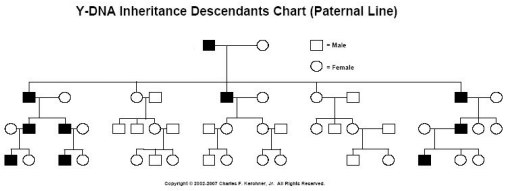
Outline

Y chromosome and history

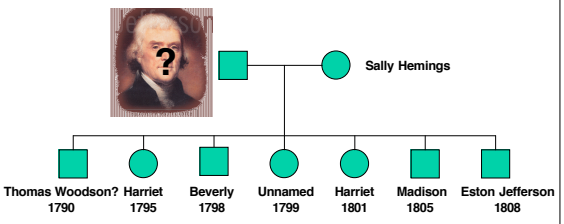
advantages of using the Y chromosome
Thomas Jefferson/Sally Hemings debate
genetic evidence

Mitochondrial DNA

mitochondria
inheritance
evolution
recent history
human evolution



Sally Hemings' children



For Jefferson and Hemings history, check out

http://www.monticello.org/plantation/hemingscontro/hemings-jefferson_contro.html

The Story

Sally Hemings, a slave of President Thomas Jefferson, had six or seven children. In 1802 James Callender, a scandalmonger, published an article accusing President Jefferson of fathering the Hemings' children.

Arguments for: Children looked like Jefferson; Jefferson and Hemings were in France or at Monticello together nine months before the birth of each of the children; Jefferson freed Sally's children and other members of her family. Madison claimed that Sally told him that Jefferson was his father and the father of his five siblings.

Arguments against: Jefferson's denial; Jefferson's personality; difference in age; Madison and Eston were born after scandal; former Monticello manager claimed another man was often seen leaving Sally's quarters.

There are two oral histories:
The Jefferson/Randolph oral history: Peter and Samuel Carr fathered Sally's children.

The Hemings oral history: Thomas Jefferson fathered Sally's children.

scientific correspondence

Jefferson fathered slave's last child

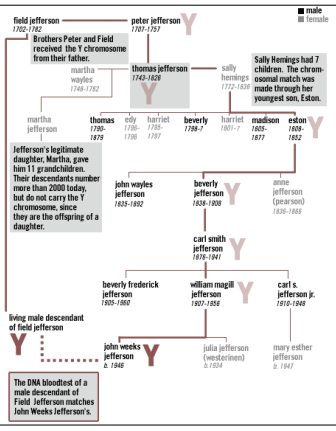
There is a long-standing historical controversy over the question of US President Thomas Jefferson's paternity of the children of Sally Hemings, one of his slaves[1–4]. To throw some scientific light on the dispute, we have compared Y-chromosomal DNA haplotypes from male-line descendants of Field Jefferson, a paternal uncle of Thomas Jefferson, with those of male-line descendants of Thomas Woodson, Sally Hemings' putative first son, and of Eston Hemings Jefferson, her last son. The molecular findings fail to support the belief that Thomas Jefferson was Thomas Woodson's father, but provide evidence that he was the biological father of Eston Hemings Jefferson.

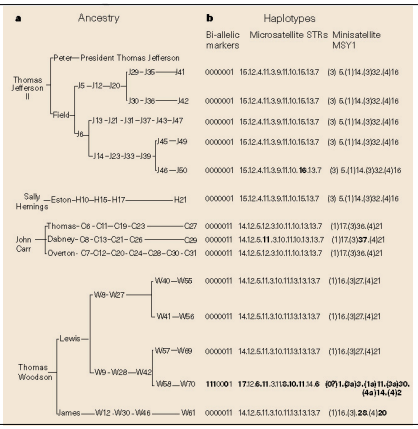
In 1802, President Thomas Jefferson was accused of having fathered a child, Tom, by Sally Hemings[1]. Tom was said to have been born in 1790, soon after Jefferson and Sally Hemings returned from France where he had been minister. Present-day members of the African-American Woodson family believe that Thomas Jefferson was the father of Thomas Woodson, whose name comes from his later owner[2]. No known documents support this view.

Sally Hemings had at least four more children. Her last son, Eston (born in 1808), is said to have borne a striking resemblance to Thomas Jefferson, and entered white society in Madison, Wisconsin, as Eston Hemings Jefferson. Although Eston's descendants believe that Thomas Jefferson was Eston's

Jefferson shared the same haplotype at [illegible] loci, and the fifth differed by only a single unit at one microsatellite locus, probably by mutation. This haplotype is rare in the population, where the average frequency of microsatellite haplotype is about 1.5 per cent. Indeed, it has never been observed outside the Jefferson family, and it has not been found in 670 European men (more than 1,200 worldwide) typed with the microsatellites or 308 European men (690 worldwide) typed with MSY1.

Four of the five male-line descendants of Thomas Woodson shared a haplotype (one MSY1 variant) that was not similar to the Y-chromosome of Field Jefferson but was characteristic of Europeans. The fifth Woodson descendant had an entirely different haplotype, most often seen in sub-Saharan Africans, which indicates illegitimacy in the line after individual W42. In contrast, the descendant of Eston Hemings Jefferson did





Conclusions

Thomas Woodson was not the son of Thomas Jefferson or Peter or Samuel Carr.

Eston Jefferson was not the sone of either Peter or Samuel Carr.

Eston Jefferson could have been the son of Thomas Jefferson.

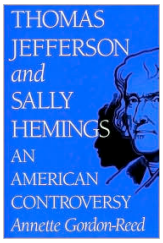
Shortly after the DNA test results were released in November 1998, the Thomas Jefferson Foundation formed a research committee consisting of nine members of the foundation staff, including four with Ph.D.s. In January 2000, the committee reported its finding that the weight of all known evidence - from the DNA study, original documents, written and oral historical accounts, and statistical data - indicated a high probability that Thomas Jefferson was the father of Eston Hemings, and that he was perhaps the father of all six of Sally Hemings' children listed in Monticello records - Harriet (born 1795; died in infancy); Beverly (born 1798); an unnamed daughter (born 1799; died in infancy); Harriet (born 1801); Madison (born 1805); and Eston (born 1808).

Although the relationship between Jefferson and Sally Hemings has been for many years, and will surely continue to be, a subject of intense interest to historians and the public, the evidence is not definitive, and the complete story may never be known. The Foundation encourages its visitors and patrons, based on what evidence does exist, to make up their own minds as to the true nature of the relationship.

The Thomas Jefferson Foundation

The Scholar's Commission, appointed by the Thomas Jefferson Heritage Society, concluded that the allegation that Thomas Jefferson fathered Sally Hemings is not proven. With the exception of one dissenter, the opinions range from skepticism to the charge being false.

"One post-DNA commentator, historian John d'Entremont, perceptively noted that the "it-could-never-be-Thomas Jefferson" school is akin to a religion. As evidence is not required to sustain the faith, there is little reason to believe that any amount of evidence could be offered to diminish it."



The New York Times

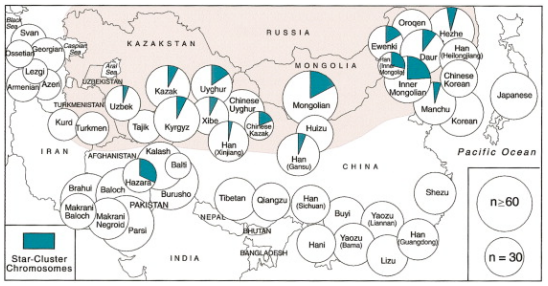
Thursday, March 1, 2007

Study Raises Possibility of Jewish Tie for Jefferson

Article Tools Sponsored By
By NICHOLAS WADE
Published: February 28, 2007

Was Thomas Jefferson the first Jewish president? Researchers studying Jefferson's Y chromosome have found it belongs to a lineage that is rare in Europe but common in the Middle East, raising the possibility that the third president of the United States had a Jewish ancestor many generations ago.

16 million men or ~8% of a large part of Asian men have a Y chromosome that is thought to have been inherited from Ghengis Khan



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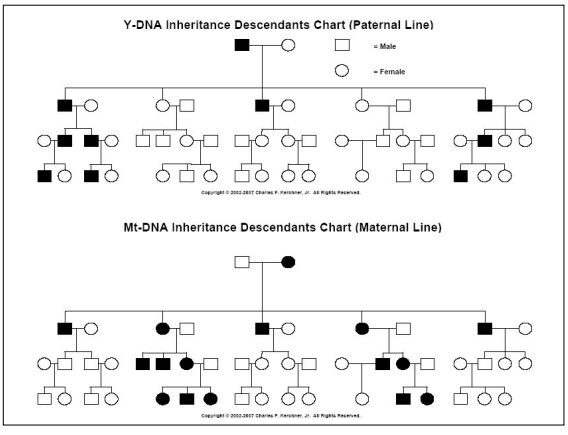
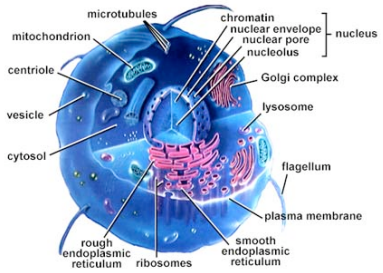
Y chromosomes can be used to follow paternal lineages

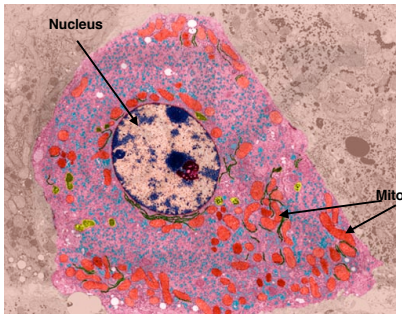
mtDNA can be used to follow maternal lineages



Cells contain organelles



Mitochondria are organelles that produce energy.



Mitochondria

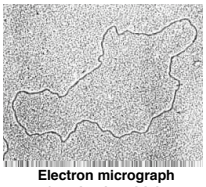
Use oxygen to produce energy efficiently (aerobic metabolism).
-muscle cells are loaded with them.

Contain own small genome ~17,000 bp circular DNA in humans

Encodes 2 rRNAs and 22 tRNAs for protein synthesis
13 proteins for energy metabolism

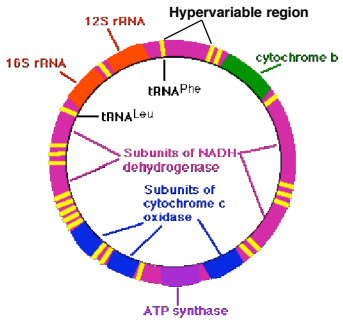
99.9% of the mitochondrial proteins encoded by nuclear genes.

Electron micrograph of a mitochondrion



Electron micrograph of a mitochondrial DNA

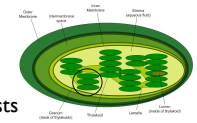
Map of human mtDNA



Molecules that are not linked to chromosomes bearing nuclear centromeres behave differently during mitosis and do not obey Mendel's rules.

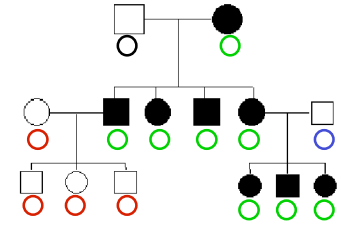
Organelle chromosomes

Mitochondria

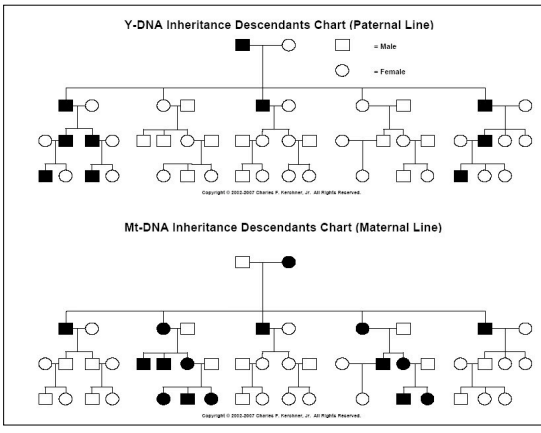


Chloroplasts

Maternal Inheritance

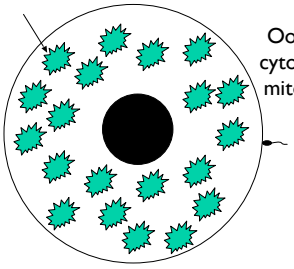


mtDNA A mtDNA C
mtDNA B mtDNA D



Why?

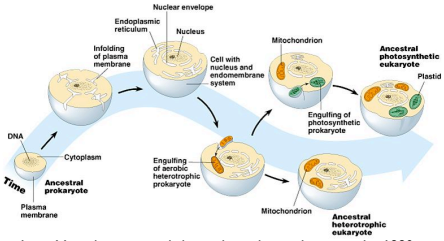
mitochondria



Oocytes contribute cytoplasm, and hence mitochondria during fertilization

Digression:

How did mitochondria (and chloroplasts in plants) arise?



Lynn Margulis proposed the endosymbiont theory in the 1980s. She proposed that an anaerobic cell engulfed aerobic bacteria, and the two cells developed a symbiotic relationship. With time most bacterial genes ended up in the nucleus, but a few genes remained in what became mitochondria.

Evidence for Endosymbiont Theory

Similar lipid compositions in membranes of bacteria and mitochondria

Bacterial and mitochondrial genomes circular and lack associated histones

Protein synthesis in bacteria and mitochondria similar

rRNAs similar in bacteria and mitochondria