

# History of Indian Science

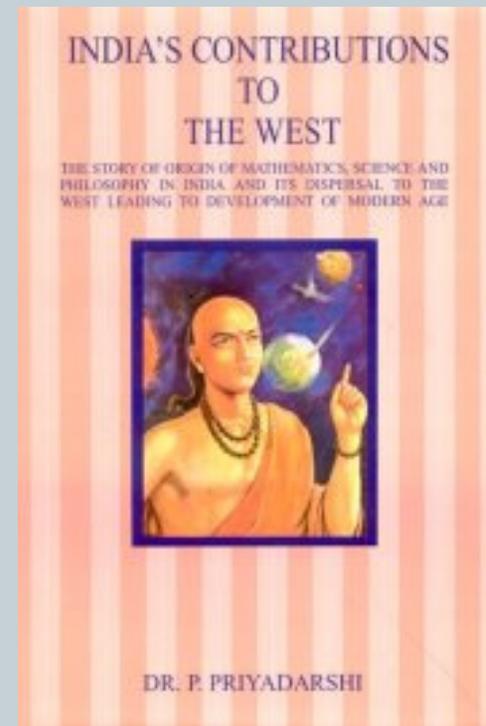
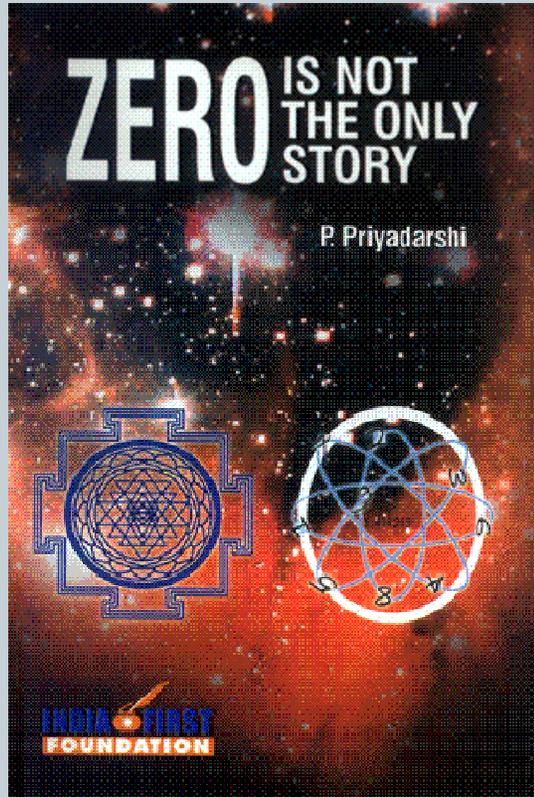


**DR P. PRIYADARSHI**  
**MBBS, MD, FRCP (UK)**

1. *India's Contributions to the West* (2004)

2. *Zero is not the Only Story: Ancient*

*Indian Contributions to Modern Sciences*  
(2007)



# Some Incredible Achievements of Ancient Indian Scientists

**Velocity of Light**

**3,00,000 kms**

Sayana Bhashya of the  
Rig-Veda, I.50.4.

Also quoted by

1. G.V. Raghavrao
2. Dr H. C. Varma
3. P. Priyadarshi (2004)

# The Big Bang Theory



The *Nasadiya Sutra* of the *Rig-Veda*  
(*Rig-Veda* 10.129)

That this and other Vedic descriptions of creation are a  
“Big Bang” theory has been accepted after proper  
examination of the texts.

(See Priyadarshi 2007; Capra, 1991, *The Tao of Physics*; Teresi, 2002, *The Lost Discoveries*)

# Vedic Astronomy



It is generally held by the historians that the concept of the **heliocentric** solar system was invented by the ancient Greeks, and that the division of the heavens or sphere into **360** part and the 12 signs of **zodiac** were borrowed by the Indians from the Babylonians.

## Dirgha-tama Sukta, RV, 1.164.48



“Twelve spokes, one wheel, navels three.

Who can comprehend this?

On it are placed together

three hundred and sixty like *shanku* (cones, angles).

They shake not in the least.” RV 1.64.48

The three axes are clearly: diurnal, annual and  
precession.

RV 1.164.2 also mentions “three naved wheel”.

## Zodiac sign



“Formed with twelve spokes, by length of time, unweakened, rolls round the heaven this wheel (cycle) of orderly existence. Herein established, joined in pairs together, seven hundred and twenty sons, O *Agni*.”

*Rig Veda* 1.164.11;

# Heliocentric Solar System



It is explicit in the Chandogya Upanishad that the Sun is the “*madhye-sthata*” lying at the centre.

Ch. U. 3.11.1

Also,

# Moon lighted by Sun's Light



"The moon gets light from the ray of the sun named *Susumna*".

*Shukla- Yajurveda Samhita* 18.40.

Chaukhamba Vidya Bhavan, Varanasi, 1996. p.456.

Also, *Taittiriya Samhita (Krishna Yajurveda)*, 3.4.7.1.

Such views about moon had survived at least  
until about 1000 AD

Al-Biruni, a Muslim traveller and historian from about  
1000 AD noted that  
the Hindus believed

“when the solar ray meets the moon, the ray becomes  
as cool as moon herself, then, being reflected, it  
illuminates the darkness, makes the night cool and  
extinguishes any hurtful kind of combustion wrought  
by the sun.



It is important to accept the incredible mature of these views. Because people outside India believed that sun and moon are lighted objects placed by God to are arrangements



Current available evidence shows that India was the world leader of science from the earliest times (Vedic Period) until the twelfth century. Bhaskaracharya II was the best mathematician and astronomer world over in the twelfth century.

By the end of the twelfth century, Indian universities at Nalanda, Vikramashila and Odantpuri were destroyed by Bakhtiyar Khilji, propelling India into a Dark Age of ignorance.



However, some mathematicians and scientists fled to the South, where they continued to flourish as the South or Kerala school of Indian mathematics. Nilakantha, Mahadeva etc are mathematicians from that school of Kerala.

It has been found that much of what Newton is credited for, and many of the European mathematical discoveries were actually brought to Europe as the translations of the works of the scholars of the Kerala school, and also the earlier Indian scholars like Bhaskara, Aryabhata and Brahmagupta.

(George Ghevergese Joseph, *The Crest of the Peacock: Non-European roots of mathematics*, Princeton University Press)

# The Sulba Sutras



Pythagoras in the sixth century BCE came to India, where he learned Indian mathematics and then went back to Greece to establish the first mathematical tradition of Europe.

The Baudhayana Sulba Sutra of the Vedic text Katyayana Kalpa Sutra is known to us today as the Pythagoras's Theorem.

# Early Mathematics



Any mathematics textbook from Vedic times has not survived till today. Yet from the stray mentions, we are able to arrive at an evidence based conclusion that the decimal system of numbering, geometry etc were present during the Vedic Age itself.

We will not go into the details of Vedic Age mathematics.

# Kanada's Vaishesika Sutra



**THE ONLY SURVIVING  
TEXTBOOK OF PHYSICS  
FROM 6<sup>TH</sup> CENTURY BCE**

# KANADA'S *VAISHESHIKA SUTRA*



PERIOD: SIXTH CENTURY BC

A COMPREHENSIVE TEXTBOOK OF PHYSICS

DISCUSSES:

MECHANICS

HYDRAULICS

ELECTRICITY

HEAT

LIGHT

MENTIONS MAGNET

QUANTUM, ATOM AND SPACE

PHYSICAL CHEMISTRY

# Anti-matter



Mentioned by Kanada as “*abhava-padartha*”

Today we can say that *abhava-padartha* of Kanada is nothing but anti-matter.

# Anti-Matter



*“Tadabhave samyogabhvopradurbhavashcha mokshah.”*

Tad abhave samyoga bhavo pradurbhavah cha mokshah.

The union of bhava matter and abhava matter leads to annihilation of (both).

*Vaisheshika darshanam, 5.2.18*

## Kanada mentions magnet too



“*Mani-gamanam suchi-abhisarpanam-adrishta-karanam*”.

(When the magnet moves, the *suchi* also moves; this is due to invisible cause.)

*Vaisheshika Sutra*, 5.1.15

Linguistic analysis shows: suchaka = indicator derived from “suchi” (needle) why?

## Magnetic compass mentioned in 9<sup>th</sup> century



Adi Shankaracharya (9<sup>th</sup> century AD) too mentioned magnet and compass “*bhraamakasya lauha bhramanena*”.

(Sri Madbhagavad-Gita, 18.66 commentary 66.12)

He uses the word *bhraamaka*.

Bhraamaka literally means “one which aids in bhramana”.

## We will today examine some sutras discussing mechanics



- One substance changes into other substance, and its properties change into other properties.  
(*Vaisheshika sutra, 1.1.10*)
- This is Law of Conservation of matter and energy.  
(First Law of Thermodynamics)
- The First Law of Thermodynamics is stated at many places in ancient literature. One is *Bhagavad-Gita* 2.16, other is *Chhandogya Upanishad* 6.2.2.  
*kathamasad-sajjayet*

One *karma* (energy) is not produced by other  
*Karma* (energy).

*[karma karma saadhyam na vidyate]*  
*(Vaisheshika-Sutra, 1.1.11)*

Here Acharya postulates, that one *karma* (energy)  
cannot produce another *karma* (energy) [directly,  
without intervening work].

Only a modern physicist can judge how far he was  
correct.

*Karya-virodhi-karma.*

Energy is against the work.

*(Vaisheshika-Sutra, 1.1.14)*

In other words, the accumulated *karma* (potential energy) is exhausted by same amount of work in the opposite direction.

Another meaning is :

Work done = Energy Required; And the diction is opposite.

# An example of systematic disposition of a topic by Kanada



***VAISHESHIKA SUTRA: CH. 5.***

**IT DISCUSSES PRIMARILY  
PHYSICS INVOLVED IN THE  
PROCESS OF MILLING  
(POUNDING).**

**ENERGY, ELASTICITY,  
COLLISION**

Active and passive work, gravity and collision  
(elastic) have been discussed in Chapter 5 of  
the Vaisheshika Sutra



## *Vaisheshika Sutra, 5.1.1*



- The self causes the 'hand' to move up.

This is the first cause of initiation of the milling process.

Effort by hand (lifting) produces *karma* in the *musal*. (*Vaisheshika-Sutra*, 5.1.2)

At this point, we do not know whether *karma* means kinetic energy or upward momentum.

When the *musal* falls back on the *ukhala* (base), hand is not working. (*Vaisheshika-Sutra*, 5.1.3)

Here it has been explained to the student, by means of a suitable example, that for doing a work, one needs to apply force. Hand is not applying any force hence not working. In this case actually gravity is doing the work.

When the *musal* rebounds upwards after hitting the *ukhala*, there is no effort by hand. (*Vaisheshika-Sutra*, 5.1.4)

Here Kanada gives an example of a perfectly elastic collision in vertical line.

When the hand holds the rebounding musal, a *karma* is generated in the hand due to contact with the musal. (*Vaisheshika-Sutra*,5.1.5)

The sutra-kara understands that 'hand' is not active in upward movement, yet it has developed a velocity. Hence a *karma* develops in it. Thus we get that *karma* is a function of 'velocity' in this case. But it is not clear as yet from the text whether it is momentum or energy.

In this way, *karma* generated in hand may be either due to the hand's link with the self, or due to its link with an object. (*Vaisheshika-Sutra*, 5.1.6). Author means to say that a physical contact is essential for transfer of '*karma*'.

This sutra explains that *karma* can be transferred in anything only because of a link between it and something else for transmission.

# Then he mentions exceptions: The invisible forces:

- Like the ascent of sap in a plant against gravity. *Vaisheshika Sutra, 5.2.7*
- Ascent of vapor in sky appears to be because of invisible cause, yet actually it is because of sun-rays causing negative and positive pressures in air. (*Vaisheshika Sutra, 5.5.5-6*).
- Gravitation
- Magnetism

The purpose of the author here is to explain that often the cause may not be obvious, and one may think the cause to be non-existent, but even in there the cause exists.

Coming back to *musal*, Kanada says:

If the hold is lost, object falls because of gravity. (*Vaisheshika-Sutra*, 5.1.7)

The sutra explains here that hold ‘opposes gravity’. If there is nothing to oppose the force of gravity, “gravity causes” the fall (*gurutvaat patanam*).

Kanada claims this to be universally applicable,  
even for the water in the clouds.

*Vaisheshika Sutra. 5.2.3* says

“*apam samyogabhava gurutvat patanam*” in context  
of cloud and rain.

Back to *musal*: (Anything) cannot move upwards unless there is (applied) a critical *nodana*. (*Vaisheshika-Sutra*, 5.1.8)

This concept of 'critical force' just after the sutra discussing 'gravity' is significant. It hints that gravity (m.a or m.g) is a particular force, and any force less than that will not cause an upward motion.

Then Kanada gives relationship between *nodana* and effort:

A particular *prayatna* (effort, force) produces a particular *nodan* (?momentum).

(*Vaisheshika-Sutra*, 5.1.9)

- Nodan is 'impulse'. (Monier-Williams Dictionary). Which means change of momentum.
- Hence we can say that 'change of momentum is proportional to the force applied.'

A particular *nodan* (?momentum)  
produces a particular rise (of projectile).  
(*Vaisheshika-Sutra*, 5.1.10)

This reminds me of  $H = v^2 / 2g$ ;

When the hand (holding musal) falls freely (with the musal), it is doing a *dara-karma* or ladies act (passive work).  
(*Vaisheshika-Sutra*, 5.1.11)

This gives the definition of passive-karma. Passive karma is that karma when force is applied by something else and the motion and force both are in the same direction, as in the case of hand-musal combine.



- Thus the *Vaisheshikas* understood that work, kinetic energy and potential energy are only different stages or forms of the same thing.

# Spiritual samskara



- Samskara is ‘action’ done on to someone in the past. It includes ‘impacts’ of past violence.

# Correlation with spiritual karma



- Karma is 'accumulated work' of past actions/ efforts.
- It cannot be destroyed.
- It has to produce a certain amount of work/fruit, before it can be exhausted.

## Rate of change of sanskara with height in a vertically thrown projectile ( $d\phi/dh$ )

- *Nodnat-aadyam-ishoh karma tat-karmakaaritaat-cha samsakarat-uttaram tathottaramuttaram cha. Vaisheshika-Sutra, 5.1.17*
- *Samsakaara-abhaave gurutvaat patanam. Vaisheshika-Sutra, 5.1.18*
- Meaning: Initially the impulse (*nodana*) applied to the projectile produces *karma* (?kinetic energy) in the projectile. As the projectile rises, higher and higher *samsakara* (energy stored) is used. When the *samsakara* of the projectile is exhausted, it starts falling down under the influence of gravity.

Prashastapada says that *samskara* is of three types viz. *vega*, *bhaavana* (impression) and *sthitistapaka* (form-restoring)

*Samsakara Prakaranam* in the *Prashastapada Bhashyam*, Hindi Tr. *op. cit.* p. 221-3.

# Knowledge of Vector in ancient Indian Physics

*Dig-vishishta (karma-padartha-nirupanam Prakaranam) and  
niyat-dig-kriya-vishishta (samsakara  
prakaranam) of the Prashastapaada  
Bhashya*

Break for two minutes allowing  
a few questions



# Rediscovering Indian Past





By the time the British came in power in India, India had lost nearly all memory of her pre-Medieval past. Whatever was available comprised only of folklores and some legends contained in the religious texts like the Puranas and the Mahabharata.

Thus in the nineteenth century, Chandragupta Maurya, Kautilya's Arthashastra etc were not known to anyone.



The British took the task of unearthing India's ancient past.

However, there was resistance from Western minds to accepting any great achievement to the ancient Indians.

# The Discovering of Indian past



When it became obvious in the twentieth century that the “zero” was invented in India, many Eurocentric scholars staked claims that the “zero” had been invented by the Greeks from the Greek letter ‘omicron’.

However, when an inscription dating back to 585 AD was found in Gujarat with numeric “zero” in it, everyone had to agree. (Basham:495; Duncan:166;)



By now it has been known to the historians that the modern number system and the ten numerals were invented in India, yet the name of the numerals as the “Arabic Numerals” stays in vogue. They should be called the “International Form of the Indian Numerals” as named in the Constitution of India (Art. 343-1 ), or simply the “Indian Numerals”.

# Pingala



Even the binary number system used in computer science was invented in India.

(Pingala, *chhandah-sutra*, 8.24-25)

Pingala's book also discusses Permutation and Combination



**Panini** (600 years before Christ) gave the language theory, which became basis for modern compute language: **Backus-Naur form language**. It has been renamed as Panini-Backus form.

Has Modern Science derived  
from transmission from India



# Story of Kanaka

The Indian province of Sind was under Arab rule. A diplomatic delegate from Sind went to the Caliph's court in Bagdad in 771 AD. The delegate had included an Indian scientist Kanaka, Called al-Kanakah al-Hindi by al-Qifti.



Kanaka had taken with him a large number of Sanskrit books discussing Indian science. He presented and explained them to the Caliph al Mansur.

Caliph got amazed by science of India. He ordered translation of the texts into Arabic.



# Al-Fazari and Yaqub-ibn-Tariq

Caliph appointed these two Arabic scholars, al-Fazari and Yaqub-ibn-tariq to become students of Kanaka, to learn Sanskrit and to translate all the Sanskrit texts into Arabic.

Fig. Commemorative stamp on Al-Fazari





The most important texts were

1. Books of Aryabhata
2. Books of Brahmagupta

# The Library

## Bait-al-Hikma (House of Knowledge)

To house and preserve these texts, Caliph al-Mamun ordered founding of a library at Bagdad, which was completed in 833. It functioned like a university.

All the Arabic version of Indian books were kept here.

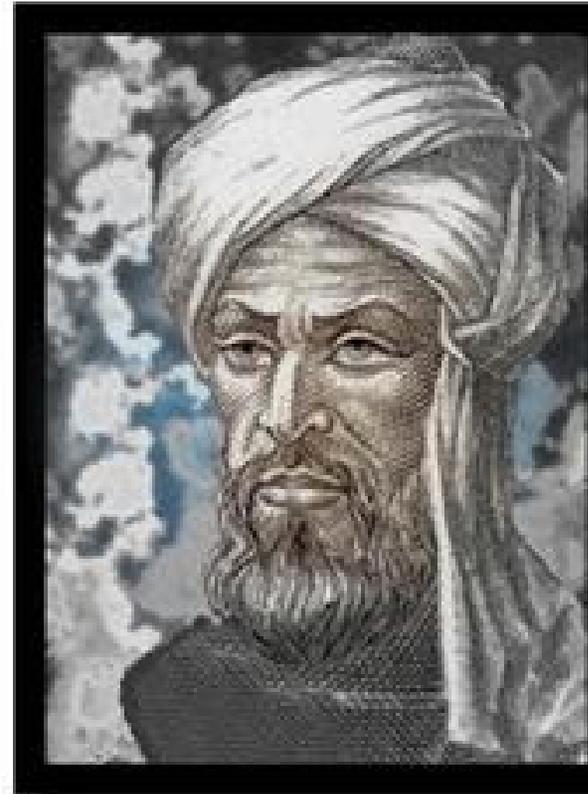


# Al Khwarizimi

Al-Khwarizimi appointed head of the library and mission for knowledge.

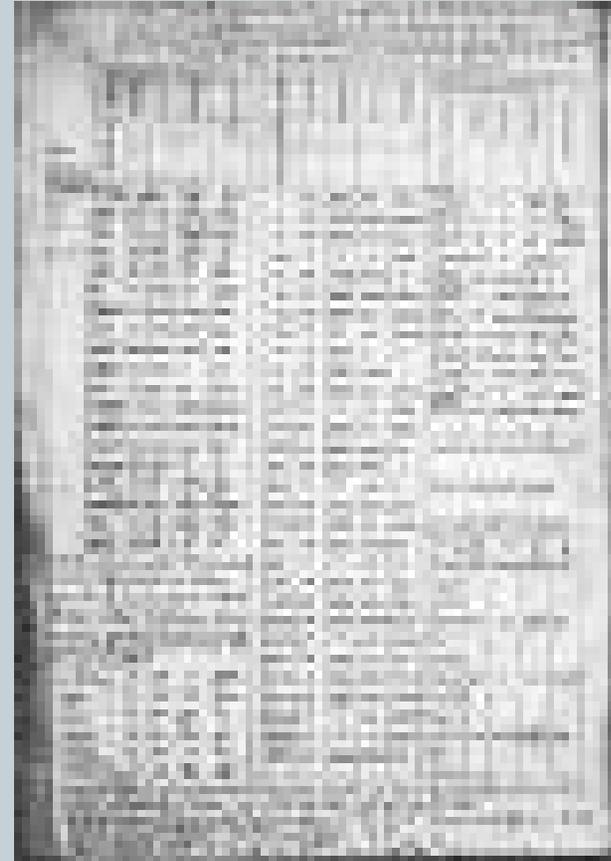
He visited India twice to take more books to Bagdad.

Later al-Khwarizimi synthesized the entire knowledge to compile a book of mathematics and science.



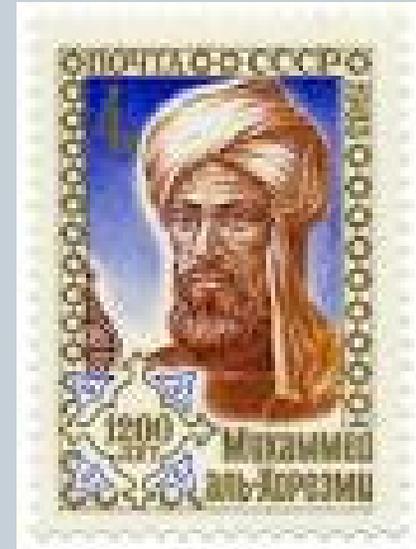
The book compiled by al-Khwarizimi was named “SIND-HIND” which is a corrupted version of “siddhanta”.

It became the main text book of maths and science in Europe later.



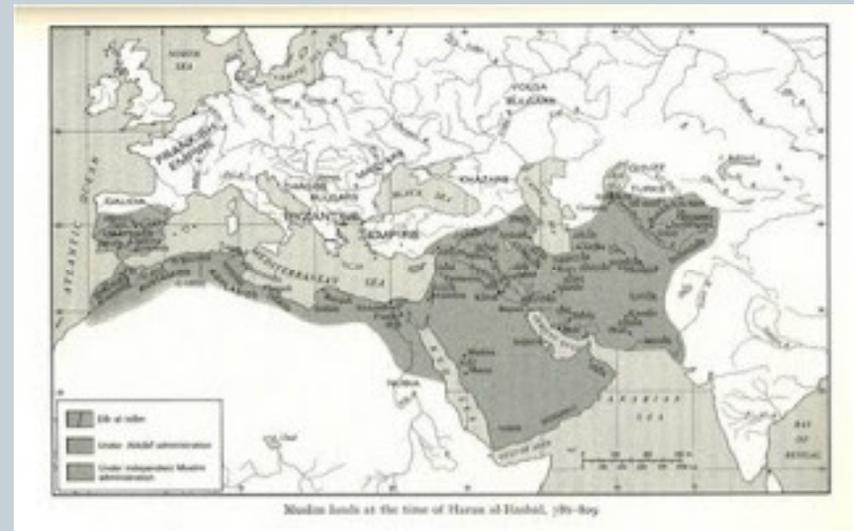
# Al-Kwarizimi

- Al-kwarizimi wrote another text book , which is not available today, but its translation into Latin served as the main light of Europe. This book was called in Europe “**Algoritimi de numero Indorum**” (Al-Khwarizmi on Indian numbers).



# Knowledge moves West: Library at Cordoba

Caliph Abd-ar-Rahman III (891-961) got a huge library constructed in Spain at Cordoba, and started the work of translating Indian science texts, available as Arabic, into Latin for use by the Europeans.



# The Journey of Indian Science



# Translations continued in Europe until 1600

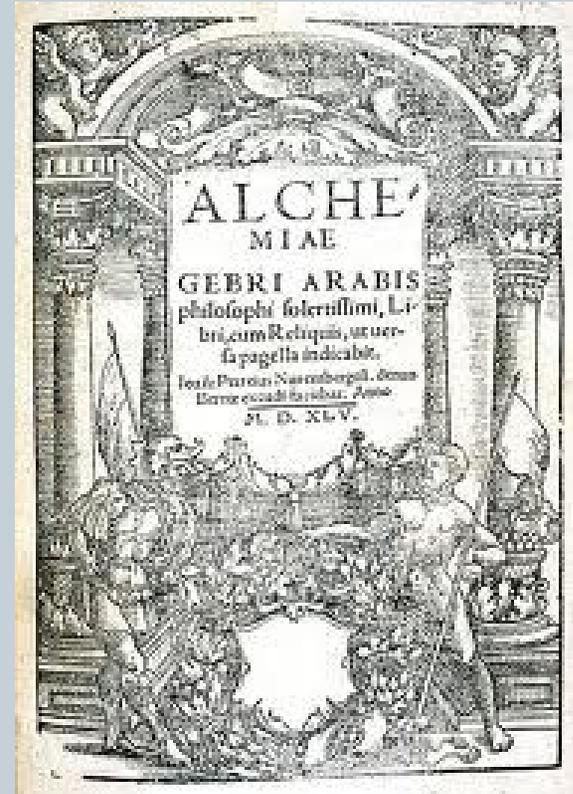
More such libraries-cum-universities were opened in Europe:

- Naples
- Paris
- Bologna (Where Copernicus studied later).

# Algebra

Al-Khwarizimi also translated the Indian books on Bij-Ganita (algebra) and compiled them as a text.

This was translated into Latin by Geraldus Cremonensis as “Liber Maumeti filli Moysi Alchorismi de algebra et al muchabala”.



# Did We Come from outside



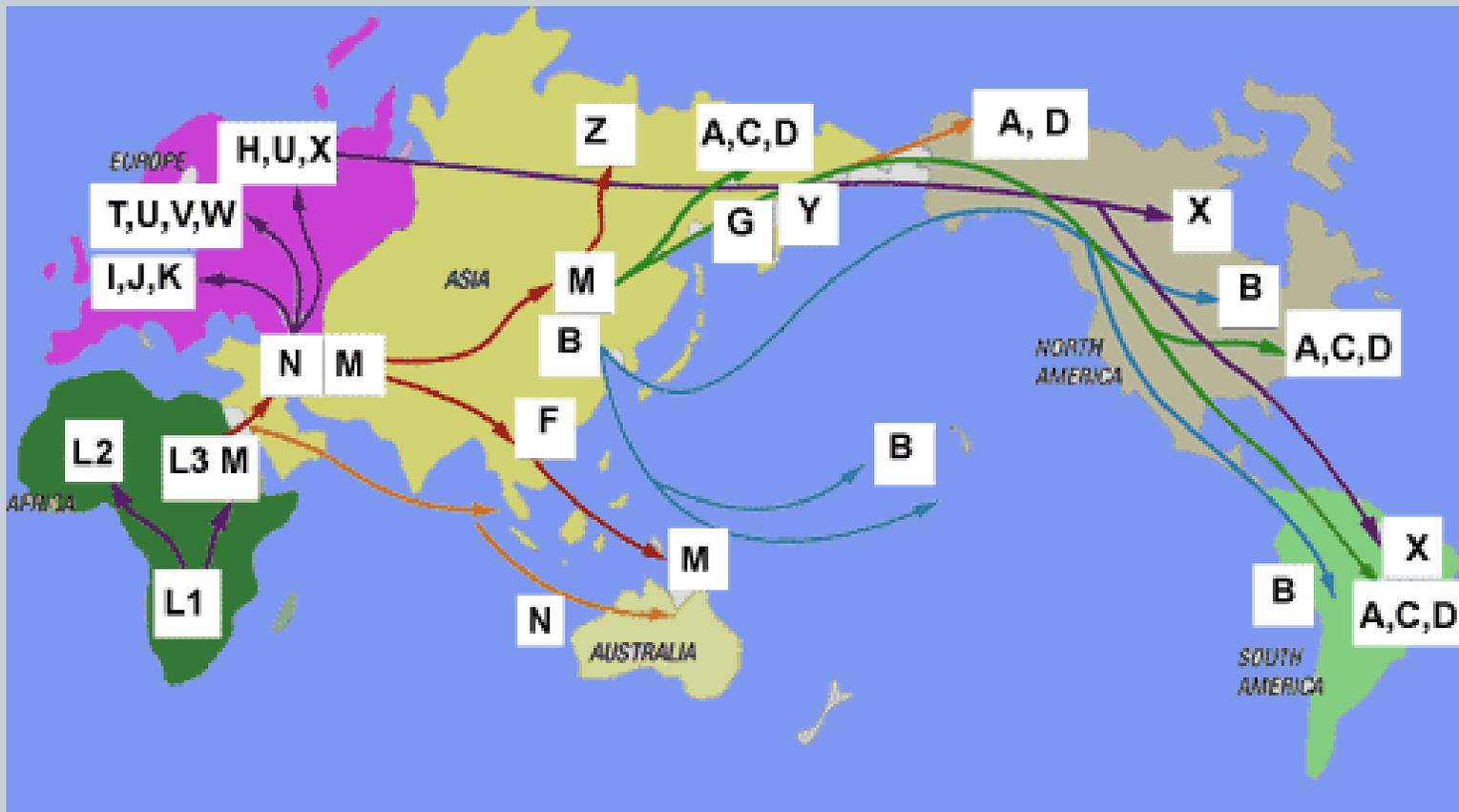
# DNA studies of *Homo sapiens sapiens* origin

1987: Cann and Stoneking

1988: Stinger and Andrews

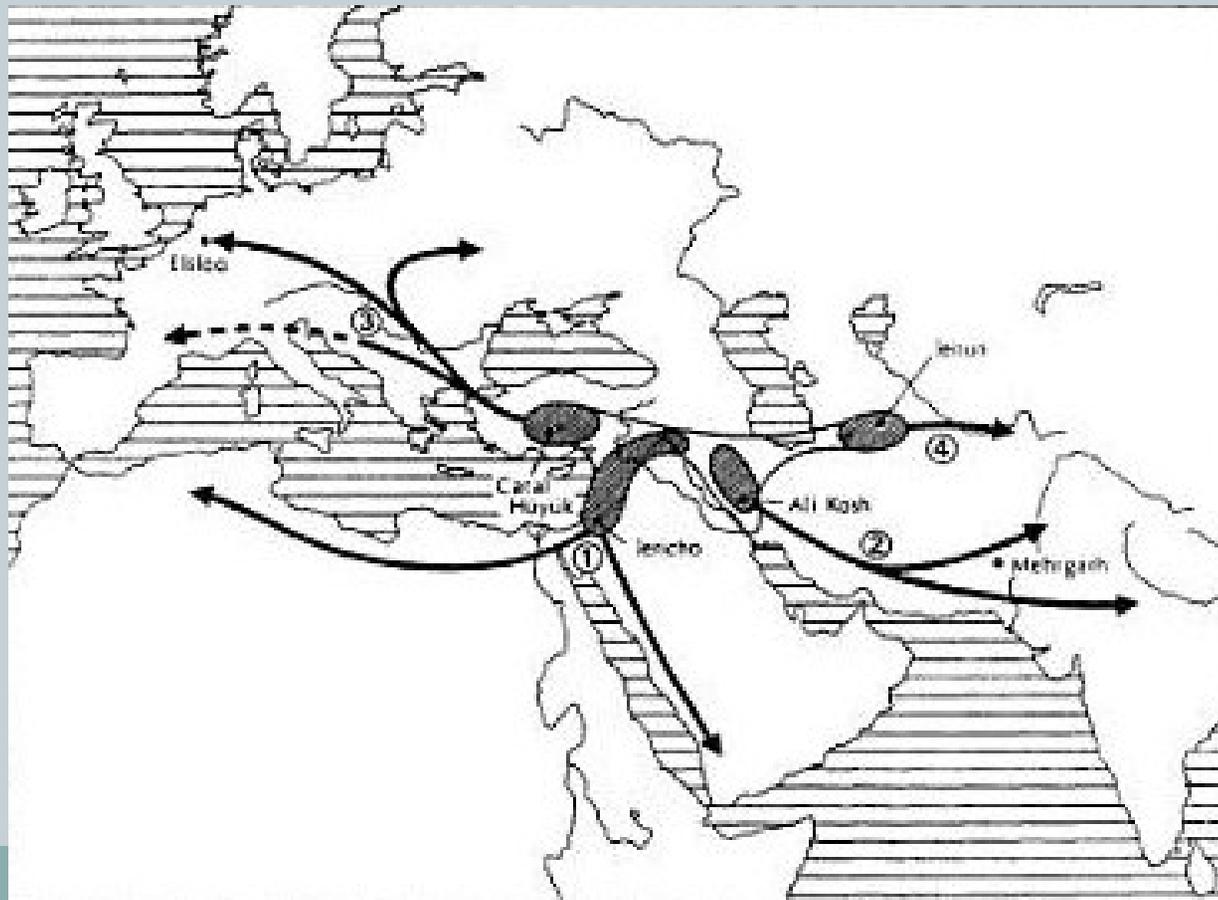
Proposed “**Out of Africa**”

*Homo sapiens sapiens* originated 160,000 BP in East Africa. It was thought that man came out of Africa by Egypt-Suez-West Asia route.



Renfrew, 1990. Farming/language dispersal Hypothesis.

- 1=Afro-Asiatic;
- 2=Elamo-Dravidian;
- 3=Aryan;
- 4=Altaic.



But soon the West Asian route was ruled out by further DNA studies

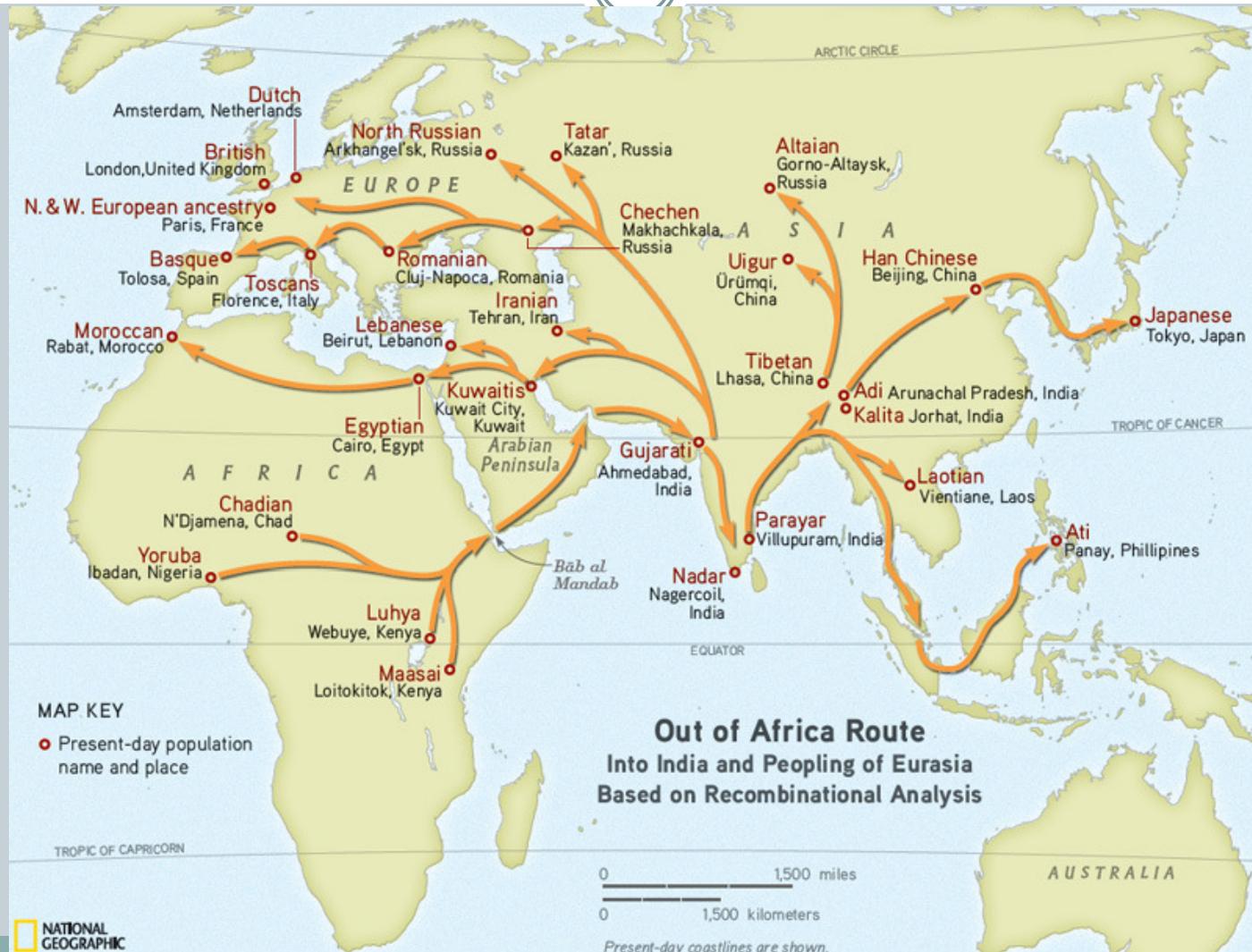


It was found that it was from **India** that entire surviving non-African Humanity has evolved. It was assumed that the first Indians came from Africa.

It was further noted that African specific **LINEAGES** never went out to anywhere (male **A, B, and Female L0-L6**).

Thus, **Indians are Out of Africa**, and rest of the world is “Out of India” in the current consensus view.

# Recombinant DNA study September 2011 Supported by IBM





# Migration Maps

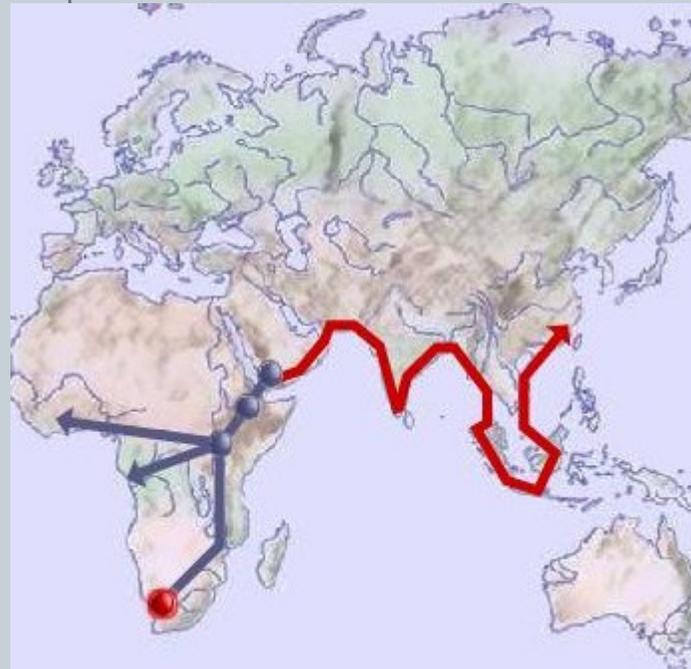
# Some men leave Africa

Man left East African horn,

Reached India,

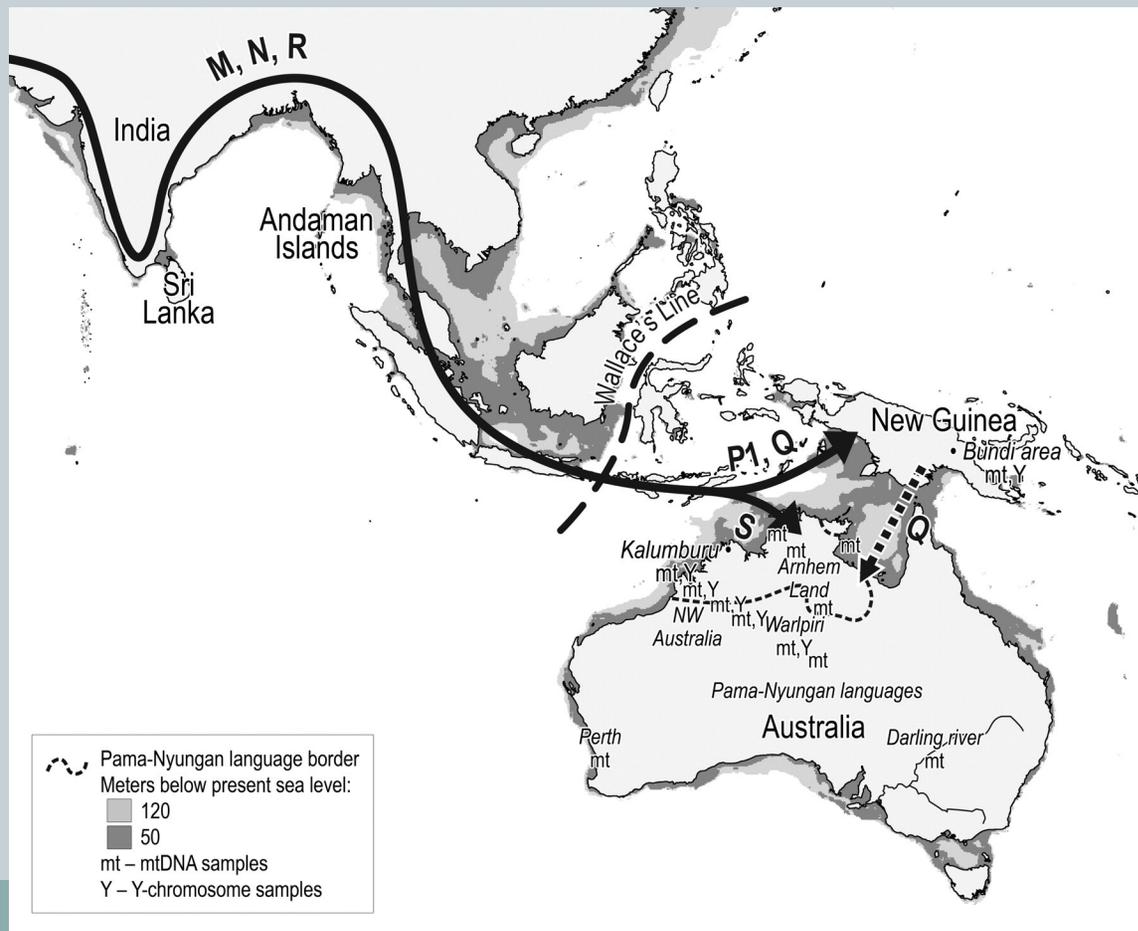
Once only.

100,000 years back (some authors write 70,000 to 60,000 years back).

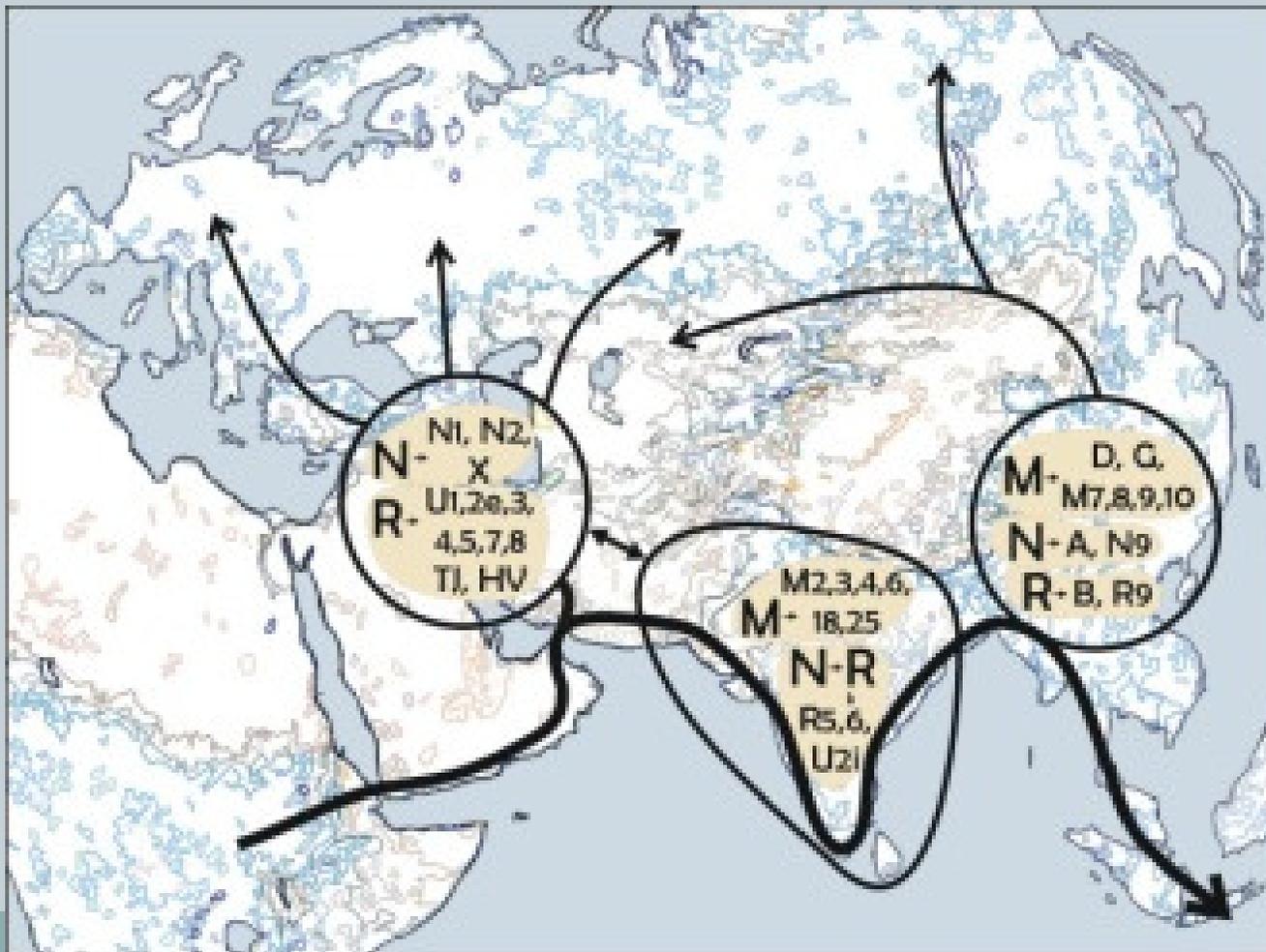


This population expanded numerically, culturally and linguistically in India over time.

The first journey out of India started  
85,000 years back and reached Australia  
by 60,000 years B.P. Hudjasove, 2007



India played a central role in populating the world. **All the European, Asian and Amerindian maternal lineages originated from India** over time as waves (Fig. Metspalu *et al*, 2004)



The view is now a consensus and official view.

Fig: Natural Environment Research Council, Cambridge, UK.



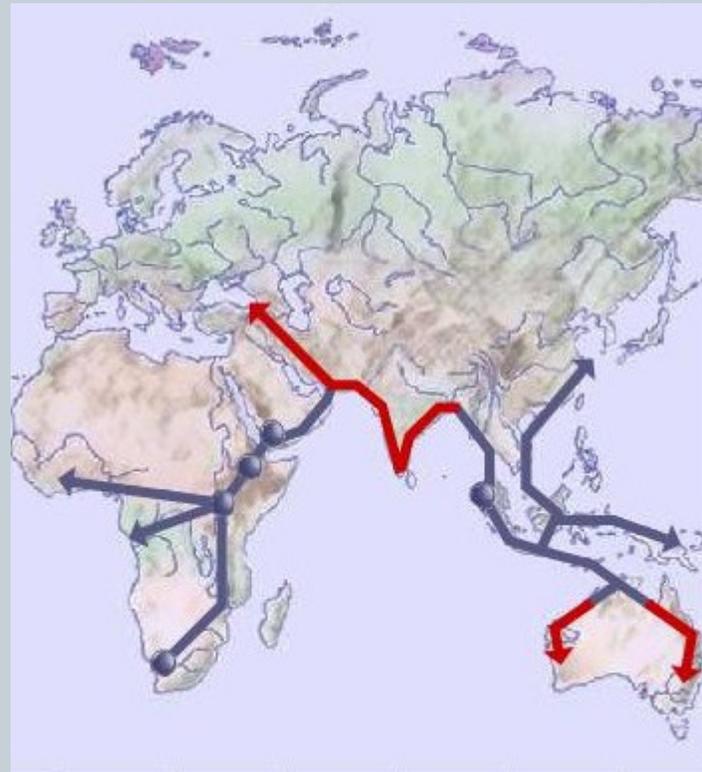
# After first migration to SE Asia, came the worst Glacial Phase (74,000 years back to 65,000 years back)

Human populations survived in **India, Southeast Asia** and **East Africa** only.

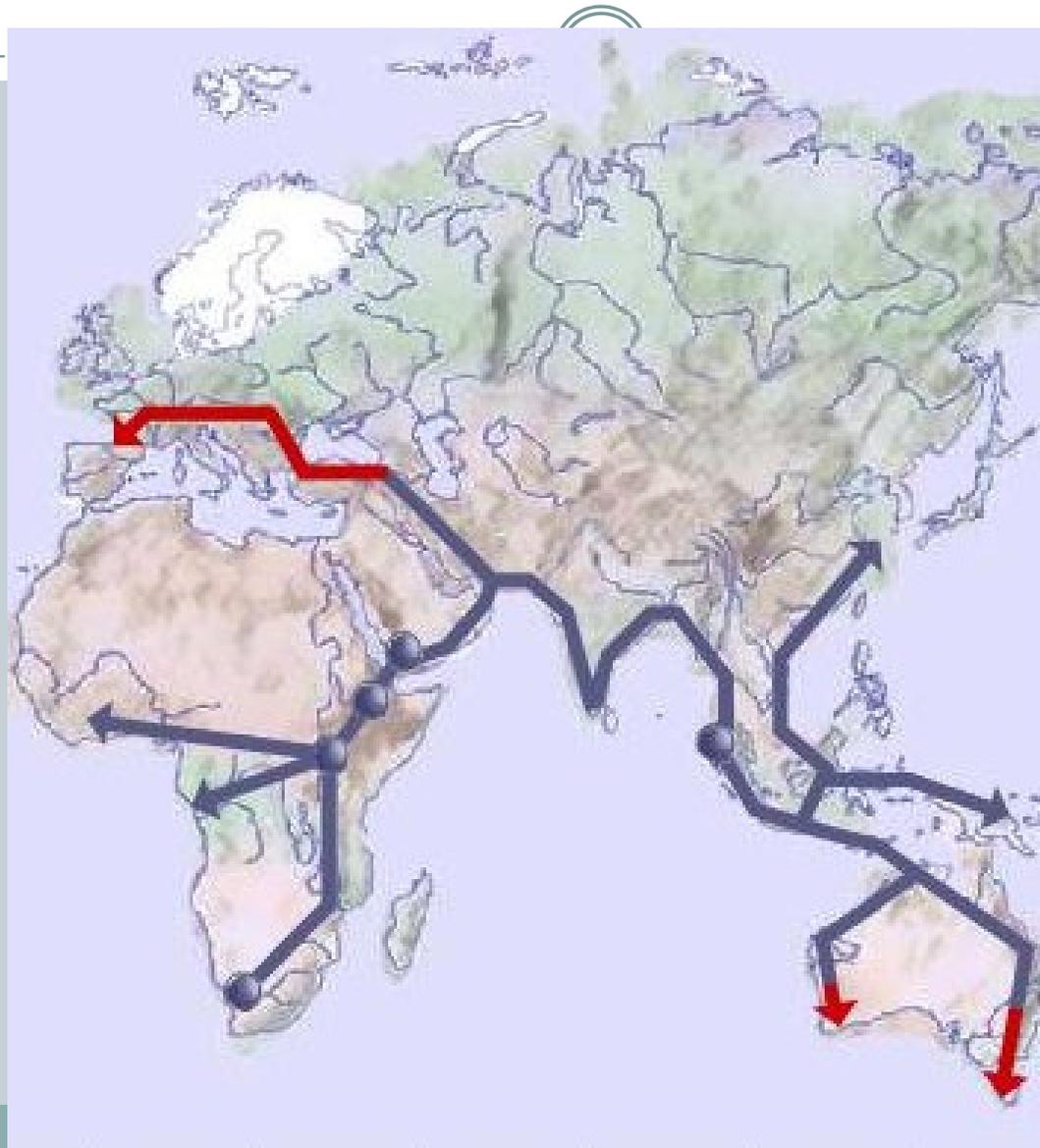
Estimated figures of survival are **1000** in India, **9000** in Africa and less than 1000 in SE Asia.

Following glacial, all the three human populations expanded. But **African one did not migrate out of Africa.**

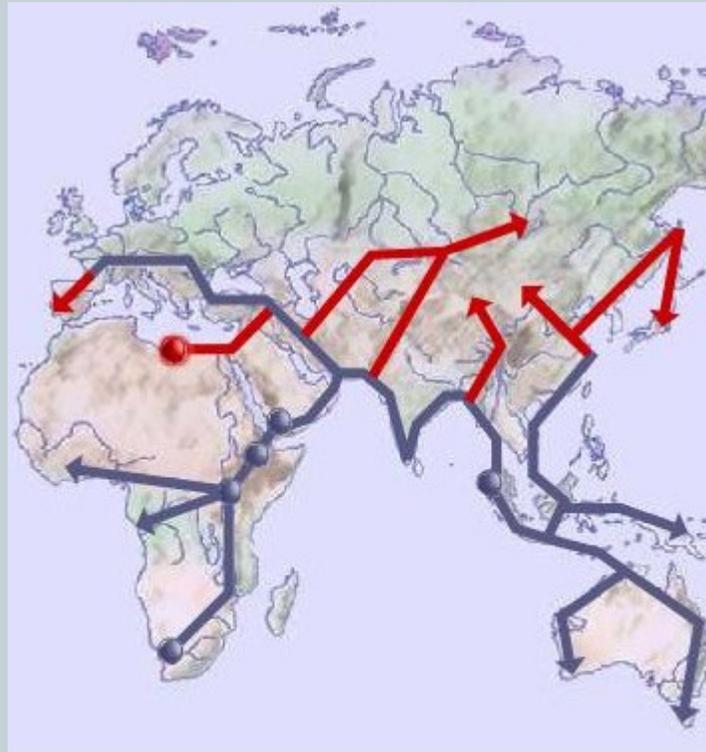
About 60,000 years back, post-glacial population expansion in India led to migration to west.



By 52,000 years before present:



40,000 b.p.: People enter China from three directions. Two sources originated from India, one from Southeast Asia.



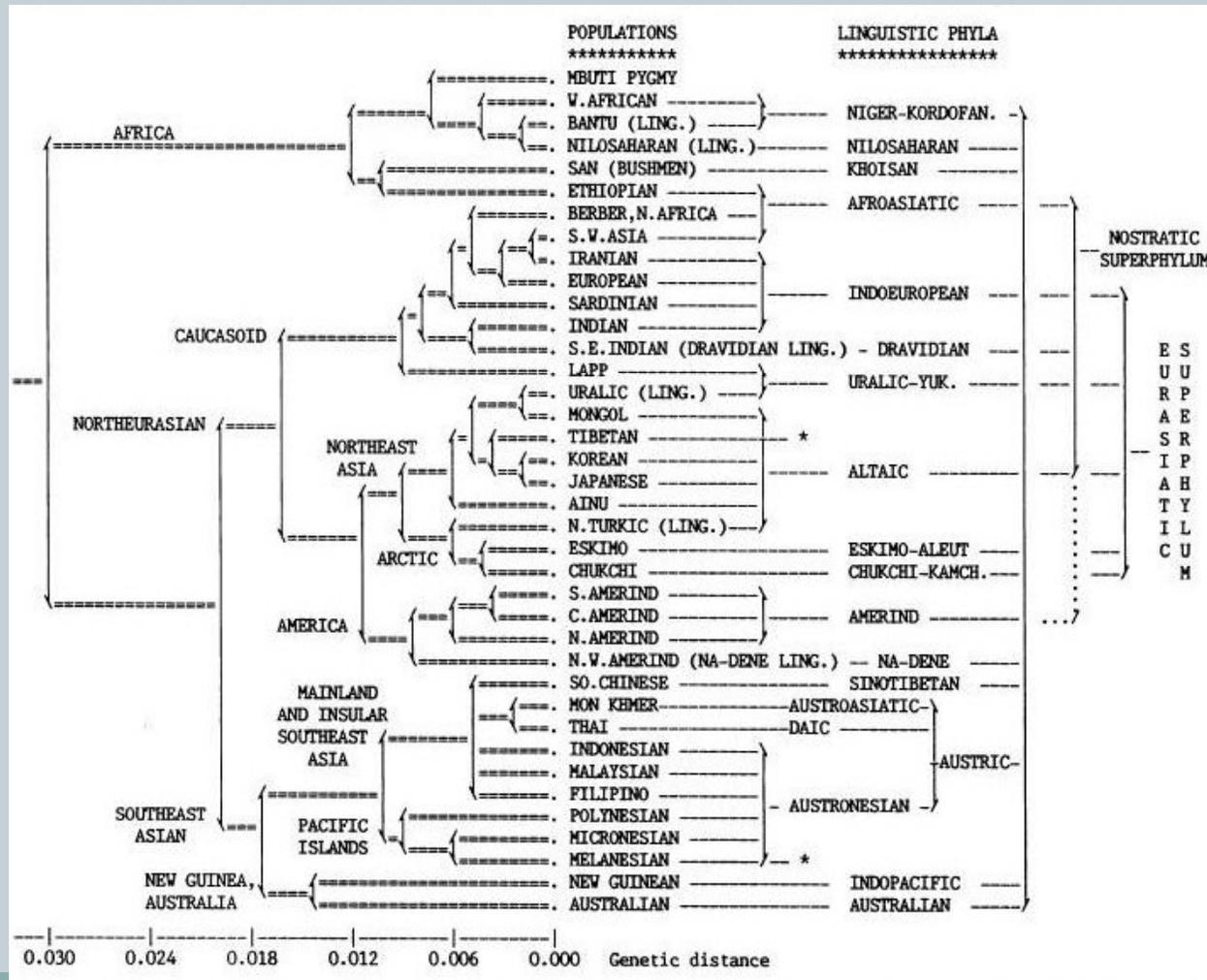


# Implications for Linguistics

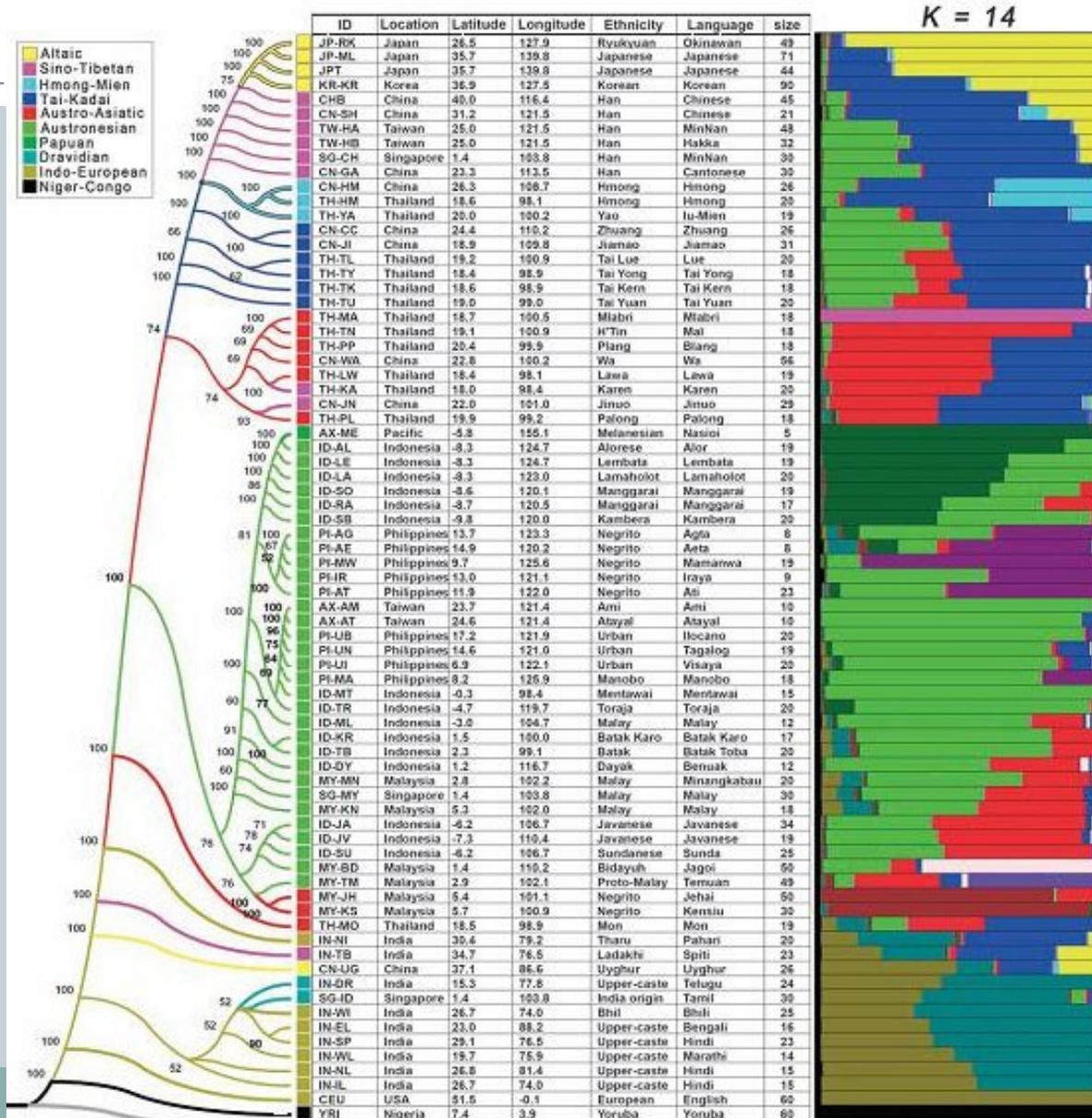
It was noted that DNA lineages and Language families overlapped exactly

- Cavalli-Sforza, L.L. *et al*, **Reconstruction of human evolution: Bringing together genetic, archaeological, and linguistic data**, *PNAS* 1998, 85: 6002-6006.
- HUGO pan-Asian SNP Consortium, **Mapping Human genetic Diversity in Asia**, *Science* 2009, 326(5959): 1541-1545.

# Cavalli-Sforza, 1998; Eurasiatic Super-Family of Language and DNA lineages matched.

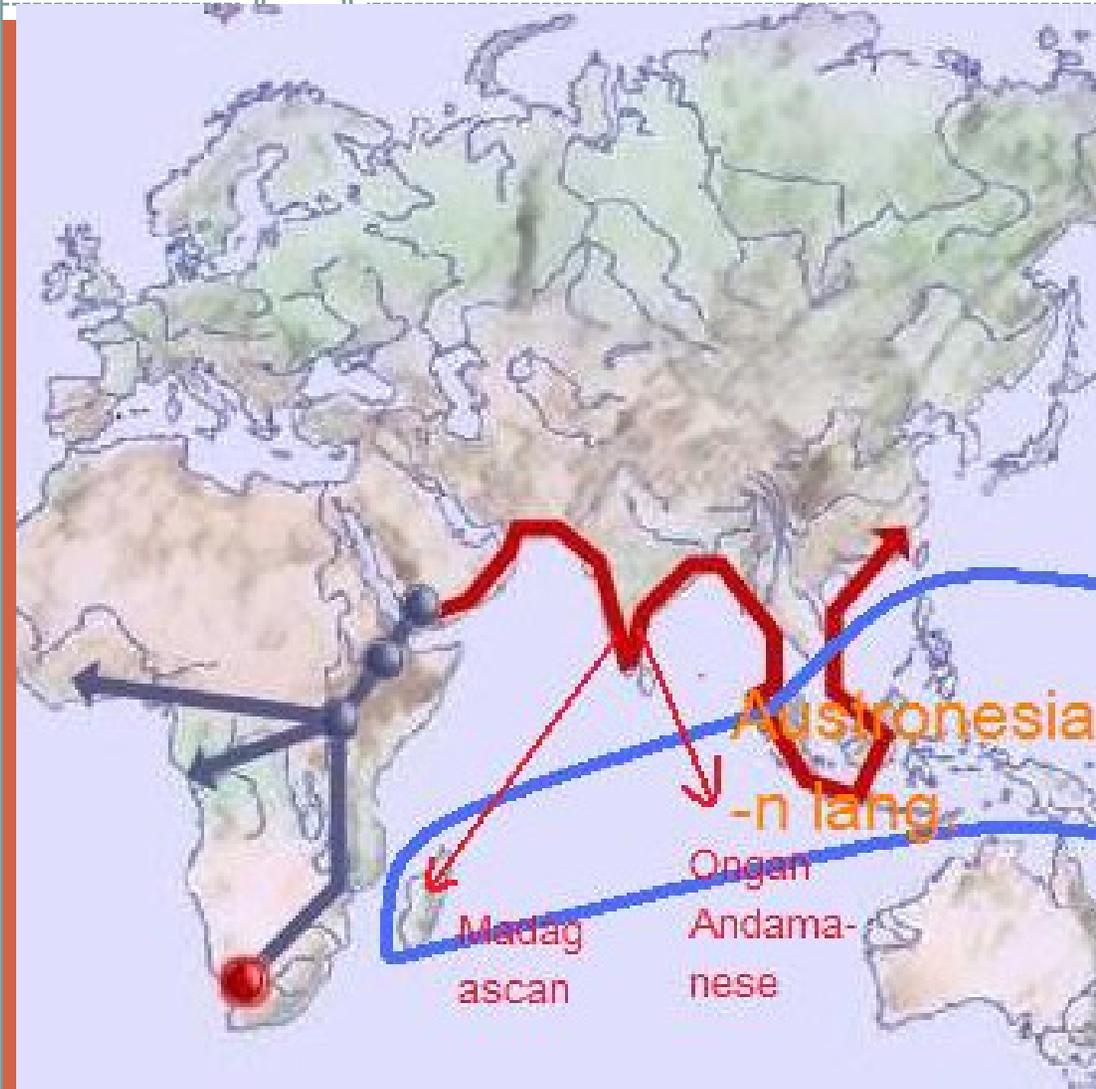


# HUGO- similar matching for East half of Asia





Hence we need to see DNA  
lineage migration and Language  
family migration together.



**At 85,000 ybp  
people migrated to  
Madagascar and  
Andaman from  
Mainland India**

Maternal lineages  
from root of 'M' and  
Paternal (Y-  
chromosomal ) C and  
D were involved.

Austronesian has left substratal remains to modern Indian (and also Sino-Tibetan, Austro-Asiatic and Daic) languages. One such example is word 'bahin'

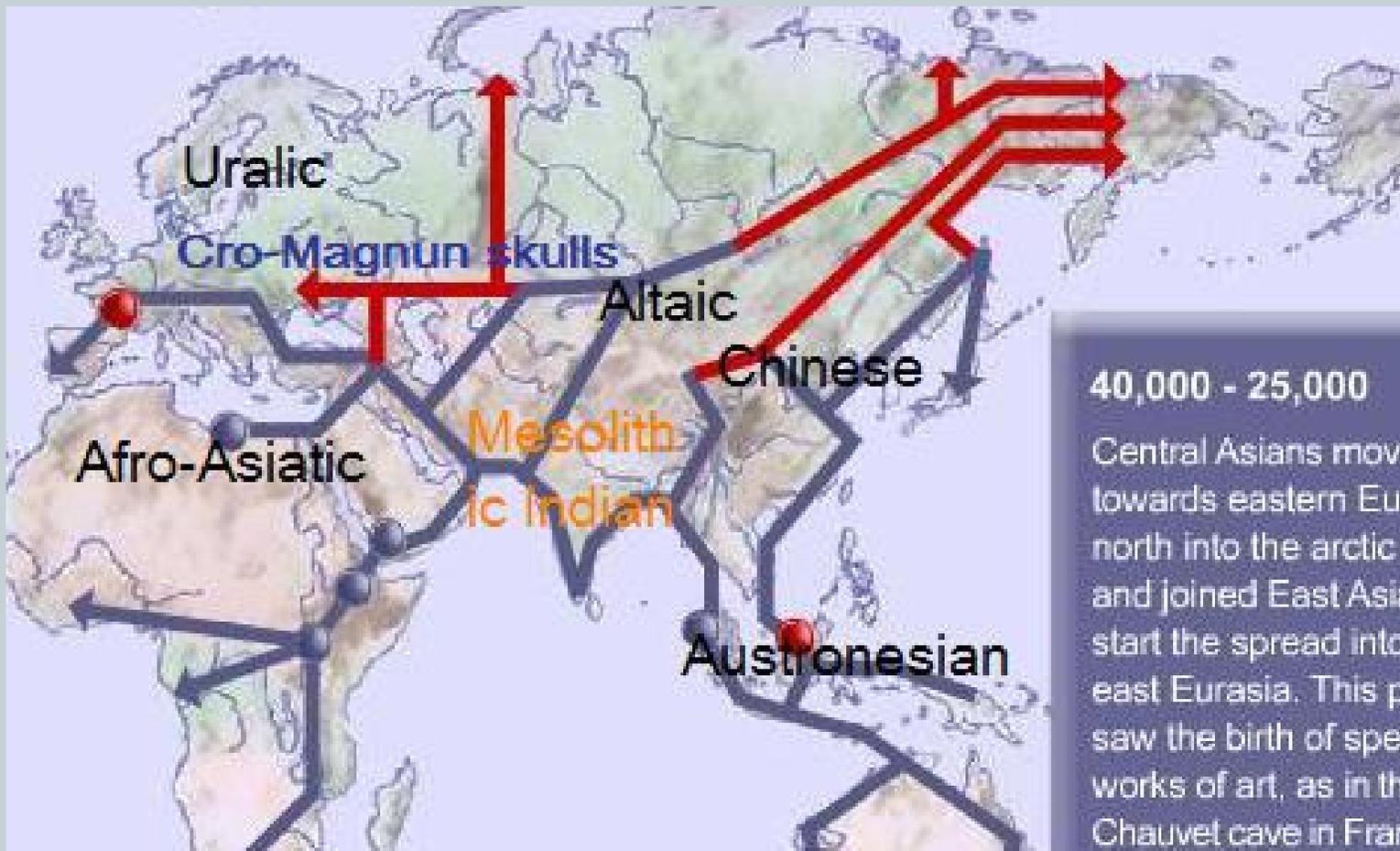
*bahine* (woman, Rapanui, Austronesian l.),  
*wahine* (woman, Maori and Hawaiian),  
*vahina* (woman, Tahitian),  
*fafine* (woman, Samoan)

AND:

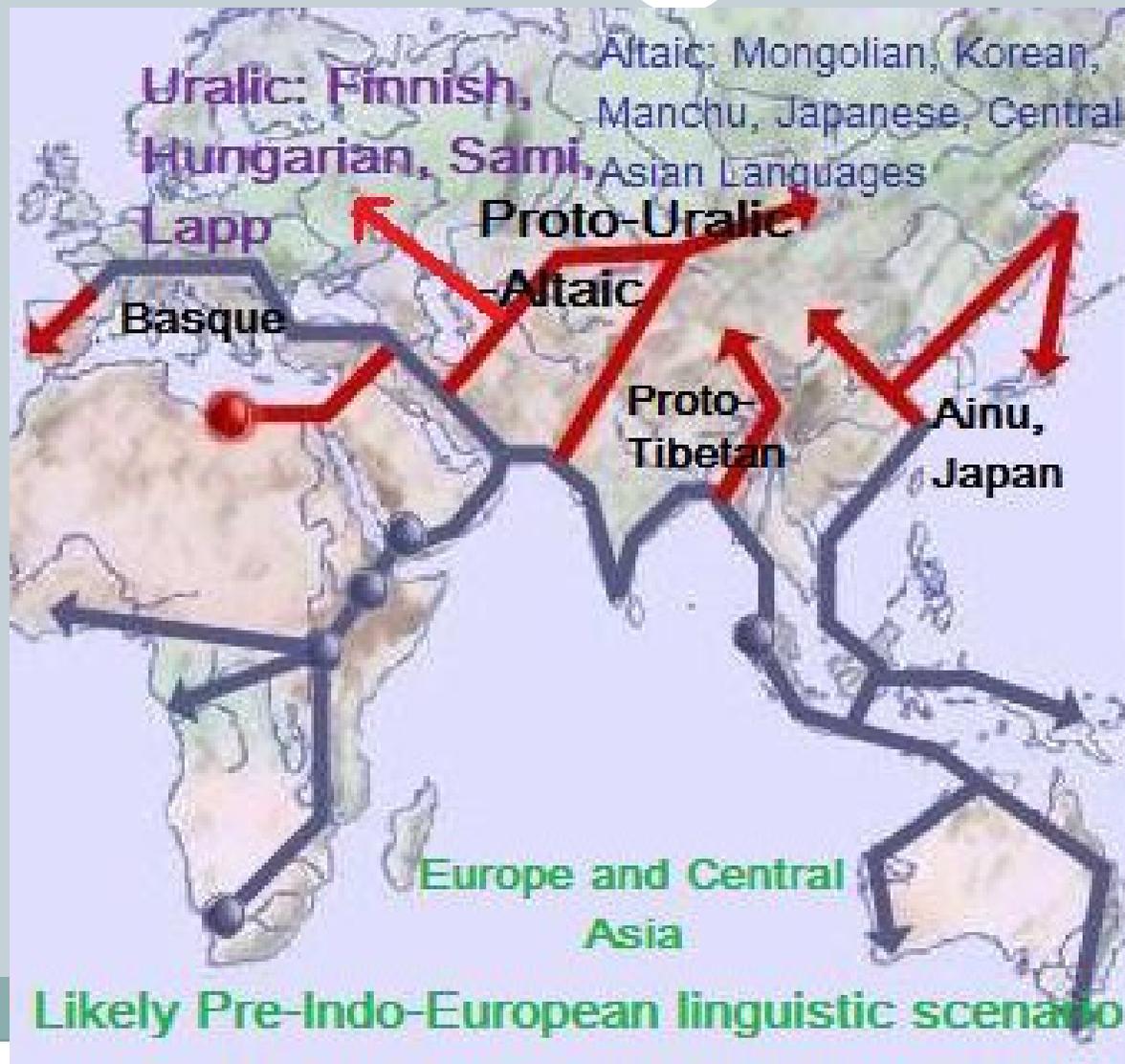
*bahin* (sister, Hindi)  
*bo-chhin* (mother, Chinese Quanzhou, Xiamen, Zhangzhou dialects),

# Asianitic Language Super-family migration: 60,000 to 52,000 BP

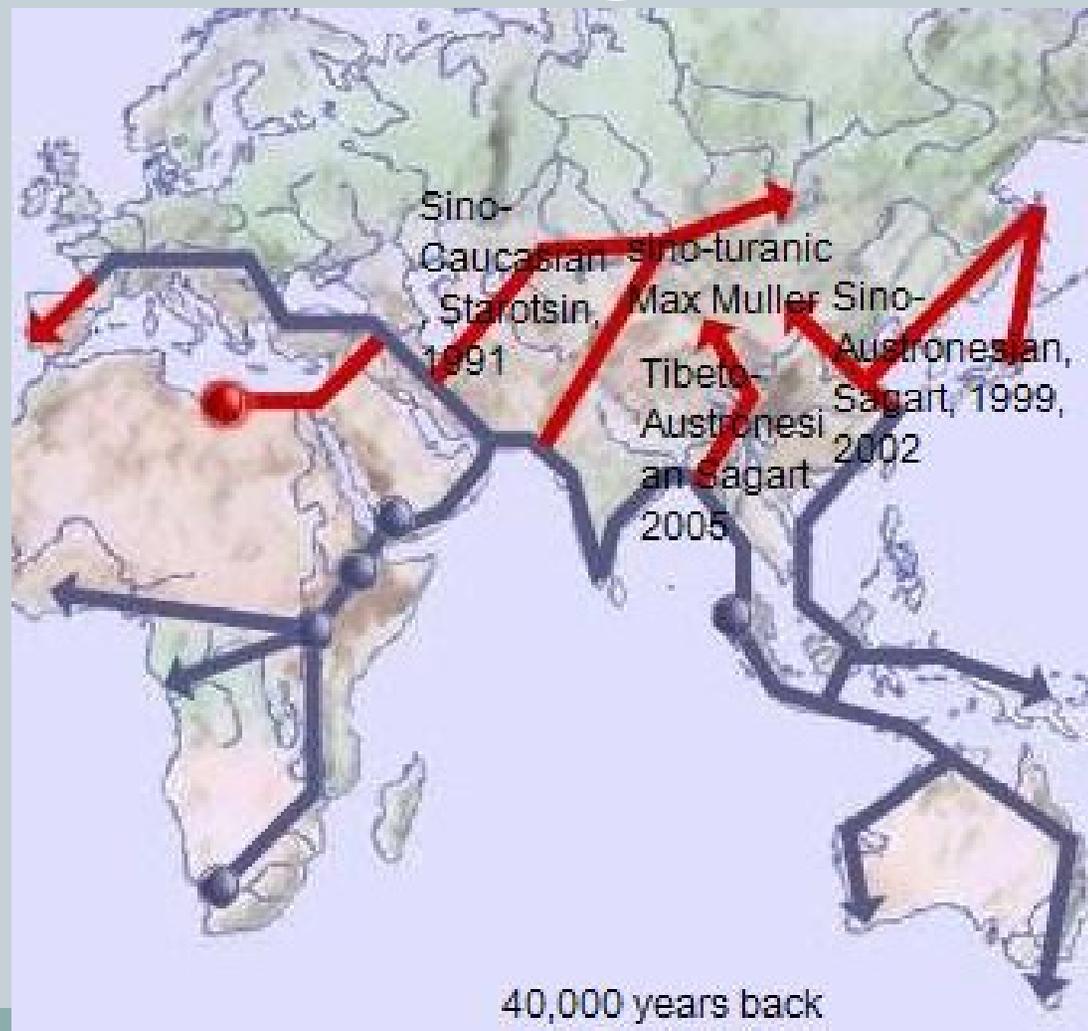




It is now established that Altaic and Uralic languages are one Altaic-Uralic super-family



# Different views on origin of Chinese language make better sense with understanding of DNA migration



Some examples of such words are



- **1. Sow (English),**
  - ***se, seh* (PIE, to sow),**
  - ***si, siu* (Munda, to plow),**
  - ***sA-* (*Sk.* To plow), *sitA*, *sirA*  
(Sanskrit, furrow)**
- etc.**

## 2. Derived from Sa/ seh



- \**sehm* (PIE, grain),
- *sasa* (Sanskrit; *sasam* in *Rig-Veda*),
- *sasya* (Sanskrit, food, seed, grain, herb),
- \**Sasja* (*Proto-Celtic*)
- \**sito-* and \**sitya-* (PIE, ‘corn’),
- *sitiyam* (Sanskrit, corn, ploughed),
- *siri* (Khowar, Afghan, barley), and *sili* (Kalasha, Hindukush, millet).
- Selo (Latin, to sow)
- Munda family *saro*, *sar* (paddy) and **Munda and Kharia have –*sro* and –*srA*, *paddy*.**
- **Words *sro*, *sre* and *sru* meaning ‘rice’ in some Khmer (Cambodia) dialects.**



- 3. **Mill** (E.),
- Old English *mylen*, Latin *mola*, all meaning millstone; Latin *molere* to grind. PIE *mel / mol / ml* to grind.
- German *muhle* and Sanskrit *musala* (grinder).
- Thai language *mo:h* means ‘**mill-stone**’ and ‘**to grind**’.



4. Pestle (E.),  
PIE \**pis-to*,  
Sanskrit *pis-*

5. **Pita** (colloquial English ‘bread’),  
Greek *pitta* bread, Italian *pizza*,  
Hindi (Bihar, East UP) *pittha*,  
Sanskrit *paishhta*.

## 6.



- Grind (E.),
- Old English *grindan*,
- P. Germanic *grindanan*,
- PIE *\*ghren*, *\*ghreu-*, *\*ghen*, (?*\*grendh-*)
- **Munda** *guru*, **Santhal** and Kherwa *guRgu* mean ‘grinding stone’.
- **Thai** *gruaam* (to grind), *gro:hng* (mortar), *gra- deuuang* (stamp-mill, mortar)

Fuller 2008, gives a large list of words used in textile present in Sanskrit and Dravidian/Munda fam. One such example is 'tantu'

*tantu* (Sk., fiber), *tantra* (Sk., loom), *tAna* (Sk., fiber, tone, tension), *tanti* and *tatama* (Hindi, weaver);

tendon (E.), tentacle (E.) tendril (E.), tent (E.), tenter (E., loom), tenet (E.), *Dendron* (Gk. fibre);

*tonti* (Juang, weaver), *dendra* (Telgu, weaver).

*tay* (Bonda, to weave), *tan* (Kharia, to weave).

*ten* (Santali, to weave),

*thai:n* (Khasi, to weave).

*tor* (Thai, to weave), *tan* (Alak, Lave, Khariya Sura and Niahon, to weave); *tana* (Nicobarese, to weave),



*tUla* (Sk., cotton), *tUlika* (Sk., brush),  
*tula* (Munda-Juang; cotton, feather, hair),  
*tol* (Old Mon; cotton, hair, feather),  
*tuy* (Tamil, cotton),  
towel (E.)

This linguistic argument is stronger than ‘horse’  
linguistic argument which had said: Cognate of PIE  
*akwa* (Sk. *Ashva*) is found in all the IE languages  
therefore Aryans must have originated at Central  
Asian steppes where horse was found in the wild.

# Male mediated Y chromosomal DNAs



# New Mischief



- **In this theory, those who went out of India before 35,000 years back, they evolved into many language groups and cultures following LGM.**
- **Then they started invading India as male-alone lineages about 10,000 years back from all directions .**

Some authors guessed that all the male lineages of India arrived from outside during Neolithic

**Dravidians** from West Asia: male lineage J2 and L1, with farming, barley and cattle (Wells, 2001); Or **Africa** (Winters) H, K2.

**Austro-Asiatic** (Munda) came from **China** (or Southeast Asia): paternal O2a and maternal R7. Or from Africa, maternal lineage M1.

And some claimed that they came from both China and Africa (**Basu**, 2004; Winters 2009).

**Aryans** (Y lineage R1a or M17) came from **Central Asia** with pastoralism and horse (Wells, 2001).

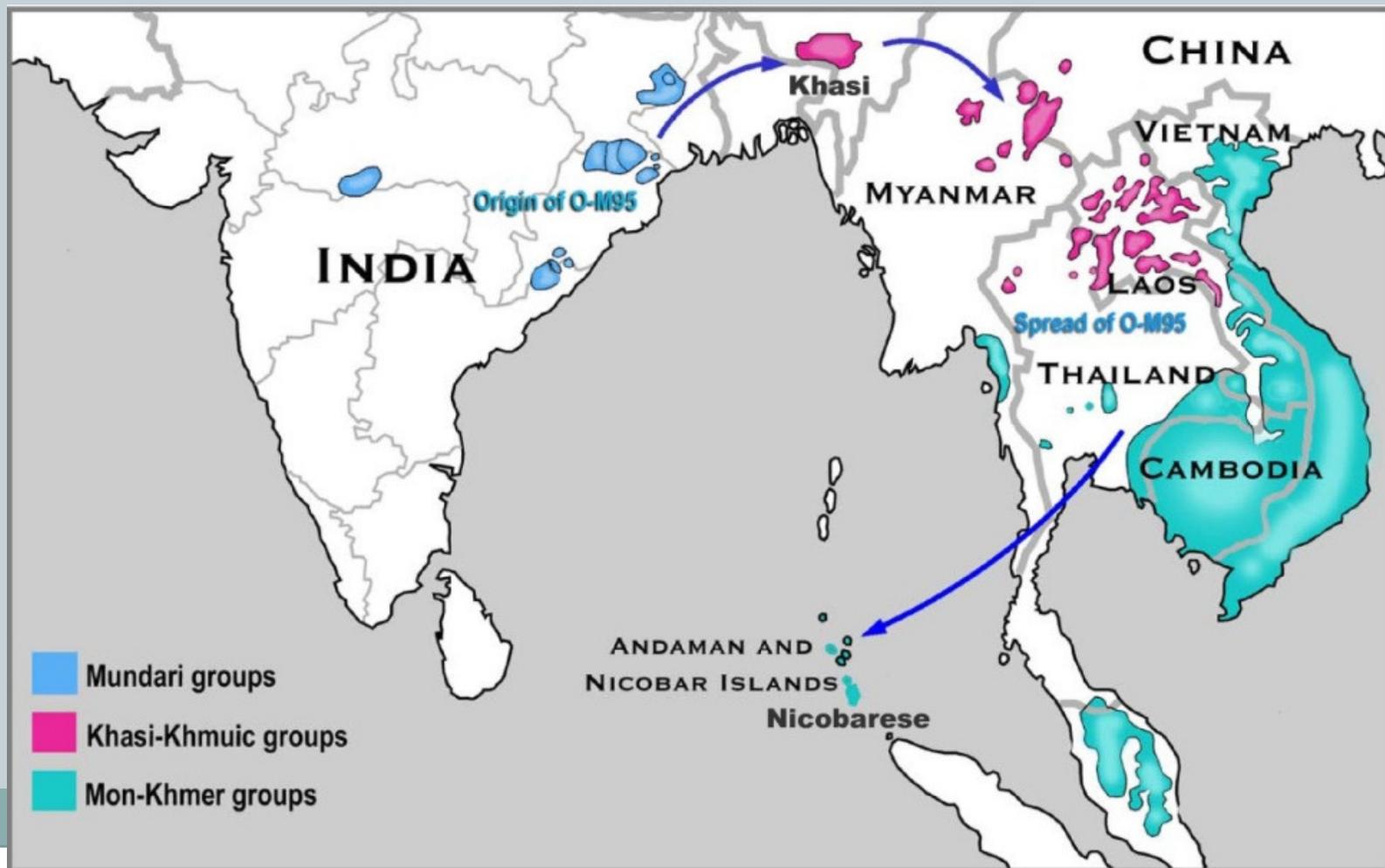
But further studies just broke these conjectures. They say: Austro-Asiatic speakers originated in India.

**Chaubey *et al* (2008)** ruled out maternal DNA R7 migration to India from SE Asia and established that this lineage originated in India.

**Kivisild (2003)** proved that all the inhabitants of India are descendants of original settlers in India, whether of any cast, tribe or linguistic affiliation.

A large number of DNA tests of Indian castes, tribes and linguistic groups repeated the same results and conclusion.

Kumar, Vikrant *et al*, Y-chromosome evidence suggests a common paternal heritage of Austro-Asiatic populations, *BMC Evol Biol* 2007, 7: 47.



We have seen that Chinese population came from NE India 40,000 years back

- Current Han population is mainly composed of O<sub>3</sub> male lineages, which originated in Burma and Northeast India.
- Other lineages in China are older C, D; and O<sub>2a</sub> and O<sub>1a</sub>.
- O<sub>3</sub>, O<sub>2a</sub> and O<sub>1a</sub> are branches of 'O' which originated in India.

DNA says--In fact no one migrated from China to even Northeast India.

In reality, Chinese originated from Southeast Asia and Northeast India.

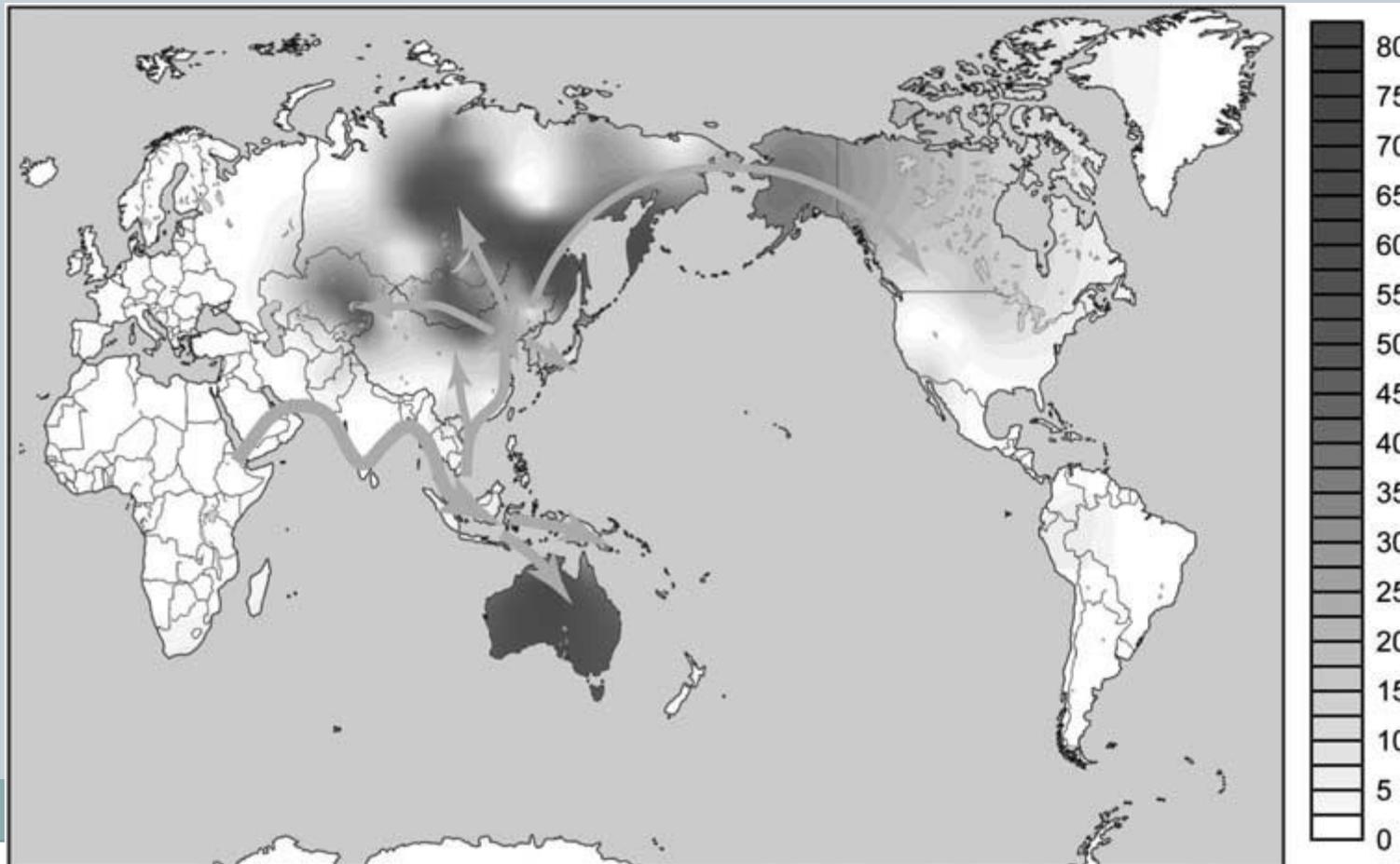
- 1. Bing Su *et al*, 1999, **Y-Chromosome Evidence for a Northward Migration of Modern Humans into Eastern Asia during the Last Ice Age**, *Am J Hum Genet*
- 2. Hong Shi *et al*, 2005, **Y-Chromosome Evidence of Southern Origin of the East Asian–Specific Haplogroup O3-M122**, *Am J Hum Genet*

## Hua Zhong *et al* 2010: 2 articles

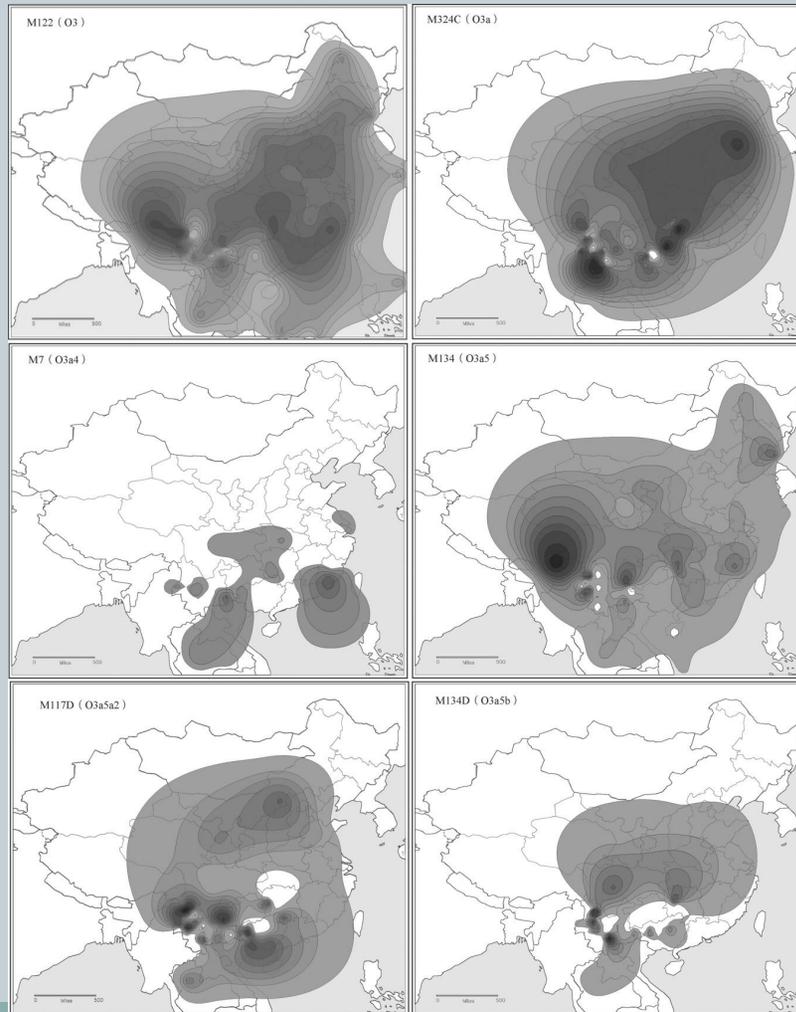


- 1. Some came to China from India and Tibet: **Extended Y-chromosome investigation suggests post-Glacial migrations of modern humans into East Asia via the northern route**, *Mol Biol Evol*.
- 2. But majority of Chinese emerged from SE Asia: **Global distribution of Y-chromosome haplogroup C reveals the prehistoric migration routes of African exodus and early settlement in East Asia**, *J Hum Genet*

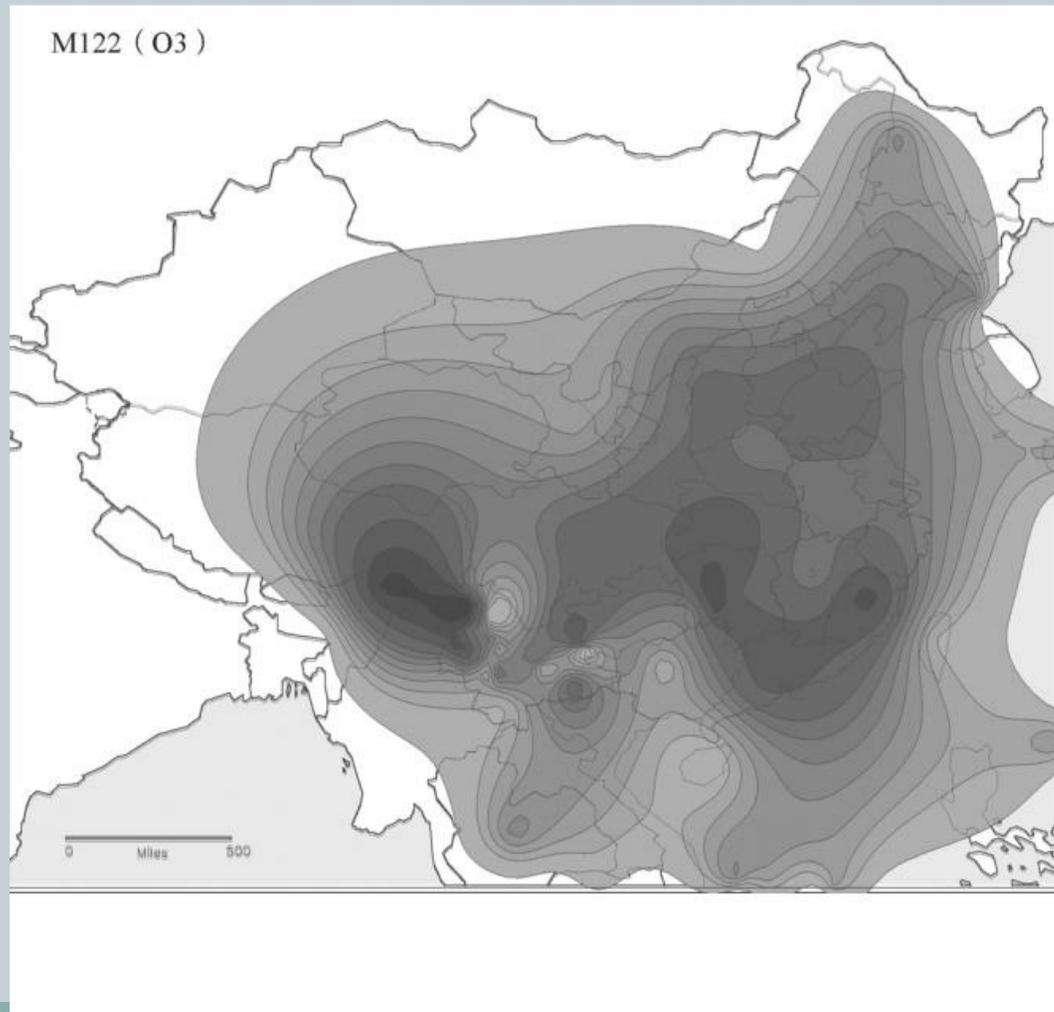
Hua Zhong (2010), with the help of Y Hg C,  
not only proves that from Africa people  
came to India, and from India to SE Asia,  
but also that the Chinese population  
originated from SE Asia.



Hong Shi, 2005, although studied the origins of Chinese O<sub>3</sub> DNA only in which India was not studied, yet its maps showed that the Chinese lineage had originated from the borders of India.

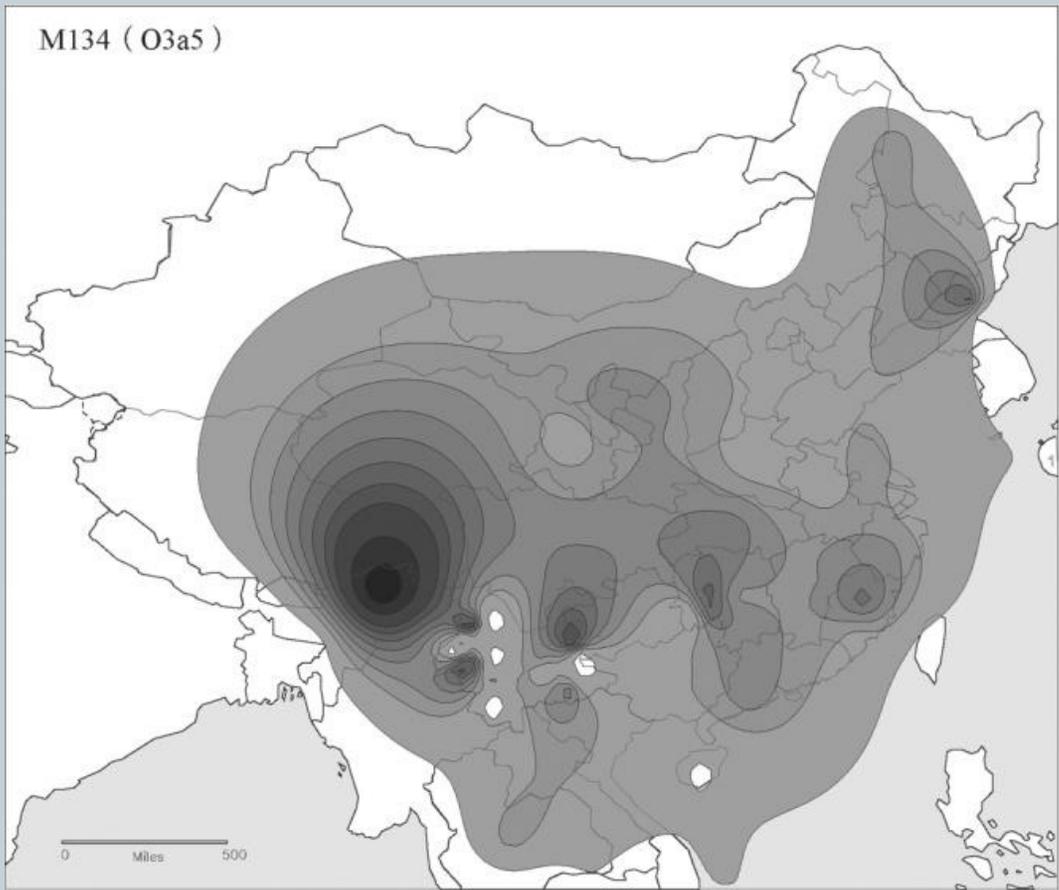


# Hong Shi *et al*, 2005; China's main male lineage O3 (Frequency map)



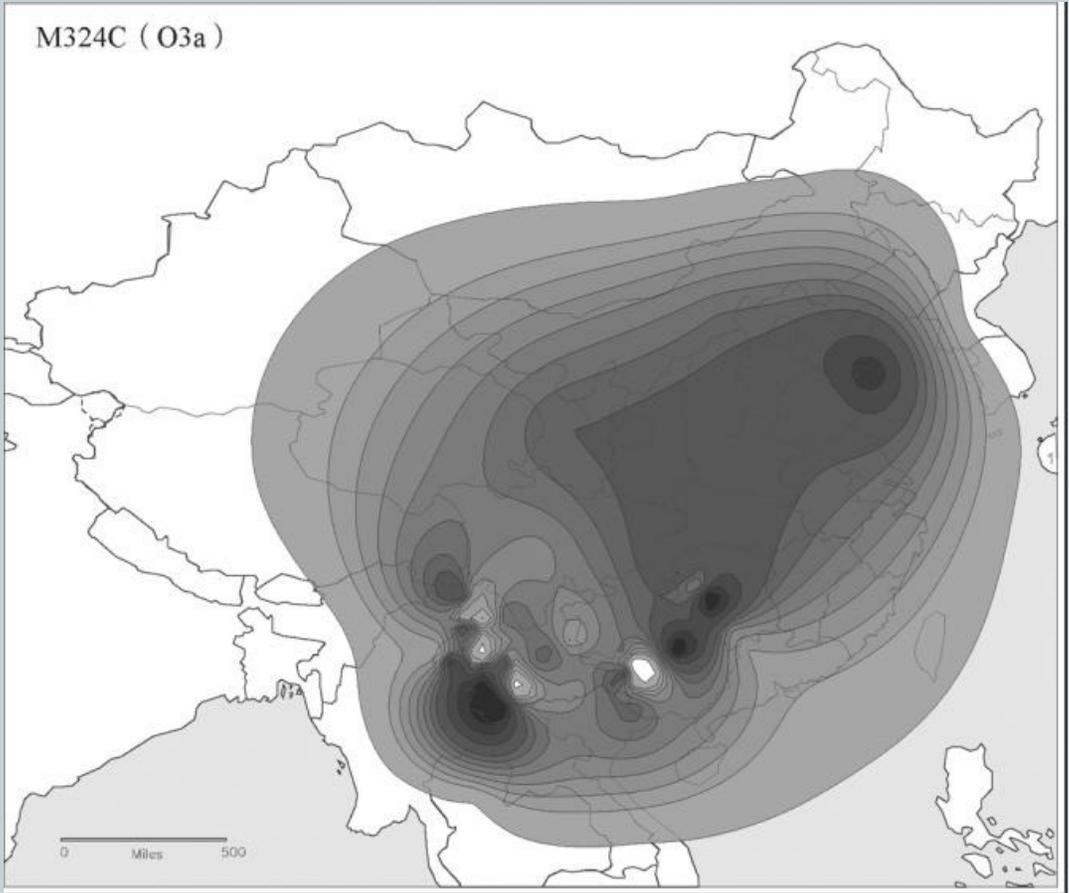


M134 ( O3a5 )



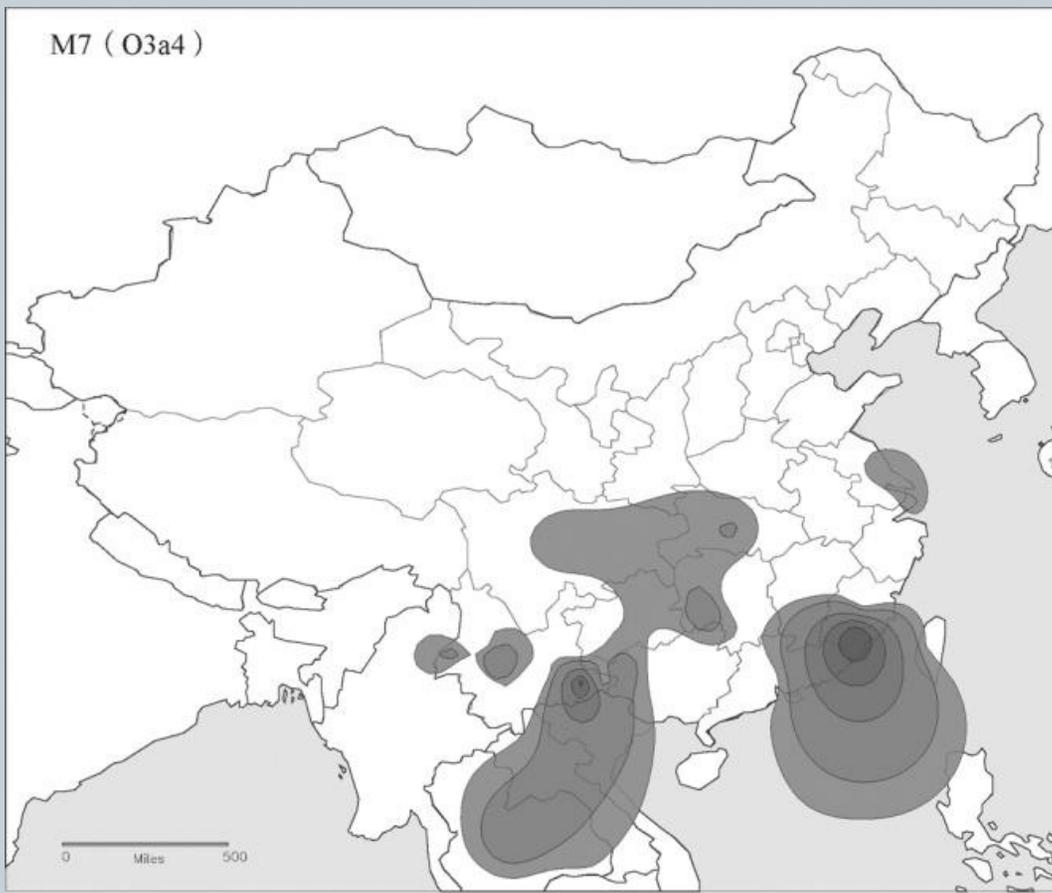


M324C (O3a)



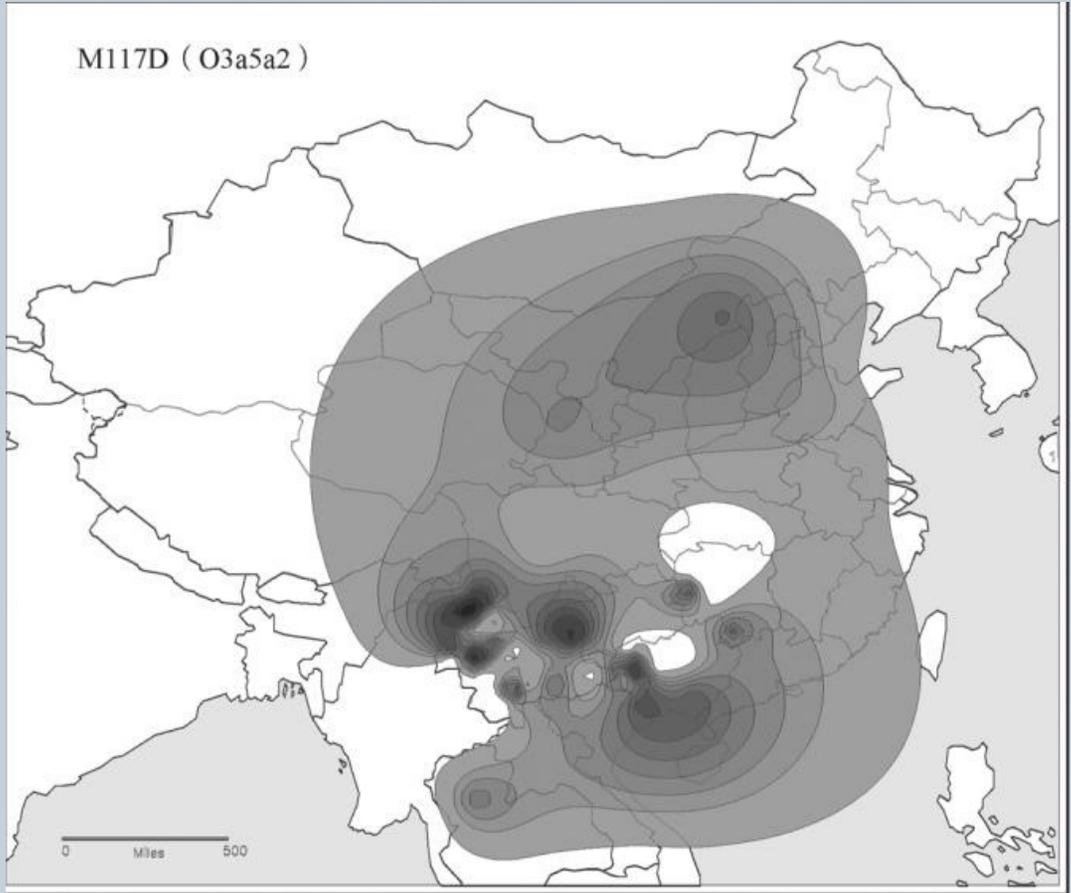


M7 (O3a4)



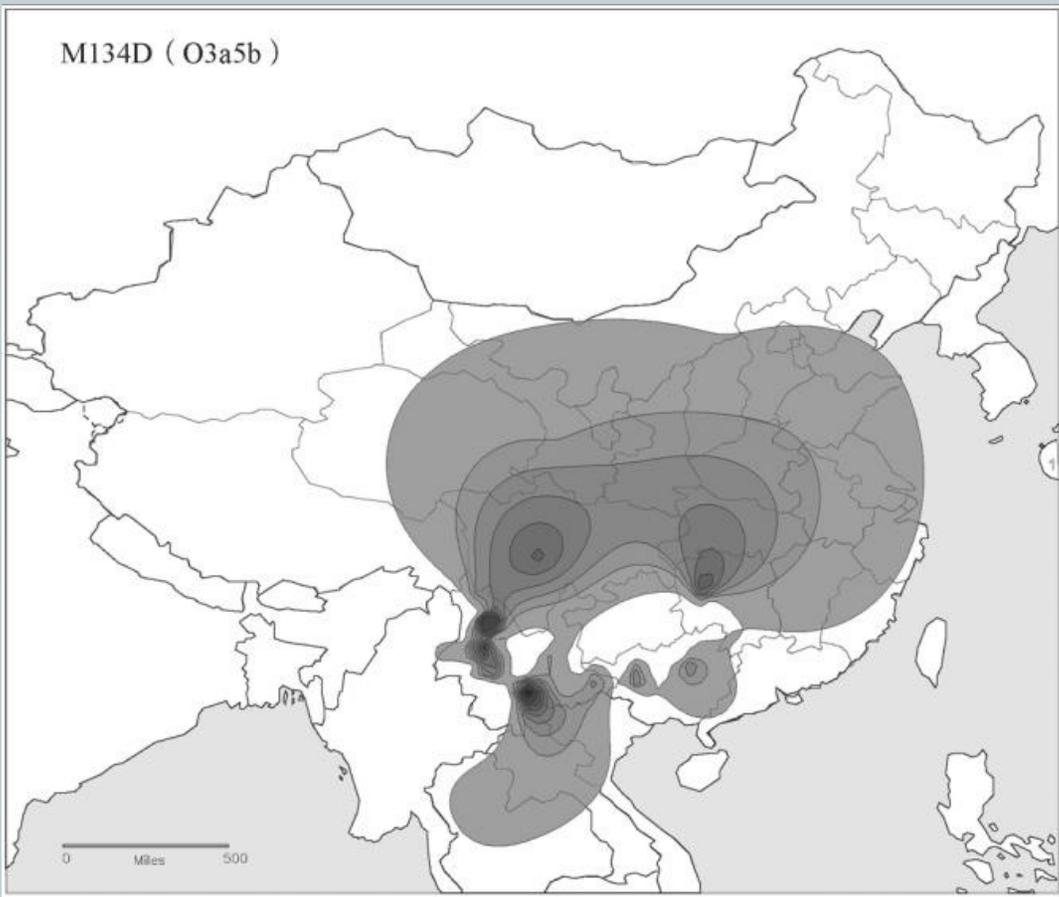


M117D (O3a5a2)

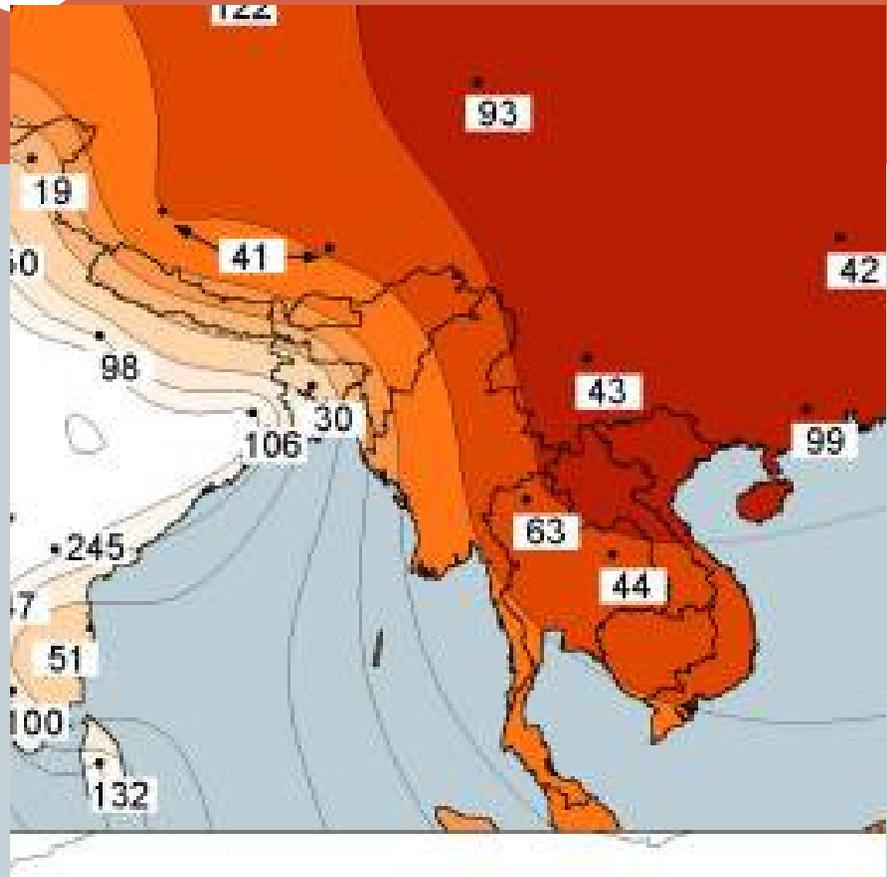
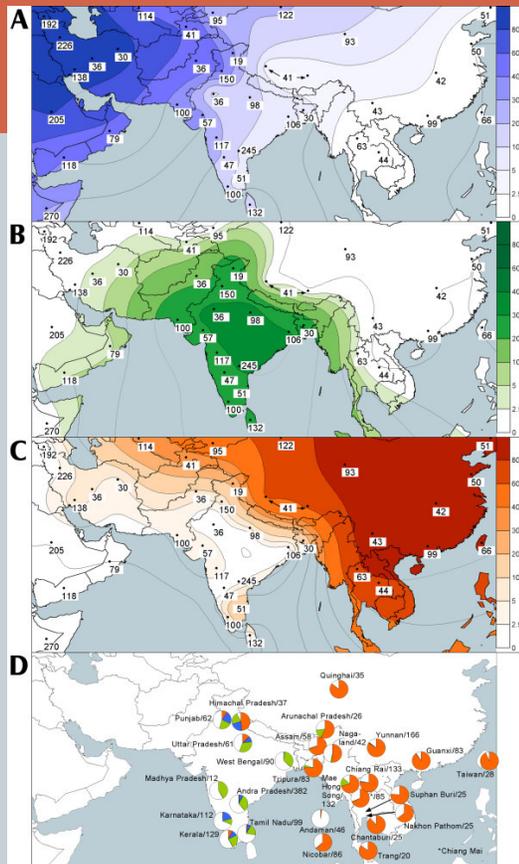




M134D ( O3a5b )



# Metspalu, 2004, rightly had made the maps:



# Aryan Invasion DNA Theory



Wells 2001, made a claim that Aryan marker male DNA, lineage R1a and R2, originated in Central Asia.

- **This gave a new lease of life to Aryan Invasion Theory. Later studies established that R1a and R2 originated in India.**

# Wells 2001-- and R1a confusion



Well's theory of Aryan Invasion was decisively **ruled out** by DNA studies **by** the following groups of workers in Genomics:

1. Oppenheimer 2003
2. Sahoo, Kivisild *et al* 2006
3. Sengupta *et al* 2006
4. Trivedi *et al* 2008
5. Sharma *et al* 2009
6. Underhill *et al* 2009

R1a-M17 and R2 both originated in India--Underhill, 2009; Sharma, 2009; Sahoo, 2006; Sengupta, 2006.

- Sharma, S. *et al*, The Indian origin of paternal haplogroup R1a1\* substantiates the autochthonous origin of Brahmins and the caste system, *Journal of Human Genetics* 2009, 54: 47–55.
- Underhill, P. *et al*, The phylogeography of Y chromosome binary haplotypes and the origins of modern human populations, *Ann. Hum. Genet.* 2001, 65:43-62. Fig. 2, p. 47.



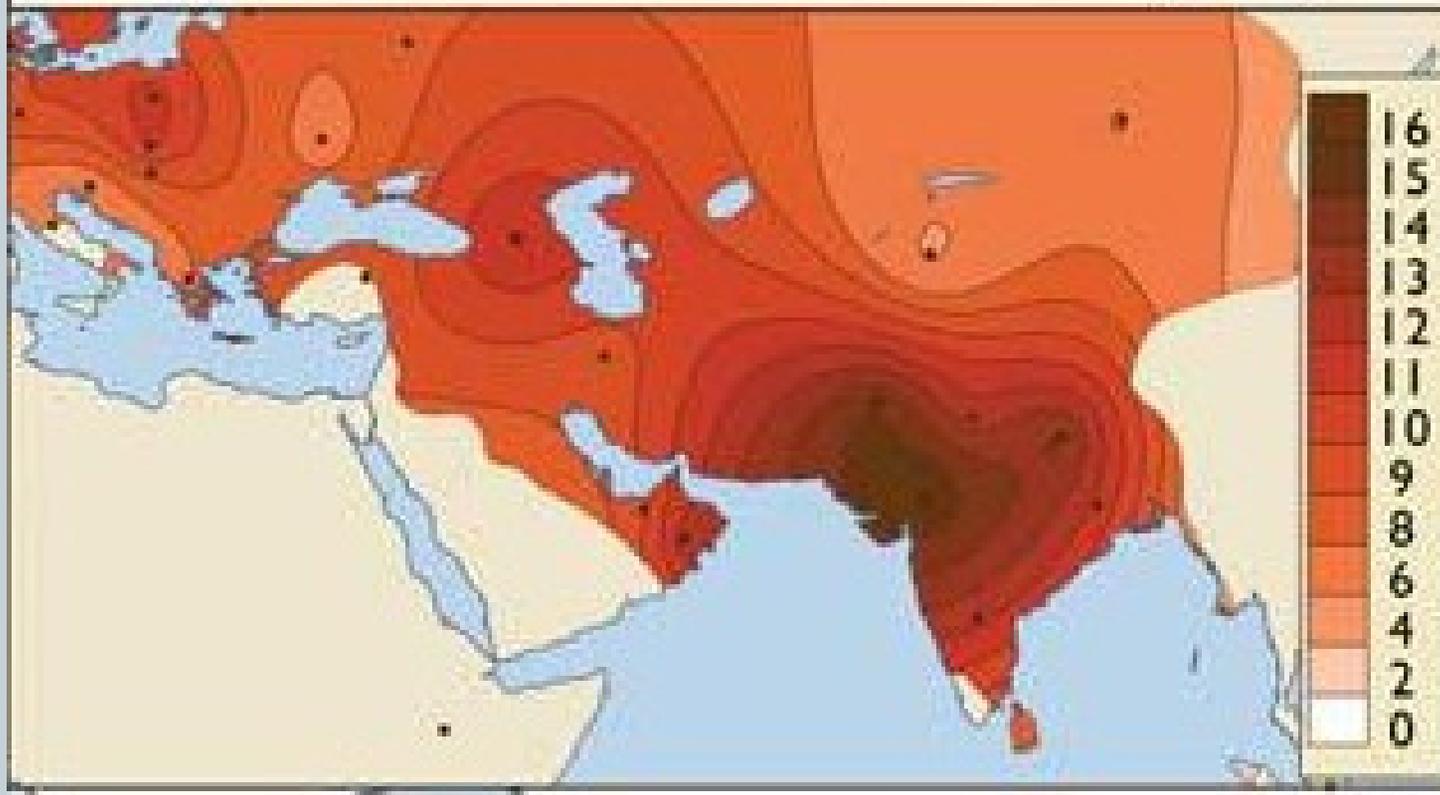
- Sahoo, Sanghmitra *et al*, A prehistory of Indian Y chromosomes: Evaluating demic diffusion scenarios, *PNAS* 2006 Jan., 103(4): 843-848.
- Sengupta, S. *et al*, Polarity and Temporality of High-Resolution Y-Chromosome Distributions in India Identify Both Indigenous and Exogenous Expansions and Reveal Minor Genetic Influence of Central Asian Pastoralists, *Am J Hum Genet* 2006 Feb., 78(2): 202–221.



Underhill 2009 also gave age of R1a in different areas



Expansion time of M17 Y-Chromosomes (KYA)



## Another controversy is about original Neolithic first farmer DNA.



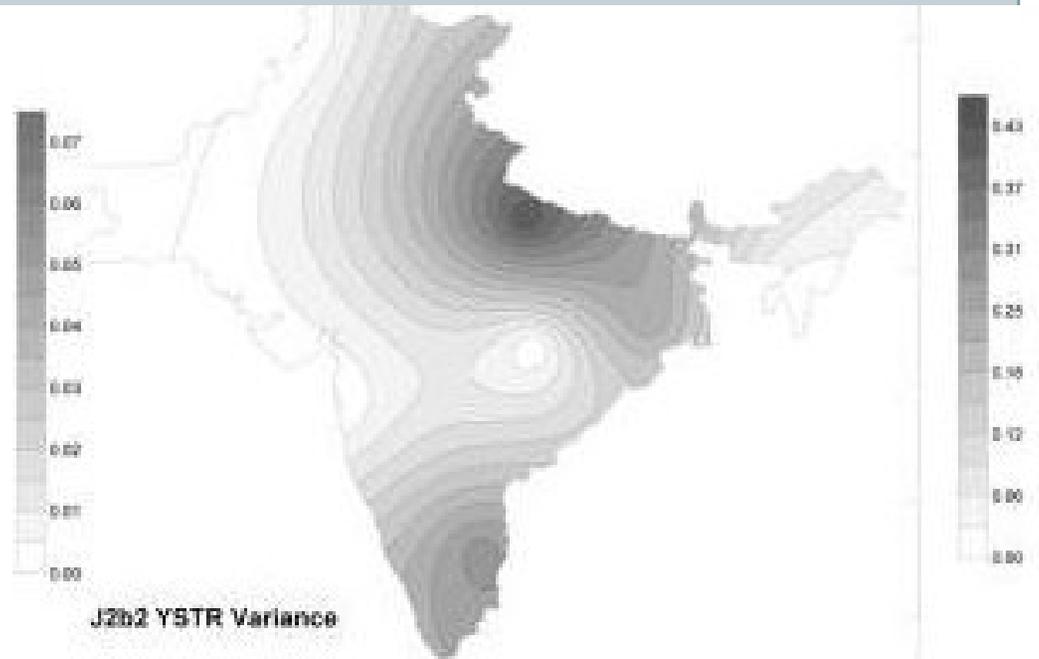
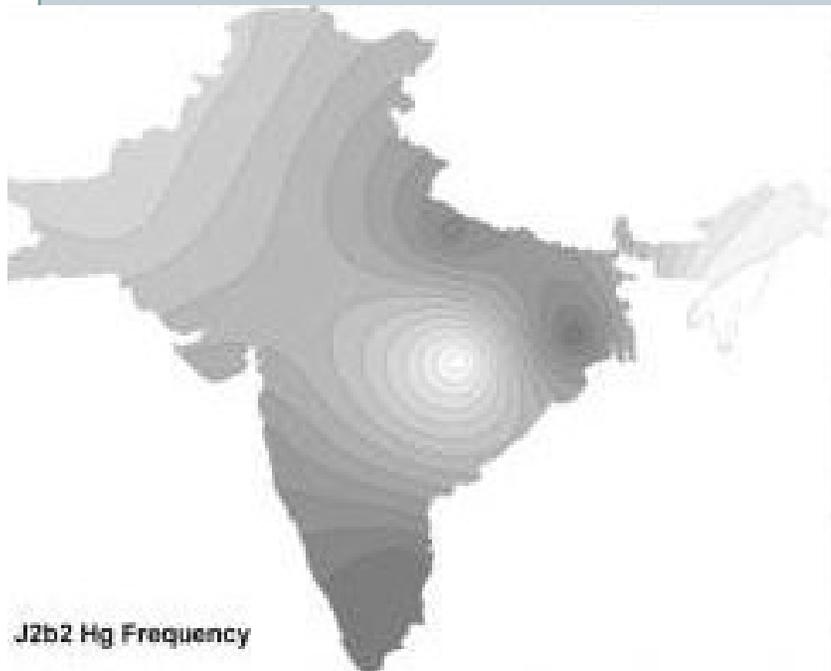
- **It was claimed that J2 originated in Anatolia and from there dispersed to Europe (with Indo-European language), and to India with farming and Dravidian language.**
- **Another DNA, L1 which was found in India and West Asia was claimed to be a marker of Dravidian arrival from Elam to India.**

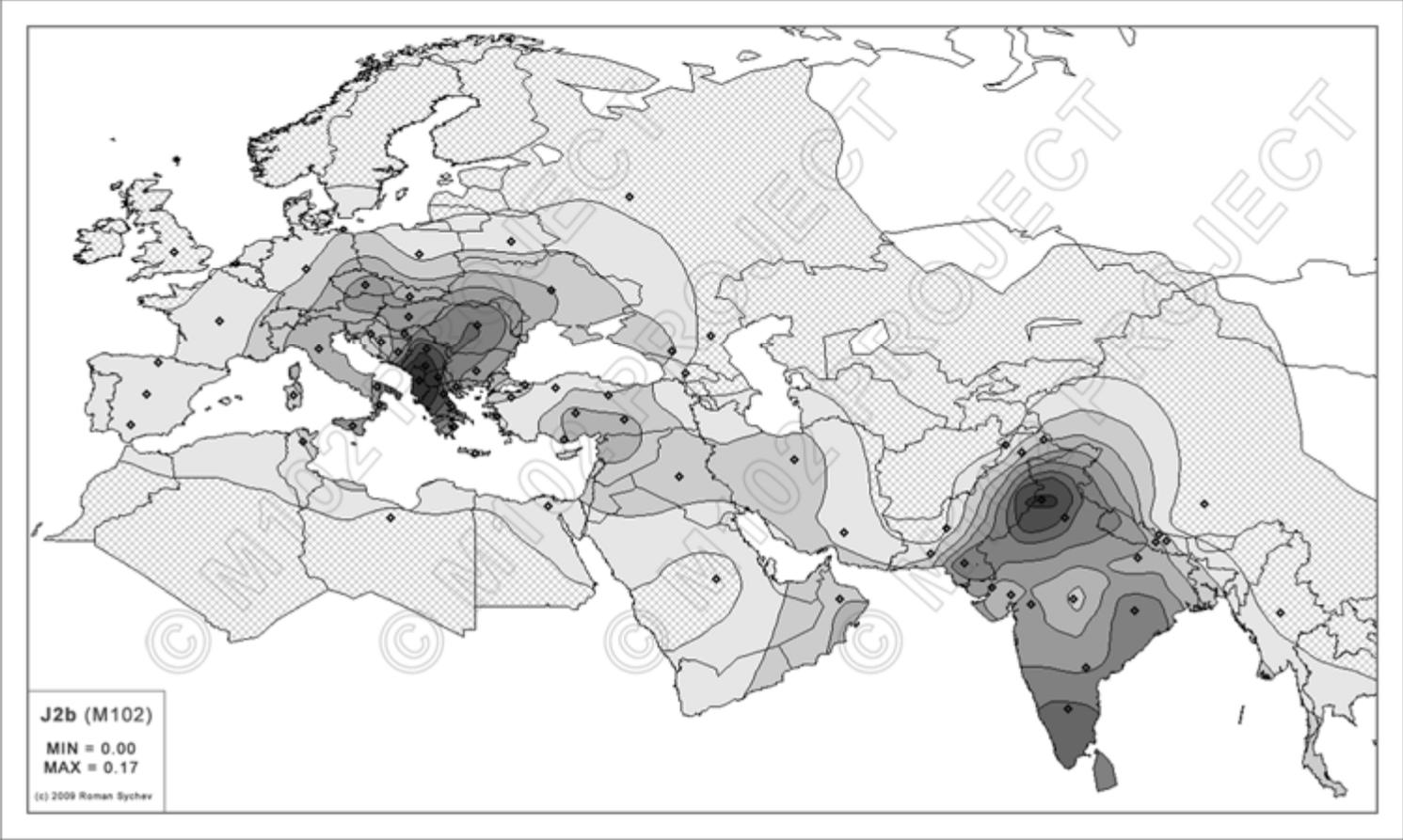
## Farmer DNAs are of Indian origin



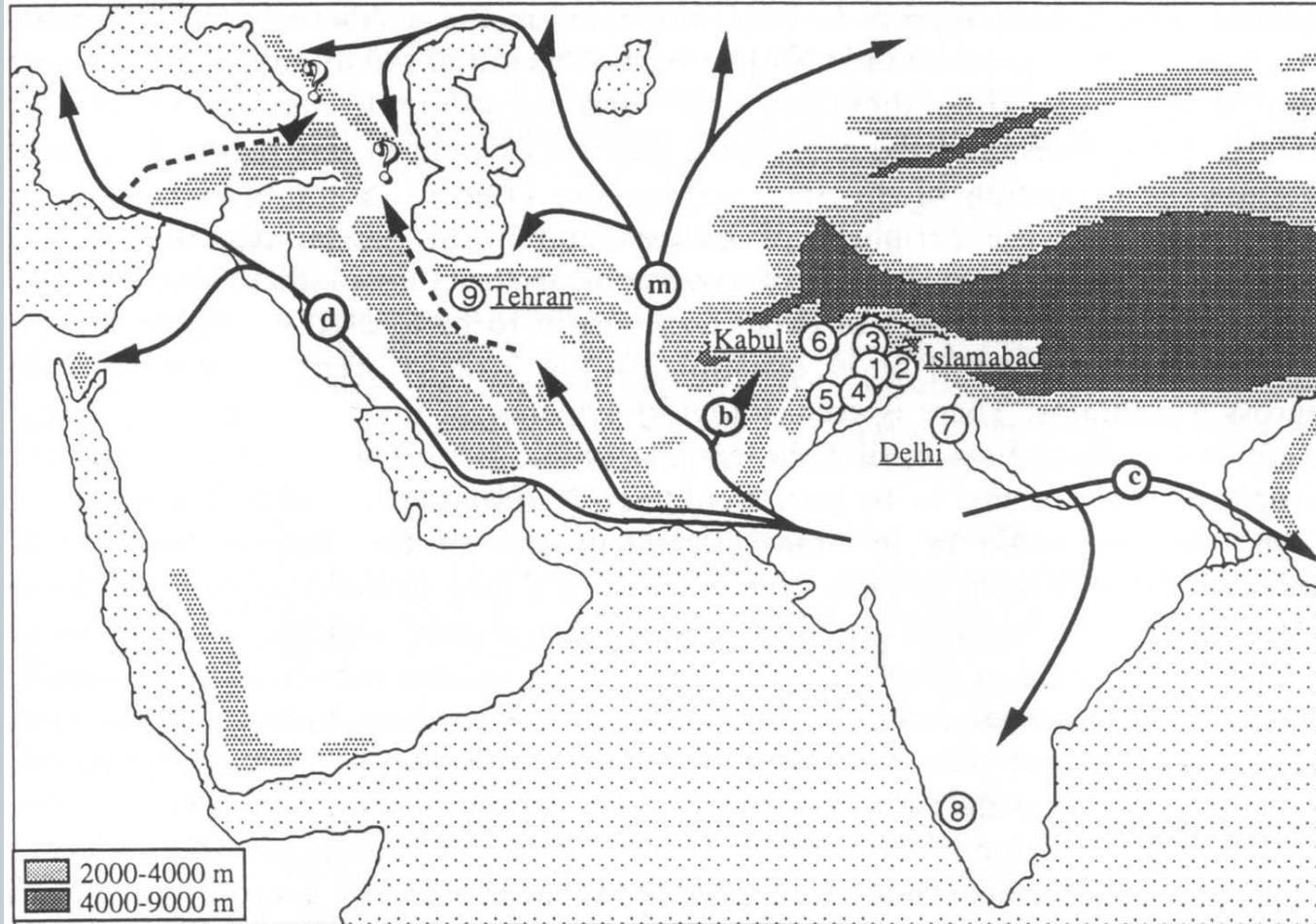
- **Sengupta *et al* 2006 found by appropriate DNA test that L1 and J2 are Indian in origin.**
- **J2b2, a sub-branch of J2 originated in UP near Lucknow, about 14,000 years back. Hence J2 must be much older in India.**
- **J2b reached Anatolia in 8,500 BP and Balkans in 4,000 ybp.**

# Sengupta, 2006; J2b2 distribution and origin maps

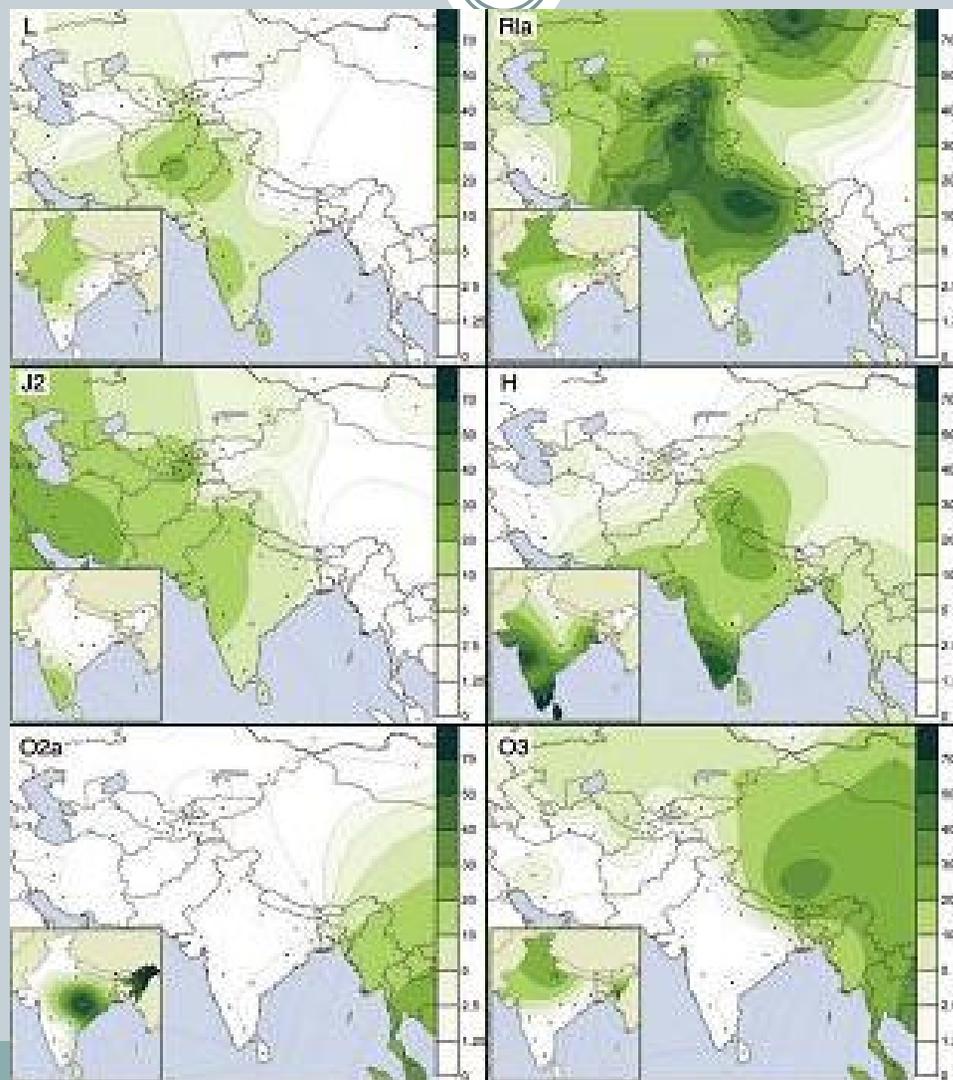


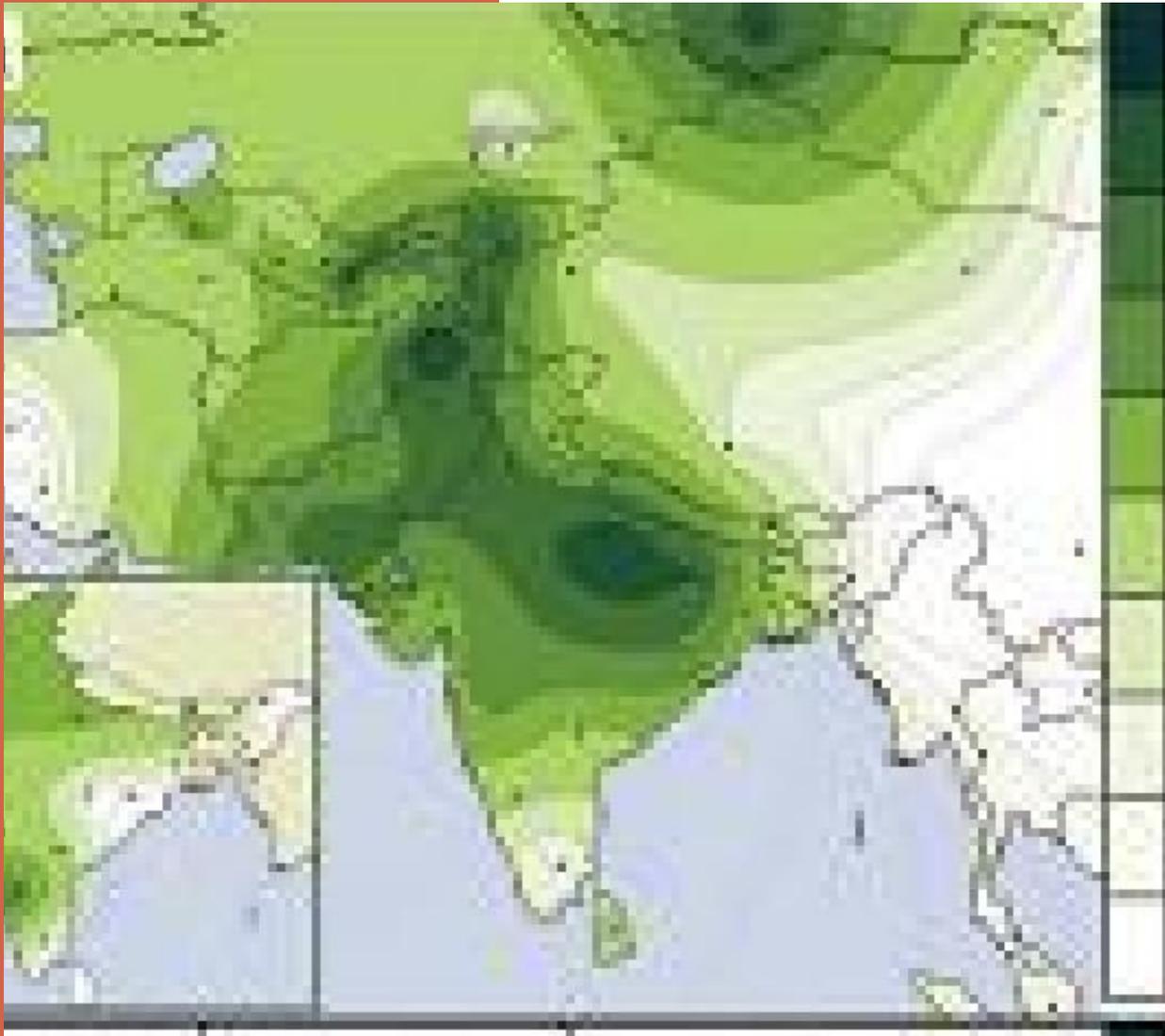


# Boursot



# Sahoo *et al* 2006





**R1a male  
lineage. Note  
particular  
density in  
Ganga Valley**

*Sahoo et  
al, 2006*



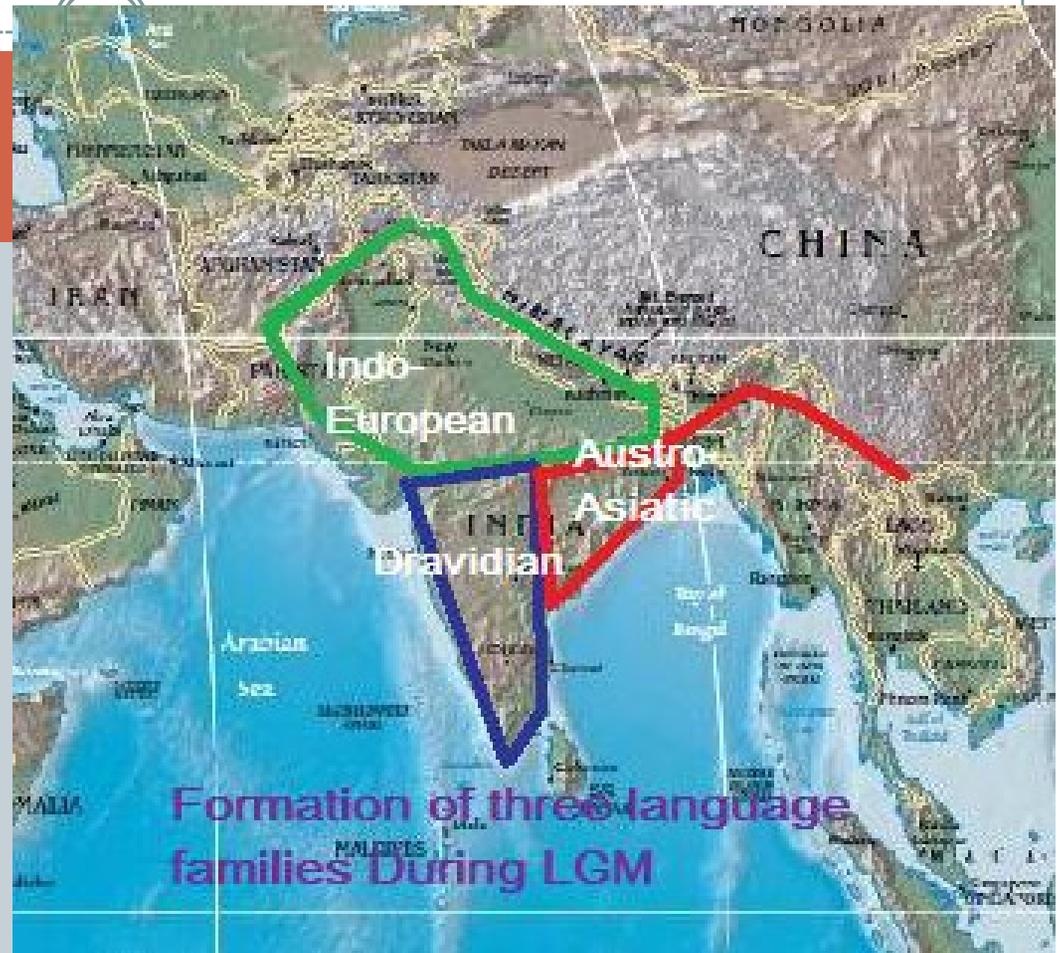
Similarly, theory of Dravidian arrival into India (L1, J2) or from Africa (K2, H1) etc have been ruled out by further detailed studies of these DNAs (Sahoo, 2006; Sengupta, 2006; Trivedi, 2008).

I am forced to conclude by the facts that Last Glacial Maximum imposed restrictions to human movements within India, promoting evolving of 3 language families

# Evolution of modern Indian Languages in India

There was enough climatic barrier in India during LGM (Petraglia, 2005).

Isolation of Indian people into three groups led to linguistic differentiation over time, and three language families emerged after LGM, from the common Mesolithic language family of India. There is no other way to explain these findings.

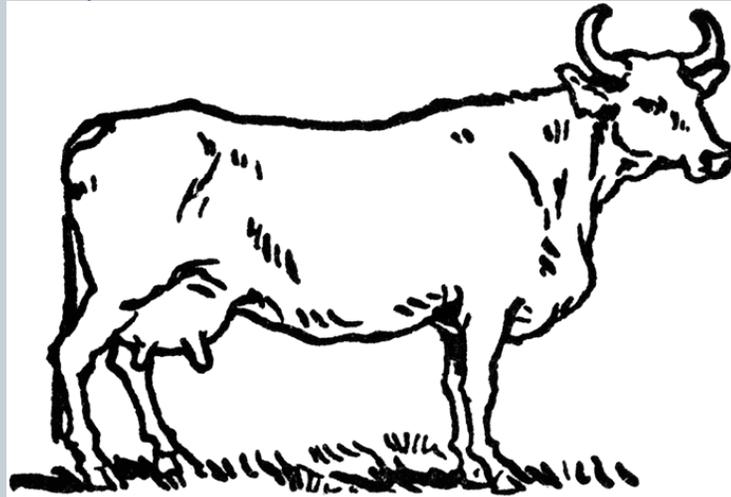




# Study of cattle and domesticated animals

The First cow  
was domesticated in India, 45,000  
years back

Evidence  
from  
DNA Study of  
Domesticated  
Cows



Earlier, many authors had said:



- Cow was domesticated first in West Asia from where it migrated to India. (Epstein, H. & Mason, I. L., in *Evolution of Domesticated Animals*, ed. Mason, I. L., Longman, New York, 1984, pp. 6-27.)

But Loftus (1994) found that Indian cow had been domesticated independently of West Asian influence.

There are two types of cows in the world:  
**taurine** (Europe, west Asia, China), and  
**Zebu or Indica** (India, Africa, Southeast  
Asia and South China, sporadically in  
Europe, Central Asia, West Asia)

- Chen (2009) proved by DNA studies that all the Zebus all over world have migrated from India, and Zebu had been domesticated only in North India.

[Chen, S. *et al*; **Zebu cattle are an exclusive legacy of the South Asian Neolithic**, *Molecular Biology and Evolution*, Sept 21, 2009]

Domesticated Indian zebu was central to catalyzing cow domestication in other parts of the world

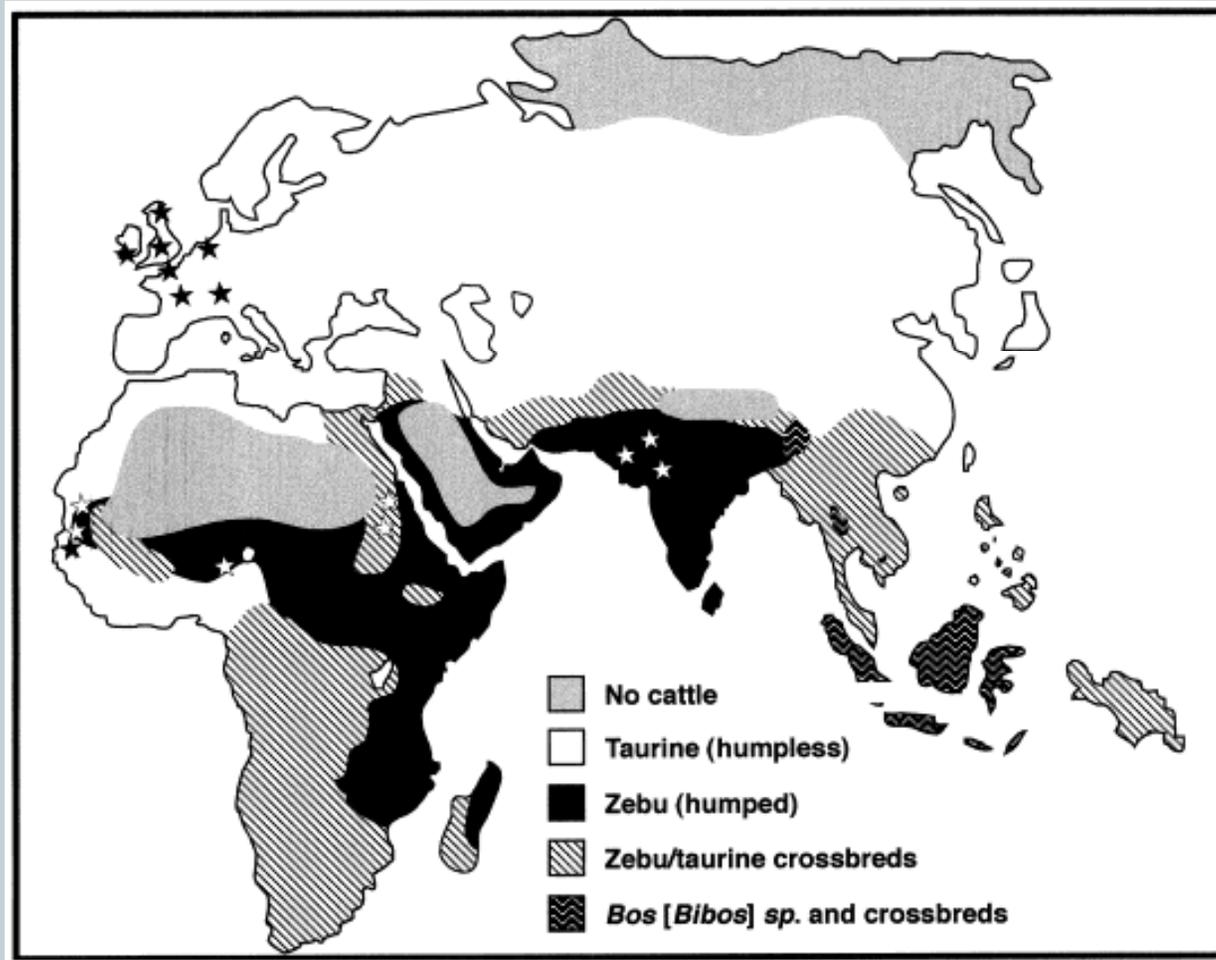


**Zebu genes are present in** most of the taurine cow lineages of Europe, West Asia, Africa, Central Asia, China and Southeast Asia.

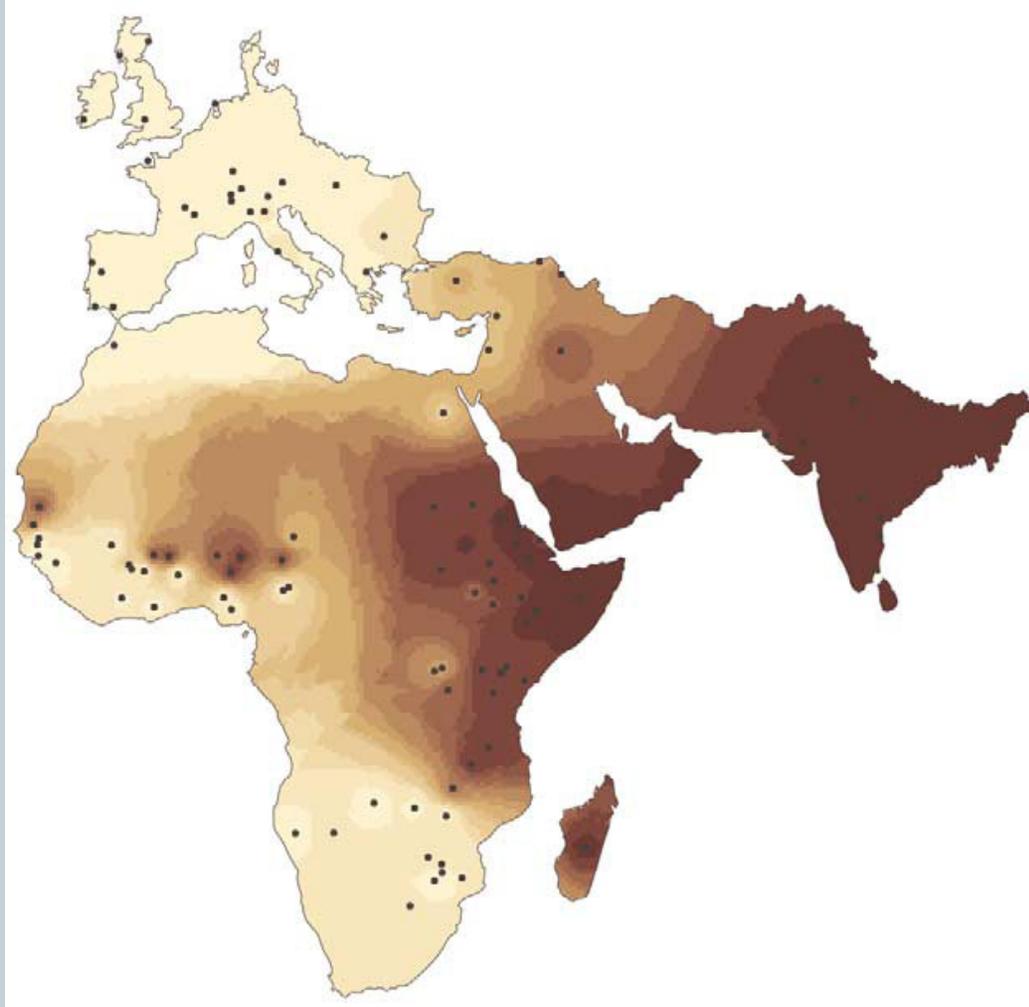
[Jann, Oliver C. *et al*, Geographic distribution of haplotype diversity at the bovine casein locus, *Genetics selection evolution* 2004, 36(2):243-257.]

[Ibeagha-Awemu, E. M. *et al*, **Molecular Characterization of Bovine CSN1S2\*B and Extensive Distribution of Zebu-Specific Milk Protein Alleles in European Cattle**, *Journal of Dairy Sciences* 2007, 90:3522-3529.]

# Map of distribution of DNA of Indian cows: hatched area represents hybrid of Indian with local cows



# Indian cow dispersal to Africa by sea route implying sea-trade:



# Linguistic evidence also supports

it

- English 'cow'
- Sanskrit: go
- German: kuhe

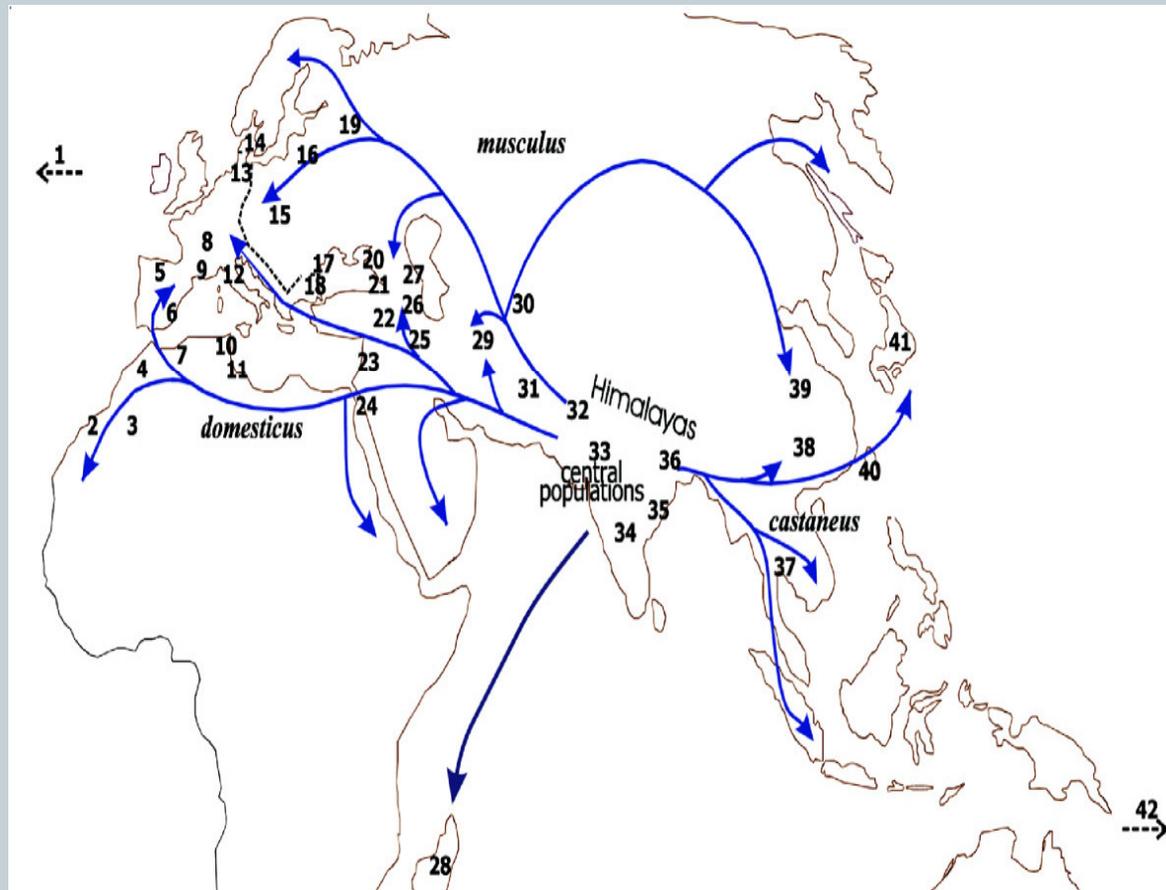
This is expected. But --

- *Chinese: gu (Pinyin), ngau (Cantonese)*
- *Thai : Koh*
- *Bantu African : gombe*

*mean migration of cattle-rearing from India.*

# Mouse Migration: from India to rest of the world

Bonhomme *et al* 2007, *Genome Biol*



Following species of mice and rats have been studied so far. And all of them have been found to have originated from India.

- **Black Rat** (*Rattus rattus*)
- **Bandicoot-rat**, *Bandicota bengalensis*, a noted rice-field pest in **Indonesia** originated in Mahanadi delta in association with buffalo
- *Mus caroli*, *Mus cervicolor* and *Rattus argentiventer* are widely distributed in Mainland Southeast Asia north of the Malay Peninsula; their distributions are spotty in the archipelago and invariably restricted to wet rice growing areas.
- *Mus dunni*, a small mice, native of northeast India and *Rattus nitidus*, a native of Nepal, are ricefield pests of Indonesia.

Water buffalo, considered essential for early rice cultivation (Bellwood), was domesticated in India.

- Groves, C. P., “Domesticated and Commensal Mammals of Austronesia and Their Histories”, in Bellwood, P., Fox, J. and Tryon, D., *The Austronesians: Historical and Comparative Perspectives*, 1995.
- Kumar, Satish *et al*, Phylogenography and domestication of Indian river buffalo, *BMC Evolutionary Biology* 2007, 7:186,

Barley was domesticated for the first time in India, although later another breed was domesticated independently in West Asia.

- Jones, Huw *et al*; “Population-Based resequencing reveals that the **flowering time adaptation** of cultivated barley **Originated east of fertile crescent**”, *Molecular Biology and Evolution*, 2008, Vol 25, Number 10, pp. 2211-2219.

# Rice domesticated for the first time in India: *Oryza sativa indica*; DNA evidence

Hiroko, Y. *et al*, “Molecular and Evolutionary analysis of the *Hd6* Photoperiod Sensitivity Gene Within Genus *Oryza*”, in *Rice* 2009, 2:56-66.

Lonedo J. P. *et al*; “Phylogenography of Asian wild rice, *Oryza rufipogon*, reveals multiple independent domestications of cultivated rice *oryza sativa*”, *Proc. Of National Acad. Of Sc. USA*, 2006, 103, 9578-5983.

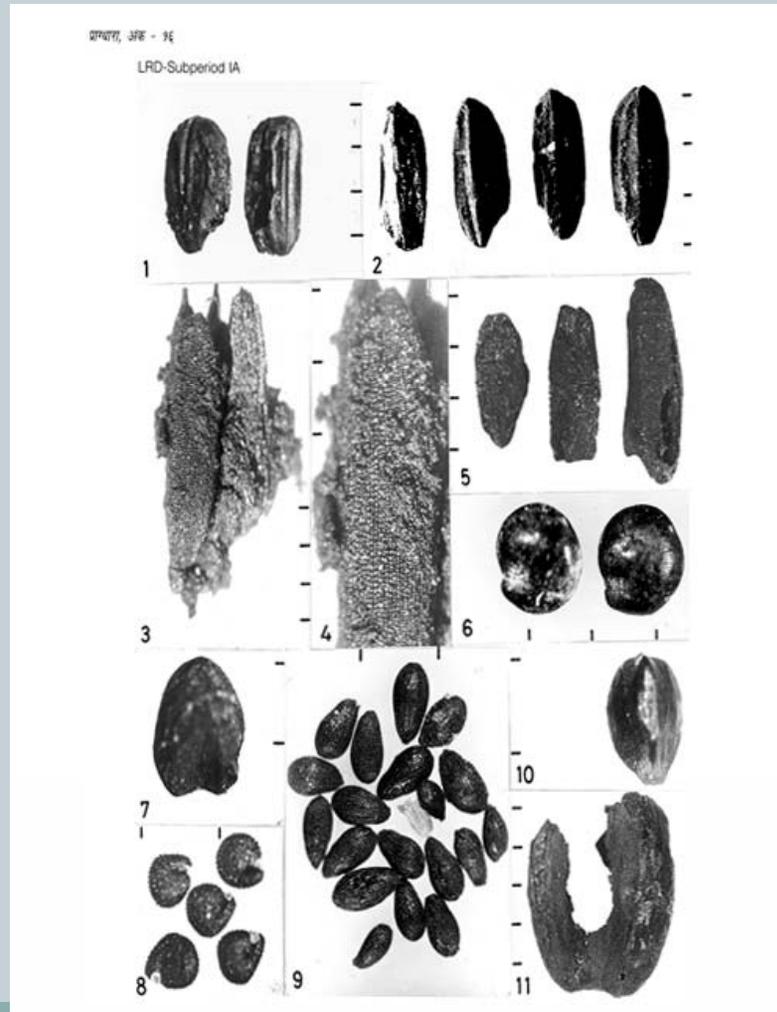
Chen, *et al*; “Distribution of deletion type in CpDNA of cultivated and wild rice”, in *Japanese Journal of Genetics*, 2003, 68: 597-603.

Harris, David; “The Multi-disciplinary Study of Agricultural Origins: ‘One World Archeology’ in Practice”, in *The Future for Archeology*, edited by Layton, Robert *et al*, Routledge Cavendish, 2006, p. 238.

Sweeny, Megan and McCouch, Susan; “The complex history of the domestication of rice”, *Annals of Botany*, 2007, 100 (5), pp. 951-957.

These studies enable  
us to push dates of  
Indian archaeology  
much back, as has  
been attempted by  
Petraglia.

# Lahuradewa: Rice



Thus first cultivation (rice) also done at  
Ganga Valley at 10,000 ybp.

First pottery was made in India: 10,000  
years back at Koldihwa, Jhusi and  
Lahuradewa.

Koldihwa--Sharma GR. 1985.

Lahuradewa--Tewari , R *et al.* 2006.

Jhusi--Dikshit, 2009.

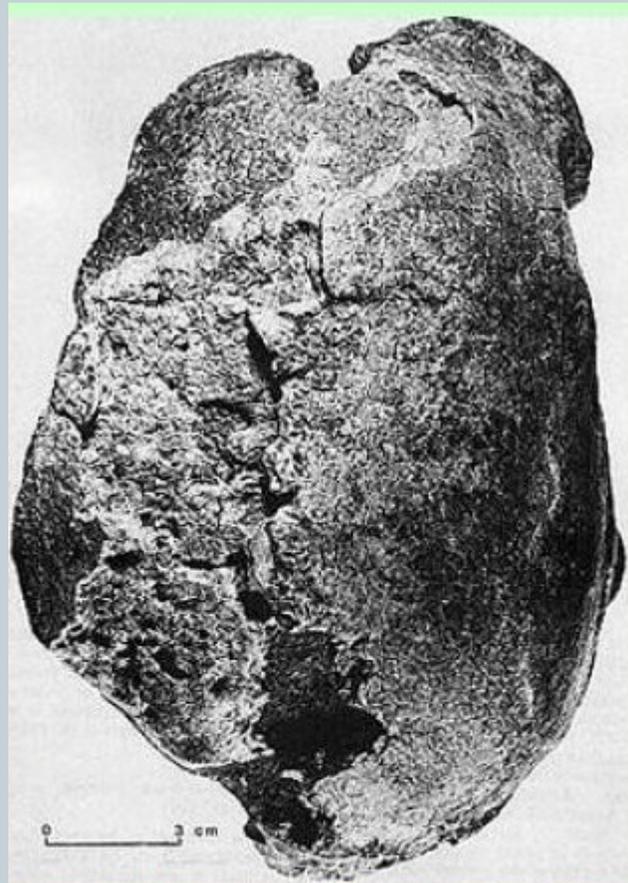
# Lahuradewa : Vase



# Some less well known newer archaeological facts

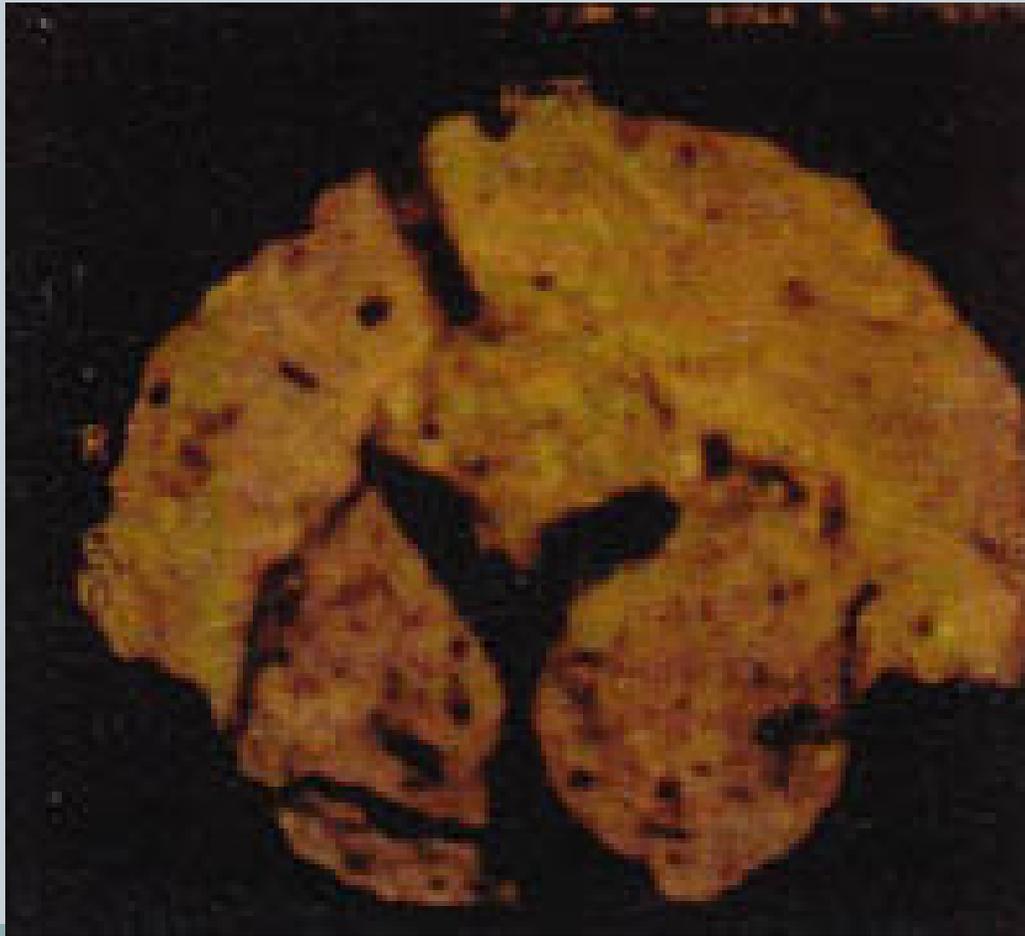


In light of DNA findings, we need to rethink Indian history. We need to weigh seriously views of Kennedy, who found that Hathnora skull was a *Homo sapiens*

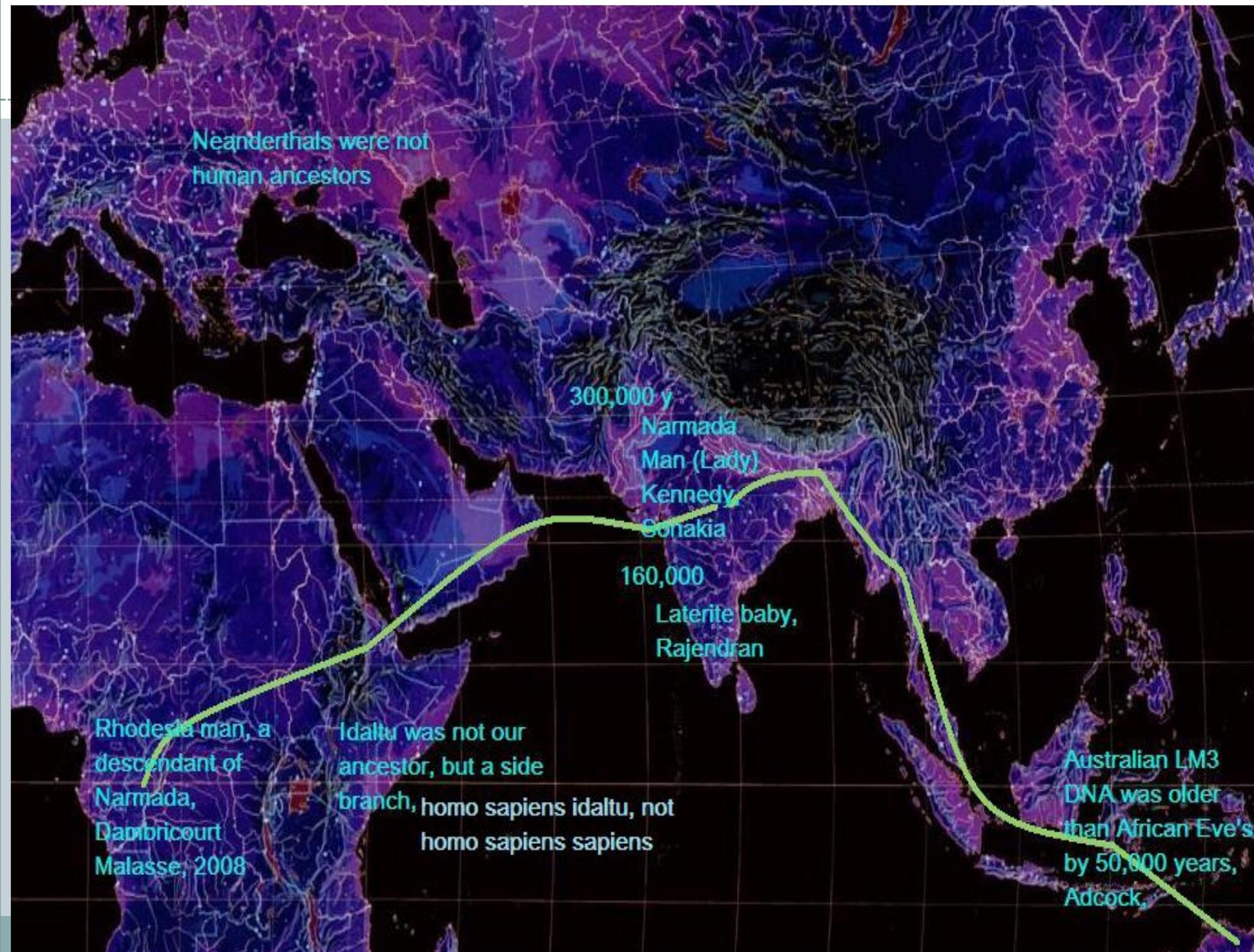


Namada *Homo Erectus* skull, Superior view

Nor should we ignore 160,000 years old  
pediatric perfectly *Homo sapiens* skull  
found near Madras: Rajendran *et al*, 2006,  
*Ancient Asia*.



# Many things are yet to be incorporated in human story



Archaeological findings prove two things more:



1. First copper was made in India 9000 years back
2. First cotton was spun in India, 9000 years back

# 9000 years old Cotton thread in Copper Bead



Journal of Archaeological Science

Volume 29, Issue 12, December 2002, Pages 1393-1401

► Abstract

References

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doi:10.1006/jasc.2001.0779

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## Regular Articles

### First Evidence of Cotton at Neolithic Mehrgarh, Pakistan: Analysis of Mineralized Fibres from a Copper Bead

Christophe Moulherat<sup>a</sup>, Margareta Tengberg<sup>b</sup>, Jérôme-F. Haquet<sup>c</sup> and Benoît Mille<sup>d</sup>

<sup>a</sup> Centre de Recherche et de Restauration des Musées de France (CNRS-UMR 171), Paris, France

<sup>b</sup> Maison de l'Archéologie et de l'Ethnologie (CNRS-UMR 7041), Nanterre, France

<sup>c</sup> Centre de Recherches Archéologiques Indus-Balochistan (CNRS-UMR 9993), Paris, France

<sup>d</sup> Centre de Recherche et de Restauration des Musées de France (CNRS-UMR 171), Paris, France

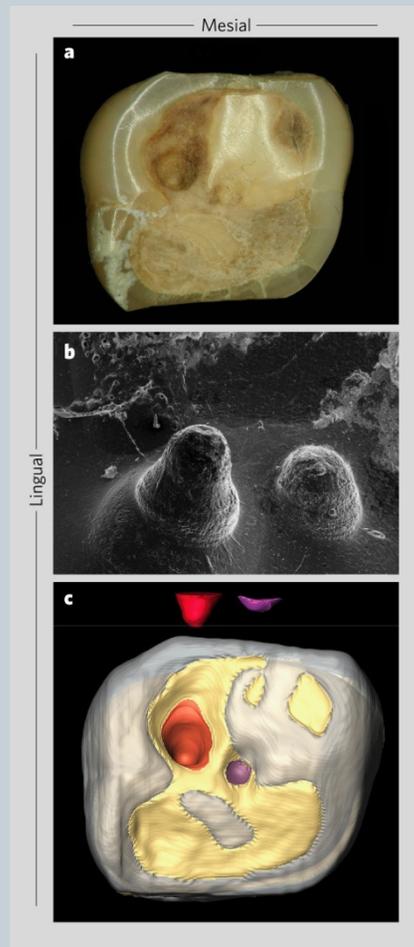
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# Drilling treatment of teeth: 8000 years old, Mehrgarh



PalaeontologyEarly Neolithic tradition of dentistry : Nature - Internet Explorer provided by Dell

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### Brief Communications

Nature 440, 755-756 (6 April 2006) | doi:10.1038/440755a; Received 22 November 2005; Accepted 1 March 2006

## Palaeontology: Early Neolithic tradition of dentistry

A. Coppa<sup>1</sup>, L. Bondioli<sup>2</sup>, A. Cucina<sup>3</sup>, D. W. Frayer<sup>4</sup>, C. Jarrige<sup>5</sup>, J. -F. Jarrige<sup>5</sup>, G. Qivron<sup>5</sup>, M. Rossi<sup>6</sup>, M. Vidale<sup>7</sup> and R. Macchiarelli<sup>8</sup>

**Prehistoric evidence for the drilling of human teeth *in vivo* has so far been limited to isolated cases from less than six millennia ago<sup>1, 2, 3</sup>. Here we describe eleven drilled molar crowns from nine adults discovered in a**

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**ABSTRACT**

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Patna Lecture Microsoft PowerPoi... PalaeontologyEarly ...

And that the robust human skeletons of Sarai Nahar Rai (Mesolithic) actually belonged to a colder period i.e. before 16,000 BP (Kennedy, 2008)

**And that Indian Mesolithic (Microlithic) started in 35,000 years back, earlier than anywhere else: Petraglia, 2009a. James and Petraglia 2005**

And Petraglia's findings from  
Jwalapuram in Kurnool Dist, Andhra  
Pradesh--that there has been a cultural  
continuity in India over last 100,000  
years or more: Petraglia, 2007, 2009b.

These show that the time to rewrite  
history has arrived.

Thank You