Day Three

Day 1: Where they were

Day 2: Where they went

Day 3: How they spoke

FIRST WORDS

Original utterance: Chimps, dolphins and early humans

As historical linguists trace the world's languages back to their earliest sources of diction and syntax, other researchers are taking on the deep mystery of how and when humans started to talk in the first place. In the forthcoming book *Uniquely Human: The Evolution of Speech, Thought and Selfless Behavior* (Harvard University Press, $27.95), linguist Philip Lieberman of Brown University argues that ancient hominids lacked the modern human's elongated vocal tract, which he contends is essential for the wide range of sounds characteristic of language. Fossil evidence suggests that fully developed language may have arisen only with the appearance of anatomically modern humans some 200,000 years ago, and that their sophisticated powers of communication may have been a key to the species' migration around the globe.

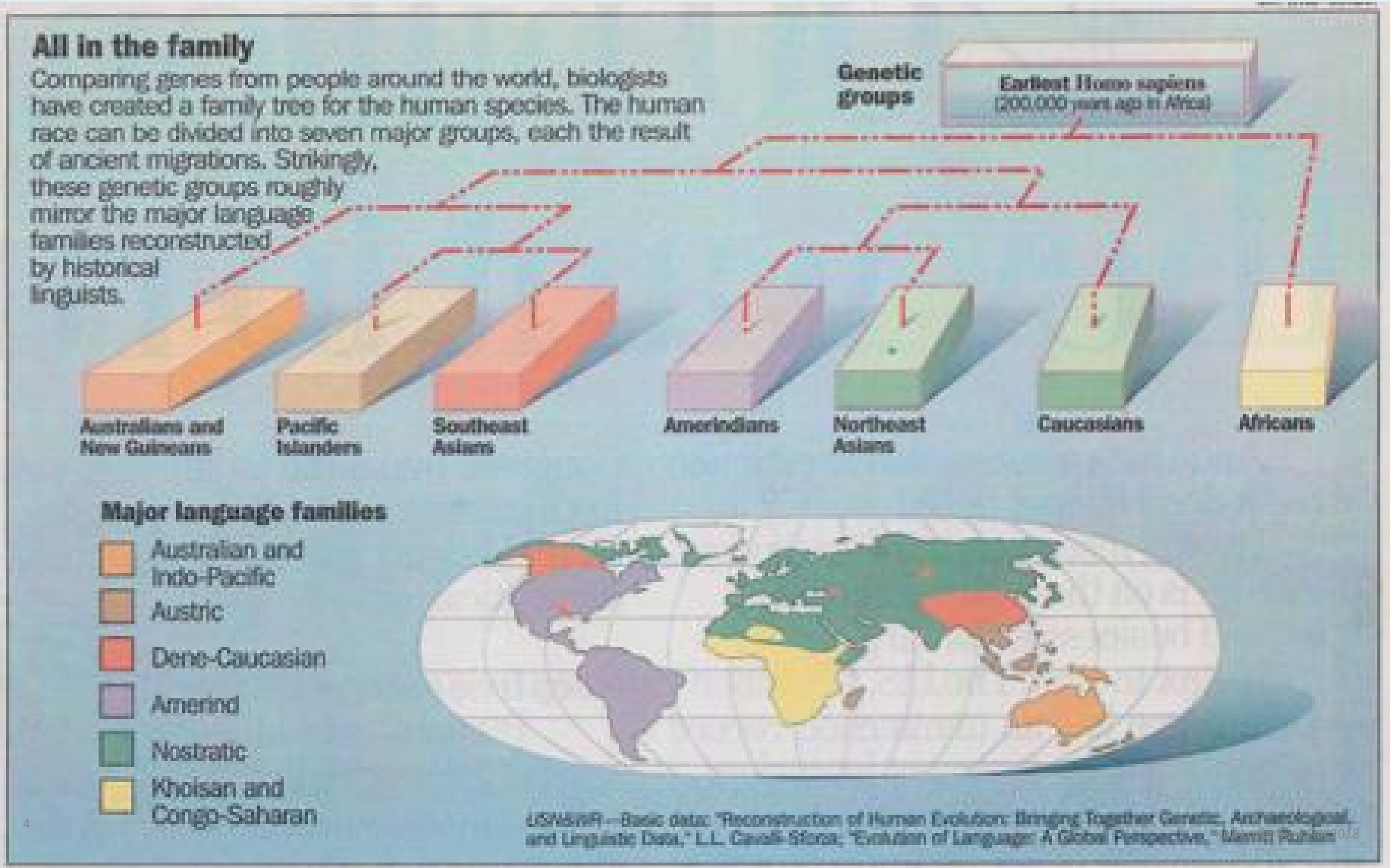
But some crude form of language may have existed long before the evolution of language as we know it. Studies of fossil skulls indicate that a part of the brain crucial to language production in modern humans existed in hominids millions of years ago, suggesting that our ancient ancestors may have had at least rudimentary linguistic abilities. In his new book, *Language and Species* (University of Chicago Press, $24.95), linguist Derek Bickerton of the University of Hawaii contends that primitive language may have arisen not so much from the need to communicate as from the mind's effort to grasp the world around it. Vestiges of this language remain with us, he says, in the form of the simple, one- and two-word utterances of toddlers and adults who speak to each other in pidgin.

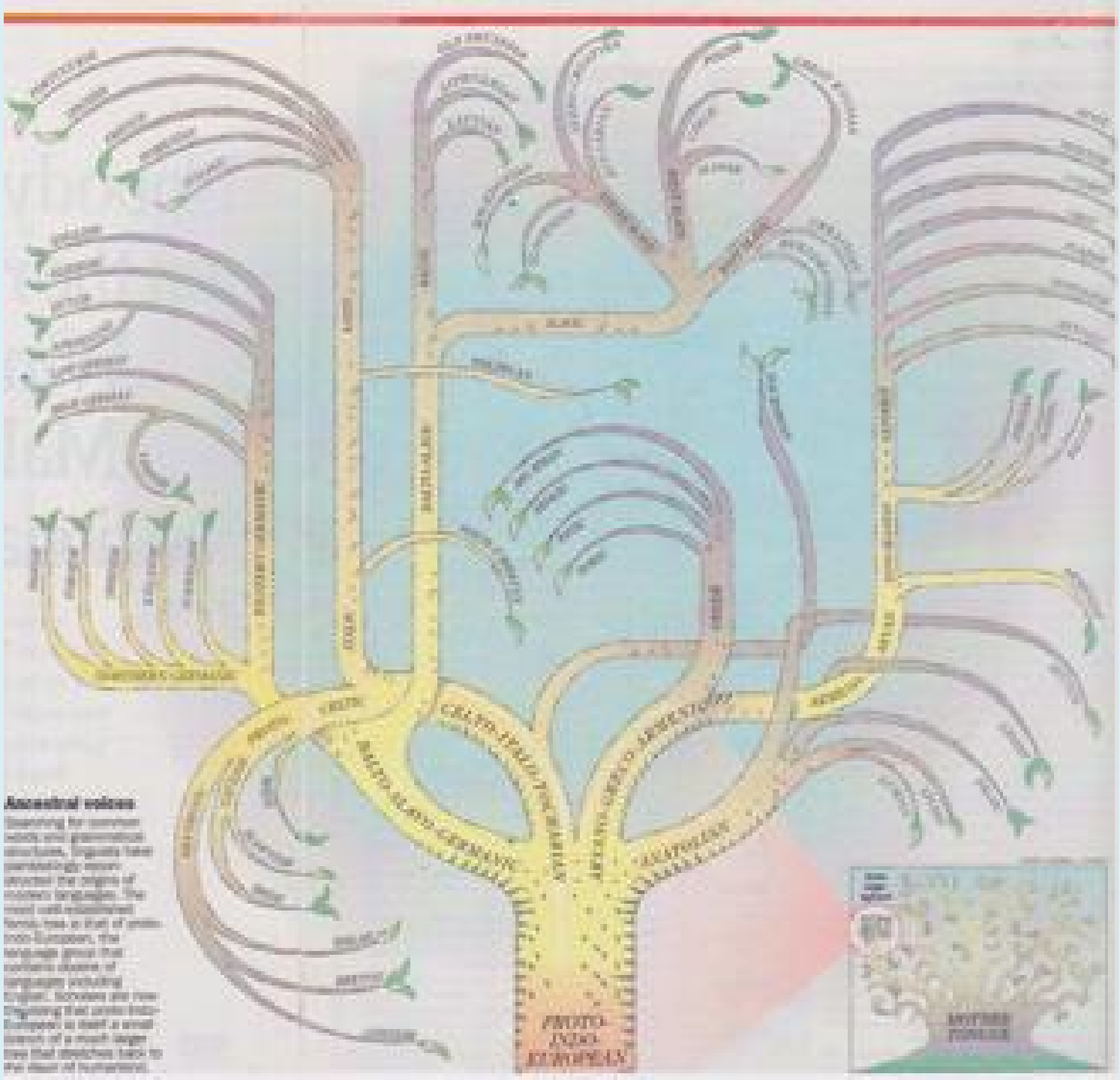
Kanzi. *Crude way with language?*

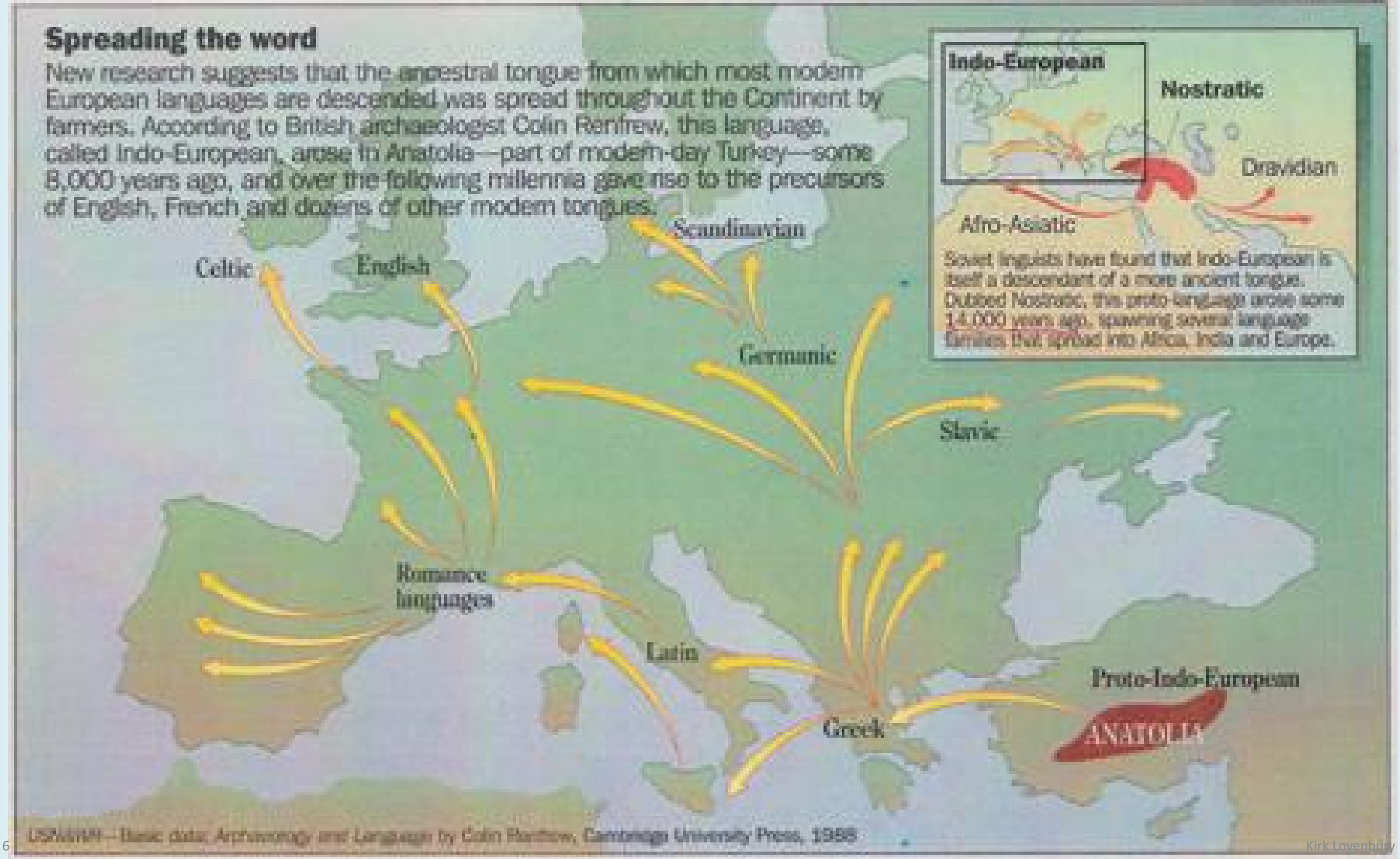
Apes and other intelligent animals may also share this rudimentary form of language. Studies of chimpanzees have shown that animals can communicate with signs or symbols only in a very limited fashion. But just last month, researchers from the University of California at Los Angeles and Emory University's Yerkes Regional Primate Research Center reported that a 5½-year-old pygmy chimp named Kanzi spontaneously learned to use grammatical rules similar to those of a 2-year-old child. UCLA psychologist Patricia Marks Greenfield and Yerkes biologist Sue Savage-Rumbaugh found that the order in which Kanzi used symbols was an integral part of their meaning. Recent studies with dolphins and sea lions demonstrate that these creatures can learn to understand word order as well.

Whether the utterances of animals represent true humanlike language abilities remains a matter of intense scientific debate, however. Critics of animal-language studies argue that the animals are only using rote behavior to get food or are responding to unconscious cues from their trainers. "All the evidence suggests that the animals are merely using sophisticated ways to request things," says Columbia University psychologist Herbert Terrace, whose ape research convinced him that animals could not learn to communicate in a humanlike language. Evidence that language may be a uniquely human trait, say some researchers, ultimately lies not in animals' language abilities but in how they use that ability. In animals, language appears to be just one more way to fulfill physical desires; in humans, language reflects not only our earthly needs but our heavenly desires, thoughts and emotions.


SIBERIA
ATLANTIC SEA
EUROPE
UKRAINE
CENTRAL ASIA
BALKANS
ANATOLIA
IRAN
INDIA
AFRICA
ARABIA


All in the family
Comparing genes from people around the world, biologists have created a family tree for the human species. The human race can be divided into seven major groups, each the result of ancient migrations. Strikingly, these genetic groups roughly mirror the major language families reconstructed by historical linguists.
Genetic groups
Earliest Homo sapiens (200,000 years ago in Africa)
Australians and New Guineans
Pacific Islanders
Southeast Asians
Amerindians
Northeast Asians
Caucasians
Africans
Major language families
Australian and Indo-Pacific
Austric
Dene-Caucasian
Amerind
Nostratic
Khoisan and Congo-Saharan


Ancestral voices


Spreading the word
New research suggests that the ancestral tongue from which most modern European languages are descended was spread throughout the Continent by farmers. According to British archaeologist Colin Renfrew, this language, called Indo-European, arose in Anatolia—part of modern-day Turkey—some 8,000 years ago, and over the following millennia gave rise to the precursors of English, French and dozens of other modern tongues.
Indo-European
Nostratic
Dravidian
Afro-Asiatic
Soviet linguists have found that Indo-European is itself a descendant of a more ancient tongue. Dubbed Nostratic, this proto-language arose some 14,000 years ago, spawning several language families that spread into Africa, India and Europe.
Scandinavian
Celtic
English
Germanic
Slavic
Romance languages
Latin
Greek
Proto-Indo-European
ANATOLIA
USWMW—Basic data: Archaeology and Language by Colin Renfrew, Cambridge University Press, 1988

Development of Language

PHONEMES

CONATES

VOWEL SHIFT

CONSONANT SHIFT

ARTICLES AND PREPOSITIONS

POLITE AND FAMILIAR

COGNATES

- b & p
- d & t
- f & v
- g & k
- s & sh
- l & r
- m
- n
- kw/qua
- w
- j
- ch

VOWEL SHIFT

- **A** as is fat, fate, fawn
- **E** as in each, etch, seem
- **I** as in it, kite, (**I** as in ee)
- **O** as in old, cot, boom
- **U** as in us, use, sun

CONSONANT SHIFT

S to K

V to B

W to V

V to W

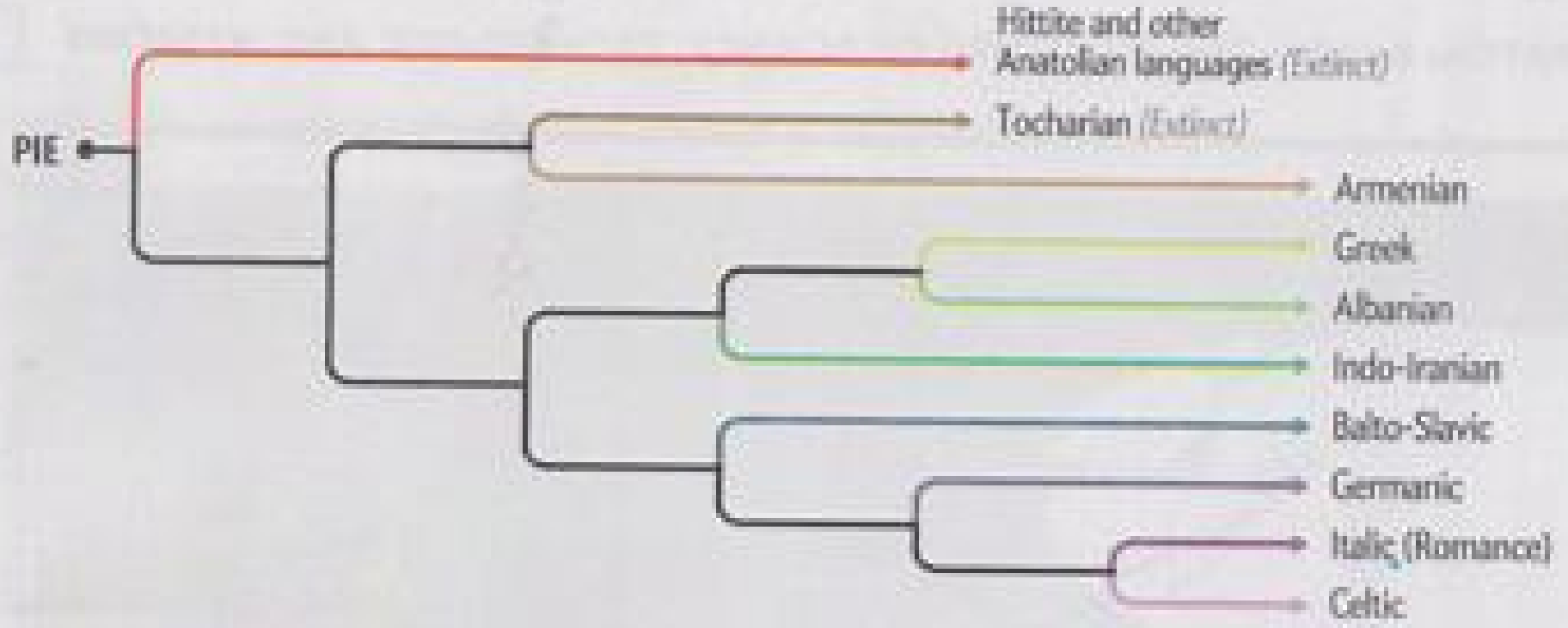
D to dh

T to stop

Add R


Chronic
Beast
Bangin'
Crucial
Epic 1883
Latin for narrative, epic came to describe events worthy of a story and then anything remarkable
Awesome
Killer
Rad
Bomb
Bad
Radical
Ripping
Smoking
All that
Immense
Badass 1955
Neato
Jelly
Groovy
Solid
Cool
Ace
Sweet
Wicked
Dynamite 1926
Greek for force, this explosive word became shorthand for intense and then impressive
Smashing
Peachy
Fly
Jim-dandy
Stellar
Choice
Capital
Smooth 1893
A descriptor for "free from lumps" expanded to mean pleasant, then superior
All right
Nifty
Sparking
Spiffy 1853
Hot
Stunning
Prime
Golden
Gay
Special
Fine
Nuts
Fabulous
Tight
Excellent
Great
Swell
Neat
Dandy
Boss 1830
From the Dutch baas, for uncle, the term for master came to mean esteemed, mastery
Slick
YEAR OF FIRST KNOWN USE OF WORD TO MEAN EXCELLENT
When did everything become 'epic'?
Slang terms like epic are almost always older than you think. Check out the first known use of the words that came to mean excellent

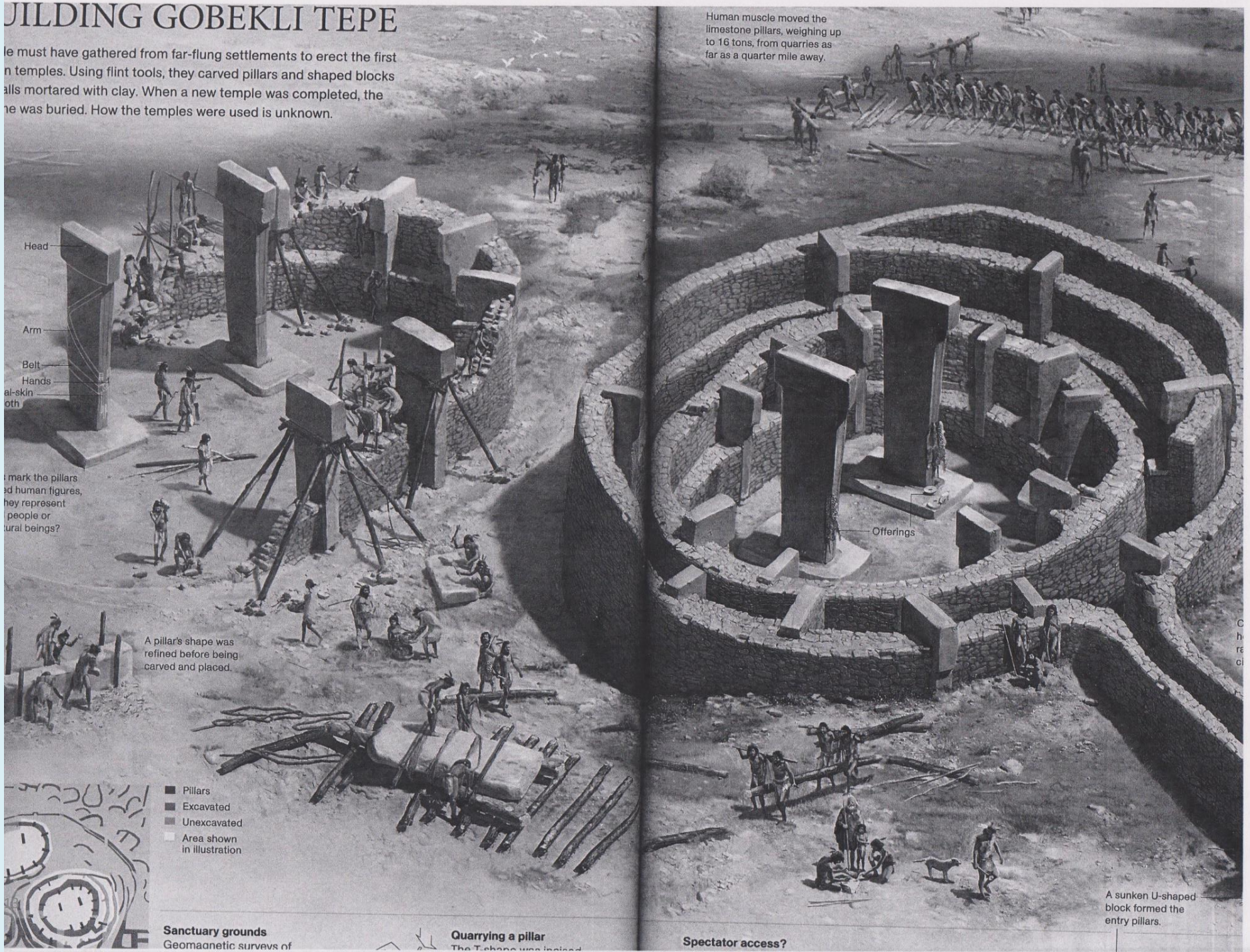
ADVANCES



A large number of languages spoken today—including English, Hindi and Persian—descended from a single root tongue, Proto-Indo-European. New genetic evidence supports the idea this language was spread by Ukrainian steppe nomads on horseback. This diagram is highly stylized and is meant to show only general relations among language groups, not actual dates of divergence.

UILDING GOBEKLI TEPE

le must have gathered from far-flung settlements to erect the first n temples. Using flint tools, they carved pillars and shaped blocks alls mortared with clay. When a new temple was completed, the ne was buried. How the temples were used is unknown.



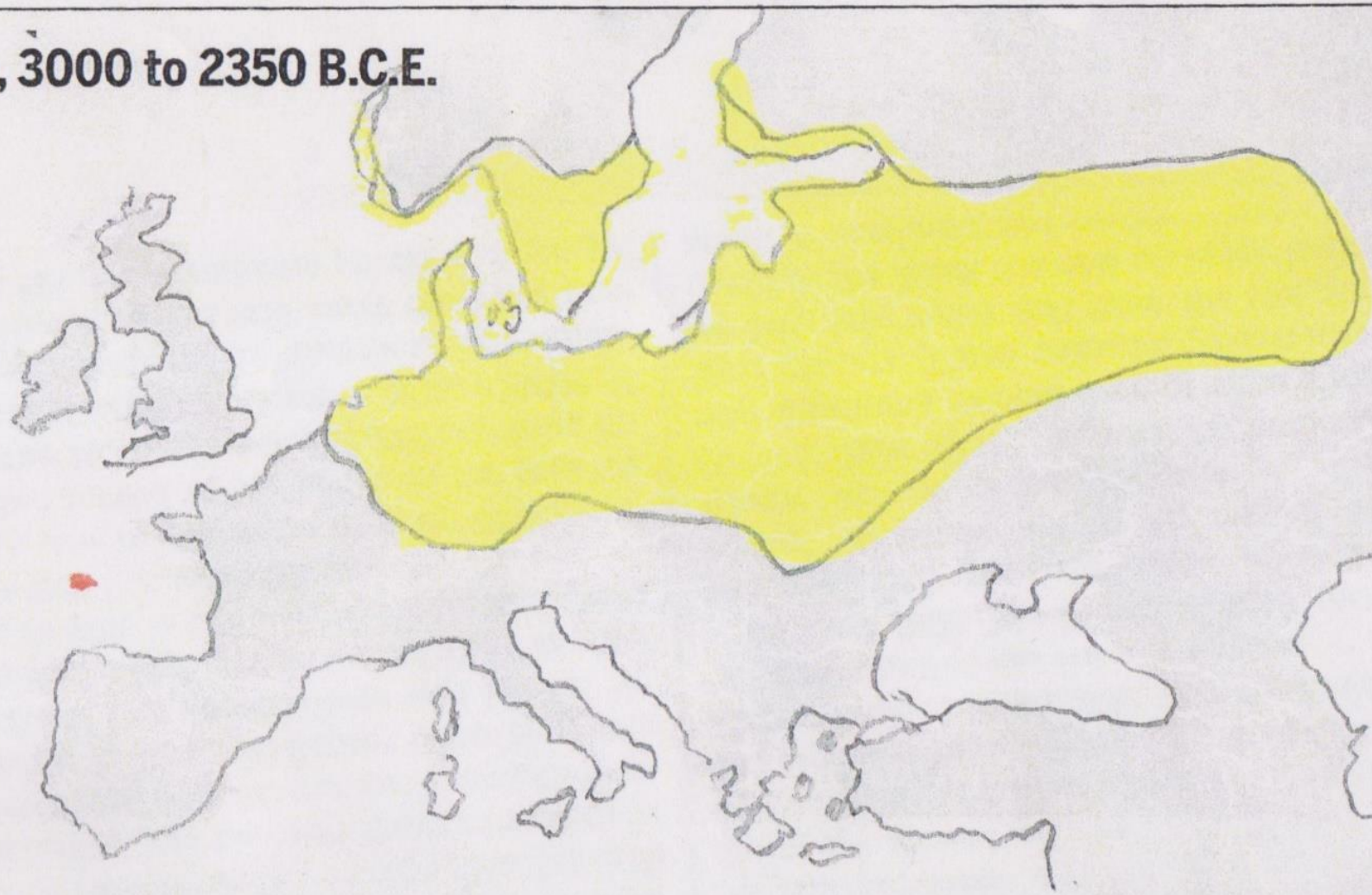
Sanctuary grounds
Geomagnetic surveys of

Quarrying a pillar
The T-shape was incised

Spectator access?

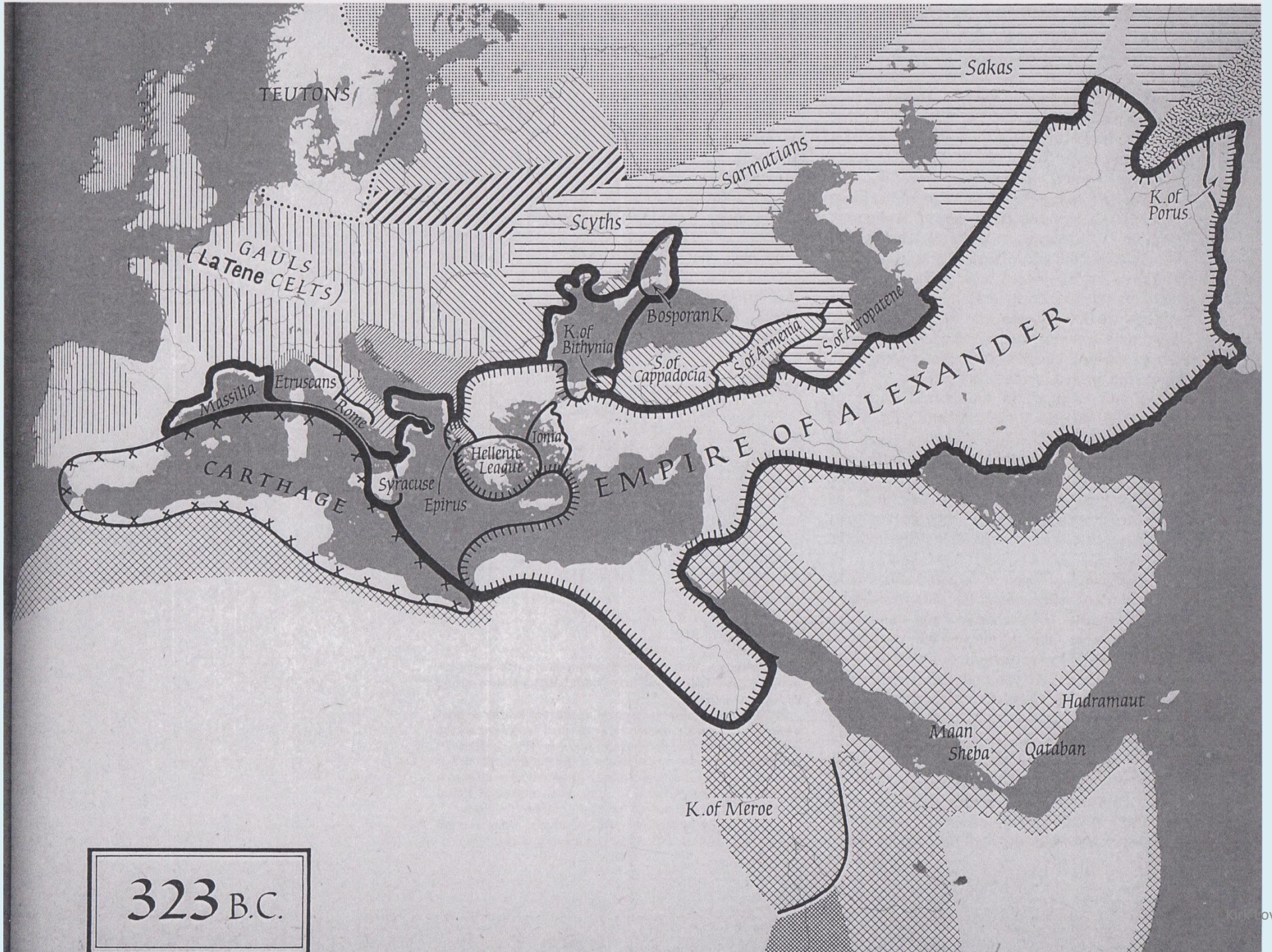

FINNS
Windmill Hill
Funnel Beaker B
Limit of Neolithic techniques
Michelsberg
Tripolye A
Ponto-Caucasian
Passage Graves
DANUBIAN II
Limit of copper working
Chassey
WESTERN NEOLITHIC CULTURES
Cortaillod
Chiozza
Boian A
CAUCASIANS
WESTERN MEDITERRANEANS
Sabadell
Vinca
Akkadians
Elamites
Sumerians
El Garcel
San Cono-Diana
BERBERS
K. of Egypt (Dyn. 2)
CUSHITES
Indo-Europeans
2750 B.C.

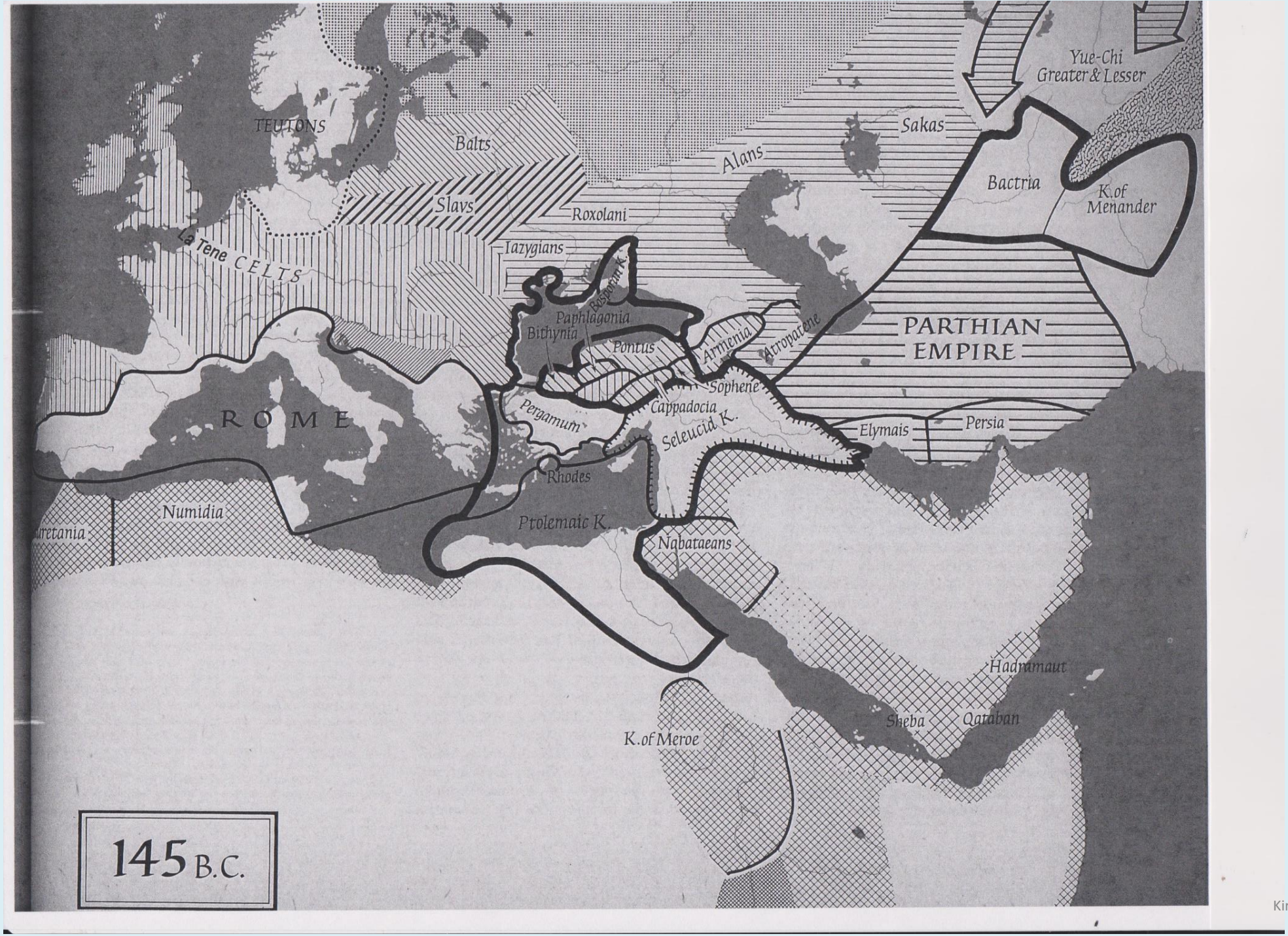
Extent of the Corded Ware culture, 3000 to 2350 B.C.E.



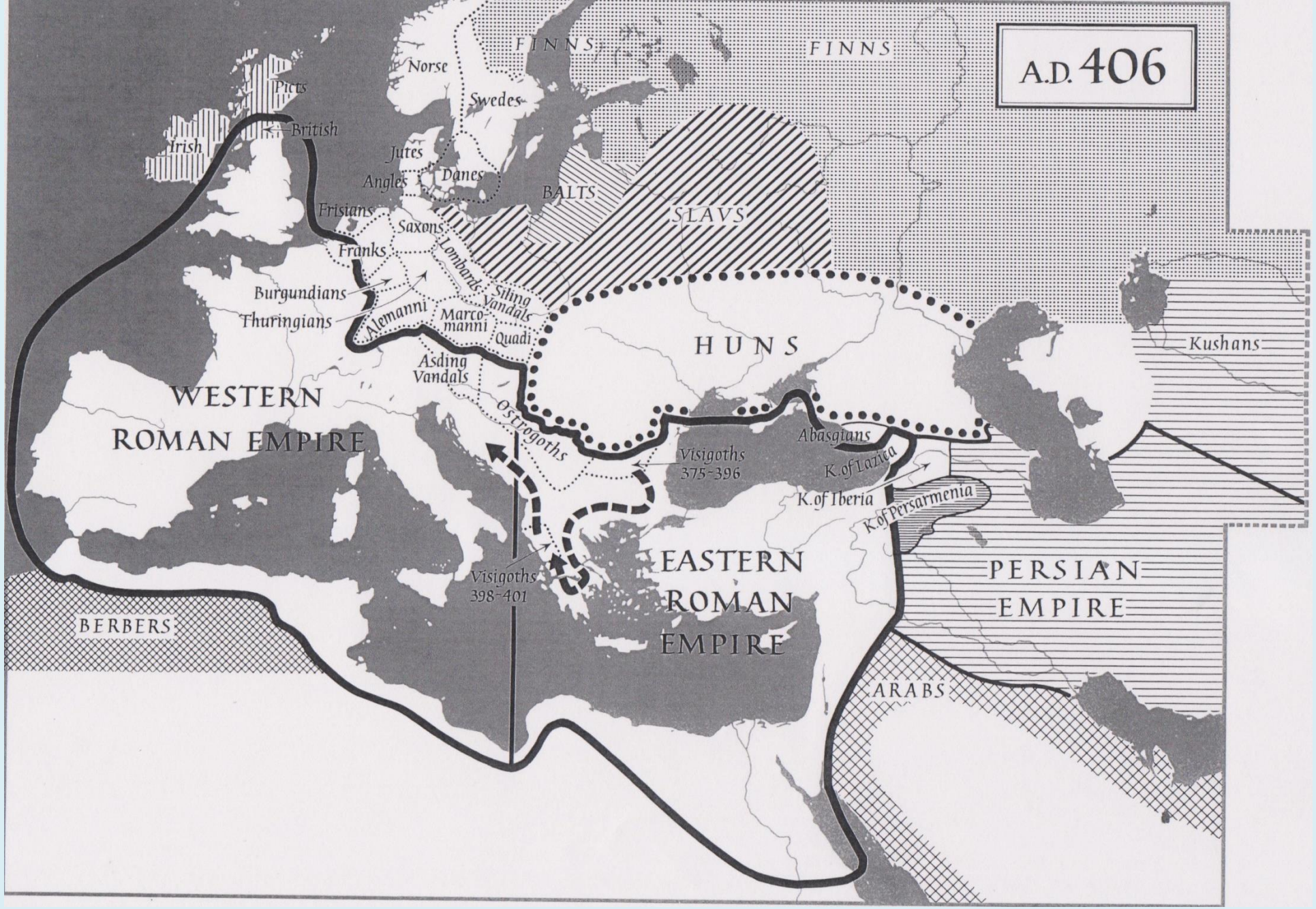
Spreading out. The Corded Ware people, known for distinctive pottery with cord impressions, began to expand their reach starting about 5000 years ago, and may have brought Eurasian genes to Europe.

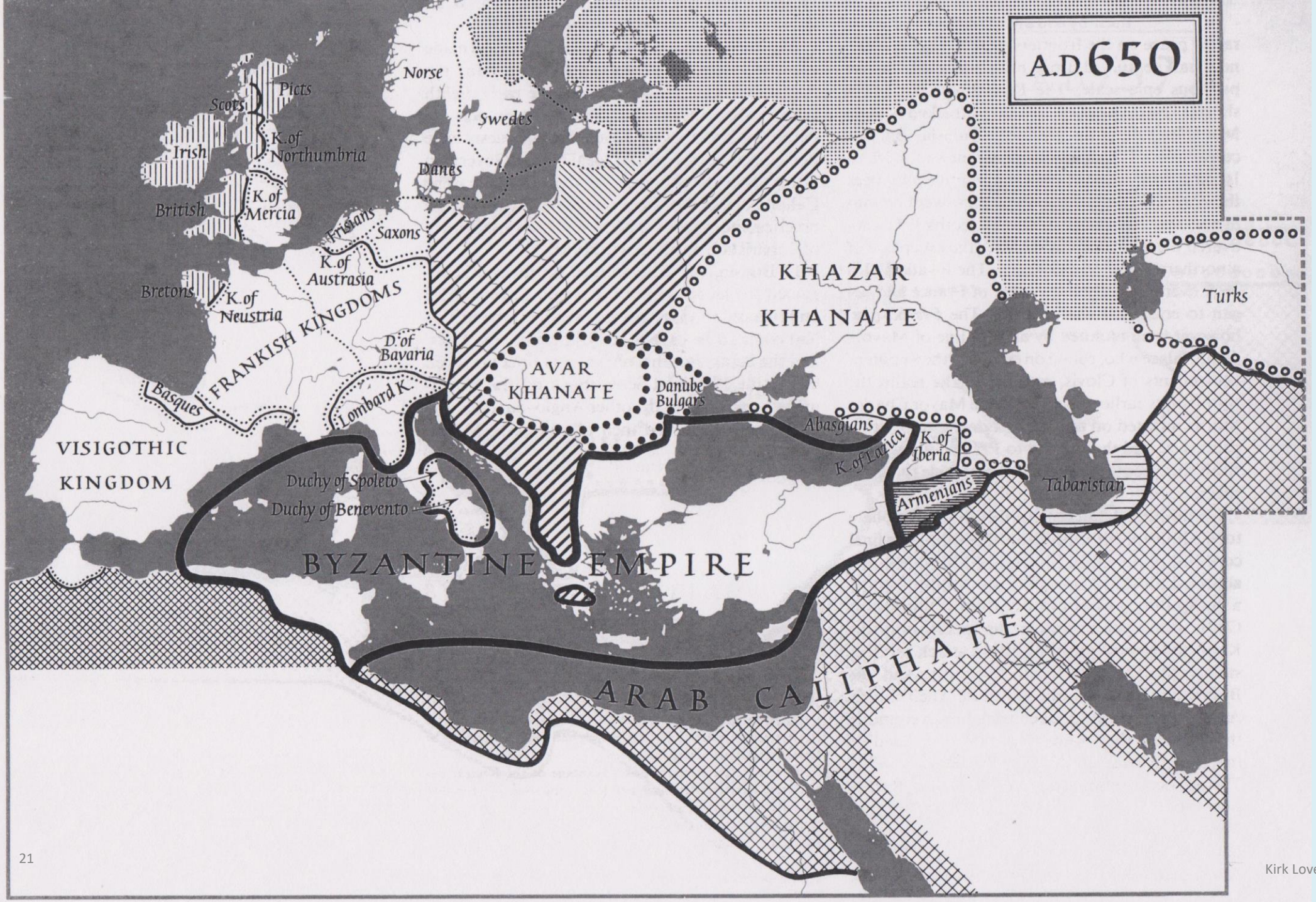

FINNS
TEUTONS
Limit of bronze working
Balts
Slavs
Limit of bronze working
IRANIANS
Aryans
CELTO-
LIGURIANS
THRACO-CIMMERIANS
IBERIANS
Etruscans
Illyrians
Italics
Hittite K.
Mitanni
Hurrians
Kassites
K. of the Sea Land
Elamites
Luvians
GREEKS
Minoans
K. of the
Hyksos
(Dyn. 15+16)
K. of Thebes
(Dyn. 17)
Limit of bronze working
1600 B.C.


TEUTONS
Sakas
Sarmatians
Scyths
K. of Porus
GAULS (La Tene CELTS)
Bosporan K.
K. of Bithynia
S. of Cappadocia
S. of Armenia
S. of Atropatene
EMPIRE OF ALEXANDER
Massilia
Etruscans
Rome
Ionia
Hellenic League
CARTHAGE
Syracuse
Epirus
Hadramaut
Maan
Sheba
Qataban
K. of Meroe
323 B.C.

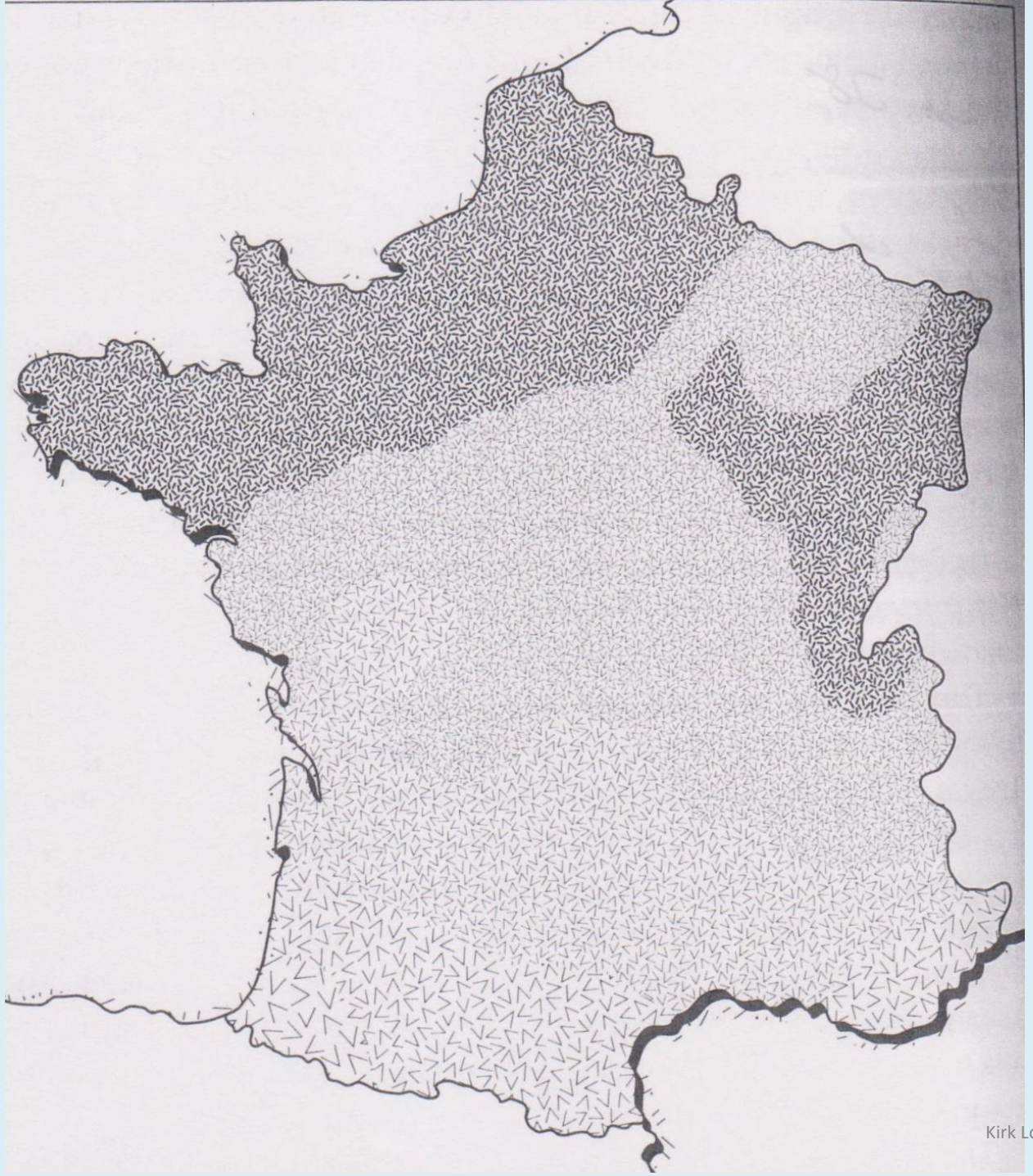

TEUTONS
Balts
Slavs
Roxolani
Iazygians
La Tene CELTS
Alans
Sakas
Yue-Chi
Greater & Lesser
Bactria
K.of
Menander
Bosporan K.
Paphlagonia
Bithynia
Pontus
Armenia
Atropatene
PARTHIAN
EMPIRE
Sophene
Cappadocia
Pergamum
Seleucid K.
Elymais
Persia
ROME
Rhodes
Numidia
Ptolemaic K.
Nabataeans
Hadramaut
Sheba
Qaraban
K.of Meroe
145 B.C.

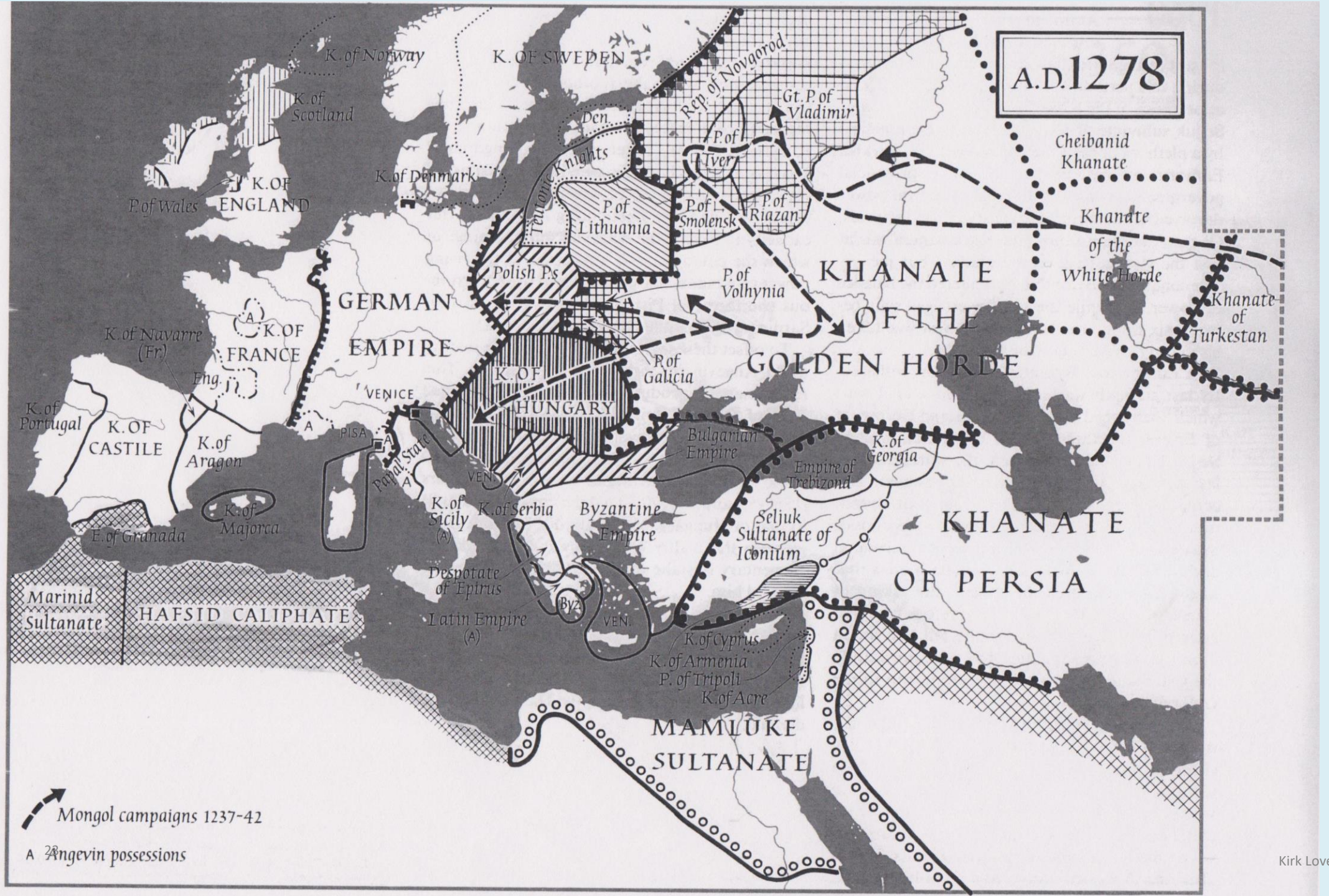

HUNS
Norse
Swedes
Picts
Irish
British
Jutes
Danes
Angles
Frisians
Saxons
Lombards
Thuringians
OSTROGOTHS
Franks
Silling Vandals
Rugians
Alans
Kushan Principalities
Burgundians
Alemanni
Quadi
Asding Vandals
Gepids
Marcomanni
Visigoths
Colchis
Iberia
Armenia
PERSIAN EMPIRE
ROMAN EMPIRE
K. of Abyssinia
A.D. 362


A.D. 406
FINNS
FINNS
Norse
Picts
Swedes
British
Irish
Jutes
Angles
Danes
BALTS
SLAVS
Frisians
Saxons
Lombards
Franks
Burgundians
Thuringians
Alemanni
Marco-manni
Siling Vandals
Quadi
Asding Vandals
HUNS
Kushans
WESTERN ROMAN EMPIRE
Ostrogoths
Abasgians
Visigoths 375-396
K. of Lazica
K. of Iberia
K. of Persarmenia
Visigoths 398-401
EASTERN ROMAN EMPIRE
PERSIAN EMPIRE
BERBERS
ARABS

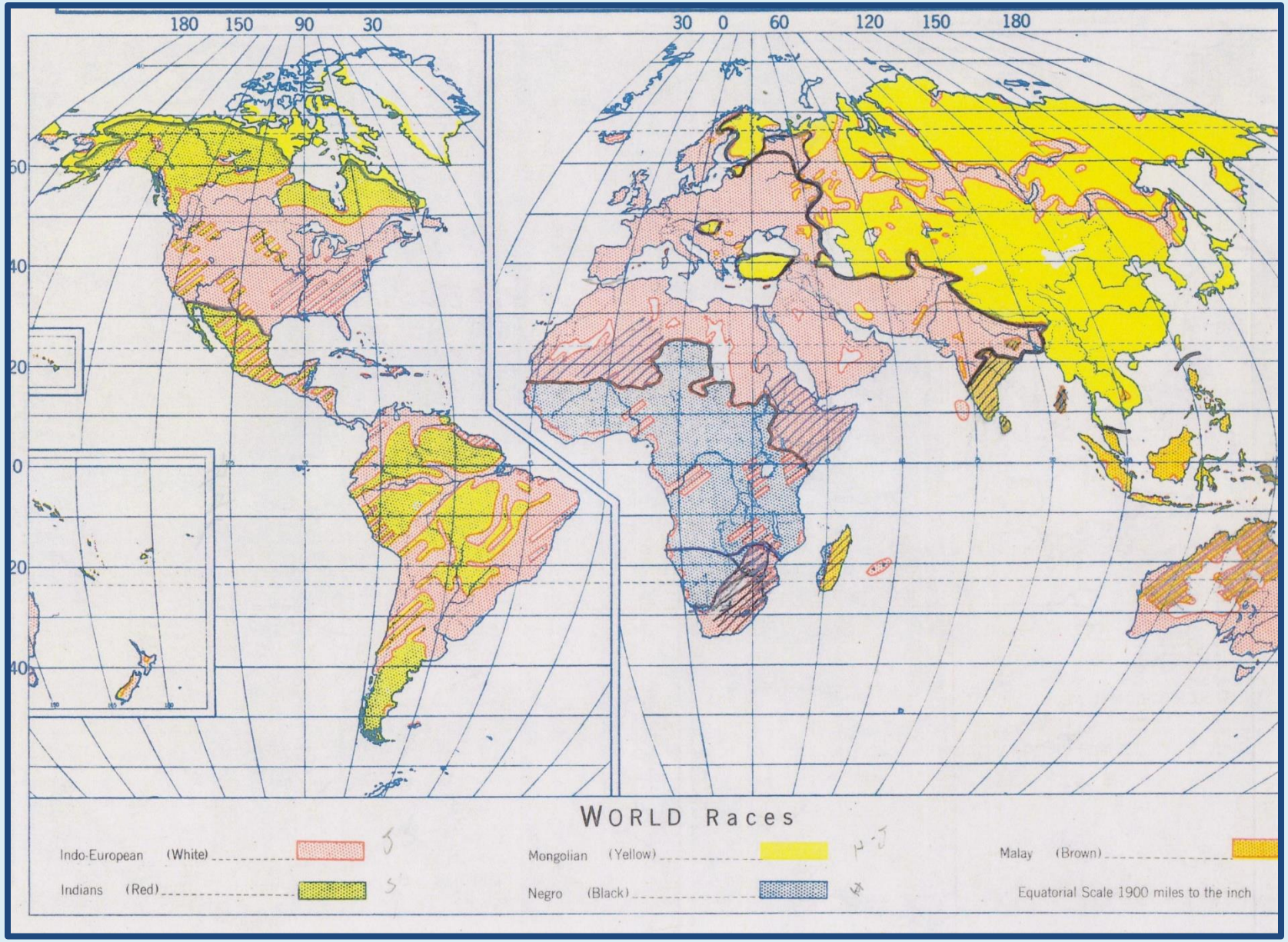

A.D. 650
Norse
Swedes
Picts
Scots
K. of Northumbria
Irish
Danes
K. of Mercia
British
Frisians
Saxons
K. of Austrasia
Bretons
K. of Neustria
FRANKISH KINGDOMS
D. of Bavaria
KHAZAR KHANATE
Turks
AVAR KHANATE
Danube Bulgars
Basques
Lombard K.
Abasgians
K. of Iberia
K. of Lazica
VISIGOTHIC KINGDOM
Duchy of Spoleto
Duchy of Benevento
Armenians
Tabaristan
BYZANTINE EMPIRE
ARAB CALIPHATE

FRANCE




A.D. 1278
K. of Norway
K. OF SWEDEN
Rep. of Novgorod
Gt. P. of Vladimir
K. of Scotland
Den.
P. of Tver
Cheibanid Khanate
K. of Denmark
Teutonic Knights
P. of Wales
K. OF ENGLAND
P. of Lithuania
P. of Smolensk
P. of Riazan
Khanate of the White Horde
Polish P.s
P. of Volhynia
KHANATE OF THE GOLDEN HORDE
GERMAN EMPIRE
K. of Navarre (Fr.)
K. OF FRANCE
Eng.
P. of Galicia
Khanate of Turkestan
K. OF HUNGARY
VENICE
K. of Portugal
K. OF CASTILE
K. of Aragon
PISA
Papal State
Bulgarian Empire
K. of Georgia
Empire of Trebizond
VEN.
K. of Majorca
K. of Sicily (A)
K. of Serbia
Byzantine Empire
Seljuk Sultanate of Iconium
KHANATE OF PERSIA
E. of Granada
Despotate of Epirus
Marinid Sultanate
HAFSID CALIPHATE
Byz.
Latin Empire (A)
VEN.
K. of Cyprus
K. of Armenia
P. of Tripoli
K. of Acre
MAMLUKE SULTANATE
Mongol campaigns 1237-42
A Angevin possessions

World Races


180 150 90 30
30 0 60 120 150 180
60
40
20
0
20
40
WORLD Races
Indo-European (White)
Indians (Red)
Mongolian (Yellow)
Negro (Black)
Malay (Brown)
Equatorial Scale 1900 miles to the inch

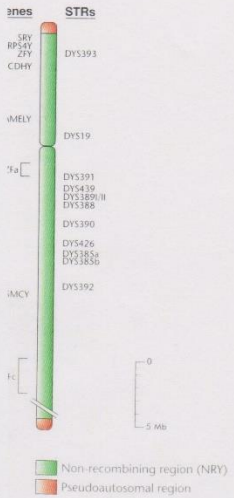
e Genetic Signposts

LINEAGE

e Y Chromosome

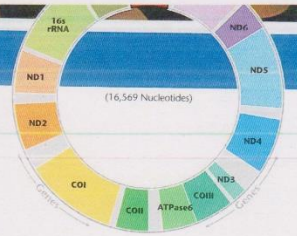
chromosome is the sex-
ining chromosome in humans.
all other chromosomes are found in
ing pairs, it is the mismatch of the
its partner, the X chromosome,
etermines gender—men have a
tched pair (Y and X), while women
wo X chromosomes. Because the Y
ot have a matching chromosome,
f it (the non-recombining region,
') escapes the shuffling process
as recombination that occurs
generation in the rest of our
e. This allows the Y to be passed
through a purely male line,
ed only by random mutational
. These mutations have given rise
y useful genetic markers, such as
shown on the tree diagram to the
e.g., M91, M60, etc.), with varying
phic distributions in men from
the world.

CHROMOSOME

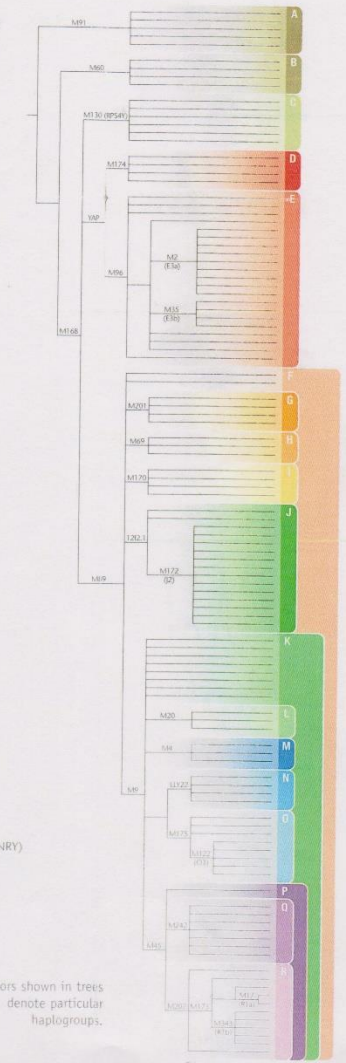


Colors shown in trees denote particular haplogroups.

mtDNA GENOME



Y CHROMOSOME TREE

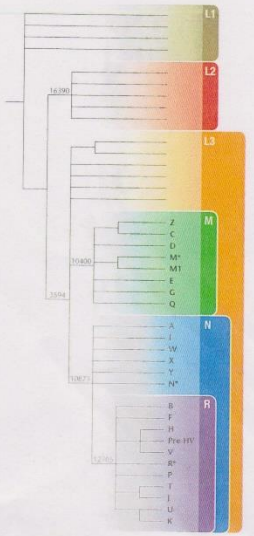


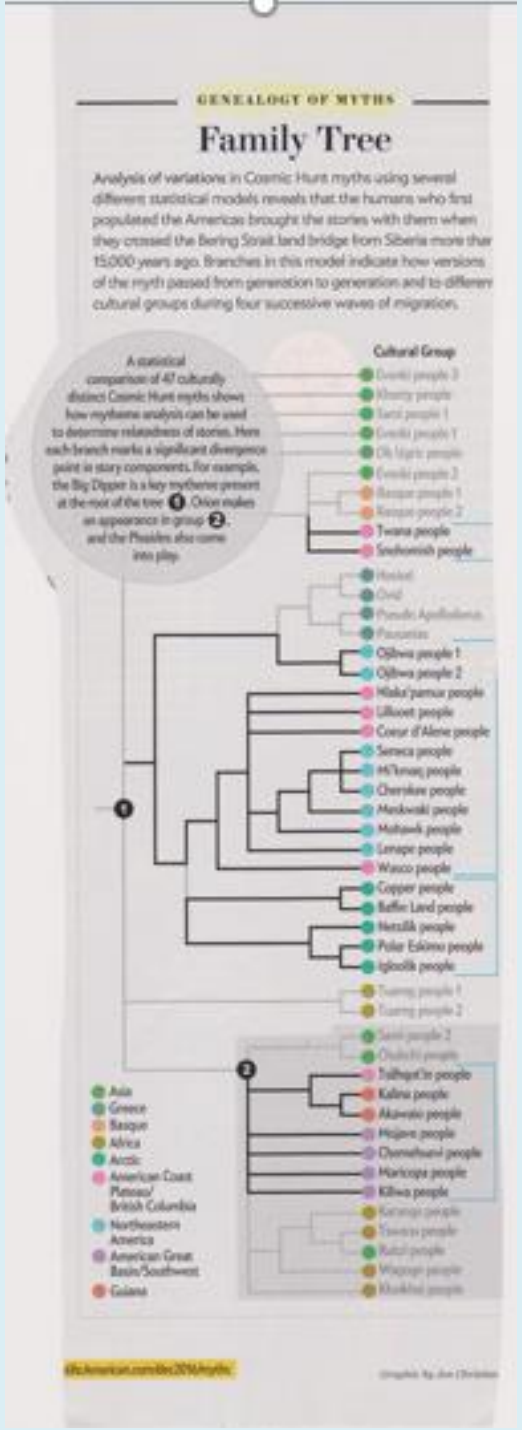
FEMALE LINEAGE

Mitochondrial DNA

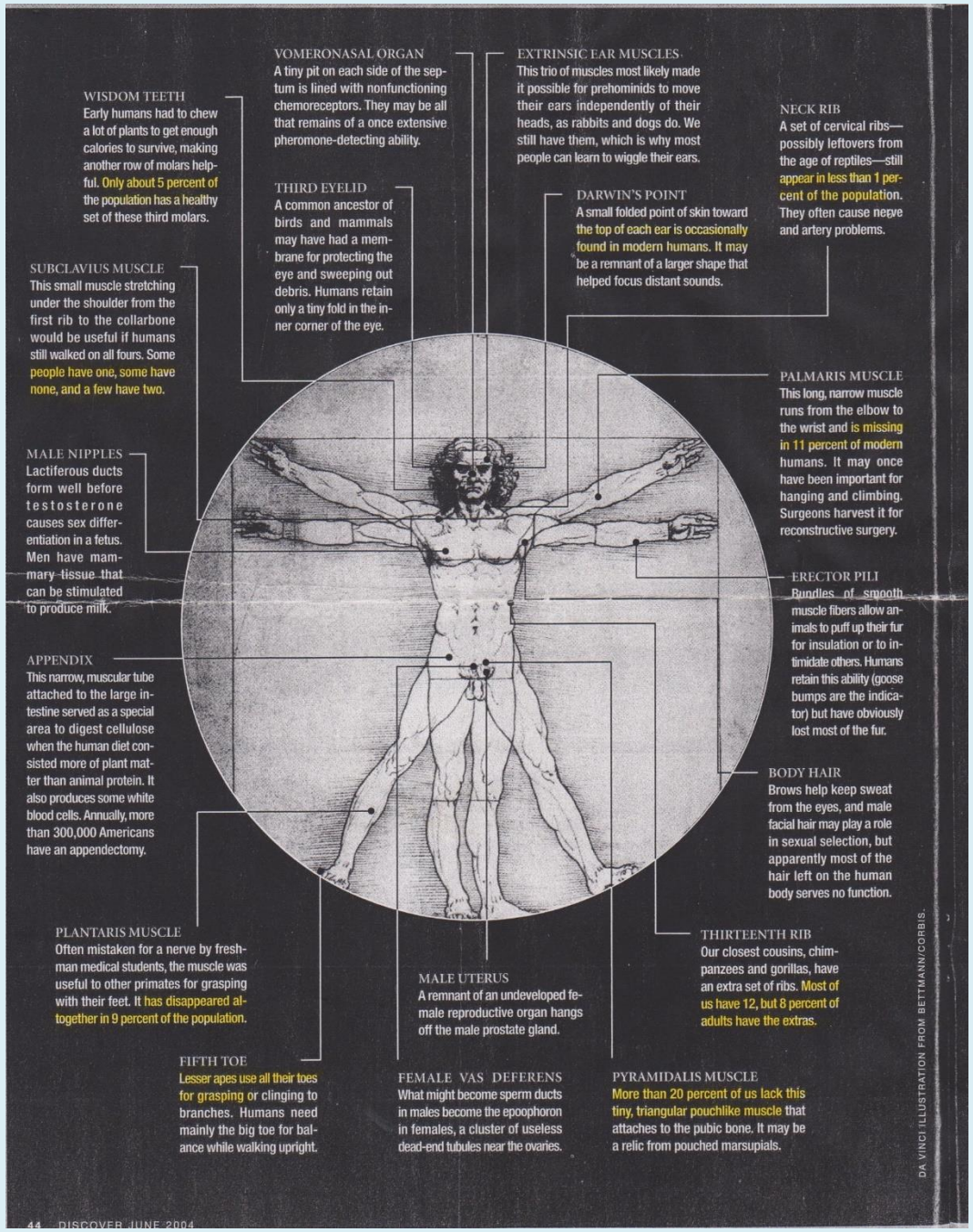
If the Y chromosome traces the male lineage back through history, then the mitochondrial genome (mtDNA) can be considered its female counterpart. Mitochondria are self-reproducing structures found inside the cells of all higher organisms, typically present in hundreds of copies per cell. They are responsible for generating most of the energy used by the cell. Because there are no mitochondria in the head of a mature sperm, they are passed down solely from mother to offspring. One region of particular importance in mtDNA is the hypervariable region (HVR 1&2), where the rate of mutation has been shown to be up to 100 times greater than that of the nuclear genome. Because of its much shorter length (several hundred nucleotides, versus millions of nucleotides, or Mb, for the Y), the HVR can be quickly scanned to reveal many informative mutational events that have been passed down through the maternal line.

mtDNA TREE




GENEALOGY OF MYTHS
Family Tree
Analysis of variations in Cosmic Hunt myths using several different statistical models reveals that the humans who first populated the Americas brought the stories with them when they crossed the Bering Strait land bridge from Siberia more than 15,000 years ago. Branches in this model indicate how versions of the myth passed from generation to generation and to different cultural groups during four successive waves of migration.
A statistical comparison of 47 culturally distinct Cosmic Hunt myths shows how mytheme analysis can be used to determine relatedness of stories. Here each branch marks a significant divergence point in story components. For example, the Big Dipper is a key mytheme present at the root of the tree ❶. Orion makes an appearance in group ❷, and the Pleiades also come into play.
Cultural Group
Twana people
Snohomish people
Ojibwa people 1
Ojibwa people 2
Hidatsa people
Lillooet people
Coeur d'Alene people
Seneca people
Mi'kmaq people
Cherokee people
Menkwaki people
Mohawk people
Lenape people
Wasco people
Copper people
Baffin Land people
Netsilik people
Polar Eskimo people
Iglulik people
Tsilhqot'in people
Kalina people
Akawaio people
Mojave people
Chemehuevi people
Maricopa people
Kiliwa people
Asia
Greece
Basque
Africa
Arctic
American Coast Plateau/ British Columbia
Northeastern America
American Great Basin/Southwest
Guiana

Leonardo


WISDOM TEETH
Early humans had to chew a lot of plants to get enough calories to survive, making another row of molars helpful. Only about 5 percent of the population has a healthy set of these third molars.
VOMERONASAL ORGAN
A tiny pit on each side of the septum is lined with nonfunctioning chemoreceptors. They may be all that remains of a once extensive pheromone-detecting ability.
EXTRINSIC EAR MUSCLES
This trio of muscles most likely made it possible for prehominids to move their ears independently of their heads, as rabbits and dogs do. We still have them, which is why most people can learn to wiggle their ears.
NECK RIB
A set of cervical ribs—possibly leftovers from the age of reptiles—still appear in less than 1 percent of the population. They often cause nerve and artery problems.
THIRD EYELID
A common ancestor of birds and mammals may have had a membrane for protecting the eye and sweeping out debris. Humans retain only a tiny fold in the inner corner of the eye.
DARWIN'S POINT
A small folded point of skin toward the top of each ear is occasionally found in modern humans. It may be a remnant of a larger shape that helped focus distant sounds.
SUBCLAVIUS MUSCLE
This small muscle stretching under the shoulder from the first rib to the collarbone would be useful if humans still walked on all fours. Some people have one, some have none, and a few have two.
PALMARIS MUSCLE
This long, narrow muscle runs from the elbow to the wrist and is missing in 11 percent of modern humans. It may once have been important for hanging and climbing. Surgeons harvest it for reconstructive surgery.
MALE NIPPLES
Lactiferous ducts form well before testosterone causes sex differentiation in a fetus. Men have mammary tissue that can be stimulated to produce milk.
ERECTOR PILI
Bundles of smooth muscle fibers allow animals to puff up their fur for insulation or to intimidate others. Humans retain this ability (goose bumps are the indicator) but have obviously lost most of the fur.
APPENDIX
This narrow, muscular tube attached to the large intestine served as a special area to digest cellulose when the human diet consisted more of plant matter than animal protein. It also produces some white blood cells. Annually, more than 300,000 Americans have an appendectomy.
BODY HAIR
Brows help keep sweat from the eyes, and male facial hair may play a role in sexual selection, but apparently most of the hair left on the human body serves no function.
PLANTARIS MUSCLE
Often mistaken for a nerve by freshman medical students, the muscle was useful to other primates for grasping with their feet. It has disappeared altogether in 9 percent of the population.
THIRTEENTH RIB
Our closest cousins, chimpanzees and gorillas, have an extra set of ribs. Most of us have 12, but 8 percent of adults have the extras.
MALE UTERUS
A remnant of an undeveloped female reproductive organ hangs off the male prostate gland.
FIFTH TOE
Lesser apes use all their toes for grasping or clinging to branches. Humans need mainly the big toe for balance while walking upright.
FEMALE VAS DEFERENS
What might become sperm ducts in males become the epoophoron in females, a cluster of useless dead-end tubules near the ovaries.
PYRAMIDALIS MUSCLE
More than 20 percent of us lack this tiny, triangular pouchlike muscle that attaches to the pubic bone. It may be a relic from pouched marsupials.
DA VINCI ILLUSTRATION FROM BETTMANN/CORBIS.
44 DISCOVER JUNE 2004

la fin

төгсгөл

اختتام

پایان

ekupheleni

结束

qhov kawg

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The End

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النهاية

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