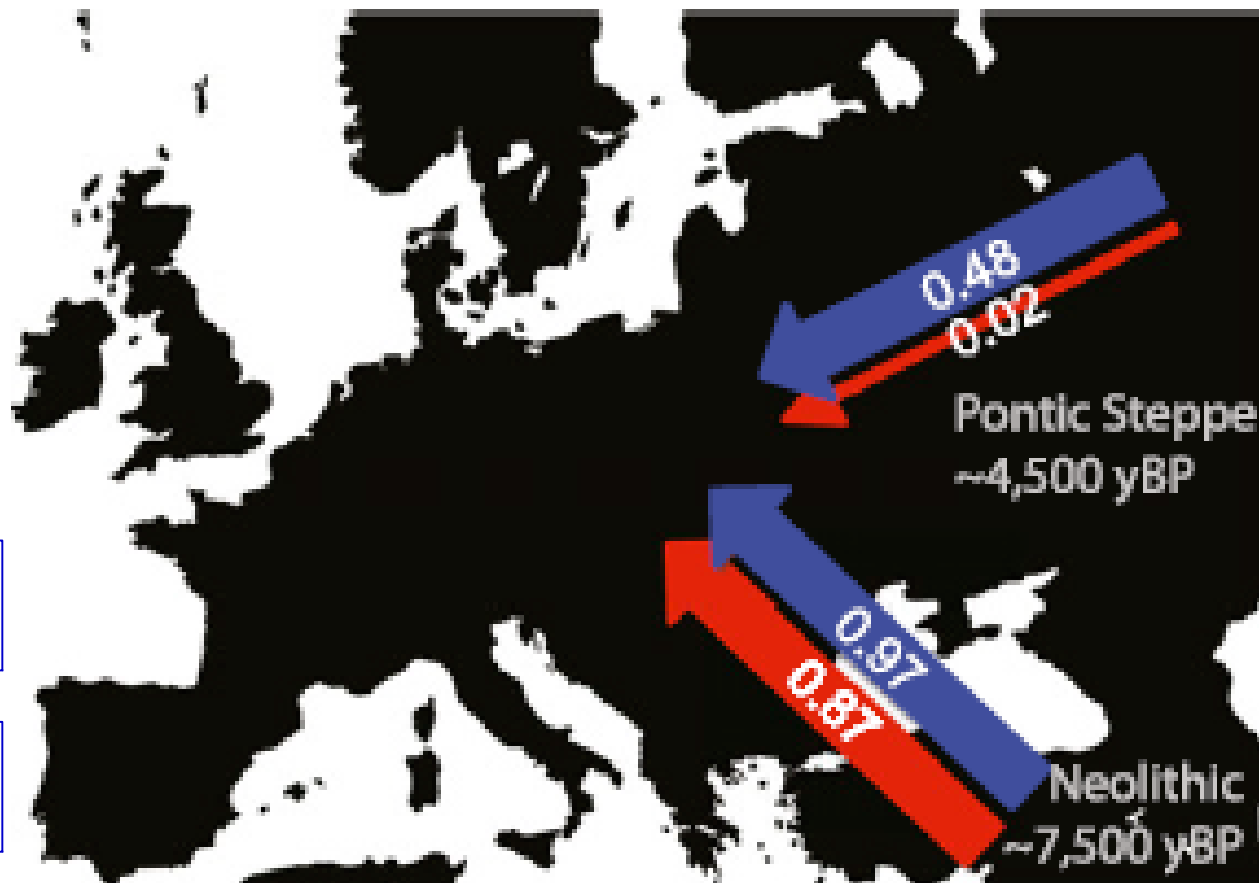
ΓΕΝΕΤΙΚΗ ΣΥΝΕΙΣΦΟΡΑ ΔΥΟ ΦΥΛΩΝ ΣΤΗΝ ΕΥΡΩΠΗ ΔΥΟ ΜΕΤΑΚΙΝΗΣΕΩΝ

ΜΠΛΕ
Άνδρες

ΚΟΚΚΙΝΟ
Γυναίκες

Goldberg et al.
PNAS 2017

Mathieson et al.
Nature 2018



ΠΑΡΑΓΩΓΗ ΦΑΓΗΤΟΥ Αγροτική-Κτηνοτροφική



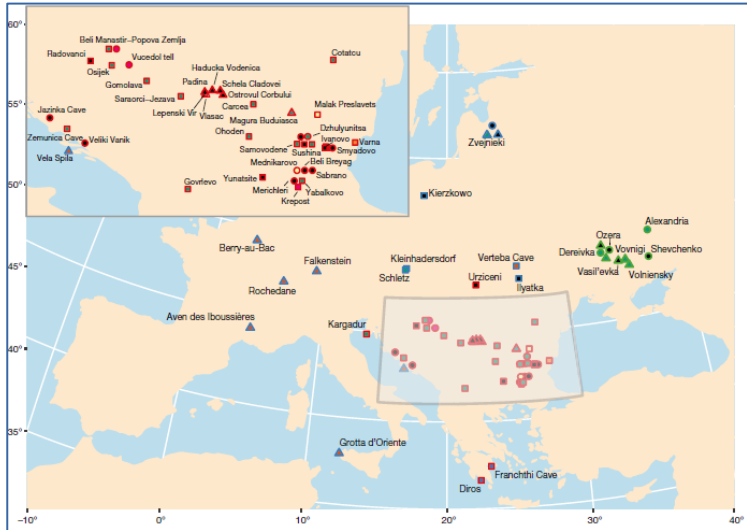
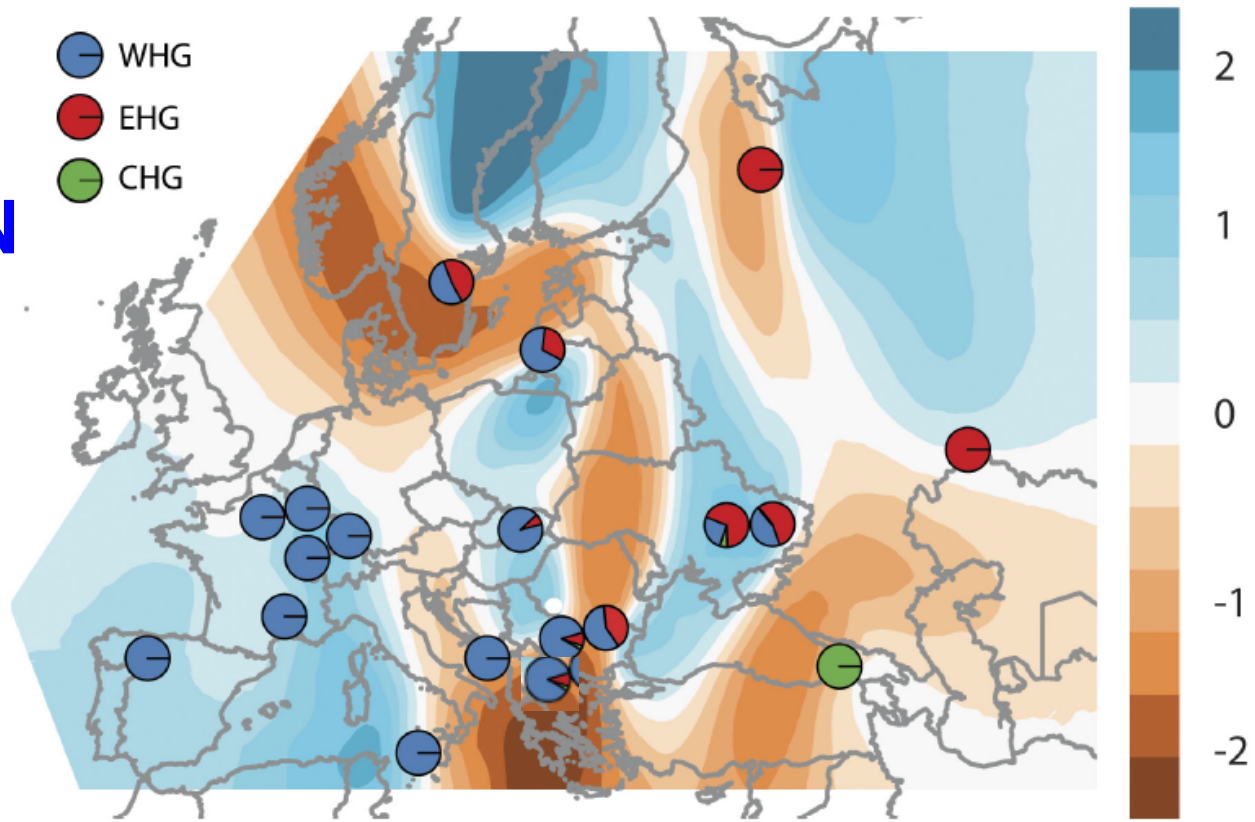
- Τοπική εξέλιξη με επιρροές από Μέση Ανατολή
- Ταυτόχρονη περίπου εξημέρωση ζώων και φυτών
- Πειραματισμός
- Σταθεροί αγροτικοί οικισμοί
- 7000 πΧ: βόδι, πρόβατο, χοίρος, σιτάρι, κριθάρι - Άργισσα Μαγούλα (Θεσσαλία)
- 6000 πΧ: κασίκα – Σπήλαιο Φράχθι (Αργολίδα, Πελοπόννησος)
- Σημαντικές ενδείξεις ότι η αγροκαλλιέργεια και κτηνοτροφία είχαν καθιερωθεί στην Ελλάδα το 6000-5500 πΧ, στην Νότια/Κεντρική/Ανατολική Ευρώπη το 5000 πΧ, στην Βόρεια/Δυτική Ευρώπη το 5300-4000 πΧ
- Η χρήση αλετριού ξεκίνησε το 3600 και καθιερώθηκε έως 2600 πΧ

Munro and Stiner
Current Anthropology 2015



ΓΕΝΕΤΙΚΗ ΕΥΡΩΠΑΙΩΝ

- WHG
- EHG
- CHG



Mathieson et al.
Nature 2018



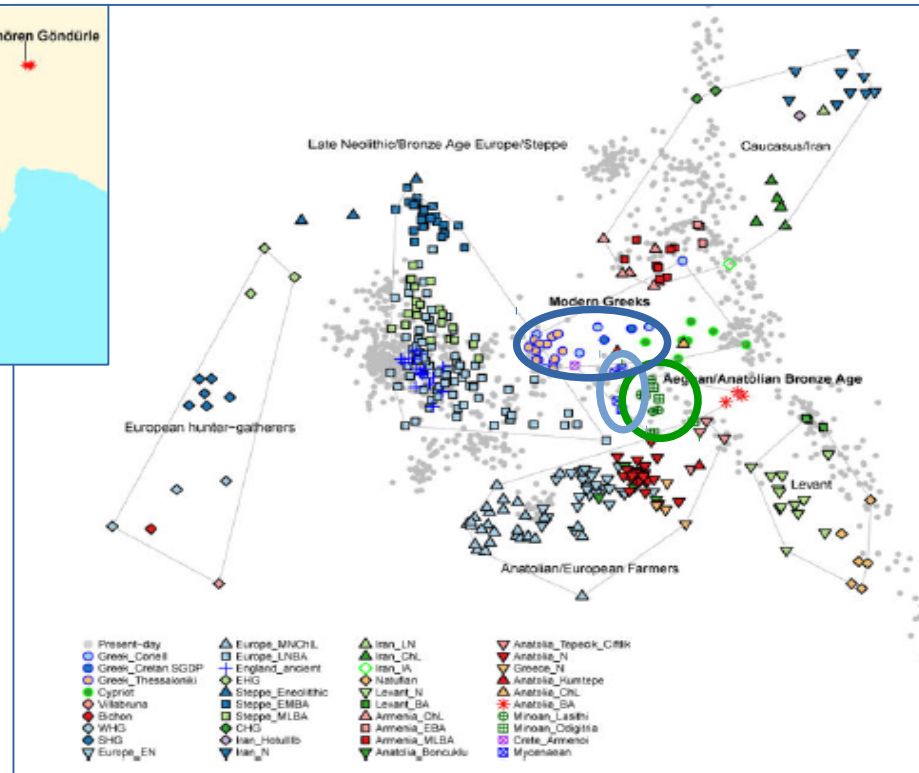
ΓΕΝΕΤΙΚΗ ΜΙΝΩΙΤΩΝ

Lazaridis et al.
Nature 2017

Nature. 2017 August 10; 548(7666): 214–218. doi:10.1038/nature23310.

Genetic origins of the Minoans and Mycenaeans

Iosif Lazaridis^{1,2,*†}, Alissa Mittnik^{3,4,*}, Nick Patterson^{2,5}, Swapan Mallick^{1,2,6}, Nadin Rohland¹, Saskia Pfrenkle⁴, Anja Furtwängler⁴, Alexander Peltzer^{3,7}, Cosimo Posth^{3,4}, Andonis Vasilakis⁸, P.J.P. McGeorge⁹, Eleni Konsolaki-Yannopoulou¹⁰, George Korres¹¹, Holley Martlew¹², Manolis Michalodimitrakis¹³, Mehmet Özsait¹⁴, Nesrin Özsait¹⁴, Anastasia Papathanasiou¹⁵, Michael Richards¹⁶, Songül Alpaslan Roodenberg¹, Yannis Tzedakis¹⁷, Robert Arnott¹⁸, Daniel M. Fernandes^{19,20}, Jeffery R. Hughey²¹, Dimitra M. Lotakis²², Patrick A. Navas²², Yannis Maniatis²³, John A. Stamatoyannopoulos^{24,25,26}, Kristin Stewardson^{1,6}, Philipp Stockhammer^{3,27}, Ron Pinhasi^{19,28}, David Reich^{1,2,6,†}, Johannes Krause^{3,4,†}, and George Stamatoyannopoulos^{22,25,†}



Μινωίτες
~2,900–1,700 πΧ

Μυκηναίοι
~1,700–1,200 πΧ



ΓΕΝΕΤΙΚΗ ΜΙΝΩΙΤΩΝ

nature COMMUNICATIONS

ARTICLE

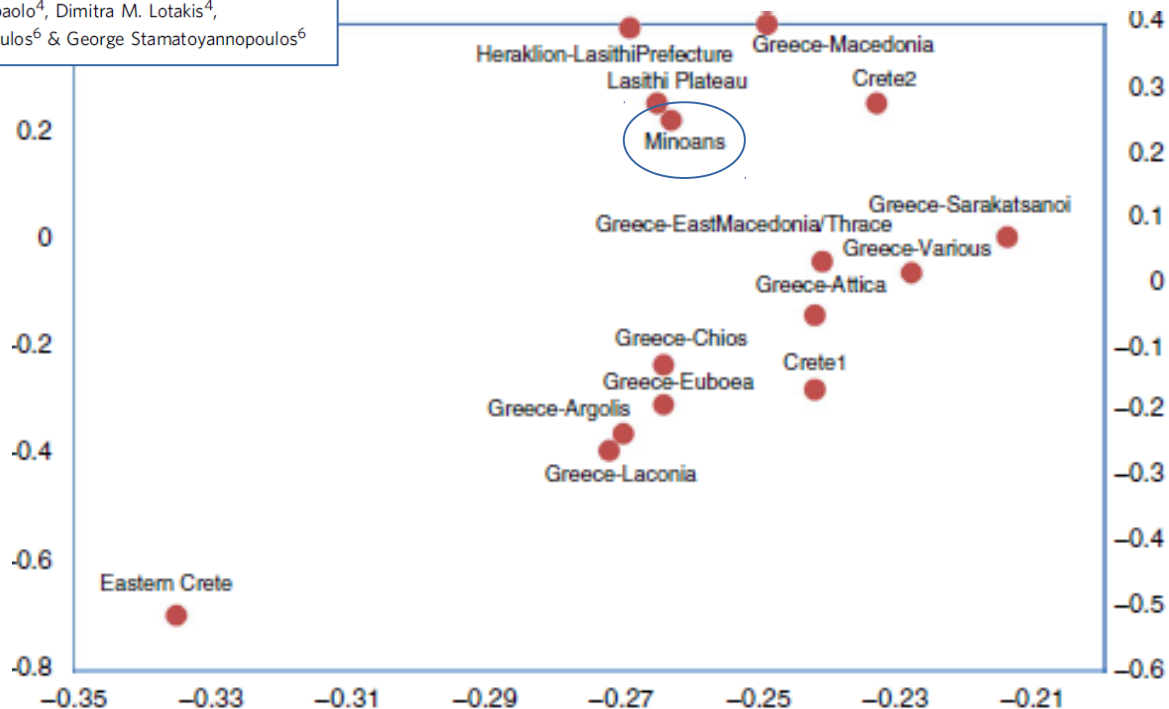
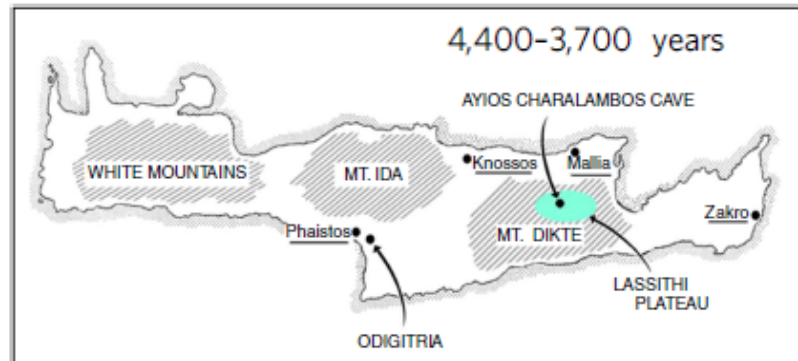
Received 31 Dec 2012 | Accepted 12 Apr 2013 | Published 14 May 2013

DOI: 10.1038/ncomms2871

OPEN

A European population in Minoan Bronze Age Crete

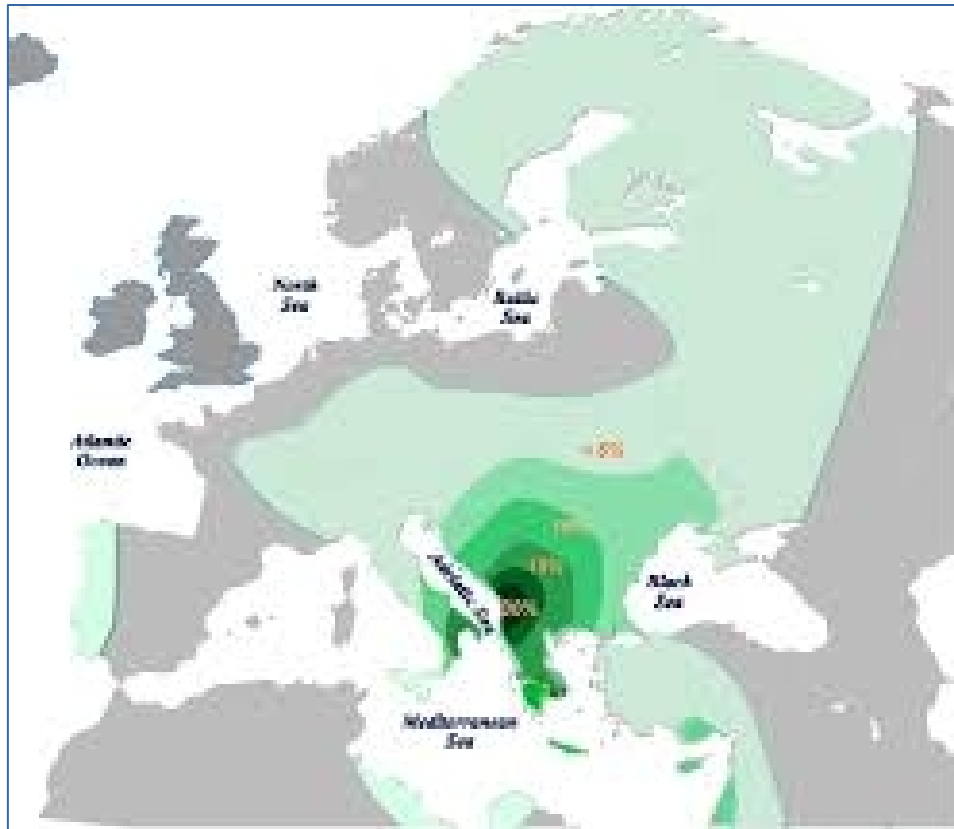
Jeffery R. Hughey¹, Peristera Paschou², Petros Drineas³, Donald Mastropaolo⁴, Dimitra M. Lotakis⁴, Patrick A. Navas⁴, Manolis Michalodimitrakis⁵, John A. Stamatoyannopoulos⁶ & George Stamatoyannopoulos⁶



Hughey et al.
Nature Communications
2013



“Ελληνικό” Y haplogroup E1b1b1a2 (E-V13)



King, Di Cristofaro, Kouvatsi, Triantaphyllidis et al.
(Corsica) *BMC Evol Biol* 2011

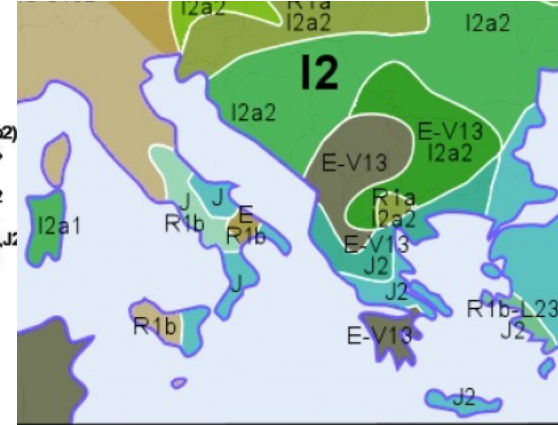


Gunther, Jakobsson
Current Opinion in Genetics & Development 2016

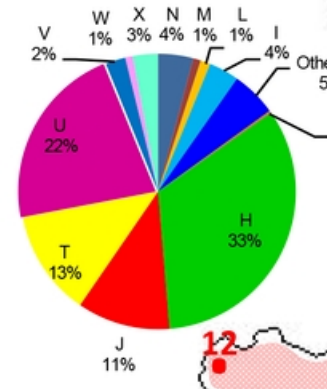
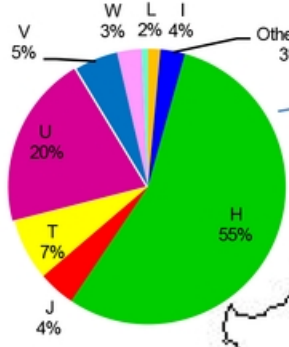
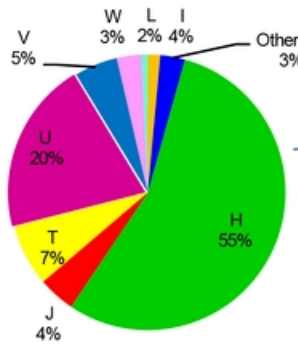
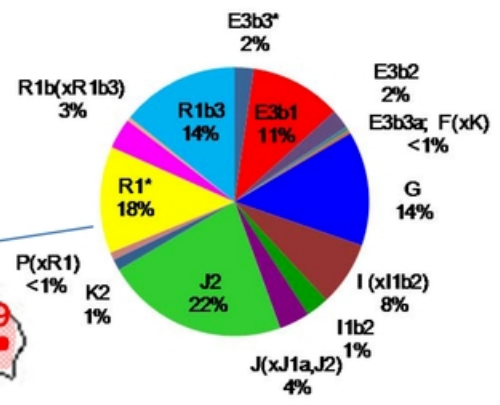
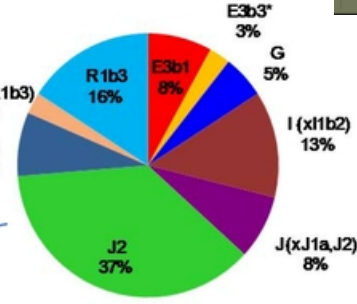
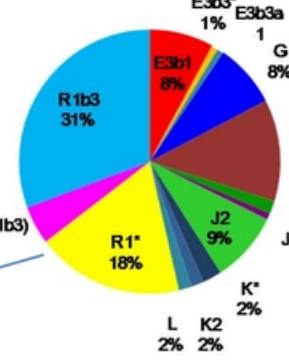


ΓΕΝΕΤΙΚΗ ΙΤΑΛΩΝ

North



Y-chr



Centre

South

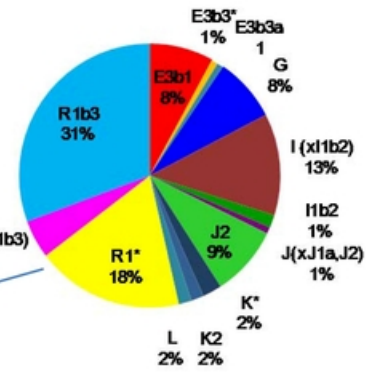
mtDNA

Brisighelli et al.
PLOS ONE 2012

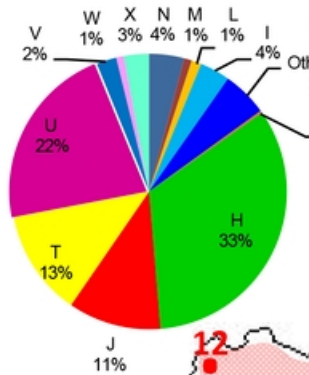
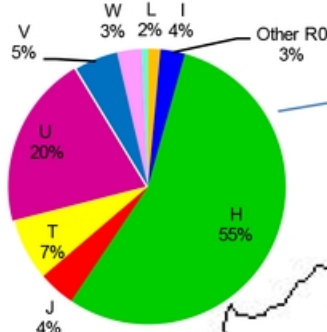
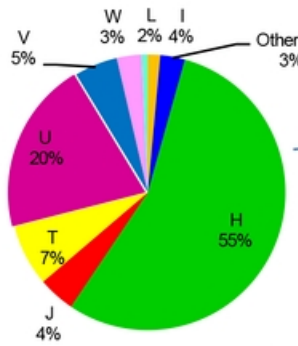
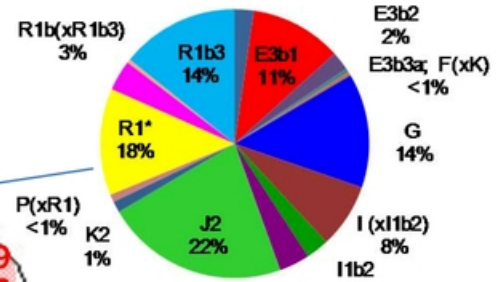
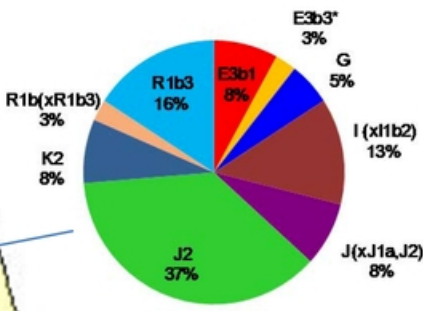


ΓΕΝΕΤΙΚΗ ΙΤΑΛΩΝ

North



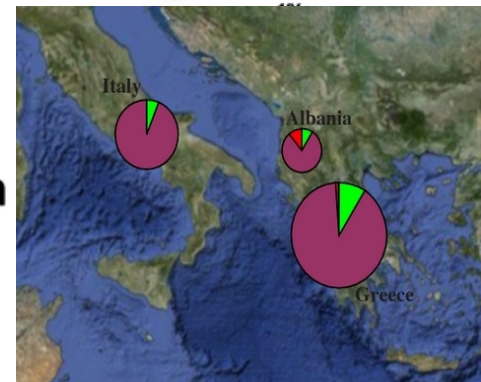
Y-chr



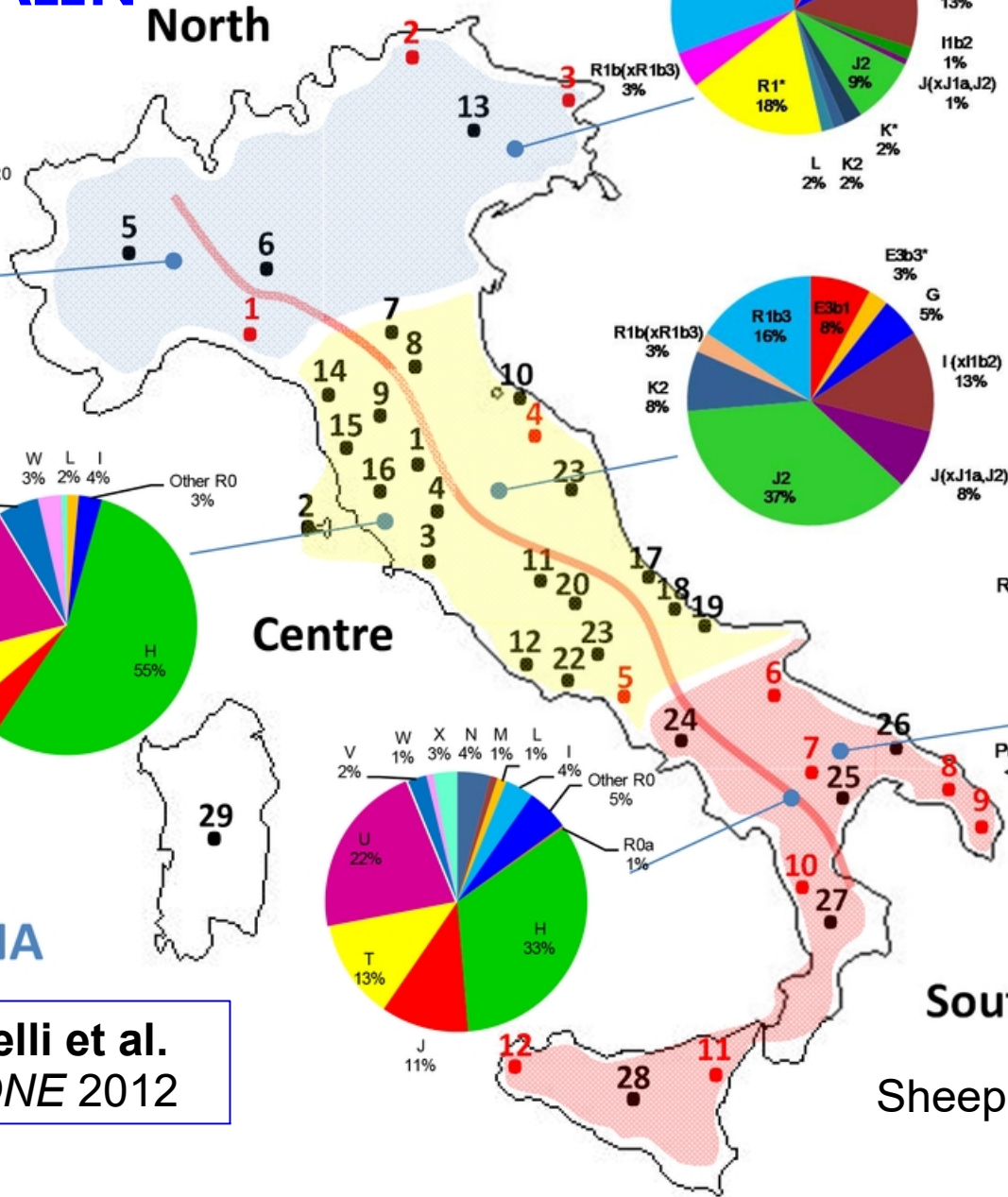
mtDNA

South

Sheep!!!



Brisighelli et al.
PLOS ONE 2012





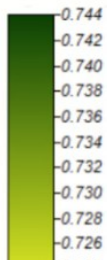
ΓΕΝΕΤΙΚΗ ΠΡΟΕΛΕΥΣΗ ΕΤΡΟΥΣΚΩΝ



Central Italy
Etruria

Armenian
Highlands

Lydia

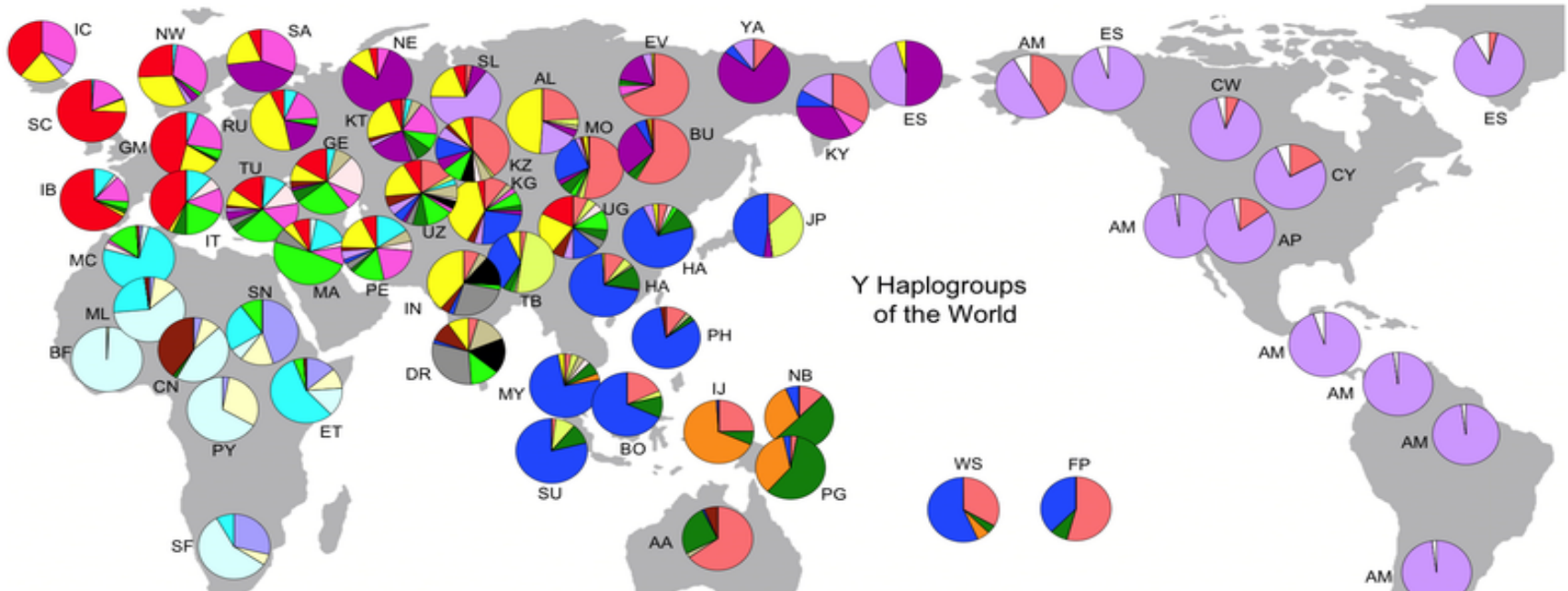
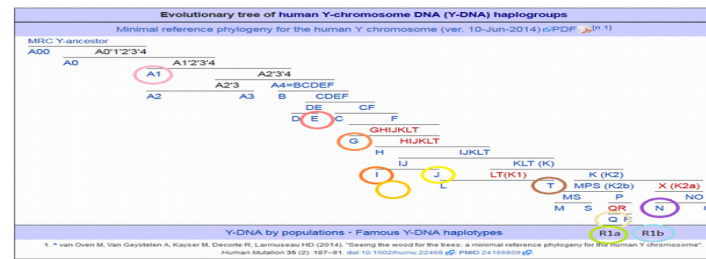


- Achilli et al. 2007
- Milanesi et al. 2007
- Pardo-Seco et al. 2014





Y haplogroups Paternal Inheritance



Y Haplogroups
of the World

- | | | |
|---------------------|------------------|---------------------|
| AA Australian | IB Iberia | NW Norwegian |
| AL Altaians | IC Iceland | PE Persian (Iran) |
| AM Amerinds | IJ Irian Jaya | PG Papua New Guinea |
| AP Apache (N-D) | IN Indo-European | PH Philippines |
| BF Burkina Faso | IT Italy | PY Pygmy |
| BO Borneo | JP Japan | RU Russia |
| BU Buryats | KG Kyrgyzstan | SA Saami |
| CN Cameroon | KT Kazan Tatar | SC Scotland |
| CW Chippeway (N-D) | KY Koryaks | SL Selkups |
| CY Cheyenne | KZ Kazakhstan | SF South Africa |
| DR Dravidian | MA Mideast Arabs | SN Sudan |
| ES Eskimos | MC Morocco | SU Sumatra |
| ET Ethiopia | MI Maori | TB Tibet |
| EV Evenks | ML Mali | TU Turkish |
| FP French Polynesia | MO Mongols | UG Uygurs |
| GE Georgia-Armenia | MY Malaysia | UZ Uzbek |
| GM Germany | NB New Britain | WS Western Samoa |
| HA Han Chinese | NE Nenets | YA Yakuts |

- | | | | | | | |
|-------|---|---|---|-------|-----|-----|
| A | B | C | D | ExE3b | E3b | F |
| G | H | I | J | K | L | M |
| N | O | P | Q | RxR1 | R1a | R1b |
| Other | | | | | | |

The data in this map is supposed to represent the situation before the recent European expansion beginning about 1500 AD. In some cases such as some Native American tribes and the Maori this can be done reliably because STR typing was done. In other cases, especially in America, it is guesswork. The "Other" sectors in America indicate this. Native American groups are labeled by language group as Amerind, Na-Dene (N-D), and Eskimo. F, K, L, and P are in some cases "catchall" groups because some researchers did not use enough markers for a full haplotype determination.



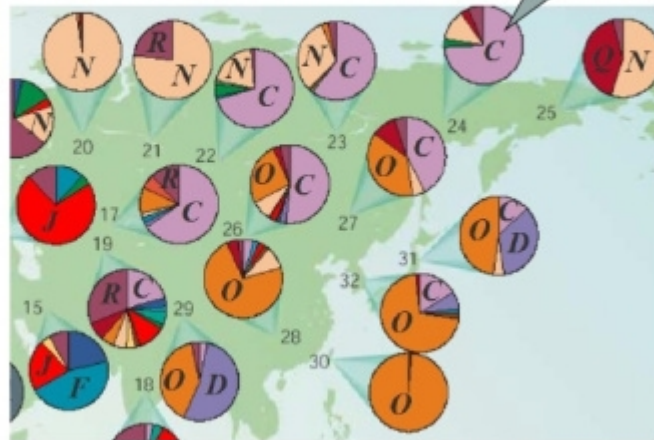
Υ απλότυπος του Τζέγκις Χαν

- ~10% των ανδρών στην περιοχή της Μογγολικής εξαάπλωσης
- ~0.5% των ανδρών παγκοσμίως, περίπου 16 εκατομμύρια σήμερα



The genetic legacy
Genghis Khan?

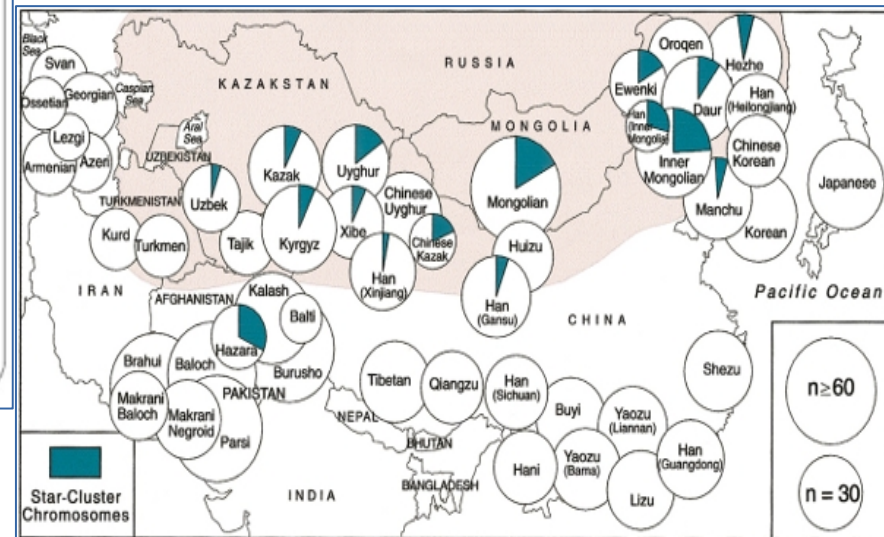
Haplogroup C is
widespread in Asia



The age of
haplogroup C
is about 1,000
years and it
seemed to have
originated in
Mongolia.

It is thought haplogroup C represents putative male-line
descendants of Genghis Khan (circa 1162–1227)

(Jobling and Tyler-Smith 2003)



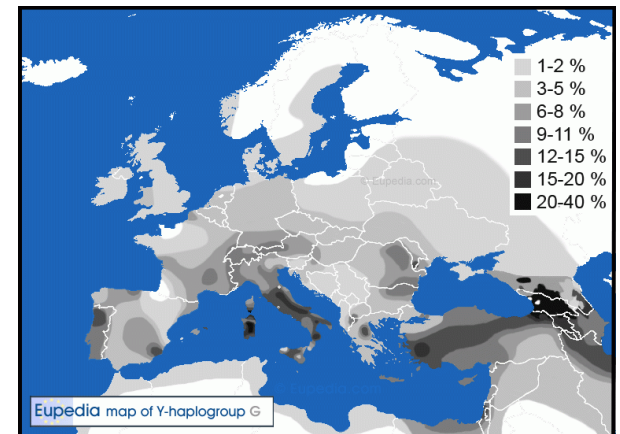
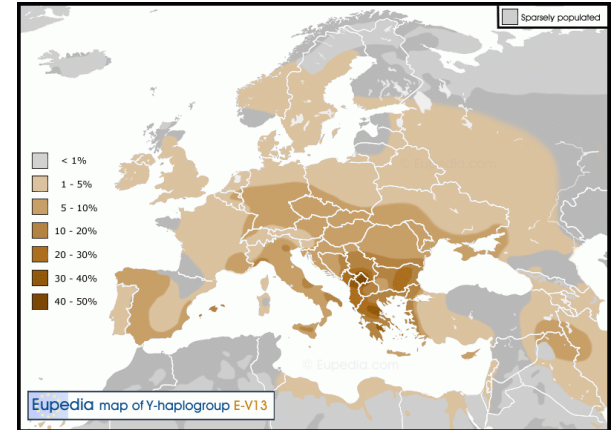
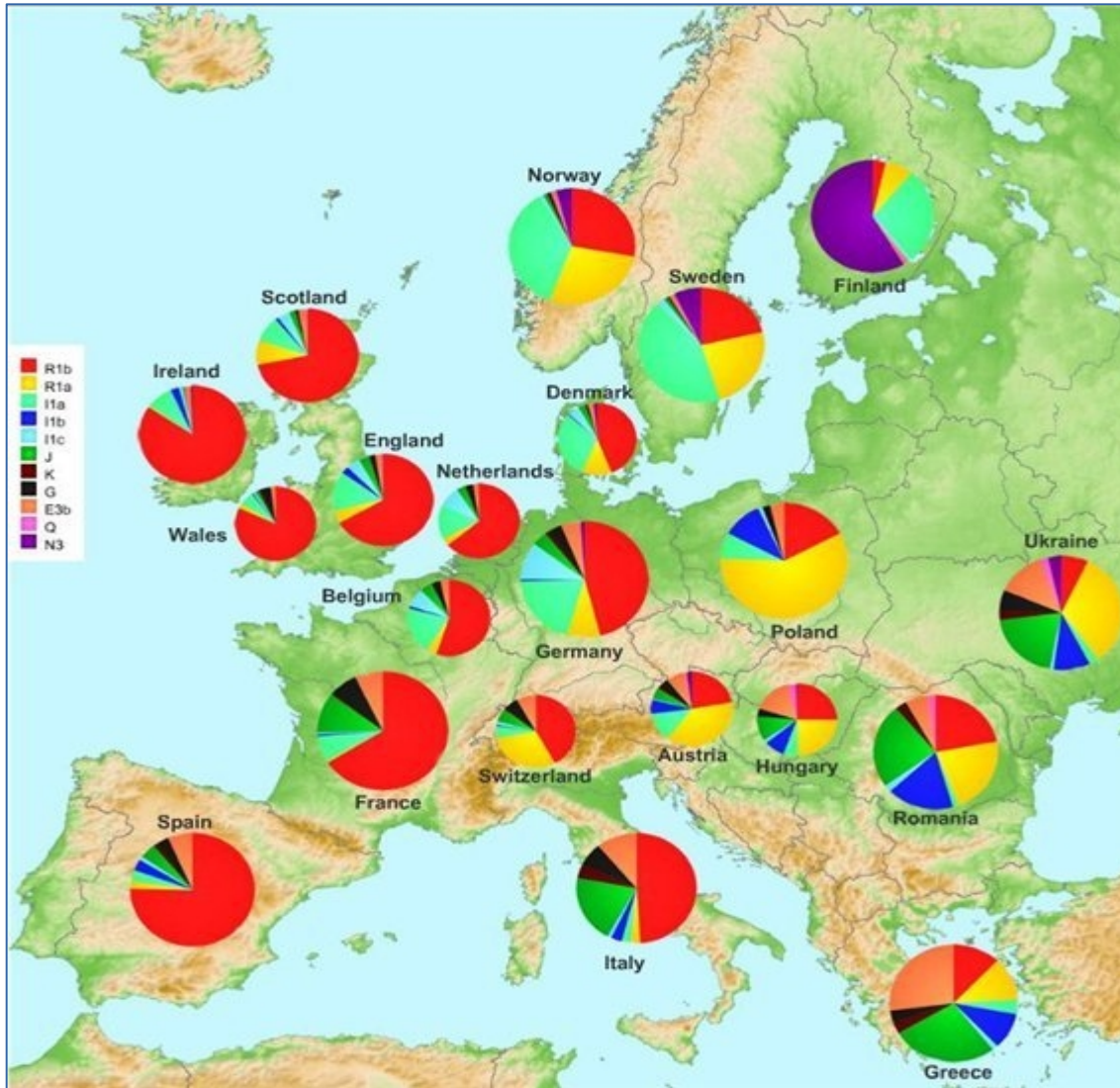
Zerjal et al.

The genetic legacy of the Mongols
Am J Hum Genet 2003



Υ απλότυποι στην Ευρώπη

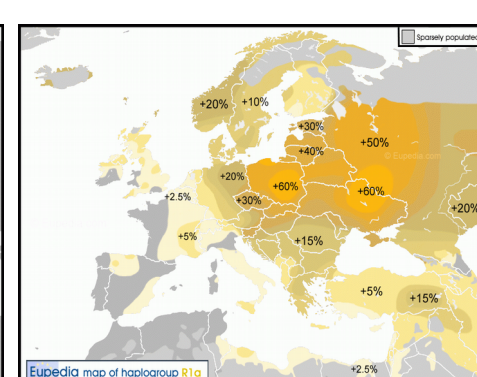
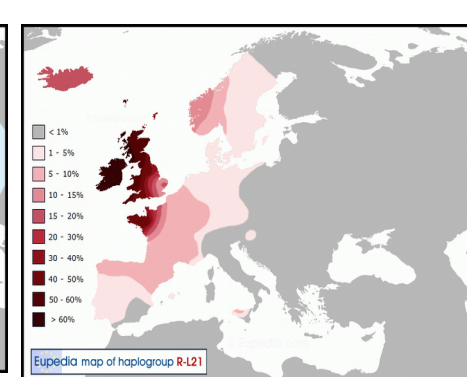
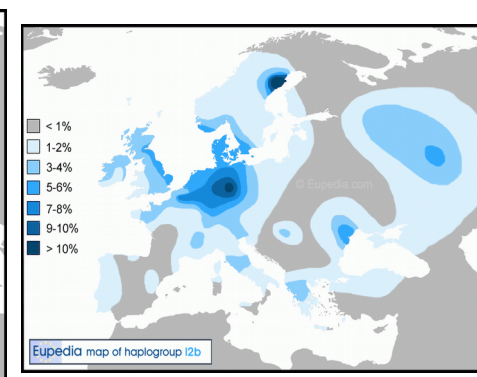
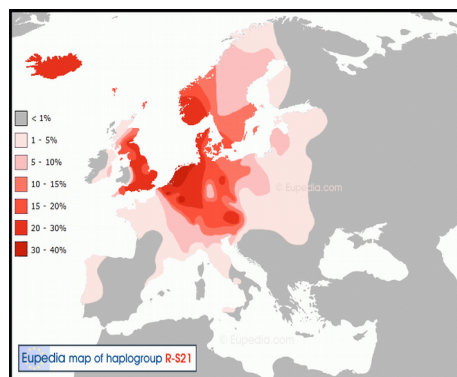
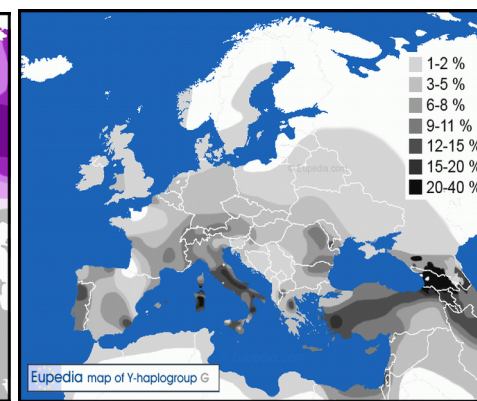
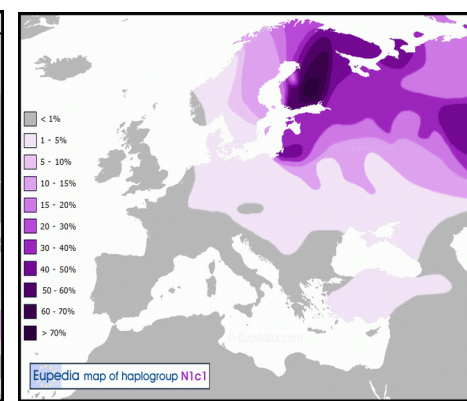
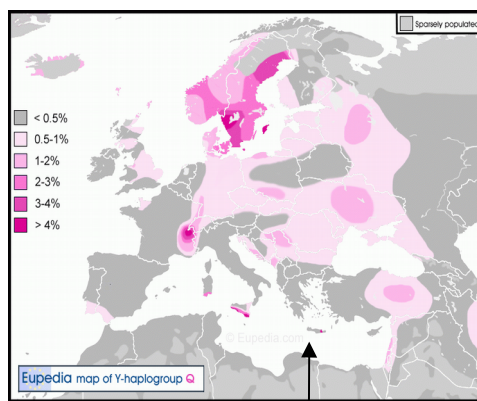
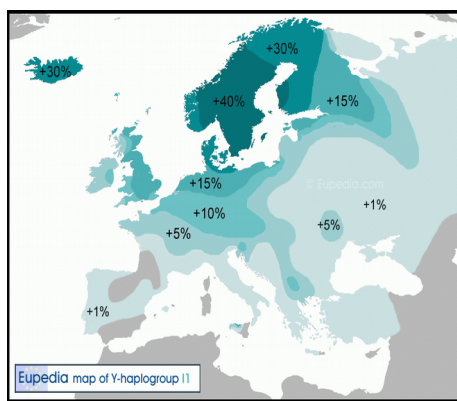
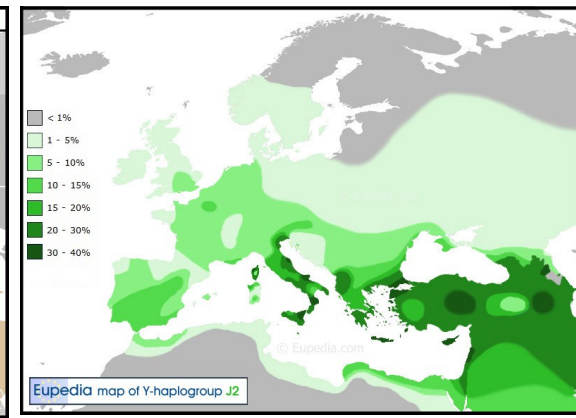
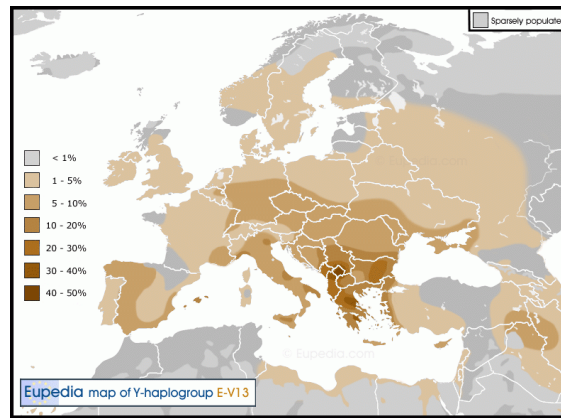
Soares et al.
Current Biology 2010





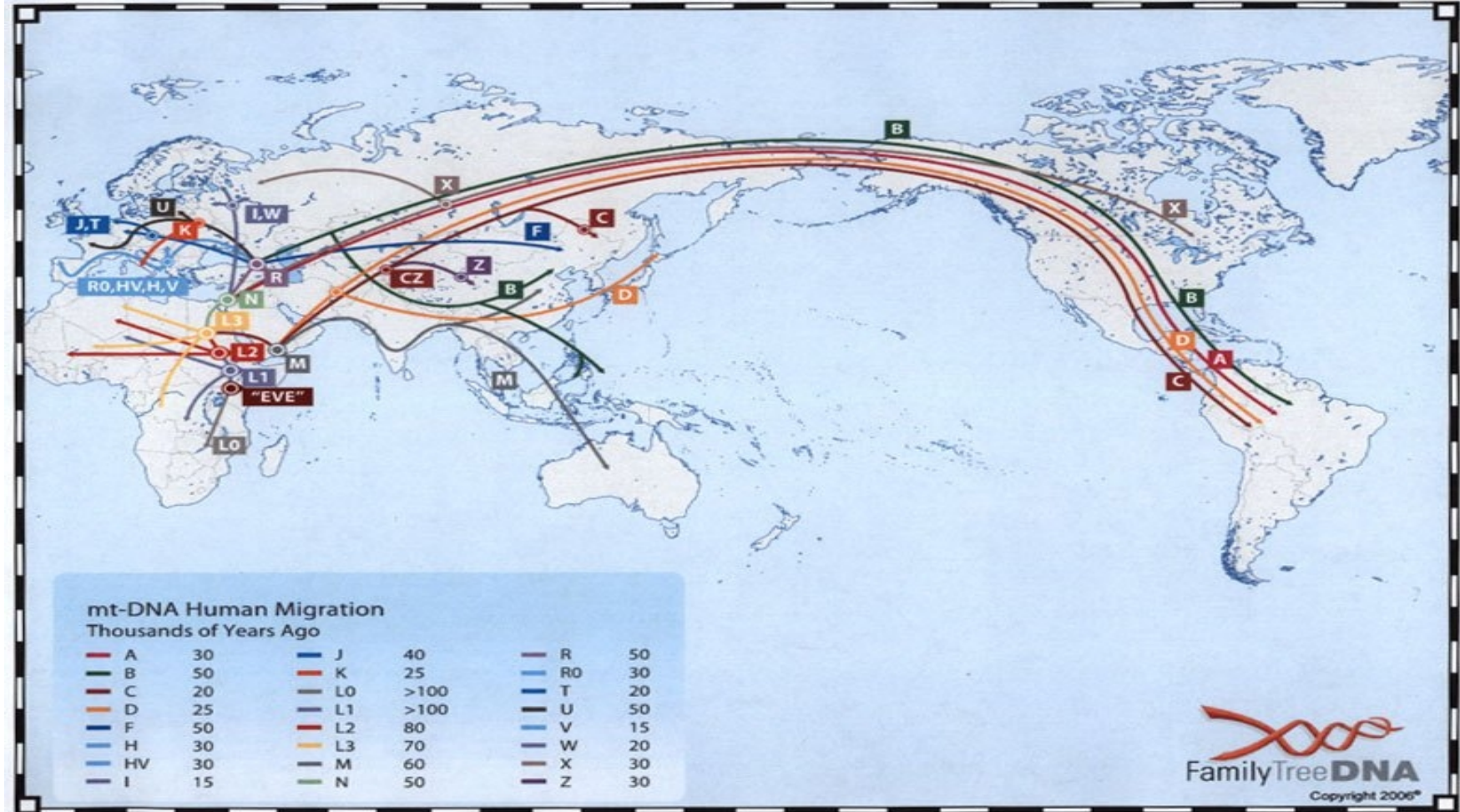
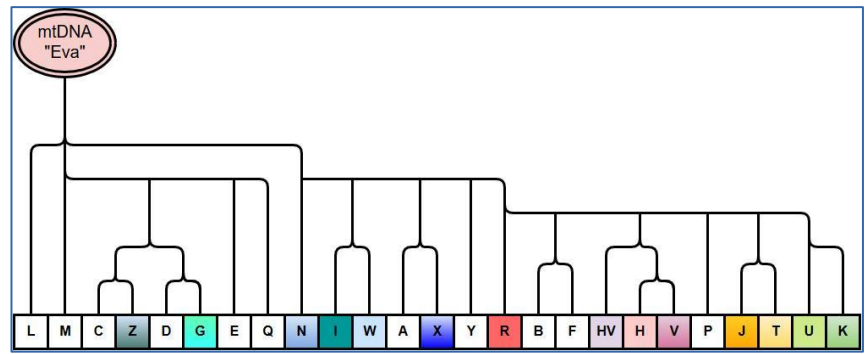
Y haplogroups In Europeans

Soares et al.
Current Biology 2010





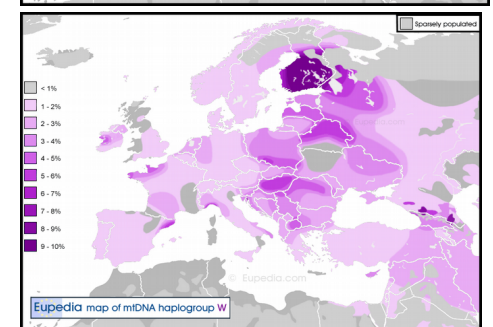
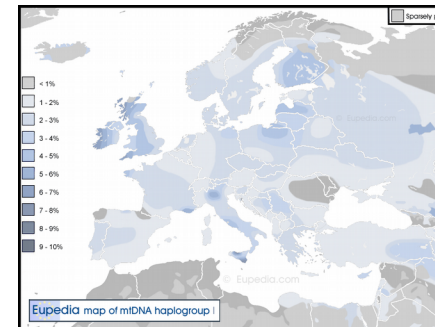
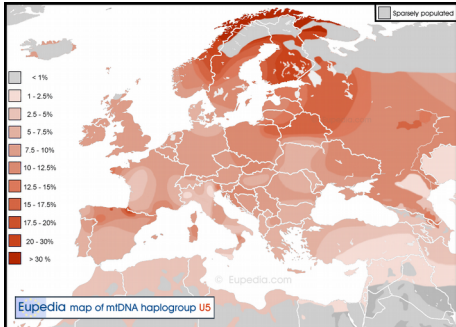
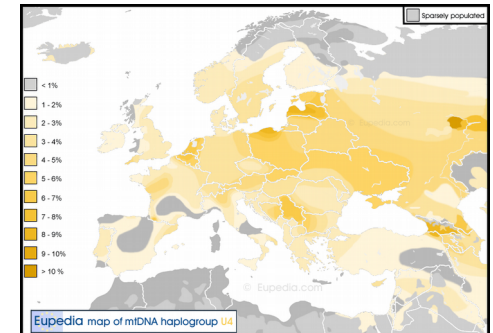
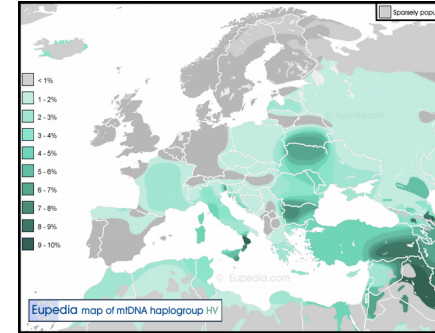
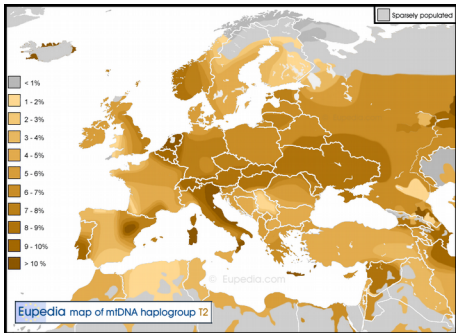
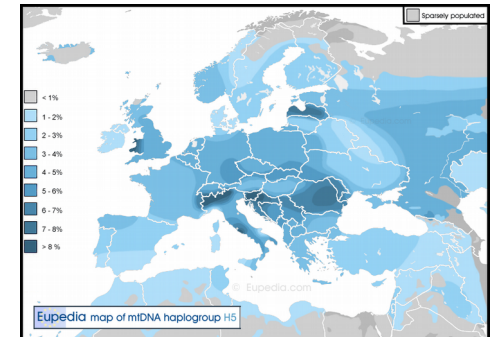
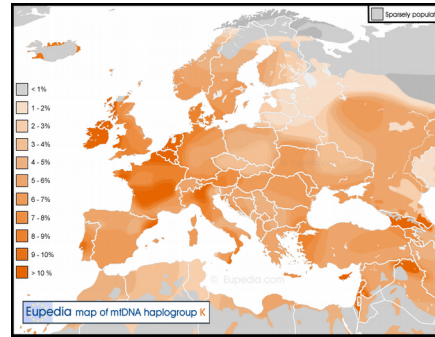
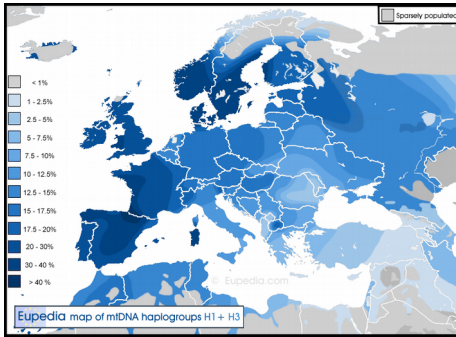
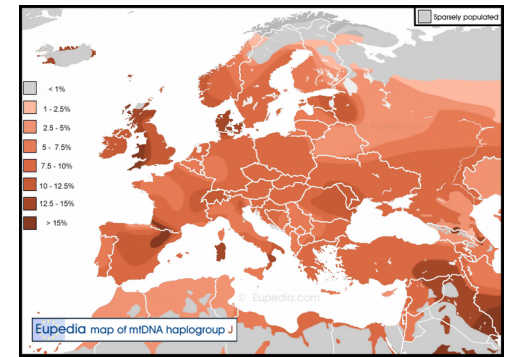
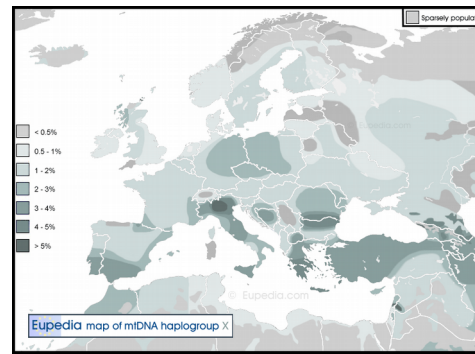
mt haplogroups Maternal Inheritance





mt haplogroups in Europeans

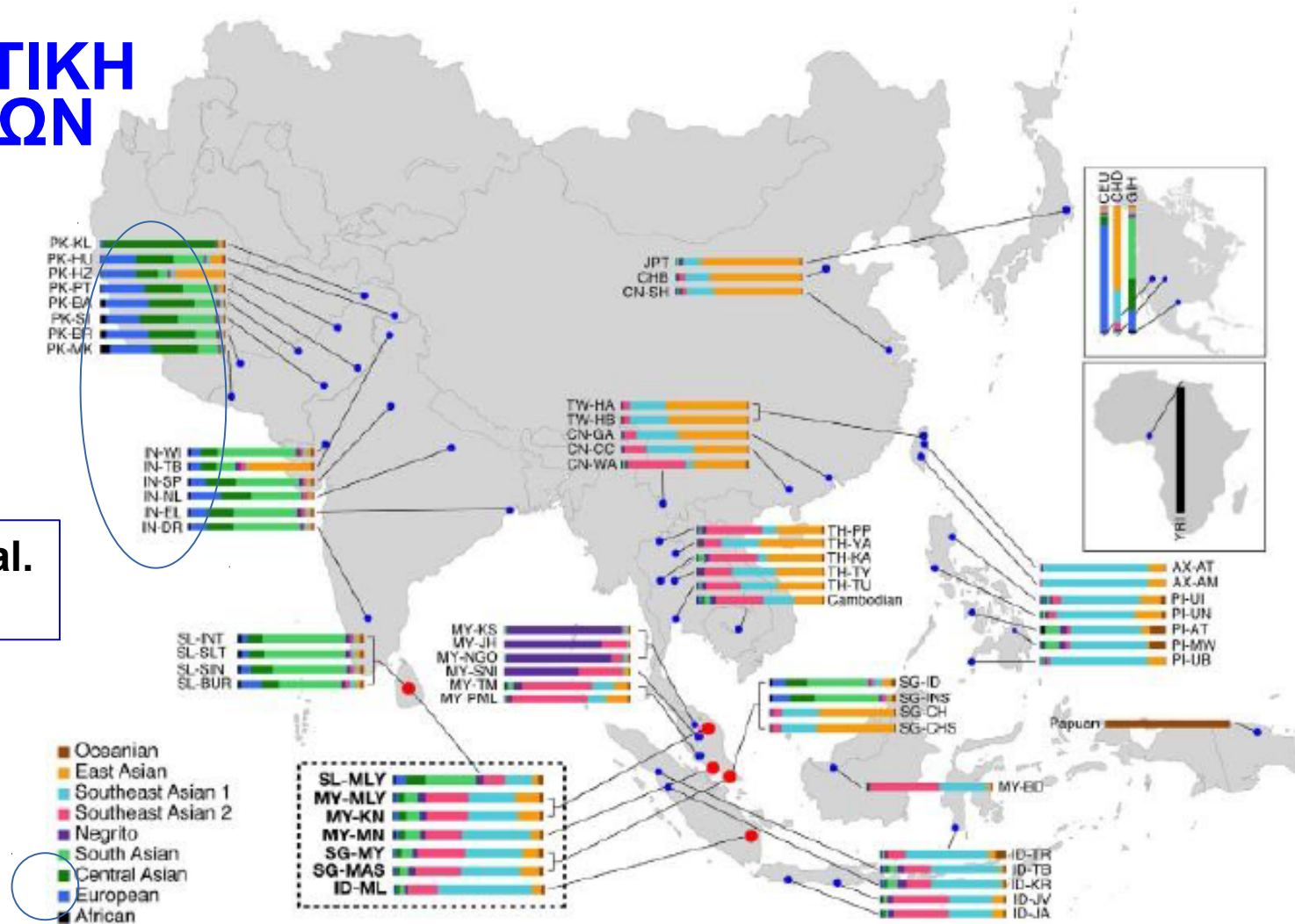
Soares et al.
Current Biology 2010





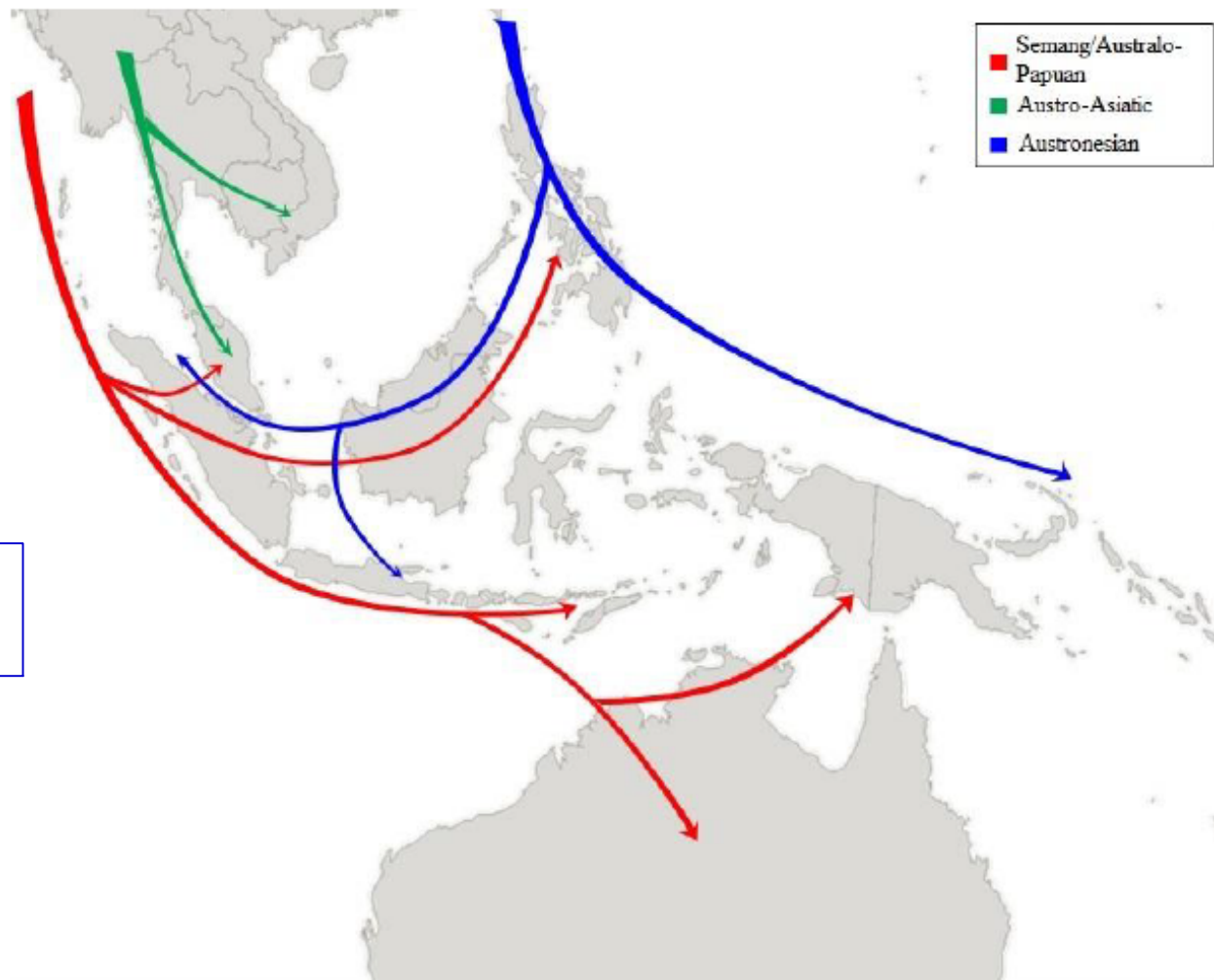
ΓΕΝΕΤΙΚΗ ΑΣΙΑΤΩΝ

Norhalifah et al.
Gene 2016





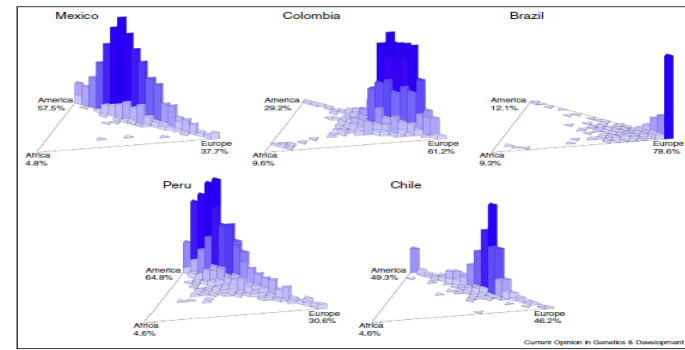
ΓΕΝΕΤΙΚΗ ΩΚΕΑΝΙΑΣ-ΠΟΛΥΝΗΣΙΑΣ



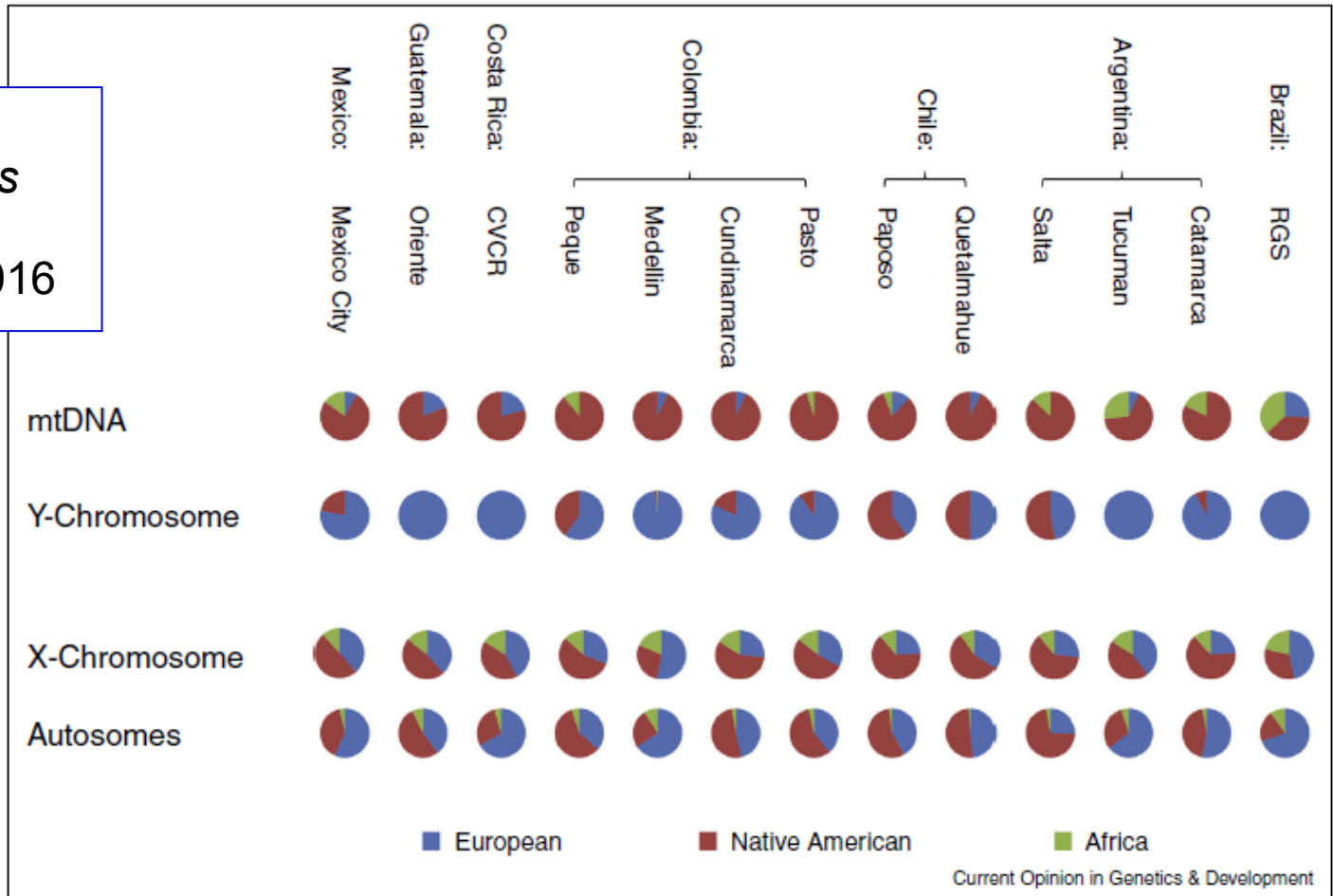
Norhalifah et al.
Gene 2016



ΓΕΝΕΤΙΚΗ ΛΑΤΙΝΟΑΜΕΡΙΚΑΝΩΝ



Adhikari et al.
*Current Opinions
in Genetics &
Development 2016*



ΜΥΘΟΙ ΠΟΥ ΚΑΤΑΡΡΙΠΤΕΙ Η ΑΝΑΛΥΣΗ DNA



- Μύθος δημιουργίας ανθρώπου από χώμα
- Μύθος δημιουργίας άνδρα πρώτα (μύθος ανωτερότητας)
- Μύθος ύπαρξης Αδάμ και Εύας
- Μύθος ύπαρξης καθαρών αιμών φυλών
- Μύθος ανωτερότητας κάποιων φυλών
- Μύθος ανωτερότητας Άριας φυλής
- Μύθος ρατσισμού
- Ο ρατσισμός των Ναζιστών (“καθαρότητα Άριας φυλής”, “φυλετική εξυγίανση από τους “υπανθρώπους”) προέρχεται από τον μύθο του Πλάτωνα **περί ανθρώπων των οποίων η σύσταση περιέχει χρυσό, άργυρο, χαλκό και σίδηρο**, και περί της θεικής προφητείας ότι η πόλις θα καταστραφεί όταν κυβερνηθεί από ανθρώπους χάλκινου και σιδηρού γένους (Πλάτων *Πολιτεία* 3.415a-c

Bannes J. Hitlers Kampf und Platons Staat, 1933

Gabler A. Platon und der Führer, 1934)

Ἄμεινον εἰπαίτην ἢ ἀπαιδευτὸν εἶναι. Ὁ μὲν γὰρ χρημάτων, ὁ δὲ ἀνθρωπισμοῦ δεῖται» (Δ.Λ, ΙΙ70)
**“Καλύτερα να είναι κάποιος ζητιάνος παρά ἀπαιδευτος. Διότι ὁ
ζητιάνος χρειάζεται πράγματα, ἐνῶ ὁ ἀπαιδευτος ἀνθρωπισμό”**
(Ἀρίστιππος, Ἀθηναϊκὴ Δημοκρατία 400πΧ)



Stephen Hawking

January 8, 1942–March 14, 2018

“

We are just an advanced breed of monkeys on a minor planet of a very average star. But we can understand the Universe. That makes us something very special.

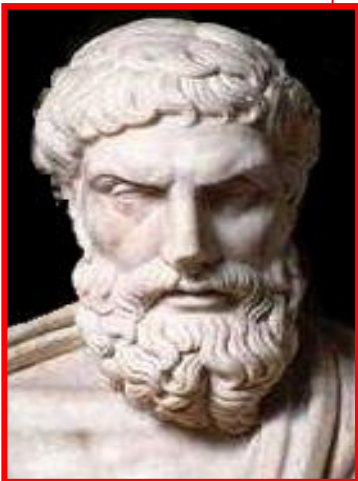
”

—STEPHEN
HAWKING



Stephen Hawking (1942-2018)

«Είμαστε, απλώς, ένα εξελιγμένο είδος μαϊμούδων σε έναν ασήμαντο πλανήτη ενός πολύ μέτριου αστέρα. Αλλά μπορούμε να αντιληφθούμε το Σύμπαν. Αυτό μας κάνει ιδιαίτερα σημαντικούς».



Μέμνησο ὅτι θνητός ὢν τῇ φύσει καὶ λαβὼν χρόνον ὠρισμένον ἀνέβης τοῖς περὶ φύσεως διαλογισμοῖς ἐπὶ τὴν ἀπειρίαν καὶ τὸν αἰῶνα καὶ κατεῖδες τὸ τ' ἔοντα τὰ τ' ἐσόμενα πρὸ τὰ ἔοντα.
(Επικ. Προσφ. 10)

Επίκουρος ο Αθηναίος(341-270 πΧ)

“Να θυμάσαι ὅτι αν και εἶσαι θνητός σύμφωνα με τη Φύση και ἔχεις λάβει μια περιορισμένη διάρκεια ζωής, ἀνέβηκες με τους διαλογισμούς περὶ της Φύσης τόσο στην ἀπειρία της, ὅσο και στην αιωνιότητά της, και εἶδες καθαρά τα τωρινά, τα μελλούμενα και τα παρελθόντα”.*

* Παναγιωτόπουλος Τ. epicuros.gr



Ευχαριστώ για την προβοχή σας!

