

MY PATERNAL ANCESTRY AND HUMAN MIGRATION

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at
Life Enrichment Club
of
Taiwanese American Senior Society
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My Immediate Ancestors



Inheritance

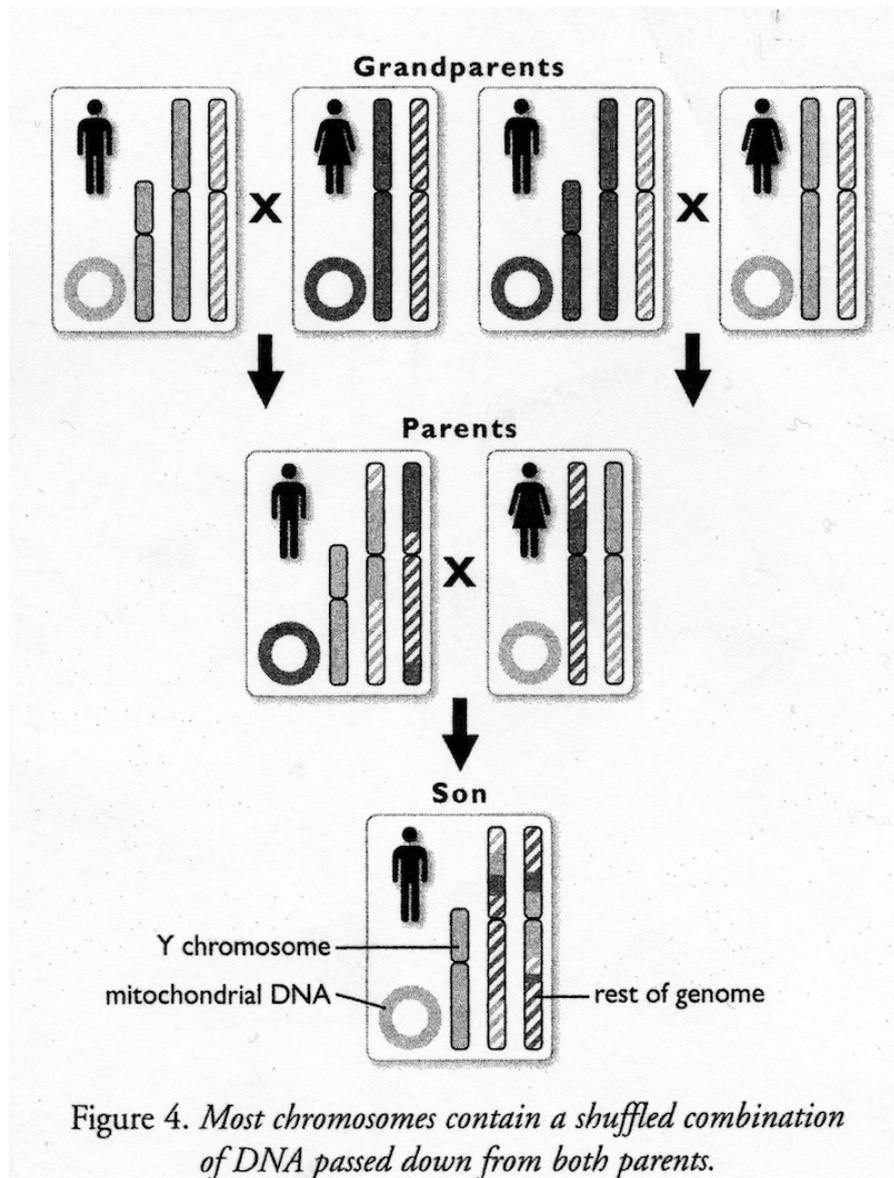


Figure 4. *Most chromosomes contain a shuffled combination of DNA passed down from both parents.*

Human Cells

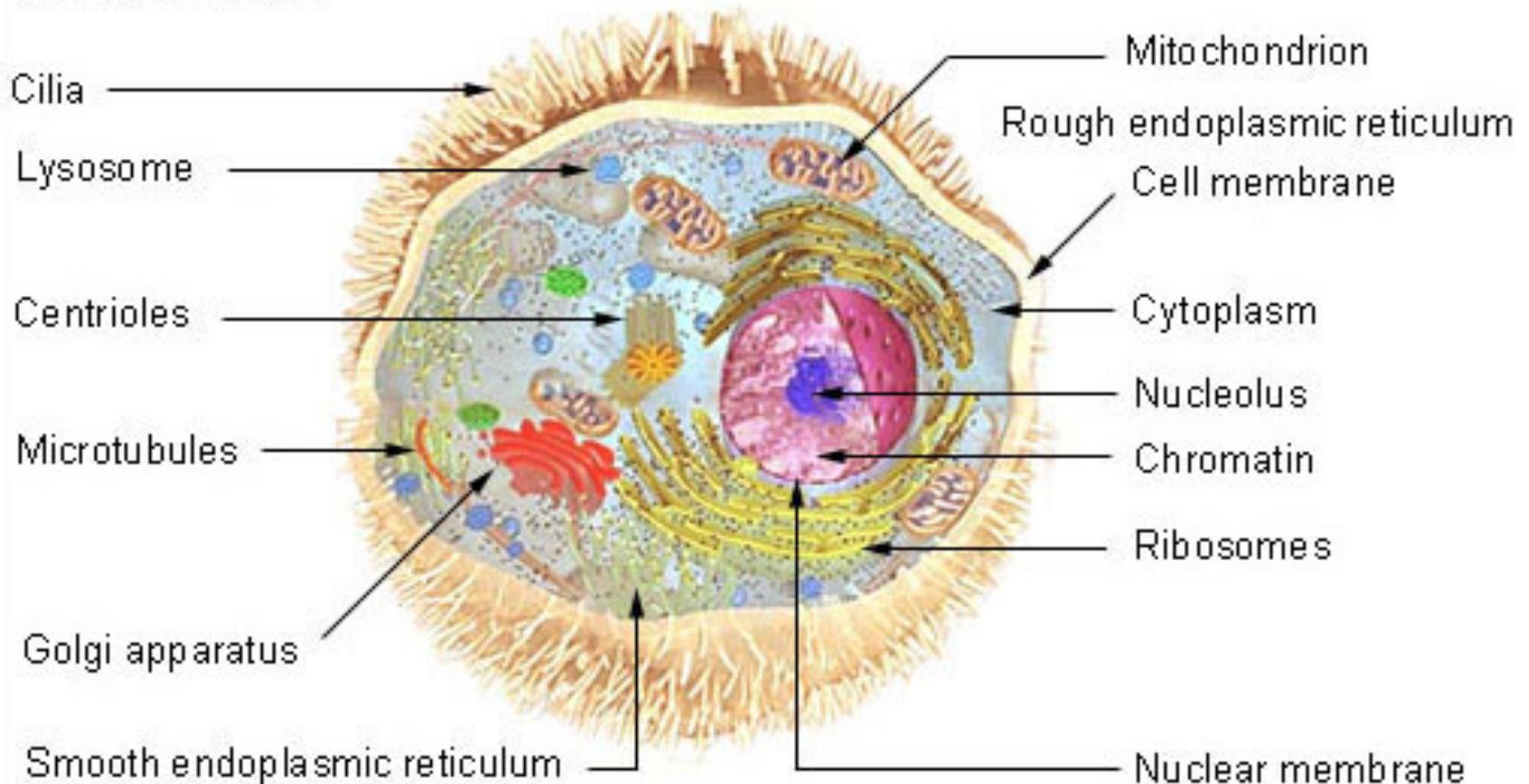
- The human body contains about 100 trillion cells
- A cell contains 23 pairs of chromosomes in its nucleus and several copies of a single, circular chromosome in its mitochondrion
- DNA is made of nucleotides (A, T, G and C) that line up in a particular order within a large molecule
- A gene is a sequence of DNA that stores an instruction
- Each chromosome contains about 500 to 4,000 genes
- There are about 32,000 genes in a cell
- There are about 3 billion base pairs (A and T or G and C) in a cell
- Each chromosome contains from 50 million base pairs to 250 million base pairs

Genetics

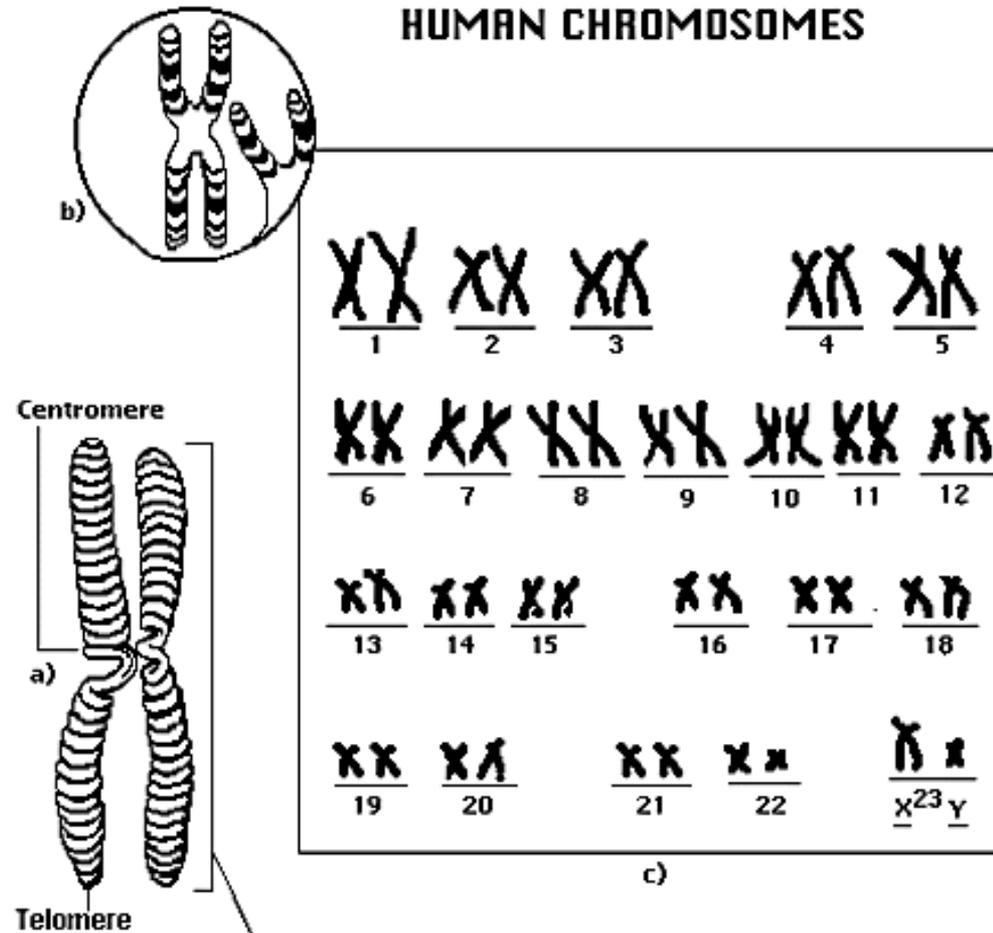
- The first famous geneticist: Gregor Johann Mendel (1822-1884), a German-Czech Augustinian monk
- The complete sequence of the human genome (2.85 billion units or base pairs) was announced on June 26, 2000, by Bill Clinton in the East Room of the White House
- Present at the announcement were two great geneticists, Francis Collins (director of NIH in Maryland) and Craig Venter (founder of many companies, including J Craig Venter Institute in Rockville, Maryland)
- We are living in the "genetics valley" of the world, Montgomery County, Maryland!

Cell Structure

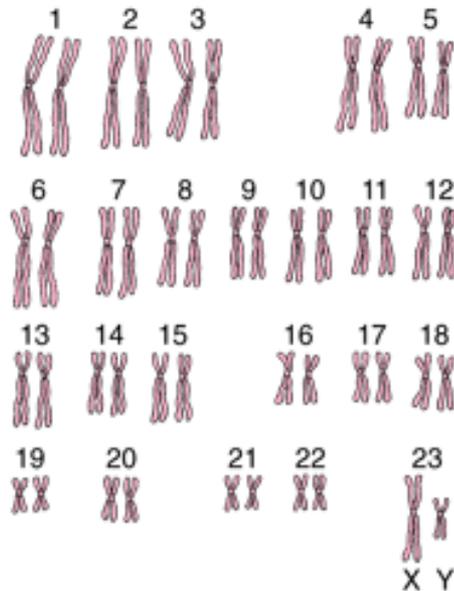
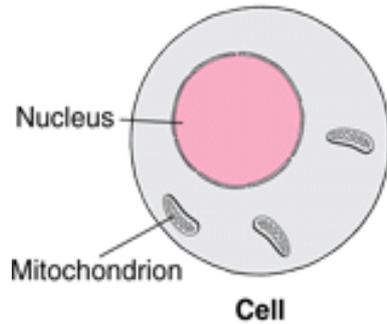
Cell Structure



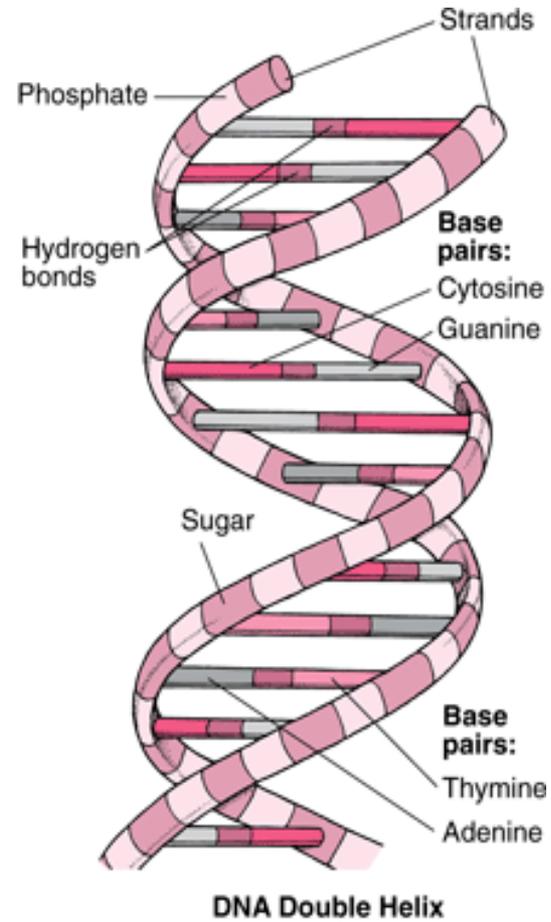
Human Chromosomes



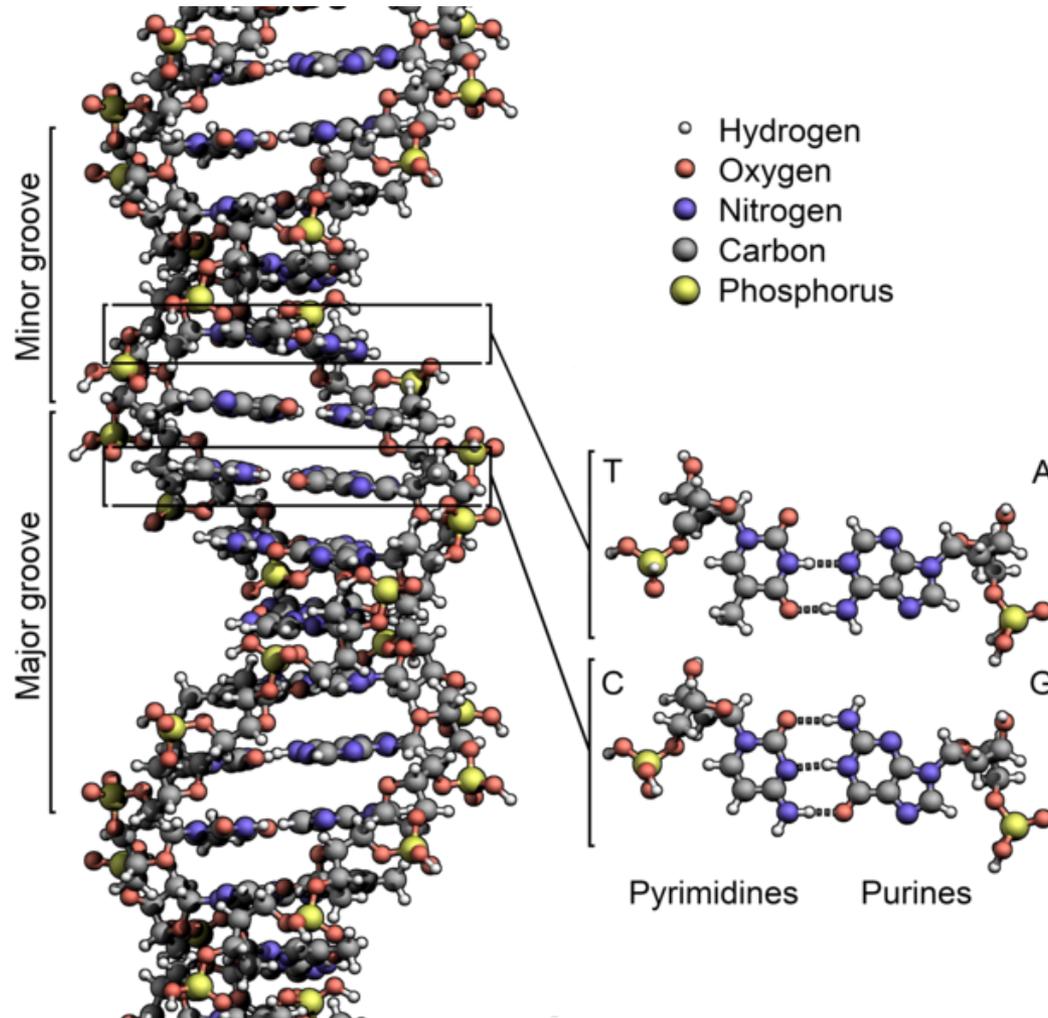
Chromosomes



Pairs of Chromosomes
in a Human Cell



Double Helix



Y Chromosome



50 million base pairs



- Short stature homeo box, Y-linked
- Short stature
- Leri-weill dyschondrosteosis
- Langer mesomelic dysplasia
- Interleukin-3 receptor, Y chromosomal
- Sex-determining region Y (testis-determining)
- Gonadal dysgenesis, XY type
- Protocadherin 11, Y-linked
- Azoospermia factors
- Male infertility due to spermatogenic failure
- Growth control, Y-chromosome influenced
- Chromodomain proteins
- Retinitis pigmentosa, Y-linked

Recombination

- Genetic recombination is a process by which a molecule of nucleic acid (DNA or RNA) is broken and then joined to a different one.
- All DNA in the 23 pairs of chromosomes go through recombination after a sperm enters an egg, except a major portion of Y chromosome.
- MtDNA does not go through recombination.
- New combinations of DNA represent genetic variation in offspring, which in turn enables populations to adapt during the course of evolution.

Replication

- DNA replication starts with one double-stranded DNA molecule and produces two identical copies of the molecule.
- There is a mechanism to make sure that the copying process is correct, but when the copying is incorrect, it is called "mutation."
- A mutation represents a genetic marker for a different lineage.

Number of Ancestors

Generations	Ancestors
1	2
2	4
3	8
5	32
10	1,024
15	32,768
20	1,048,576

20 generations about 600 years

100 generations about 3,000 years

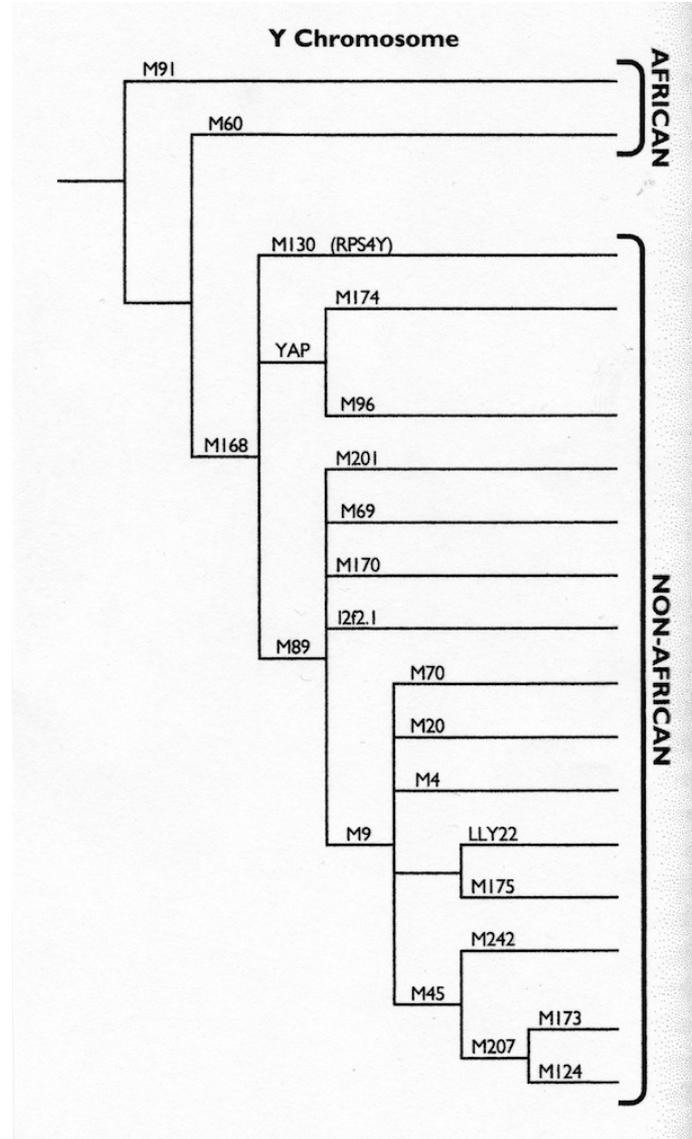
2000 generations about 60,000 years

Homo Sapiens

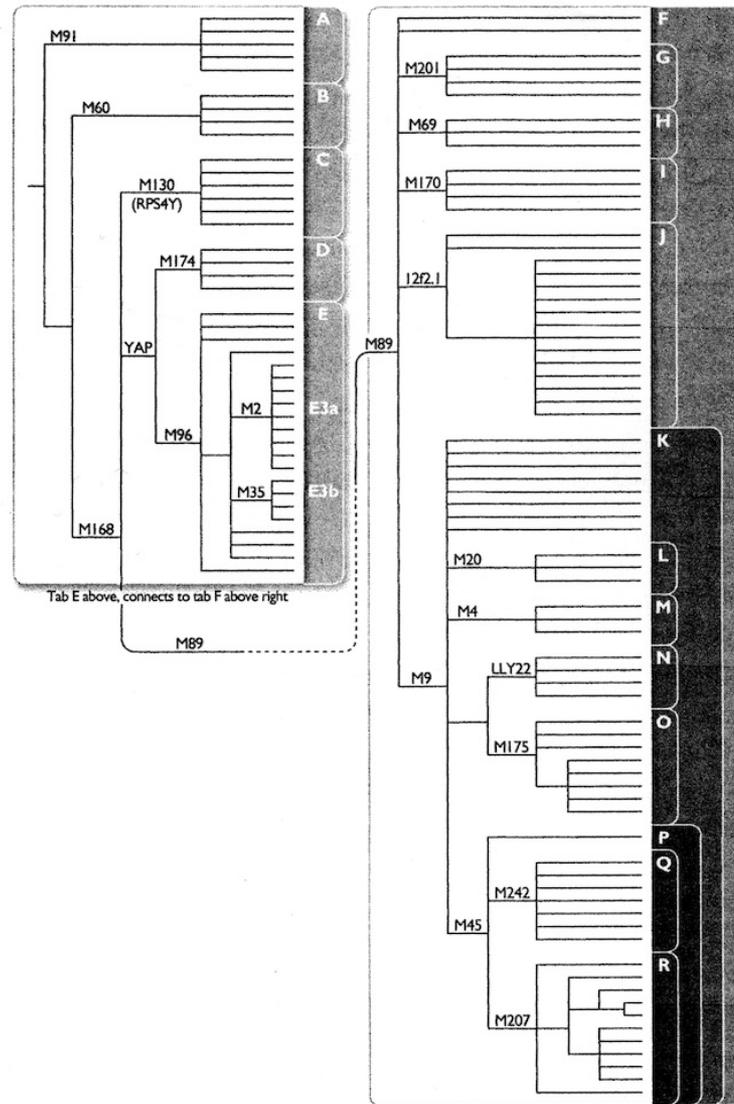
- 200,000 years ago: Two (?), "Genetic Adam" and "Genetic Eve," somewhere in Africa
- 60,000 years ago: About 10,000
- 1 AD: About 200 million
- 1900 AD: 1.6 billion
- 2011 AD: 7 billion

- Barack Hussein Obama's father was born in Kenya, Africa, very likely the general area where the first *Homo sapiens* emerged on earth 200,000 years ago

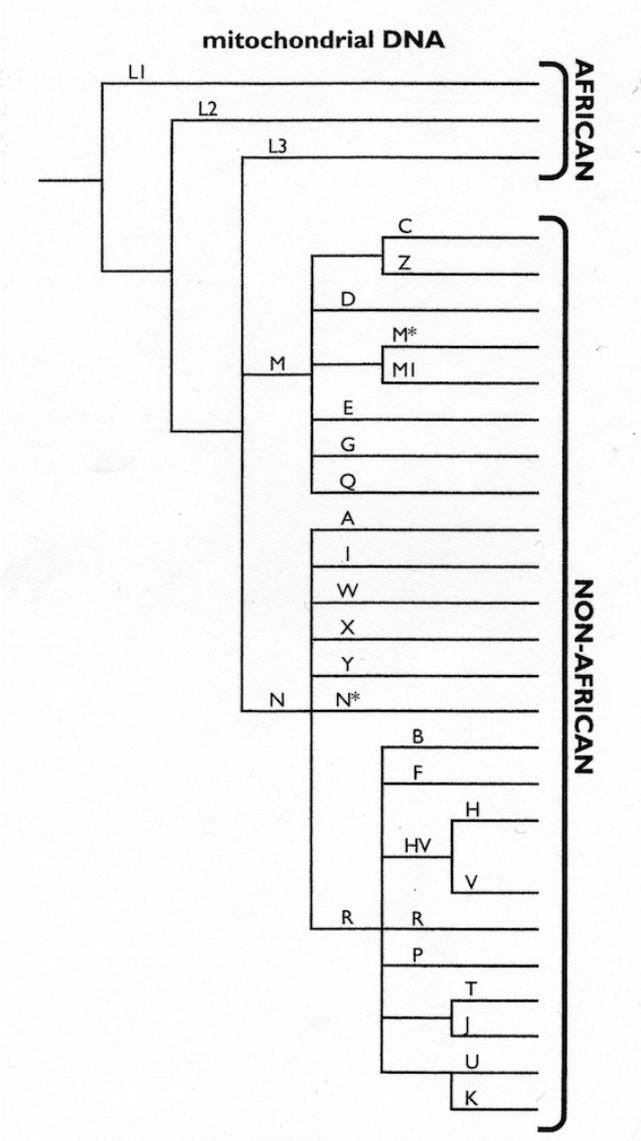
Y-Chromosome Haplogroups



Y-Chromosome Haplogroups



Mitochondrial-DNA Haplogroups



Haplogroup O1A (M119)

- M168 > M89 > M9 > M175 > M119
- First appeared in South China or Southeast Asia about 30,000 years ago
- This group includes O1a*, O1a1*, O1a2, etc.
- Mostly found in Southeast Asia
- A group of M119 went to Taiwan, where O1a appears in frequencies of around 50 percent in several aboriginal populations

Haplogroup O2 (P31)

- M168 > M89 > M9 > P31
- Appeared roughly 30,000 years ago in eastern Asia, perhaps in southern China
- His descendants spreading to Southeast Asia, Korea, and Japan
- Now found mostly in Malaysia and Thailand

Haplogroup O3 (M122)

- M168 > M89 > M9 > M175 > M122
- First appeared in China or southeast Asia
- This group includes O3*, O3a*, O3a3*, O3a4*, etc.
- His descendants include more than half of Chinese men
- Probably closely tied to the spread of agriculture
- This group of people might be instrumental in the development of rice agriculture in China, Taiwan, Japan, and Southeast Asia

Genographic Project

- A project under National Geographic, to study human migration using DNA
- Director: Dr. Spencer Wells
- <https://genographic.nationalgeographic.com/genographic/index.html>
- Paternal lineage: with Y-chromosome DNA (Y-DNA), testing 12 loci or locations or markers; \$99.95
- Maternal lineage: with mitochondrial DNA (mtDNA); \$99.95

12-Marker Y-DNA Test

- While comparing 12-marker tests does not provide enough information to be genealogically relevant, 12 marker Y-chromosome tests can predict one's paternal ancient ancestry or haplogroup. For family history purposes, comparing participants with a 12-marker test cannot sufficiently narrow the range of generations for estimating their Most Recent Common Ancestor (MRCA.) The closest range a perfect 12 out of 12 match yields is 14 generations at a 50% probability.
- A 12-marker test can, however, be effective in predicting your Paternal Haplogroup. And for some haplogroups, even predict a sub-group (sub-clade) such as a "J2" or "R1b".

Dr. Spencer Wells

- Video: The Journey of Man: A Genetic Odyssey, 2002
- Book: The Journey of Man: A Genetic Odyssey, 2002
- Video: The Human Family Tree, 2009
- Book: Deep Ancestry: Inside the Genographic Project, 2007

Note: The above videos by Wells are available, free, online. In addition, Dr. Alice Roberts' five-part BBC presentation, "The Incredible Human Journey," produced in 2009, is also available online. Use Google to search for them.

Note: Almost all data in this PowerPoint Presentation are obtained from the above sources and Internet websites, including Wikipedia.

Family Tree DNA

- A company associated with Genographic Project
- Performing more tests than those at Genographic Project
- Test samples and results from Genographic Project can be transferred to Family Tree DNA for additional tests
- Y-chromosome test of 37 loci or markers: \$169
- Y-chromosome test of 67 markers; \$268
- Family Finder + Y-DNA (12 markers); \$339
- mtDNA Plus: mid-level mtDNA test, including HVR1 and HVR2; \$159
- mtDNA Full Sequence: High-level test; \$299
- Family Finder + mtDNA; \$339

M. Lin's DNA Research

- 林媽利, 我們流著不同的血液, 2010
- M. Lin started her career in the research of blood types
- Then she worked on HLA (human leukocyte antigen, 人類白血球抗原, 或稱組織抗原), the super locus found in chromosome 6, containing a large number of genes related to immune system function in humans
- Then she studied mitochondrial DNA (粒線體DNA)
- Then she studied Y-chromosome DNA (Y染色體)
- Her book is about her studies in all the four fields about the populations in Taiwan

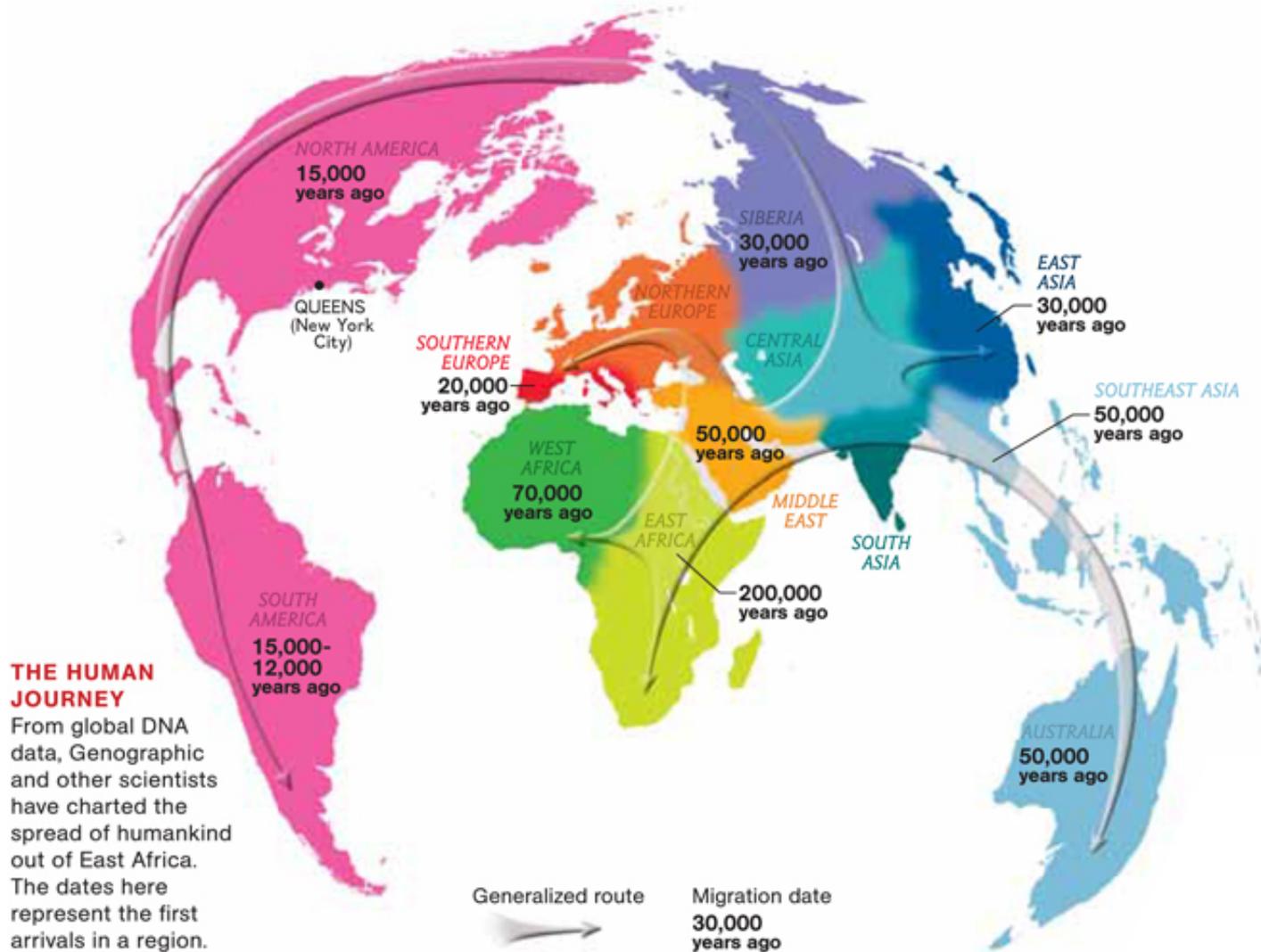
DNA Tests in Taiwan

- 台灣微測有限公司 (Taiwan Environmental Medicine Company), <http://www.taiwanancestry.com>
- 服務費用男性為12,000元(包括Y染色體、粒線體DNA及HLA)，女性為9,000元(包括粒線體DNA及HLA) (女性因不帶Y染色體，不能得知父系血緣。如有需要，請由該女性之兄弟取樣進行)。

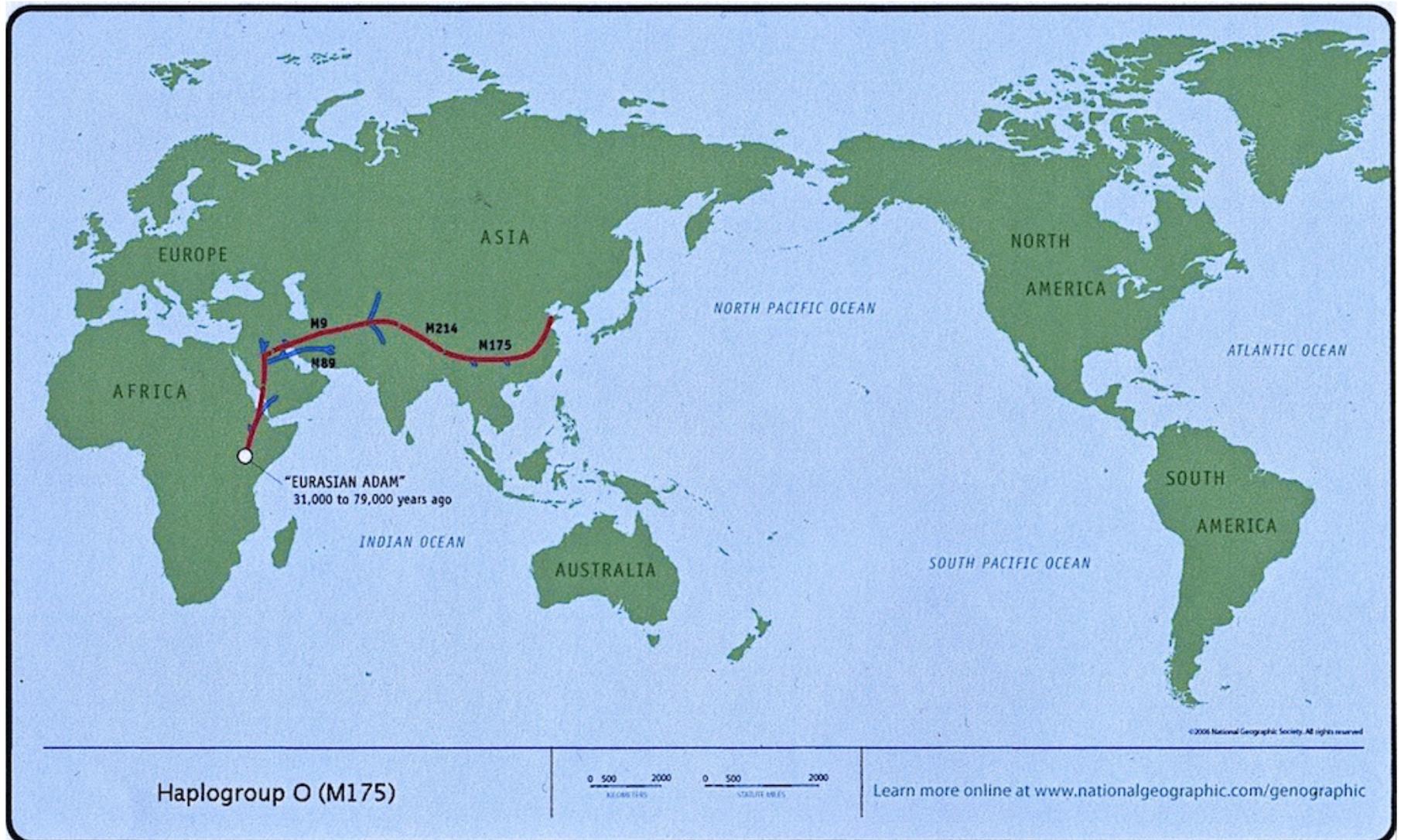
My DNA Tests

- Y-DNA test at Genographic Project, 12 markers
- I belong to Haplogroup O (M175)
- My Y-DNA sample was transferred to Family Tree DNA
- Additional test by Family Tree DNA, called Deep Clade Test, for sub-group within my Haplogroup O (M175): \$86
- Members of Haplogroup O (M175) carry the following Y-chromosome markers: M168 > P143 > M89 > L15 > M9 > M214 > M175
- mtDNA test at Genographic Project: still pending

Human Migration Map



Migration of My Paternal Ancestry



Haplogroup O (M175)

Learn more online at www.nationalgeographic.com/genographic

Certificate of my Y-DNA Test



Certificate of Y-chromosome DNA testing

In recognition of your participation in the Genographic Project, we hereby certify that

SUNG-PENG HSU

belongs to:

Haplogroup O (M175)

The designations for all twelve loci examined for this purpose are listed here, along with the Short Tandem Repeats (STRs) outcome for each.

393	390	19	391	385a	385b	426	388	439	389-1	392	389-2
12	24	15	11	12	14	11	12	11	12	13	16

Haplogroup O (M175)

This lineage group carries the following Y-chromosome markers:

M168 > P143 > M89 > L15 > M9 > M214 > M175

Today, more than half of all Chinese males carry the genetic marker M175, which is also widespread throughout East Asia and found in lower frequencies in Tahiti and Indonesia.

Y-Chromosome and Mutation

- The Y-chromosome is passed exclusively and directly from father to son, unchanged, from generation to generation. Unchanged, unless there is a mutation.
- The mutation is a random, naturally occurring, usually harmless change.
- The mutation, known as a marker, acts as a beacon. It can be mapped through generations from father to son for thousands of years.
- Each mutational event represents the beginning of a new lineage on the family tree of the human race.
- The Genographic Project is to build a large enough database of anthropological genetic data to trace human migration.

M168: My Earliest Paternal Ancestor

- Earliest in the sense that my Y-DNA can be used to trace.
- Time of emergence: roughly 50,000 years ago
- Place of origin: Africa
- Climate: Temporary retreat of Ice Age; Africa moves from drought to warmer temperatures and moister conditions
- Estimated number of *Homo sapiens*: About 10,000
- Tools and skills: Stone tools; earliest evidence of art and advanced conceptual skills
- Note: It is generally agreed that *Homo sapiens* emerged in Africa about 200,000 years ago, but Y-DNA cannot be used to trace that far. M168 is believed to be the ancestor of all non-Africans.

M89: Moving through the Middle East

- Time of emergence: 45,000 years ago
- Place: Northern Africa or the Middle East
- Climate: Middle East: Semi-arid grass plains
- Estimated number of *Homo sapiens*: tens of thousands
- Tools and skills: Stone, ivory, wood tools
- M89 is a marker found in 90 to 95 percent of all non-Africans.
- The first wave of migration came out of Africa and followed the coastal route to Australia; Haplogroup C (M130) and D (M174)
- My ancestor belonged to the second wave who migrated to Middle East and beyond, M89

M9: The Eurasian Clan

- Time of Emergence: 40,000 years ago
- Place: Iran or southern Central Asia
- Estimated number of *Homo sapiens*: Tens of thousands
- Tools and skills: Upper Paleolithic
- At the “Pamir Knot,” located in present-day Tajikistan (formed by the Hindu Kush, the Tian Shan, and the Himalayas), M9 split into two groups. Some moved north into Central Asia, others moved south into what is now Pakistan and the Indian subcontinent.
- Most people native to the Northern Hemisphere trace their roots to the Eurasian Clan. Nearly all North Americans and East Asians are descended from M9, as are most Europeans and many Indians.

M214 (NO)

- Time of emergence: 35,000 years ago
- Place: Eurasia east of the Aral Sea
- Estimated number of Homo sapiens: about 100,000
- Tools and skills”: Upper Paleolithic
- M214 or NO Haplogroup is the parent group to two important sub-groups, N or LLY22 and O or M175. The group M214 is rarely found today, but it is the direct patrilineal ancestor of a very large percentage of present-day humans, through LLY22 and M175.

O (M175): The East Asian Clan

- Time of emergence: 35,000 years ago
- Place of origin: Central or East Asia
- Climate: Ice Age
- Estimated number of *Homo sapiens*: about 100,000
- Tools and skills: Upper Paleolithic
- This group of people moved from Central Asia, through southern Siberia, and arrived in China and East Asia.
- Today, some 80 to 90 percent of all people living east of Central Asia are members of Haplogroup O (M175), which is nearly non-existent in western Asia and Europe.
- *Homo erectus* lived in Asia for nearly a million years and disappeared about 100,000 years ago. Peking Man was *Homo erectus*, not *Homo sapiens*.

Some Conclusions

- Genetically, every human being is unique.
- Genetically, there is no such thing as "Pure Chinese" or "Pure Taiwanese" or "Pure American." They are simply social/cultural/political ideas or even myths.
- All humans are related as one. They live on the same earth. They share the same ancestors who very likely emerged in Africa about 200,000 years ago. For non-Africans, they share the same ancestors who migrated out of Africa about 50,000 or 60,000 years ago.