

In a study of more than 2100 males from Central Asia, a team of scientists led by Chris Tyler-Smith from the University of Oxford found that approximately 8% of those studied had a unique Y chromosome lineage. These samples formed a central star-cluster that possessed the following Y-STR profile (repeat numbers in parentheses after each marker): DYS389I (10), DYS389II (26), DYS390 (25), DYS391 (10), DYS392 (11), DYS393 (13), DYS388 (14), DYS425 (12), DYS426 (11), DYS434 (11), DYS435 (11), DYS436 (12), DYS437 (8), DYS438 (10), and DYS439 (10). An analysis of at least 16 additional markers in the form of Y-SNPs placed all of these samples in haplogroup C*(x3C), which is common in Asia (see Jobling and Tyler-Smith 2003). By making some assumptions regarding mutation rates and a generational time of 30 years, these researchers were able to calculate a time to the most recent common ancestor for these particular Y-lineages of ~1000 years ago. The highest frequency was in Mongolia leading to the assumption that it was the source of these particular male lineages, but it was spread throughout 16 different populations in Asia. Interestingly the geographical distribution of these populations closely matches the area of Genghis Khan's former Mongol Empire. The evidence that this Y-lineage was from Genghis Khan (circa 1162-1227) and his close male-line relatives was strengthened by a match to a group in Pakistan who by oral tradition consider themselves direct male-line descendants of Genghis Khan. Thus DNA testing can reveal some interesting historical clues into our past as a human race.

Sources:

Zerjal, T., et al. (2003) The genetic legacy of the Mongols. *American Journal of Human Genetics*, 72, 717-721.
 Jobling, M.A. and Tyler-Smith, C. (2003) The human Y chromosome: an evolutionary marker comes of age. *Nature Reviews Genetics*, 4, 598-612.

information in addressing the issue of whether or not Thomas Jefferson fathered some of his slaves is presented below as an example of the power and the pitfalls of answering historical questions with DNA information from modern-day individuals. As in forensic casework, DNA information is only part of the evidence available in most investigations and should be considered carefully in the context of the 'case' without overstepping the bounds of conclusions that can be drawn.

THE THOMAS JEFFERSON-SALLY HEMINGS AFFAIR

In 1802, a year after becoming President of the United States, Thomas Jefferson was publicly accused by a Richmond, Virginia newspaper of fathering a child by his slave, Sally Hemings. While it is uncertain how this accusation arose, the connection between Thomas Jefferson and his slave Sally Hemings has been a source of controversy for almost 200 years.

Then, in November 1998, the prestigious scientific journal *Nature* published a report that introduced DNA evidence into this historical controversy (Foster et al. 1998). The report entitled 'Jefferson fathered slave's last child' used Y chromosome DNA markers to trace the Jefferson male line to a descendant of Sally Hemings's youngest son, Eston Hemings. The study involved 19 samples collected from living individuals who represented the Jefferson and Hemings line as well as other people who potentially could have been Jefferson's offspring or the father of Eston Hemings. These samples were tested at 19 different sites on the Y chromosome.

TRACKING DOWN LIVING RELATIVES

The study began in 1996 when Dr. Eugene Foster, a retired pathology professor, began tracking down living male-line relatives of President Thomas Jefferson. In order to show whether or not President Jefferson had fathered a child with Sally Hemings, direct male descendants were needed from both the Jefferson and the Hemings lines. Unfortunately, Jefferson's only legitimate son died in infancy. His two daughters who lived to adulthood obviously did not carry his Y chromosome and therefore their descendants were not useful in this study. There were two other possibilities for direct male-line descendants, Thomas Jefferson's brother Randolph and his father's brother Field.

The last of the direct male descendants of Jefferson's brother Randolph died in the 1920s or 1930s so Dr. Foster turned to the relatives of President Jefferson's paternal uncle, Field Jefferson. Seven living descendants of Field Jefferson were located. Five of them agreed to cooperate in the study and had their blood drawn for Y chromosome marker testing purposes.

On the Hemings side of the equation, it was even difficult to come up with an abundance of living male relatives. Sally Hemings had at least six and possibly seven children: Harriet (1795-1797), Beverly (1798-post 1822), Harriet (1801-post 1822), an unnamed daughter (1799-1800), Madison (1805-1877), and Eston (1808-1856). According to the oral history of the descendants of Thomas Woodson (1790-1879), he was Sally Hemings's first child. Sally's son, Beverly and daughter, Harriet are listed as dying post 1822 because they disappeared into white society in the Washington, D.C. area in the year 1822.

Of the three known male sons from Sally Hemings, only descendants of Madison and Eston could possibly be located since Beverly's fate is unknown. Madison's Y chromosome line ended in the mid-1800s when one of his three sons vanished into white society and the other two had no children. Thus, Eston Hemings's descendants remained the last chance to find a male-line descendant of the man who fathered Sally Hemings's children.

Eston Hemings was born on 21 May 1808, at Monticello where he lived until President Jefferson's death in 1826, at which time he was freed. Eventually he married and moved to Ohio and finally to Madison, Wisconsin where he died and was buried in 1856. Eston assumed the surname of Jefferson when he left Virginia and gave everyone the impression that he was white because of his light skin color. Eston Hemings Jefferson had two sons and a daughter. His youngest son, Beverly Jefferson, lived from 1838-1908 and had one son, Carl Smith Jefferson, lived from 1876-1941 and had two sons, William Magill Jefferson (1907-1956) and Carl Smith Jefferson, Jr. (1910-1948). Only William had a son. This son, John Weeks Jefferson was born in 1946. As the *only* living male descendant of Eston Hemings, John Weeks Jefferson's blood was drawn to help answer the question of whether or not President Thomas Jefferson was Eston Hemings's father (Murray and Duffy 1998).

ADDITIONAL SAMPLES GATHERED FOR THIS STUDY

Several additional samples were gathered to serve as controls in this study and to address potential paternity questions. Thomas Woodson, who was mentioned earlier as possibly the first child born to Sally Hemings, was an African-American whose first known appearance in the documentary record is from a deed issued in 1807. He moved from Virginia to Ohio where he lived as a successful farmer until his death in 1879. His descendants now number over 1400 and are scattered across the United States (Murray and Duffy 1998). According to Woodson family tradition, he was the oldest child of Thomas Jefferson and Sally Hemings, born in 1790 shortly after Sally returned to Monticello from France (Monticello 2000). While there were no supporting documents for the claim of Thomas Woodson's family, Dr. Foster collected blood samples from five of his living descendants to help confirm or disprove this family tradition. Another important set of samples for testing was gathered from direct male line descendants of Samuel and Peter Carr, who were Thomas Jefferson's nephews, the sons of his sister. According to Thomas Jefferson's grandchildren Thomas Jefferson Randolph and Ellen Coolidge, Samuel and Peter Carr were the fathers of the children of Sally Hemings and her sister (Monticello 2000). Dr. Foster collected three blood samples from living descendants of John Carr, the grandfather of Samuel and Peter Carr. Finally, five male descendants from several old-line Virginia families around Charlottesville were sampled to serve as control samples. These controls were tested to provide a 'background' signal with the idea that potential similarities in the Y chromosome tests due to geographic proximity needed to be eliminated (Murray and Duffy 1998).

THE Y CHROMOSOME MARKERS EXAMINED

DNA samples from each of the 19 blood specimens gathered by Dr. Foster were carefully extracted by a pathologist at the University of Virginia (Murray and Duffy 1998). The DNA samples were coded by Dr. Foster and then taken to England where researchers at Oxford University examined them. Eventually the team of scientists involved expanded to include researchers from the University of Leicester in England and Leiden University in the Netherlands. A variety of tests were run independently at these three locations (Foster *et al.* 1998). The Y chromosome markers used in this study are listed in Table 9.8. In all, there were 19 Y chromosome markers examined in this study. These included 11 STRs, seven SNPs, and one minisatellite MSY1, which proved to be the most polymorphic marker.

Table 9.8
Y chromosome markers
and results used to trace
Thomas Jefferson's male-
line ancestry (Foster *et al.*
1998). The Field Jefferson
(uncle of President
Thomas Jefferson) male-
line matches the Eston
Hemings (youngest son of
Sally Hemings, one of
President Jefferson's slaves)
male-line exactly. The
numbers shown in the
table represent the number
of repeats observed for
each X chromosome
marker. Arrows have been
placed next to the alleles
in the X haplotypes for
John Carr and Thomas
Woodson male-lines that
differ from the Jefferson
males.

DNA Marker	Tested	Field Jefferson Male-Line	Eston Hemings Male-Line	John Carr Male-Line	Thomas Woodson Male-Line
Number of individuals typed	5	3	1	3	5
Y STR Loci					
DYS19	15	14	15	14	14
DYS388	12	12	12	12	12
DYS389A	4	5	4	5	5
DYS389B	11	12	11	11	11
DYS389C	3	3	3	3	3
DYS389D	9	10	9	10	10
DYS390	11	11	11	11	11
DYS391	10	10	10	10	10
DYS392	15	13	15	13	13
DYS393	13	13	13	13	13
DXYS156Y	7	7	7	7	7
Y SNP Loci					
DYS287 (YAP)	0	0	0	0	0
SRM8299	0	0	0	0	0
DYS271 (5Y81)	0	0	0	0	0
LY229	0	0	0	0	0
Tat	0	0	0	0	0
92R7	0	0	0	0	0
SRYm153Z	1	1	1	1	1
Minisatellite Locus MSY1	(3)-5	(1)-14	(3)-32	(1)-17	(1)-16
	(3)-5	(1)-14	(3)-32	(1)-17	(1)-16
	(4)-16	(3)-32	(4)-16	(4)-21	(4)-21

All 19 regions of the Y chromosome examined in this study matched between the Jefferson and Hemings descendants. These DNA results were viewed by Dr. Foster and his co-authors as evidence for President Thomas Jefferson fathering the last child of Sally Hemings (Foster *et al.* 1998). Interestingly the John Carr and Thomas Woodson's male lines differed significantly from the Jefferson-Hemings results (Table 9.8). At least seven of the 19 tested DNA markers gave different results. Thus, Thomas Jefferson could not be linked as the father of Thomas Woodson nor was Samuel Carr or Peter Carr the father of Hemings. The results of the Virginia old-line families were not reported, presumably because these samples served their purpose as effective controls and revealed no unusual Y chromosome patterns.

In this study, Y chromosome markers demonstrated their usefulness in monitoring paternal transmission of genetic information by tracing the male lineage of Thomas Jefferson across 15 generations (Figure 9.10). The ability to connect Y chromosome DNA information across the generation gaps meant that living relatives could be used in this investigation rather than disturbing the almost 200-year-old burial site of President Jefferson.

ALTERNATIVE SCENARIOS

Shortly after the results of Dr. Foster's study were announced, an alternative scenario was proposed. Could some other male Jefferson have fathered

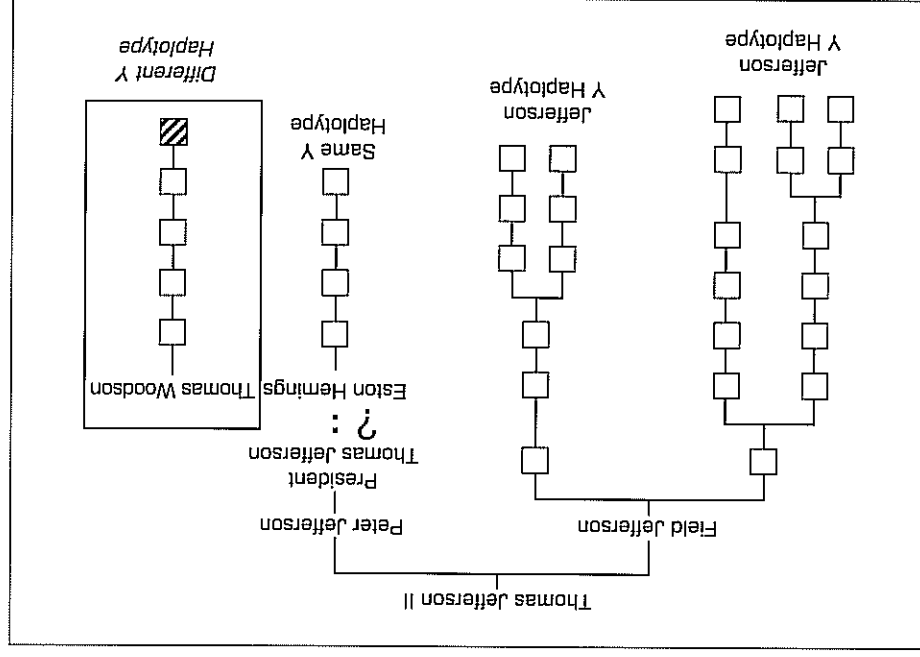


Figure 9.10 Ancestry of Thomas Jefferson and Sally Hemings male lines. The shaded boxes represent the samples tested by Foster *et al.* (1998) in their Jefferson Y chromosome study. A male descendant of Estlin Hemings, son of Thomas Jefferson's slave Sally Hemings, was found to have a Y chromosome haplotype that matched male descendants of Field Jefferson, President Jefferson's uncle. A male descendant of Thomas Woodson, claimed by some to be descended from Jefferson, had a different Y haplotype and therefore could not have been a Jefferson.

Estlin Hemings? All the results in this study conclusively show is that there is a genetic match between descendants of Estlin Hemings and Thomas Jefferson's uncle, Field Jefferson. Was it historically possible for another male Jefferson to have fathered Sally Hemings's children? The Thomas Jefferson Memorial Foundation, a private, non-profit organization established in 1923 that owns and operates Monticello with the goal of preservation and education, conducted a yearlong investigation into the historical record.

According to this careful historical investigation, 25 adult male descendants of Thomas Jefferson's father Peter and his uncle Field lived in Virginia during the 1794–1807 period of Sally Hemings's pregnancies (Monticello 2000). Most of them lived over 100 miles from Monticello and make no appearance in Thomas Jefferson's correspondence documents. Several male Jeffersons including President Jefferson's brother Randolph and his sons did live in the area of Monticello and visited occasionally. However, the historical records fail to indicate that any of these individuals were present at Monticello during the time of the fact that Thomas Jefferson was present at Monticello during the time of conception of each of Sally Hemings's six children led to the 26 January 2000 Thomas Jefferson Memorial Foundation report that he was the father of all of Sally Hemings's children (Monticello 2000).

A more recent study by a 13-member Scholars Commission of the Thomas Jefferson Heritage Society unanimously agreed that the allegations of a relationship are 'by no means proven.' The findings of this group are reported in a 565-page report available at the Heritage Society's web site: <http://www.jheritage.org>. This report notes that the original DNA study indicated only that a Jefferson male had fathered one of Sally Hemings's children and that the available DNA evidence could not specify Thomas Jefferson as the father to the *exclusion of all other possibilities*. Thomas Jefferson's younger brother Randolph, who was known to fraternize with the Monticello slaves, is considered a likely possibility by many members of the Scholars Commission. Randolph and other family members would have visited Monticello when President Jefferson was home and therefore the circumstantial evidence of Thomas Jefferson being present on the plantation when Sally Hemings conceived might not be as strong as originally presented.

This study of Jefferson lineage DNA demonstrates one of the major disadvantages of Y chromosome DNA testing, namely that results only indicate connection to a male lineage and are not specific to an individual like autosomal STR profiles can be. While a Jefferson Y chromosome match exists between his descendants and those of Sally Hemings, the matter can probably never be definitely solved by Y chromosome information alone.