

The Y-DNA Genetic Signature of an American Founding Father – John Hart the Signer

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Abstract

The goal of this Y-DNA research study is to utilize both traditional genealogical and current DNA methods and technology to identify the unique Y-DNA genetic signature of John Hart, the thirteenth signer of the Declaration of Independence, and an American Founding Father.

Traditional genealogical methods provided the foundation for our study. We researched the history and genealogy of the family of John Hart, and we identified and located seven pedigreed descendants of his patrilineal lineage, including four son-after-son descendants of three of his sons, and two son-after-son descendants of his paternal uncle. We then utilized genetic genealogical methods to compare the Y-DNA genetic profiles of these seven pedigreed descendants. We determined that they all genetically matched each other at both 37 and 67 STR markers. Their lineage-specific haplotype was unique to the point that they had no other genetic matches at 67 STR markers, other than their fellow pedigreed Hart descendants.

Based on the results of SNP genotyping through FTDNA's "Big Y-500" test, we established their haplogroup/subclade designation, which, in conjunction with their lineage-specific haplotype, comprises the Y-DNA genetic signature of their patrilineal line, back to their most recent common ancestor, the grandfather of John Hart the Signer.

This report of the Y-DNA genetic signature of one of America's Founding Fathers proves historic lines of descent using genealogical research methods, establishes a Y-DNA genetic signature that can be utilized to identify previously unknown or unrecognized descendants, and demonstrates a pioneering methodology that can be applied to studies of other historical figures and their descendants.

Introduction

We, as Americans, cherish our history. We especially revere and hold in high esteem our Founding Fathers — those individuals of the Thirteen Colonies in North America who led the American Revolution against the authority of the British Crown in word and deed and contributed to the establishment of the United States of America.¹

In addition to the key Founding Fathers — John Adams, Benjamin Franklin, Alexander Hamilton, John Jay, Thomas Jefferson, James Madison, and George Washington — the term "Founding Fathers" also applies to the 56 Signers of the Declaration of Independence in 1776,² as well as to the Framers — those 55 individuals who were appointed as delegates to the 1787 Constitutional Convention and took part in drafting the proposed Constitution of the United States.^{3, 4, 5}

There are national museums dedicated to displaying the documents, portraits, symbols, and artifacts of our Founding Fathers. Numerous history books and biographies have been written about them, and scores of plays, movies, and television dramas have told their stories.

For many Americans, looking at the documents and letters that were written by our nation's founders offers a visceral connection to our country's beginning. Seeing their portraits, or their personal handwriting on pages that are faded and wrinkled with age, provides us with a tangible connection to our history.

History enthusiasts and collectors pay handsomely for such documents — an archive consisting of hundreds of Washington family papers dating from 1662 through 1835 recently sold for \$50,788,⁶ while an 1803 letter penned by Thomas Jefferson to Georgia Governor John Milledge, sold for \$93,750.⁷

Even the personal effects and belongings of our Founding Fathers are prized heirlooms.^{8, 9} Recently, a saddle pad used by George Washington and British General Edward Braddock sold for \$150,000 at auction.¹⁰ A compass that was used by George Washington when he was a young surveyor in Virginia, fetched \$59,750, while several pieces of Washington's original coffin, including the handle, brought more than \$12,000.¹¹

As much as we value these documents and relics of our Founding Fathers, however, identifying their unique DNA coding sequences or “genetic signature” might be the ultimate artifact related to them.¹² The Y-DNA genetic signature of a Founding Father is comprised of specific Y-DNA coding sequences that are unique to his patrilineal line. The Y-DNA genetic signature is much more useful than a piece of memorabilia, as it may be utilized to identify the Founding Father's patrilineal descendants; as such, it has permanent and lasting value.

The “written code” in our DNA doesn't just tell us about ourselves; it tells us about our connection to human history. As George Church, the Harvard genetics professor who founded the Personal Genome Project, once said: “Written records go back to the dawn of written history. DNA goes back to the dawn of human existence.”¹³

Undoubtedly, if DNA technology had been available several centuries ago, the genetic signatures of our Founding Fathers would have been collected, preserved, and treasured, together with their handwritten notes and letters, locks of hair, clothing, and other personal effects.

With 21st century advances in DNA technology, surname projects have been undertaken to determine the Y-chromosome markers of key Founding Fathers, including Thomas Jefferson,^{14, 15} John Adams,^{16, 17} Alexander Hamilton,^{18, 19, 20, 21} and Benjamin Franklin.^{22, 23, 24, 25}

Few of these Founding Father DNA projects have thus far culminated in publishable studies, however, due mainly to uncertainties in their lineage, the lack of living male descendants available for testing, uncertainties regarding the pedigrees of the testers, outdated DNA testing methods, the small number of descendants and/or DNA markers tested, or a combination of these factors.²⁶

It has long been the lead author's belief that the unique Y-DNA genetic signatures of America's Founding Fathers should be identified and documented for posterity.²⁷ Unfortunately, since Y-DNA studies require testing of son-after-son descendants of the founder of the lineage, it is already too late to acquire DNA samples from the descendants of many of America's Founding Fathers, because their lineages have either died out or daughtered out, leaving no paternal descendants in the lineage to test.

That is one of the main reasons why it is so important to identify and test pedigreed descendants of America's historic families while there are still living paternal descendants of the lineage available to test. The results of such Y-DNA research studies provide important genetic information that becomes increasingly valuable with the passage of time. This genetic information will enable current and future generations of descendants of the Founding Fathers to discover, validate, and prove their genetic connections to their forefathers' lineage.

The goal of this Y-DNA research study is to combine traditional genealogical methods with current DNA methods and technology to identify the unique Y-DNA haplotype and haplogroup which comprise the Y-DNA genetic signature of John Hart, an American Founding Father, and the thirteenth signer of the Declaration of Independence.²⁸ To accomplish this goal, we identified and tested the Y-DNA of seven pedigreed descendants of the Hart patrilineal line from five different branches of John Hart's family.²⁹ Three of these pedigreed descendants had previously had their Y-DNA tested with Family Tree DNA (FTDNA; Houston, Texas, USA); the others had not previously tested.

We originally presented the data, results, and conclusions of the Y-DNA testing and analysis at 37 short tandem repeat (STR) markers for five pedigreed Hart descendants, in a preliminary study that was published on Independence Day, July 4, 2017. Y-DNA tests were subsequently upgraded to 67 STR markers for all pedigreed Hart descendants, and FTDNA's Big Y-500 test was also ordered. These upgraded results were then combined with the results of Y-DNA testing of two additional pedigreed Hart descendant and are included in this final report.

The Life of John Hart

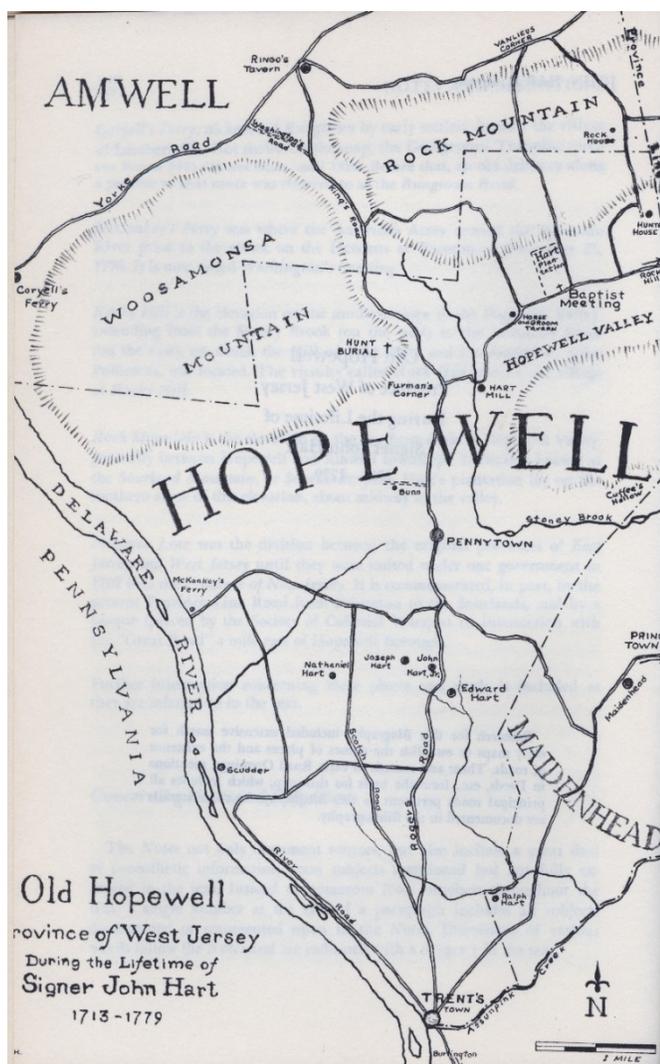


John Hart (1713–1779)

John Hart, the thirteenth Signer of the Declaration of Independence, was a grandson of John Hart Jr. (c. 1650–1712),³⁰ one of the early settlers of Hopewell, NJ.

In the 1690s, John Hart Jr. left his farm on Long Island in the care of his older sons, John and Ralph, and moved to Hopewell, where his carpentry skills were in demand, and he could prepare the way for his family. His sons probably arrived in New Jersey between 1703 and 1704.^{31, 32} The family was undoubtedly of English stock.³³

John Hart Jr.'s five sons, John (c. 1675–1753), Ralph (c. 1675–1749), Nathaniel (c. 1682–1742), Edward (c. 1690–1752), and Joseph (c. 1695–1777), eventually inherited their father's vast estate, which was divided among them.³⁴



Their tracts of land, which adjoined the Scudder estate along the Delaware River to the west and the town of Maidenhead to the east (see map), were located just a few miles north of Trent's Town (Trenton).

John Hart Jr.'s son Edward (c. 1690–1752) arrived in Hopewell at the age of twenty and married Martha Furman in 1712.³⁵ He became a prosperous farmer, a Justice of the Peace, and a Public Assessor.³⁶

In 1746, he was granted a warrant to raise a company of militia to fight the French in Canada; fifteen months later, however, the company was dismissed, without being deployed to Canada. Captain Edward Hart lost much of his personal wealth in providing for his men during the long wait in Albany, NY. He spent the rest of his life trying to recover his expenses and died in 1752.³⁷

John Hart the Signer, a son of Edward and Martha Hart, was born in Hopewell³⁸ and baptized in Maidenhead, in December 1713.³⁹

Map of Old Hopewell, with the locations of the Hart plantation and mill, the Scudder estate, and the properties of John Hart Jr.'s sons, Nathaniel, Joseph, John, Edward, and Ralph Hart.⁴⁰

Like most men of his time, John Hart had little formal education: “After reaching adulthood, he spent many years as a farmer. He was well regarded for his common sense, was reasonably well read as proved by his understanding of the law and showed acumen on business matters.”⁴¹

John Hart was attracted to a young lady, who was said to be of considerable beauty, named Deborah Scudder. She was the only child of Richard Scudder from Scudder Falls. Deborah’s great-grandfather, John Scudder, came to Salem, MA, on the *James*, in 1635. John rode his horse approximately thirty miles round trip to court Deborah, and they were married in 1739.⁴²

John and Deborah had thirteen children: Sarah (b. 1741), Jesse (b. 1742), Martha (b. 1744⁴³ or 1746⁴⁴), Nathaniel (1747-1823⁴⁵ or 1830⁴⁶), John (1748-1790), Susannah (1750-1832), Mary (1752-1782), Abigail (1754-1832), Edward (1755-1812), Scudder (1757-1776), a daughter who died in childhood (b. 1761), Daniel (1762-1848), and Debra (1765-1848), born when her mother, Deborah, was 44 years of age.^{47, 48, 49}

John Hart began acquiring property in 1740, buying the “homestead plantation” of 193 acres on the north side of Hopewell⁵⁰ (see map). Two years later, John and his father, Edward, together repurchased 100 acres of their own property after a land title dispute,⁵¹ and in 1772, he acquired an additional 230 acres, making him the largest land owner in Hopewell, with over 600 acres.

On his prosperous plantation, John Hart had many cattle, sheep, pigs, horses, and fowl, and he also owned four slaves.⁵² The original part of his home was made of stone. The original small barn is still on the property, which is now privately owned. The home stands on Hart Avenue in Hopewell.^{53, 54}



John Hart's home and barn, Hopewell, NJ. Photo courtesy of Leigh Beasley Gillis

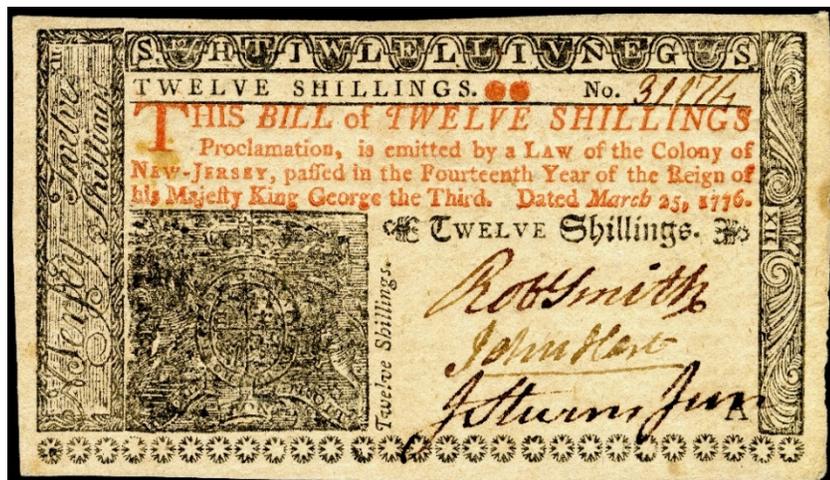
John Hart became part-owner of two mills. In 1751, he and his brother Daniel bought a mill along Stoney Brook (see map). They sold it in 1766, and in 1773, he and a son-in-law, John Polhemus, who would later become a captain in the Continental Army, purchased a large mill in Rocky Hill.^{55, 56}

Although John Hart was a Presbyterian, in 1747 he donated a parcel of land from his front meadow to the Baptists of Hopewell, who wanted to build a meeting house in the town. The town was subsequently called Baptist Meeting House until it was renamed during the Revolution.⁵⁷

John Hart began his career of public service in 1750, when he was elected to the Hunterdon County Board of Chosen Freeholders. Five years later, he was elected Justice of the Peace.⁵⁸ With this appointment, he was considered a gentleman, earning the title of “Esquire.”

In 1761, he was elected as a representative of his district (Hunterdon, Morris, and Sussex Counties) to the colonial legislature, and he was thereafter re-elected annually until 1772.^{59, 60} In 1768, despite his lack of formal education, and the total absence of any legal training in his background, he was also appointed as a judge in the New Jersey Court of Common Pleas.^{61, 62}

In the years preceding the American Revolution, he became actively engaged in protest against British rule. While serving in the New Jersey colonial legislature, “... He protested, and recorded his vote against the stamp act, against taxation without representation, against interfering with the liberty of the press and trial by jury, and especially, by his vote, did he refuse to grant further supplies to maintain the king’s troops, quartered in the province, which refusal of the legislature caused its dissolution by the angry royal governor, Franklin,” in 1774.⁶³



New Jersey Colonial currency (1776) signed by John Hart

In 1774, John Hart was elected to a committee to “elect and appoint Delegates to the First Continental Congress, and to protest the Tea Act.” In 1775, he was elected to the New Jersey Committee of Correspondence, which communicated with the other colonies, and he served on the Committee of Safety “to act in the public welfare of the colony in the recess of the Congress.”⁶⁴

In 1776, he was elected to the New Jersey Provincial Congress, and became Speaker of the House.⁶⁵ That same year he was designated to sign the new Colonial currency “Bill of Credit Notes,” money issued by the Colony of New Jersey. His neighbors called him “Honest John,” and Hart became known as “the most considerable man in his community.”⁶⁶



On June 22, 1776, he and four other New Jersey Delegates were chosen to replace the incumbent conservatives in the Second Continental Congress. The new delegation arrived in Philadelphia, just a few days before the votes for independence on July 1-2 and cast affirmative ballots.⁶⁷ The other signers from New Jersey were the eminent lawyer Richard Stockton, Dr. John Witherspoon, the president of Princeton College, Judge Francis Hopkinson, and Abraham Clark. Although John Hart was not equal in professional ability to the first three, "... He was adjudged by the people their worthy associate, and fully their peer in soundness of judgment, in boldness and firmness of purpose, and in pure and enlightened patriotism."⁶⁸

New Jersey Signers of the Declaration of Independence⁶⁹

An honest and courageous patriot of noble purpose, "John Hart was the thirteenth delegate to put his signature on the historic document. He was willing to pledge his life, his fortune, and his sacred honor in doing so."⁷⁰

In August 1776, John Hart was elected to the New Jersey State Assembly, under the new state constitution, and he was again elected Speaker of the House. He soon returned home to attend to family matters. Sadly, his wife, Deborah, died on October 8, 1776, with John at her side.⁷¹

In December of 1776, as Washington's army retreated across New Jersey, the British and Hessians ravaged the Hopewell area, as they hunted down members of the New Jersey legislature. John Hart's home and property suffered severe damage, two young children fled to the homes of relatives, and Hart himself took refuge wherever he could in the woods, hiding in caves on Sourland Mountain.⁷² When the British began their withdrawal from the area after George Washington's victories in the Battles of Trenton and Princeton, John Hart returned home,⁷³ although the damage to his estates and the loss of his mills and other improvements reduced him to poverty.^{74, 75}

When the legislature reconvened in January 1777, John Hart was unanimously elected Speaker of the Assembly. He was re-elected twice as Speaker and served until November 7, 1778. He also was elected to the Council of Safety and became its Treasurer. In addition, he was Commissioner of the New Jersey Loan Office and had the power to sign bills of credit notes.⁷⁶

In June 1778, John Hart invited George Washington's army to encamp on his farm. George Washington accepted his offer, and "12,000 men camped in John Hart's field during the growing season, and refreshed themselves with the cool water that flowed on the property."⁷⁷ The troops left on the 24th of June, and four days later fought and won the Battle of Monmouth.^{78, 79}

John Hart served in the New Jersey legislature until November 7, 1778, when he resigned because of ill health. The last days of John Hart were filled with pain and suffering caused by kidney stones. He died on May 11, 1779, at the age of 66, at his home in Hopewell, surrounded by his family.^{80, 81}

John Hart died owing money, and because of the shortage of hard money, the depreciation of colonial money, and the overabundance of land on the market as Loyalist land was confiscated and sold, most of his property was sold for a pittance.⁸²

John Hart and his wife, Deborah, were originally buried in the family burying ground of John Price Hunt. In 1865, their remains were transferred to the cemetery of the Baptist Meeting House on the property that John had donated to them in 1747. The obelisk marking John Hart's grave has the date of John Hart's death as 1780, but most biographers and the *NJ Gazette* say that he died on May 11, 1779. John's will was dated April 16, 1779.

The State of New Jersey voted to erect a monument to John Hart's memory; it was dedicated on July 4, 1865. A memorial bronze plaque was dedicated there in 2006 by Descendants of the Signers of the Declaration of Independence.⁸³



John Hart Memorial, Hopewell, NJ

On May 19, 1779, the *New Jersey Gazette* printed a tribute to him:

On Tuesday the 11th instant, departed this life at his seat in Hopewell, John Hart, Esq. the Representative in General Assembly for the county of Hunterdon, and late Speaker of that House. He had served in the Assembly for many years under the former government, taken an early and active part in the present revolution and continued to the day he was seized with his last illness to discharge the duties of a faithful and upright patriot in the service of his country in general, and the county he represented in particular. The universal approbation of his character and conduct among all ranks of people, is the best testimony of his worth, and as it must make his death regretted and lamented, will ensure lasting respect to his memory.⁸⁴

Dr. Benjamin Rush, in a letter to John Adams in February 1790, offered glimpses of the members of Congress who had signed the Declaration of Independence. He characterized John Hart as: "A plain, honest, well-meaning Jersey farmer, with but little education, but with good sense and virtue enough to discover the true interests of his country."⁸⁵

Cleon E. Hammond, who became the owner of the Hart homestead in 1955, summed up in his book what came to his mind while looking through the windows of John Hart's home, which Hammond owned at the time of writing his book in 1977:

To look upon his gently-sloping hillside where the American Army once camped, drink from his lusty old spring, and tread upon soil that was his, instilled a sense of identification with Mr. Hart that at times seemed very real. Far from a legend, he was a very human being, moved by the same forces that influence the lives and fortunes of all men. As one becomes acquainted with John Hart, there emerges a capable, personable, ambitious, yet dedicated man ... essentially conservative, but heroically liberal. In his world, there were pioneers of land, of enterprise, and of political philosophy. From a good but modest beginning, John Hart embodied all three, and attainments qualify him, unreservedly, to be described as a self-made man in his time.⁸⁶

Five of the daughters of John Hart (Sarah Wikoff, Martha Wood, Susannah Polhemus, Abigail Stout, and Deborah Ott)⁸⁷ married local men, whereas his five adult sons moved to the frontiers: Jesse, to Washington, PA; Nathaniel, in 1795 to Mason County, KY; John, circa 1770, to Point Coupee, LA; Edward, circa 1785, to Beverly in Randolph County, VA (now WV); and Daniel, in 1794 to Beverly, VA.⁸⁸ John Hart's progeny continued to thrive, and more of his descendants are identified today than those of any other signer.⁸⁹

Identifying Pedigreed Descendants of John Hart

Genetic tests, including Y-DNA tests, are not a substitute for traditional genealogical research, and a substantial knowledge of the lineage under study is required before Y-DNA tests can make a significant contribution. It is especially important, for the purpose of identifying the Y-DNA genetic signature of a lineage, to know the precise line of descent for all tested descendants.

The Hart lineage back to John Hart's grandfather extends over nearly four centuries, and identifying living paternal descendants, descending solely from father to son, who are willing and able to take a Y-DNA test, presents unique genealogical challenges.⁹⁰

In organizing this study, and locating potential candidates for testing, we researched many online family trees of the Hart family. We also contacted various genealogical societies and associations for assistance, including the Sons of the American Revolution (SAR), the Society of the Descendants of the Signers of the Declaration of Independence (DSDI), the Daughters of the American Revolution (DAR), and the Skillman Family Association.

Each pedigreed descendant who participated in our study was asked to provide his line of descent from the Hart line, going back at least as far as John Hart the Signer, with appropriate documentation, including dates and places of birth and death for each ancestor. If the participant was a member of SAR, he was asked to provide a copy of his SAR application.

For pedigreed descendants with uncertainties or gaps in their lineage, genealogical reference sources such as "The Harts of Randolph,"⁹¹ the Hacker's Creek Pioneer Descendants website,⁹² the Hart Family Y-DNA project on the World Families website,⁹³ and John Hart family trees on Ancestry.com (Lehi, Utah, USA)⁹⁴ and FamilySearch.org (Salt Lake City, Utah, USA)⁹⁵ were consulted to check and verify the line of descent from John Hart, or his cousinly line.

From our search of Hart family trees and genealogical records, we identified seven pedigreed descendants as potential study participants and candidates for Y-DNA testing. Two of these study participants descend from John Hart's uncle, Joseph Hart (b. ~1695), through his sons, Amos and Joseph Jr. Their common ancestor with the other pedigreed descendants is John Hart's grandfather, John Hart Jr. Another study participant descends from John Hart's second eldest son, Nathaniel Hart (b. 1747), two descend from his fourth eldest son, Edward Scudder Hart (b. 1755), and two descend from his sixth and youngest son, Daniel Hart (b. 1762).

Each of the seven pedigreed descendants identified and selected for Y-DNA testing, and the branches of the Hart lineage from which they descend, are described below, and summarized in Table 1. The genealogical sources for the names, and years of birth and death for all descendants in Table 1 have been compiled into one master genealogical source document.⁹⁶

Joseph Hart Sr. Branch of John Hart's Lineage



Edwin Robert Hart Jr.

Edwin Robert (Bob) Hart is a 9th-generation descendant of John Hart the Signer's uncle, Joseph Hart Sr., and a 7th-generation descendant of John Hart. His line of descent is: John Hart Jr. (1650 – 1712) > Joseph Hart Sr. (c. 1695 – 1777) > Amos Hart (1732 – 1823) > Asa Hart (1767 – 1857) > Reuben Hiram Hart (1791 – 1858) > George Hart (1836 – 1914) > Enos Ray Hart (1879 – 1949) > Edwin Ray Hart (1909 – 1969) > Edwin Robert Hart Sr. (1929 – 2009) > Edwin Robert Hart Jr. (b. 1953). Edwin Robert Hart had previously taken a Y-DNA37 test at Family Tree DNA (FTDNA) in 2006.



David Lee Hart

David Lee Hart is also a 9th-generation descendant of John Hart the Signer's uncle, Joseph Hart Sr., and a 7th-generation descendant of John Hart. His line of descent is: John Hart Jr. (1650 – 1712) > Joseph Hart Sr. (c. 1695 – 1777) > Joseph Hart Jr. (1740 – 1794) > Amos Hart (1776 – 1863) > Andrew Stout Hart (1804 – 1891) > John P. Hart (1854 – 1904) > Leland A. Hart Sr. (1876 – 1957) > Leland Alan Hart Jr. (1906 – 1960) > William Lee Hart (1931 – 2004) > David Lee Hart (b. 1954). David Lee Hart had previously taken a Y-DNA37 test at Family Tree DNA (FTDNA) in 2011.

Nathaniel Hart Branch of John Hart's Lineage



John Wayne Hart

John Wayne Hart is a 7th-generation direct paternal descendant of John Hart the Signer through his son, Nathaniel Hart. His line of descent is: John Hart (1713 – 1779) > Nathaniel Hart (1747 – 1823) > John Hart (1787 – 1851) > Francis Hart (1836 – 1918) > John Quincy Hart (1872 – 1940) > John Irvin Hart (1909 – 1998) > John Leroy Hart (1933 – 2015) > John Wayne Hart (b. 1956). Reverend John Wayne Hart had not previously had his Y-DNA tested.

Edward Scudder Hart Branch of John Hart's Lineage



John Larry Hart

John Larry Hart is a 7th-generation direct paternal descendant of John Hart the Signer through his son, Edward Scudder Hart. His line of descent is: John Hart (1713 – 1779) > Edward Scudder Hart (1755 – 1812) > Joseph Hart (1797 – 1881) > Milton Hart (1823 – 1895) > Lorenzo Dow Hart (1859 – 1935) > Chester Hart (1881 – 1962) > John Loren Hart (1908 – 1998) > John Larry Hart (b. 1932). Reverend John Larry Hart had not previously had his Y-DNA tested.



Craig Julian Hart

Craig Julian Hart is an 8th-generation direct paternal descendant of John Hart the Signer through his son, Edward Scudder Hart. His line of descent is: John Hart (1713 – 1779) > Edward Scudder Hart (1755 – 1812) > Joseph Hart (1797 – 1881) > Milton Hart (1823 – 1895) > Lorenzo Dow Hart (1859 – 1935) > Chester Hart (1881 – 1962) > Frank Alger Hart (1903 – 1990) > Julian Fay Hart (1927 – 2016) > Craig Julian Hart (b. 1956). Craig Julian Hart had not previously had his Y-DNA tested.

Daniel Scudder Hart Branch of John Hart's Lineage



Steven Durwood Hart

Steven Durwood Hart is an 8th-generation direct paternal descendant of John Hart the Signer through his son, Daniel Scudder Hart. His line of descent is: John Hart (1713 – 1779) > Daniel Scudder Hart (1762 – 1848) > John Scudder Hart (1791 – 1860) > Jacob Scudder Hart (1827 – 1903) > Gilbert Milton Hart (1854 – 1913) > James Taylor Brown Hart (1879 – 1950) > Cleophus Hart (1901 – 1985) > Cleophus Durwood Hart (1927 – 1975) > Steven Durwood Hart (b. 1959). Steven Durwood Hart had previously taken a Y-DNA37 test at FTDNA in 2010.



Steven Philip Hart

Steven Philip Hart is a 7th-generation direct paternal descendant of John Hart the Signer, also through his son, Daniel Scudder Hart. His line of descent is: John Hart (1713 – 1779) > Daniel Scudder Hart (1762 – 1848) > James Montgomery Hart (1791 – 1874) > Ezra Pugh Hart (1820 – 1903) > John Chenoweth Hart (1843 – 1919) > Wade Hampton Hart (1878 – 1964) > Arnold Wilson Hart (1919 – 1992) > Steven Philip Hart (b. 1960). Steven Philip Hart had not previously had his Y-DNA tested.

TABLE 1

Line of Descent for Pedigreed Patrilineal Hart Descendants

GEN	LINE OF DESCENT FOR PEDIGREED PATRILINEAL HART DESCENDANTS						
-2	<p align="center">John HART Jr. b. ~1650, New town, NY; d. 1712, Maidenhead, NJ</p>						
-1	<p align="center">Joseph HART Sr. b. ~1695, New town, NY; d. 1777, NJ</p>			<p align="center">Edward HART b. ~1690, New town, NY; d. 1752, NJ</p>			
0	<p align="center">Amos HART b. 1732, Hopewell, NJ d. 1823, Trenton, NJ</p>	<p align="center">Joseph HART Jr. b. ~1740, Hopewell, NJ d. 1794, NJ</p>	<p align="center">John HART, the Signer b. 1713, Hopewell, NJ; d. 1779, Hopewell, NJ</p>				
1	<p align="center">Asa HART b. 1767, Hopewell, NJ d. 1857, Adams Co., IL</p>	<p align="center">Amos HART b. 1776, Hopewell, NJ d. 1863, McLean, NY</p>	<p align="center">Nathaniel HART b. 1747, Hopewell, NJ d. 1823, Maysville, KY</p>	<p align="center">Edward Scudder HART b. 1755, Hopewell, NJ; d. 1812, Beverly, VA*</p>	<p align="center">Daniel Scudder HART b. 1762, Hopewell, NJ; d. 1848, Beverly, VA*</p>		
2	<p align="center">Reuben Hiram HART b. 1791, Hopewell, NJ d. 1858, Houston, IL</p>	<p align="center">Andrew Stout HART b. 1804, Hopewell, NJ d. 1891, Plainwell, MI</p>	<p align="center">John HART b. 1789, Hopewell, NJ d. ~1851, Lebanon, OH</p>	<p align="center">Joseph HART b. 1797, Randolph Co., VA*; d. 1881, Wymer, VA*</p>	<p align="center">John Scudder Hart b. 1791, Hopewell, NJ d. 1860, Beverly, VA*</p>	<p align="center">James Montgomery HART b. 1791, Hopewell, NJ d. 1874, Randolph Co., VA*</p>	
3	<p align="center">George HART b. 1836, Coshocton Co., OH d. Cunningham, KS</p>	<p align="center">John P. HART b. 1854, Cussawago, PA d. 1904, Throop, NY</p>	<p align="center">Francis HART b. 1836, Lebanon, OH d. 1918, Lebanon, OH</p>	<p align="center">Milton HART b. 1823, Beverly, VA*; d. 1895, Belington, WV</p>	<p align="center">Jacob Scudder HART b. 1827, Kerens, VA* d. 1903, Kerens, WV</p>	<p align="center">Ezra Pugh HART b. 1820, Files Creek, VA* d. 1903, Elkins, WV</p>	
4	<p align="center">Enos Ray HART b. 1879, Cunningham, KS d. 1949, Muleshoe, TX</p>	<p align="center">Leland A. HART Sr. b. 1876 Sterling, NY d. 1957, Hennepin Co., MN</p>	<p align="center">John Quincy HART b. 1872, Lebanon, OH d. 1940, Oklahoma City, OK</p>	<p align="center">Lorenzo Dow HART b. 1859, Beverly, VA*; d. 1935, Enid, OK</p>	<p align="center">Gilbert Milton HART b. 1854, Kerens, VA* d. 1913, Kerens, WV</p>	<p align="center">John Chenoweth HART b. 1843, Randolph Co., VA* d. 1919, WV</p>	
5	<p align="center">Edwin Ray HART b. 1909, Clovis, NM d. 1969, Kansas City, KS</p>	<p align="center">Leland Alan HART Jr. b. 1906, Kenmare, ND d. 1960, Hennepin Co., MN</p>	<p align="center">John Irvin HART b. 1909, Tucumcari, NM d. 1998, Caldwell, ID</p>	<p align="center">Chester HART b. 1881, Wymer, WV; d. 1962, Enid, OK</p>	<p align="center">James Taylor Brown HART b. 1879, Kerens, WV d. 1950, Kerens, WV</p>	<p align="center">Wade Hampton HART b. 1878, Elkins, WV d. 1964, Elkins, WV</p>	
6	<p align="center">Edwin Robert HART Sr. b. 1929, Kansas City, KS d. 1963, Fort Benning, GA</p>	<p align="center">William Lee HART b. 1931, Minneapolis, MN d. 2004, Fridley, MN</p>	<p align="center">John Leroy HART b. 1933, Edmond, OK d. 2015, Indianola, IA</p>	<p align="center">John Loren HART b. 1908, Enid, OK d. 1998, Enid, OK</p>	<p align="center">Frank Alger HART b. 1903, Shattuck, OK d. 1990, Enid, OK</p>	<p align="center">Cleophus HART b. 1901, Kerens, WV d. 1985, Kerens, WV</p>	<p align="center">Arnold Wilson HART b. 1919, Elkins, WV d. 1992, Elkins, WV</p>
7	<p align="center">Edwin Robert HART Jr. b. 1953, Fort Benning, GA</p>	<p align="center">David Lee HART b. 1954, Hennepin Co., MN</p>	<p align="center">John Wayne HART b. 1960, Ontario, OR</p>	<p align="center">John Larry HART b. 1932, Enid, OK</p>	<p align="center">Julian Fay HART b. 1927, Enid, OK d. 2016, LeMars, IA</p>	<p align="center">Cleophus Durwood HART b. 1927, Kerens, WV d. 1975, Baker, WV</p>	<p align="center">Steven Philip HART b. 1960, Randolph Co., WV</p>
8					<p align="center">Craig Julian HART b. 1956, LeMars, IA</p>	<p align="center">Steven Durwood HART b. 1959, Kerens, WV</p>	

Notes: The (~) symbol designates approximate years of birth or death, and substitutes for the word "circa." The (*) symbol designates towns that belonged to West Virginia, which prior to 1863, was part of the State of Virginia.

Methods

The Y-DNA tests were conducted by FTDNA. The standard DNA Y-chromosome segment (DYS) markers, also referred to in genetic testing as STR markers,⁹⁷ for the seven pedigreed paternal Hart descendants are presented in Table 2.

The value of testing Y-DNA STR markers comes from creating a Y-DNA haplotype and comparing that haplotype to others in a database. They are useful for genetic genealogy because a unique Y-DNA haplotype distinguishes one paternal lineage from another. They can then be used in conjunction with Family Tree DNA's Y-DNA comparative database to discover genealogical connections or historical ancestry.

Y-DNA mutates very slowly and passes down from father to son without recombination, except for the rare mutations that occur along the hereditary line; therefore, the Y-DNA haplotype of a male descendant represents that of his entire paternal lineage. For Y-DNA testing, all descendants of the studied lineage must be strictly son-after-son, to reflect the Y-DNA genetic signature of the founder of the lineage.

Y-DNA tests of the seven pedigreed Hart paternal descendants were initially reported at the 37 STR marker level, and then upgraded to 67 STR markers. The initial haplogroup⁹⁸ for the seven descendants was predicted by FTDNA based upon their haplotype. Additional single nucleotide polymorphism (SNP) genotyping was conducted for one of the pedigreed descendants (Steven Durwood Hart) and FTDNA's Big Y test was ordered for another descendant (John Wayne Hart) to further refine the initial haplogroup classification.

Identifying the Y-DNA Genetic Signature

To identify the unique Y-DNA genetic signature of a patrilineal line, son-after-son descendants of the proband or founding ancestor must be identified, and their Y-DNA tested. Ideally, these pedigreed descendants should be from different branches of the lineage, with each descendant representing a different paternal or cousinly line of the focus ancestor. Matching Y-DNA results from three or more different lines of descent provide additional confirmation and validation of the Y-DNA genetic signature.

A well-documented paper trail of descent from the founding ancestor to the pedigreed descendants being tested is also essential. If these pedigreed descendants are found to genetically match each other, their modal haplotype and haplogroup, including their subclade and terminal SNP, will define the Y-DNA genetic signature of the lineage, back to their common ancestor. The greater the number of STR markers and SNPs tested, the more precisely the Y-DNA signature may be defined.

Most genealogical lineage societies, including the SAR, the DAR, and the DSDI, utilize traditional genealogical methods (paper documentation of pedigree), to establish lineal descent from the Founding Fathers. However, paper trails, even well-documented ones, are not perfect.

Through our experience conducting numerous pioneering Y-DNA research studies of historic patrilineal lineages, we have demonstrated the intrinsic value of identifying the Y-DNA genetic signature for validating lineages, identifying mistakes, and bridging major gaps in the paper trail.^{99, 100, 101, 102, 103, 104}

Hence, while we are not in any way diminishing the importance of a well-documented paper trail in establishing lineage, Y-DNA testing can work in conjunction with traditional genealogical documentation to help verify ancestry and provide genetic proof of ancestral connection.

The Y-DNA genetic signature of a lineage can also be used to rule out or corroborate non-paternal events, adoptions, and other suspected breaks in the lineage. It can provide indisputable evidence to help refute spurious or fraudulent claims of descent. It can also help “lost sheep,” who may have been cut off from knowledge of their ancestry due to involuntary separation from their families through divorce, premature death, or other family tragedy, rediscover their lost heritage.

Hence, Y-DNA testing of pedigreed descendants is a valuable adjunct to traditional genealogical documentation, and we anticipate that identifying the Y-DNA genetic signature of John Hart’s lineage will make a significant and valuable contribution to the genealogical literature.

Results and Discussion

Haplotype

A Y-DNA haplotype is simply the numbered results of a genealogical Y-DNA STR test. Except for infrequent allele mutations, all male descendants of the same patrilineal line will share the same haplotype, meaning that their allele values at all STR marker locations tested will match. This means that John Hart, his patrilineal ancestors, and his son-after-son descendants will all share the same haplotype. The haplotype has been referred to as the genetic signature, although, in our previous Y-DNA research studies, we have broadened the definition of the Y-DNA genetic signature to include the haplogroup as well.¹⁰⁵

Table 2 presents the Y-DNA test results for the seven pedigreed patrilineal Hart descendants. Three of the seven pedigreed descendants, Edwin Robert Hart, David Lee Hart, and Steven Philip Hart, had identical allele values at all 67 of 67 STR marker locations tested. Because they descend from three different branches of the Hart line (John Hart’s cousins Amos and Joseph Jr., and his son Daniel), their identical allele values likely represent ancestral values, also known as the modal haplotype.¹⁰⁶ John Wayne Hart genetically matched the modal haplotype on 66 of 67 STR markers; John Larry Hart matched it on 64 of 67 markers, and Craig Julian Hart and Steven Durwood Hart matched it on 63 of 67 STR markers. Non-matching allele values, representing possible gene mutations at the STR marker locations tested, are indicated by the blue-shaded cells in Table 2.

Because Steven Durwood Hart and his cousin Steven Philip Hart both descend from John Hart’s son Daniel, and because Steven Philip Hart matches the modal haplotype on 67 of 67 STR markers, it is very likely that the 4-step difference between Steven Durwood Hart and the modal haplotype is due to unique gene mutations that are specific to his line. However, these four mutations can also be the result of a single gene mutation in combination with a recombinant event, since DYS464 and DYS724 (CDYa and CDYb) are duplicated markers on the same palindrome.¹⁰⁷ A similar recombinant event appears to have also occurred at CDYa and CDYb for John Larry Hart and Craig Julian Hart.

The close Y-DNA genetic match among all seven pedigreed Hart descendants, representing five different branches of the Hart ancestral line, validates their pedigree back to their common ancestor, John Hart Jr. (b. 1650), the grandfather of John Hart the Signer.

TABLE 2

Y-DNA Test Results for Pedigreed Patrilineal Hart Descendants

Y-DNA STR MARKER	ALLELE VALUES AT 67 STR MARKER LOCATIONS FOR PEDIGREED PATRILINEAL HART DESCENDANTS						
	Edwin Robert HART	David Lee HART	John Wayne HART	John Larry HART	Craig Julian HART	Steven Durwood HART	Steven Phillip HART
DYS393	13	13	13	13	13	13	13
DYS390	24	24	24	24	24	24	24
DYS19	14	14	14	14	14	14	14
DYS391	10	10	10	10	10	10	10
DYS385a	12	12	12	12	12	12	12
DYS385b	14	14	14	14	14	14	14
DYS426	12	12	12	12	12	12	12
DYS388	12	12	12	12	12	12	12
DYS439	11	11	11	11	11	11	11
DYS389I	12	12	12	12	12	12	12
DYS392	13	13	13	13	13	13	13
DYS389II	29	29	29	29	29	29	29
DYS458	17	17	17	17	17	17	17
DYS459a	9	9	9	9	9	9	9
DYS459b	9	9	9	9	9	9	9
DYS455	11	11	11	11	11	11	11
DYS454	11	11	11	11	11	11	11
DYS447	24	24	24	24	24	24	24
DYS437	15	15	15	15	15	15	15
DYS448	19	19	19	19	19	19	19
DYS449	30	30	30	30	30	30	30
DYS464a	17	17	17	17	17	17	17
DYS464b	17	17	17	17	17	17	17
DYS464c	17	17	17	17	17	18	17
DYS464d	17	17	17	17	17	18	17
DYS460	11	11	11	11	11	11	11
Y-GATA-H4	11	11	11	11	11	11	11
YCAIIa	19	19	19	19	19	19	19
YCAIIb	23	23	23	23	23	23	23
DYS456	15	15	15	15	15	15	15
DYS607	15	15	15	15	15	15	15
DYS576	19	19	19	18	18	19	19
DYS570	17	17	17	17	17	17	17
CDYa	32	32	32	31	31	33	32
CDYb	32	32	32	31	31	33	32
DYS442	12	12	12	12	12	12	12
DYS438	12	12	12	12	12	12	12
DYS531	11	11	11	11	11	11	11
DYS578	9	9	9	9	9	9	9
DYF395S1a	15	15	15	15	15	15	15
DYF395S1a	16	16	16	16	16	16	16
DYS590	8	8	8	8	8	8	8
DYS537	10	10	10	10	10	10	10
DYS641	10	10	10	10	10	10	10
DYS472	8	8	8	8	8	8	8
DYF406S1	10	10	10	10	10	10	10
DYS511	10	10	10	10	10	10	10
DYS425	12	12	12	12	12	12	12
DYS413a	23	23	23	23	23	23	23
DYS413b	23	23	23	23	23	23	23
DYS557	17	17	17	17	17	17	17
DYS594	10	10	10	10	10	10	10
DYS436	12	12	12	12	12	12	12
DYS490	12	12	12	12	12	12	12
DYS534	16	16	16	16	16	16	16
DYS450	8	8	8	8	18	8	8
DYS444	12	12	12	12	12	12	12
DYS481	22	22	22	22	23	22	22
DYS520	21	21	21	21	21	21	21
DYS446	14	14	15	14	14	14	14
DYS617	12	12	12	12	12	12	12
DYS568	11	11	11	11	11	11	11
DYS487	13	13	13	13	13	13	13
DYS572	11	11	11	11	11	11	11
DYS640	11	11	11	11	11	11	11
DYS492	12	12	12	12	12	12	12
DYS565	12	12	12	12	12	12	12

An interesting and unexpected finding was the uniqueness of the haplotype of the Hart line, as indicated by the exclusivity of the genetic matches among all seven pedigreed descendants. Each of them matched the other six pedigreed Hart descendants at 67 STR markers, and only those pedigreed Hart descendants. There were no other genetic matches to any other men in the FTDNA database at the 67 STR marker level.¹⁰⁸ These results are summarized in Table 3.

TABLE 3

Number of Y-DNA Genetic Matches Between Hart Descendants and Other Males in the FTDNA Database

	NUMBER OF Y-DNA GENETIC MATCHES AT 67 STR MARKERS AMONG MALES IN THE FTDNA DATABASE						
	Edwin Robert HART	David Lee HART	John Wayne HART	John Larry HART	Craig Julian HART	Steven Durwood HART	Steven Philip HART
Number of Genetic Matches with Pedigreed Hart Descendants	6	6	6	6	6	6	6
Number of Non-Hart Y-DNA Genetic Matches	0	0	0	0	0	0	0
Total Number of Y-DNA Genetic Matches in the FTDNA Database	6	6	6	6	6	6	6

Time-to-Most Recent Common Ancestor (TMRCA) Predictions

In this Y-DNA study of John Hart’s lineage, as in our previous studies, the common ancestor of all pedigreed descendants is known, and therefore, each descendant’s generation or place in the lineage does not need to be estimated. However, conducting Y-DNA testing of pedigreed descendants with well-documented paper trails provides the opportunity to evaluate and assess the accuracy of current predictive models for estimating the TMRCA.

FTDNA’s time predictor (TiP) model was used to predict the TMRCA probabilities for the seven pedigreed Hart descendants. To estimate the TMRCA probabilities, each pedigreed Hart descendant’s Y-DNA results, at 67 STR markers, were compared to those of the modal haplotype, represented by the haplotype of the three pedigreed descendants, Edwin Robert Hart, David Lee Hart, and Steven Philip Hart, who had identical allele values at all 67 of 67 STR marker locations tested.

As expected, comparisons between the three modal descendants yielded equivalent probability predictions. Comparisons between them and Steven Durwood Hart yielded identical probability predictions, which was somewhat unexpected, given that Steven Durwood Hart had allele mutations at four different STR marker locations. A possible explanation for this result is that these four mutations can be ascribed to a single gene mutation in combination with a recombinant event, or that the alleles at STR marker locations DYS464 and CDY mutate so rapidly that their mutation rates do not significantly affect TiP model predictions.¹⁰⁹

Comparisons between the three modal descendants and John Wayne Hart yielded slightly lower predicted probabilities; comparisons between the modal descendants and John Larry Hart and Craig Julian Hart yielded predicted probabilities which were slightly lower still. The likely explanation for this result is that their unique mutations have slower mutation rates, and therefore, have a larger effect on the TiP model calculations. These probability predictions are presented numerically in Table 4, and graphically in Figure 1.

TABLE 4

Time-to-Most Recent Common Ancestor (TMRCA) Predictions for Pedigreed Patrilineal Hart Descendants

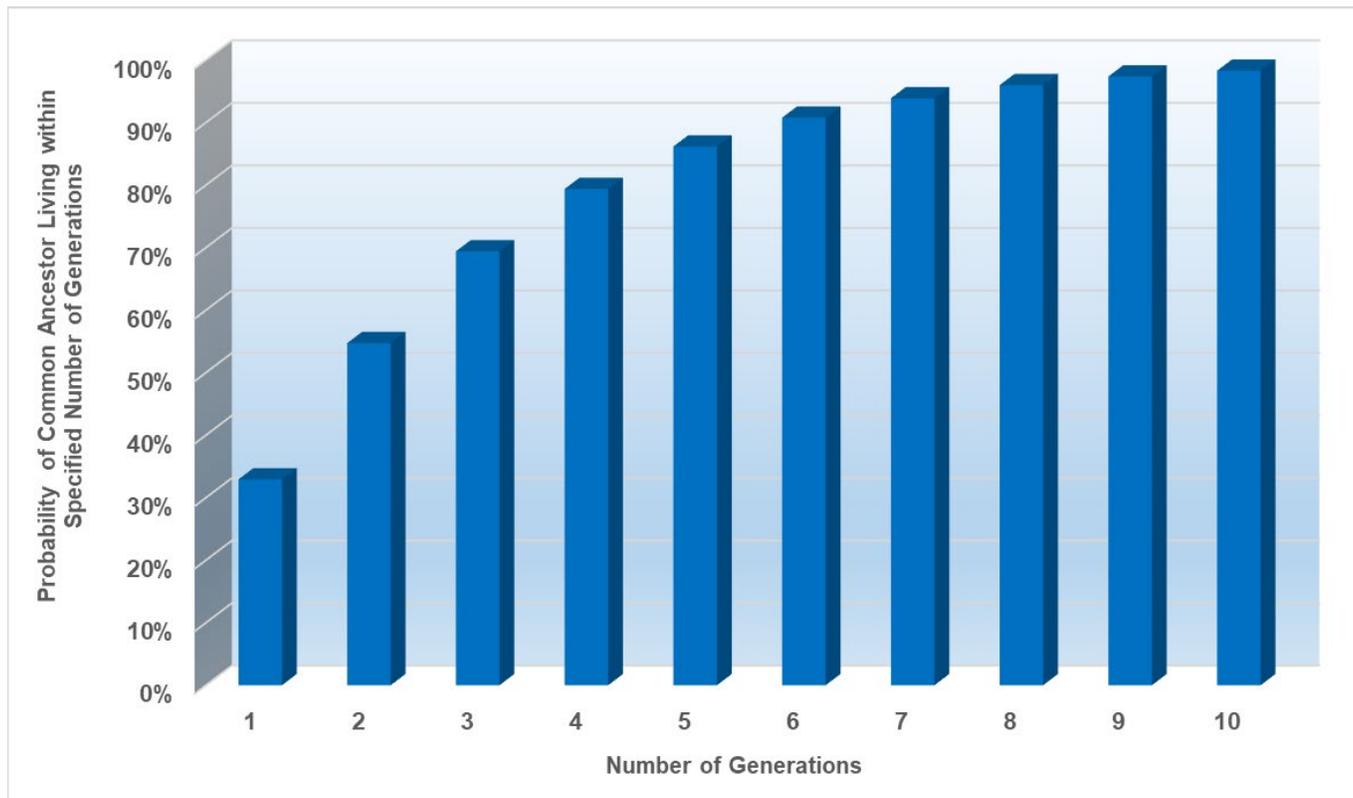
NUMBER OF GENERATIONS	PROBABILITY OF THE COMMON ANCESTOR LIVING WITHIN A SPECIFIED NUMBER OF GENERATIONS							MEAN PROBABILITY
	Edwin Robert HART	David Lee HART	John Wayne HART	John Larry HART	Craig Julian HART	Steven Durwood HART	Steven Phillip HART	
1	43.5%	43.5%	18.8%	12.4%	4.9%	43.5%	43.5%	30.0%
2	68.1%	68.1%	40.1%	28.5%	16.0%	68.1%	68.1%	51.0%
3	81.9%	81.9%	58.2%	44.1%	30.5%	81.9%	81.9%	65.8%
4	89.8%	89.8%	71.9%	57.6%	45.3%	89.8%	89.8%	76.3%
5	94.2%	94.2%	81.5%	68.5%	58.6%	94.2%	94.2%	83.7%
6	96.7%	96.7%	88.1%	77.0%	69.6%	96.7%	96.7%	88.8%
7	98.2%	98.2%	92.5%	83.4%	78.3%	98.2%	98.2%	92.4%
8	99.0%	99.0%	95.3%	88.2%	84.8%	99.0%	99.0%	94.9%
9	99.4%	99.4%	97.1%	91.6%	89.5%	99.4%	99.4%	96.5%
10	99.7%	99.7%	98.2%	94.1%	92.9%	99.7%	99.7%	97.7%

The most recent common ancestor (MRCA) for all pedigreed Hart descendants is John Hart Jr. (c. 1650–1712). He preceded descendants Edwin Robert Hart, David Lee Hart, John Wayne Hart, John Larry Hart, and Steven Philip Hart in the lineage by nine generations, and descendants Craig Julian Hart and Steven Durwood Hart by ten generations (see Table 1). These are known, documented TMRCA^s.¹¹⁰

As shown by the mean probability values in Table 4, the known TMRCA^s of generations nine and ten fall between the 96.5 and the 97.7 percent probability predictions for this study. These probability predictions are highly accurate, underestimating the actual TMRCA probabilities by 2.3 – 3.5 percent.¹¹¹

FIGURE 1

Mean Probability of the Common Ancestor Living Within a Specified Number of Generations for Pedigreed Patrilineal Hart Descendants



Haplogroup

A haplogroup is a group of similar haplotypes that share a common ancestor having the same SNP mutation in all haplotypes.¹¹² Simply put, a haplogroup is a genetic population or group of people who share a common ancestor on the patrilineal or matrilineal line.¹¹³ Because a haplogroup consists of similar haplotypes, it is possible to predict a haplogroup from the haplotype, but a SNP test is required to confirm the haplogroup prediction.

Y-DNA haplogroups are determined by SNP tests. SNPs are locations on the DNA where one nucleotide has mutated to a different nucleotide.¹¹⁴ Haplogroup classifications and the SNPs within them are organized within branches on the Y-chromosome phylogenetic tree. The defining SNP for a haplogroup is generally the furthest downstream SNP that has been identified on the phylogenetic tree. This defining SNP of the latest subclade¹¹⁵ known by current research is referred to as the terminal SNP.¹¹⁶

The International Society of Genetic Genealogy (ISOGG),¹¹⁷ FTDNA,¹¹⁸ and YFull (Moscow, Russian Federation)¹¹⁹ maintain phylogenetic or Y-SNP trees. These trees are generally updated as new branch-defining SNPs are discovered, with the YFull tree currently being relied upon as one of the more up-to-date versions.¹²⁰ Other regularly updated haplogroup-specific trees, such as the “R1b Basal Subclades Phylogenetic Trees,”¹²¹ and “The Big Tree R-Z18012,”¹²² are also available.

Based on their Y-DNA37 STR markers, all five pedigreed descendants of John Hart, and the two pedigreed descendants of his uncle, were initially classified as belonging to the R-M269 haplogroup. U.S. presidents John Adams and his son John Quincy Adams were also found to belong to Y-DNA haplogroup R1b1a1a2 (R-M269).^{123, 124}

Men from this lineage share a common paternal ancestor, which is defined by the presence of the SNP mutation referred to as M173, also known as R1. The R1 haplogroup is very common throughout Europe and western Eurasia.¹²⁵ Its main subgroups are R1a (M420) and R1b (M343).

Haplogroup R1b, also known as haplogroup R-M343, is an offshoot of M173. It is the most frequently occurring Y chromosome haplogroup in Western Europe, as well as some parts of Russia, Central Asia, and Central Africa.¹²⁶ It is also present at lower frequencies throughout Eastern Europe, Western Asia, as well as parts of North Africa and South Asia.

To further delineate the haplogroup of John Hart's lineage, we ordered FTDNA's "R1b - M343 & M269 SNP Pack," which tests for 140 SNPs downstream of M343.¹²⁷ The Y-DNA of pedigreed descendant Steven Durwood Hart was the first to be tested; he was found to belong to the R-Z2542 subclade of the R1b-M343 haplogroup. The Z2542 SNP, which is equivalent to DF13, is estimated to have been formed approximately 4400 years ago.^{128, 129} It is very common in the British Isles,^{130, 131} from which John Hart's ancestors hail.^{132, 133, 134} According to the ISOGG hierarchical terminology, this subclade is known as R1b1a1a2a1a2c1a.^{135, 136}

To identify more recent downstream SNPs, we ordered FTDNA's Big Y-500 test for pedigreed descendant John Wayne Hart. The Big Y is a next-generation sequencing test that discovers new SNPs by scanning over 10 million base pairs on the Y chromosome.¹³⁷ The Big Y-500 test can potentially discover SNPs that are pertinent to the genealogical timeframe of the last several hundred years.

The results of the Big Y-500 test initially identified John Wayne Hart as belonging to the R-Z18012 subclade, which is several branches downstream of R-Z2542. However, this was later found to be a laboratory reporting error.^{138, 139} The corrected Big Y-500 results agreed with the results of the R1b - M343 & M269 SNP Pack, and identified DF13 as the current terminal SNP.¹⁴⁰ More recently, a new terminal SNP, R-BY5949, downstream of DF13, was reported from the results of the Big Y-500 test.

The full phylogenetic path for the haplogroup subclade, as defined by this SNP, is:

R-M343 > L278 > L754 > L389 > P297 > M269 > L23 > L51 > L151 > P312 > Z290 > L21 > Z2542 (DF13) > RZ39589 > R-BY5949

There were also 23 "unnamed variants" identified by his Big Y-500 results. These SNPs are currently unnamed, and thus far these mutations are all unique to his particular Hart lineage.¹⁴¹

The Y-DNA Genetic Signature of John Hart's Lineage

As previously stated, the lineage-specific haplotype, together with the haplogroup/subclade designation, comprises the Y-DNA genetic signature for John Hart's lineage; both are essential and complementary components of the Y-DNA genetic signature of a paternal lineage.¹⁴² We have utilized this combined approach in our previous Y-DNA studies of some of the world's historic rabbinical lineages,^{143, 144, 145, 146} the benefits of which have recently been summarized.¹⁴⁷

For the lineage descending from John Hart the Signer, the allele values at the 67 STR marker locations presented in "Y-DNA Test Results for Pedigreed Patrilineal Hart Descendants" (Table 2) represent the haplotype of the lineage. The modal allele values, which correspond to the identical allele values for descendants Edwin Robert Hart, David Lee Hart, and Steven Philip Hart, likely represent ancestral values.

This distinctive pattern of allele values distinguishes John Hart's lineage from other patrilineal lineages — even those that belong to the same parent haplogroup and subclade. This is evidenced by the uniqueness of the haplotype, and the fact that the seven pedigreed Hart descendants genetically match only each other at the 67 STR marker level and have no genetic matches to other individuals in the FTDNA database (see Table 3).

The haplotype comprises an essential part of the Y-DNA genetic signature; the other part is the haplogroup. The haplogroup to which John Hart's lineage belongs is the R-BY5949 subclade of the parent R1b-M343 haplogroup. Another way of saying this is that R-BY5949 is the current terminal SNP for John Hart's patrilineal lineage.

Both the uniqueness and reliability of the Y-DNA genetic signature that we identified for John Hart's patrilineal lineage was commented on by technical reviewer Greg Hockings. Regarding John Wayne Hart's Big Y results, he stated:

John's number of unique mutations is consistent with his lack of STR matches outside of his own genealogically documented Hart lineage and so adds weight to your documentation of his Hart lineage back to the Hart founder, as this lineage is very well defined genetically and genealogically. Any other male descendant of this lineage should also be positive for most of John Hart's un-named SNPs, but the only way to test any of these at present is via Big Y (unless YSEQ would agree to develop primers for some individual SNP testing). Genetically I don't believe that such testing is necessary for your manuscript because of your convincing genealogical documentation of the Hart lineage and the concordance between this documentation and the STR results.¹⁴⁸

Recommendations for Future Study

Like most pioneering genetic genealogy studies, the John Hart Y-DNA research study opens many new promising research avenues to exploration. With the successful identification of the Y-DNA genetic signature for John Hart the Signer, the next logical step would be to conduct a population-based research study, in the form of a Hart surname study. The surname study would include individuals with the Hart surname who do not know their ancestry, or whose family tree is missing generations, and does not extend back to John Hart.

The Y-DNA genetic signature identified by this research study may be utilized as a simple and cost-effective genetic genealogy screening tool for the purpose of identifying which individuals with the Hart surname potentially descend from John Hart the Signer. For those verified descendants of John Hart who are found to match the Y-DNA genetic signature, traditional genealogical research methods could then be used to research their lineages and connect them to the many well-documented family lines for John Hart.

Another promising avenue of research would be to identify the Y-DNA genetic signature for other American Founding Fathers. This research would best be conducted with the cooperation of heritage societies, such as the SAR, the DAR, or the DSDI, as they have access to thousands of membership applications that document which lines of descent are son-after son from the Founding Fathers.

As mentioned above, the R-BY5949 SNP is the current terminal SNP identified for John Hart's patrilineal lineage. The R-BY5949 SNP, however, is not recent enough to be of value for determining descent from John Hart's lineage. In addition to the R-BY5949 SNP, there were 23 unnamed SNPs which were identified by John Wayne Hart's Big Y-500 test. These SNPs are downstream of R-BY5949, and therefore, more recent.

Additional Big Y-500 tests of the other pedigreed Hart descendants may be conducted to determine which of these unique mutations are shared among all of the Hart descendants. Ultimately, as more SNPs are identified and placed on the phylogenetic tree, it may soon be possible to determine descent from John Hart's patrilineal lineage by testing one of these yet-to-be-named terminal SNPs.

Summary and Conclusions

John Hart's lineage extends back to the Middle Ages; our research of his American lineage extends back nearly four centuries. Thanks to the numerous genealogies of the Hart lineage in published sources and family trees, the authenticity and validity of the lineage has been well-established. Extensive genealogical research of John Hart's lineage laid the necessary groundwork for identification of seven son-after-son descendants from five different branches of the Hart lineage for participation in this Y-DNA study.

The identification of the Y-DNA genetic signature of John Hart's lineage is a significant research finding with many implications for the field of genetic genealogy. Based upon the matching Y-DNA results of seven pedigreed patrilineal descendants from four different lines of descent, including three of his sons and his uncle, we have succeeded in identifying the haplotype and haplogroup that characterize the Y-DNA signature of John Hart's lineage, back to their most recent common ancestor, John Hart Jr. (1650–1712), the grandfather of John Hart the Signer.

The Y-DNA genetic signature of John Hart's patrilineal lineage is comprised of the distinct allele pattern at 67 STR marker locations, which defines the haplotype of the seven pedigreed descendants, in addition to the terminal SNP (R-BY5949), which defines their current haplogroup and subclade. The distinctive pattern of allele values distinguishes John Hart's lineage from other paternal lineages; the chances of an unrelated individual matching it by random chance are extremely remote.^{149, 150} This distinctive allele pattern contributes to the specificity of the haplotype, which makes it extremely useful for identifying descendants of John Hart's lineage.

The closeness of the genetic match among these seven pedigreed Hart descendants, taken together with their well-documented paper trails, provides a high degree of confidence in the Y-DNA genetic signature. Hence, John Hart the Signer's patrilineal lineage is very well defined, both genetically and genealogically, back to the founder of the lineage.

The identification of the Y-DNA genetic signature for John Hart's lineage is particularly useful for the many Hart descendants across America who may be unaware of their proud heritage.¹⁵¹ If a previously unknown descendant's STR markers were found to match the Hart haplotype on 67 of 67 STR markers, this would provide compelling genetic evidence of descent from John Hart. This compelling genetic evidence could then be combined with traditional genealogical research to confirm descent.

We compared known TMRCA to predicted values using FTDNA's STR mutation rate-based TiP model and found that the model accurately estimated the TMRCA with an error margin of less than 3 percent. This finding was consistent with the results of our previous Y-DNA studies, although in those studies the TiP model did not estimate the TMRCA with as high a degree of accuracy.^{152, 153, 154, 155, 156} Y-DNA research studies such as these provide useful validation data for evaluating the accuracy and reliability of current STR mutation rate-based models.

The findings and conclusions that are drawn from a Y-DNA study are only as strong as the genealogical evidence upon which they are based. In this Y-DNA research study, we were very fortunate to have been able to identify seven pedigreed son-after-son descendants with well-documented lines of descent from John Hart's lineage. This provided us with a very robust data set and a strong foundation of genealogical evidence upon which the findings and conclusions of this Y-DNA research study are based.

The application of Y-DNA to genealogy has made great strides since its beginnings just over a decade ago, and the benefits of combining DNA and traditional paper-trail methodologies are evident. This Y-DNA research study of John Hart's lineage represents a model example of how traditional genealogy and genetic genealogy work together to validate the paper trail for pedigreed patrilineal descendants, and to identify and characterize the Y-DNA genetic signature of the historic lineage under study.

With the successful identification and characterization of the Y-DNA genetic signature of John Hart's lineage, we hope to enable many more current and future generations of newly discovered Hart descendants to connect themselves and their families to this distinguished lineage, and to rediscover their remarkable American heritage.

As we have demonstrated for John Hart's lineage in this research study, identification of the Y-DNA genetic signatures of our Founding Fathers will empower generations of their patrilineal descendants to discover, validate, and prove their genetic connections to their forefathers. Those who share genetic connections to these Founding Fathers can take pride in their ancestor's role in the birth of this nation.

Acknowledgments

We wish to thank our Y-DNA study participants — pedigreed Hart descendants Edwin Robert Hart, David Lee Hart, John Wayne Hart, John Larry Hart, Craig Julian Hart, Steven Durwood Hart, and Steven Philip Hart — for their outstanding cooperation, patience, and permission to present their names and Y-DNA data in our research study. We also offer our sincere thanks to Ruth Jenkins-McIntire and Wanda Hart for their invaluable genealogical assistance and express our gratitude to our excellent technical reviewers Greg Hockings, David Stedman, and Gail Riddell, for their helpful comments regarding the Y-DNA results and haplogroup discussion.

Conflicts of interest

The authors declare no conflicts of interest.

Notes

- ¹ Wikipedia: “Founding Fathers of the United States.” https://en.wikipedia.org/wiki/Founding_Fathers_of_the_United_States.
- ² Wikipedia: “Signing of the United States Declaration of Independence.” https://en.wikipedia.org/wiki/Signing_of_the_United_States_Declaration_of_Independence.
- ³ National Archives: “Meet the Framers of the Constitution.” <https://www.archives.gov/founding-docs/founding-fathers>.
- ⁴ “The Framers of the Constitution.” <https://www.usconstitution.net/constframe.html>.
- ⁵ Stanfield, Jack (2001): “America's Founding Fathers: Who Are They Thumbnail Sketches of 164 Patriots.” Universal Publishers. According to the author: “Two further groupings of Founding Founders include: 1) those who signed the Continental Association, a trade ban and one of the colonists’ first collective volleys protesting British control and the Intolerable Acts in 1774, and 2) those who signed the Articles of Confederation, the first U.S. constitutional document.”
- ⁶ “George Washington artifacts dominate \$1.728+ million Americana sale at Heritage Auctions.” Press Release - June 2, 2011. <https://www.ha.com/heritage-auctions-press-releases-and-news/george-washington-artifacts-dominate-1.728-million-americana-sale-at-heritage-auctions.s?releaseId=2034>.
- ⁷ Thomas Jefferson: “The President Writes to Georgia Governor John Milledge Regarding the Removal of the Cherokees from Georgia.” Americana & Political Grand Format Auction, Dallas, May 13, 2017. <https://historical.ha.com/itm/miscellaneous/thomas-jefferson-the-president-writes-to-georgia-governor-john-milledge-regarding-the-removal-of-the-chokees-from-georgia/a/6172-43067.s?ic4=GalleryView-ShortDescription-071515>.
- ⁸ “USA Founding Fathers DNA.” <http://www.roperld.com/FoundingFathersDNA.htm#Jefferson>. As an example of the monetary value placed on these artifacts, the U.S. Congress established the Benjamin Franklin Tercentenary Commission to prepare for and celebrate the 300th birthday of Benjamin Franklin on 17 January 2006, one of whose duties was “The acquisition and preservation of artifacts associated with Benjamin Franklin.” The Pew Charitable Trusts granted \$4 million to support the celebration, including “locating, cataloging and conserving items that were owned by or associated closely with Franklin.”
- ⁹ “George Washington artifacts dominate \$1.728+ million Americana sale at Heritage Auctions.” *Op cit*. According to Tom Slater, Director of History at Heritage: “The results across the board show that the hunger is there for prime historical memorabilia.”
- ¹⁰ “George Washington and British General Edward Braddock: A Remarkable Leopard-Skin Saddle Pad Owned and Used by Both Historic Figures.” <https://historical.ha.com/itm/political/george-washington-and-british-general-edward-braddock-a-remarkable-leopard-skin-saddle-pad-owned-and-used-by-both-historic-f/a/6172-43025.s?ic4=GalleryView-ShortDescription-071515>.
- ¹¹ “George Washington artifacts dominate \$1.728+ million Americana sale at Heritage Auctions.” *Op cit*.
- ¹² “USA Founding Fathers DNA.” *Op cit*.

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- ¹³ “Founding Fathers’ DNA.” 23andMeBlog (July 3, 2016). <https://blog.23andme.com/ancestry/founding-fathers-dna/>.
- ¹⁴ Bettinger, Blaine: “DNA Analysis of 5 People Who Helped Create America.” The Genetic Genealogist. <http://thegeneticgenealogist.com/2007/11/01/dna-analysis-of-5-people-who-helped-create-america/>. November 1, 2007. According to this source, “Unfortunately, much like Benjamin Franklin, Jefferson does not have any male descendants who possess his Y-DNA. Instead, the DNA of five descendants of Jefferson’s paternal uncle, Field Jefferson, has been tested and retested. The results show that Jefferson’s Y-DNA belongs to Haplogroup K2, a relatively rare haplogroup for Europeans and most common in the middle east.”
- ¹⁵ “Founding Fathers’ DNA” (July 3, 2016). *Op. cit.*
- ¹⁶ Ibid. According to this source, “Although no direct descendant of John and John Quincy has been tested, the Adams Surname Y-DNA Project has results from five individuals who are related to John’s great-great grandfather Henry Adams, born in 1583 in England. The results suggest that John and John Quincy belonged to the R1b1 Haplogroup.”
- ¹⁷ “Founding Fathers’ DNA” (July 3, 2016). *Op. cit.*
- ¹⁸ Bettinger, Blaine (November 1, 2007), *Op. cit.* According to this source, “The Hamilton Surname DNA Project presents the results of Y-DNA testing of four males who are directly descended from John C.A. Hamilton, the grandson of Alexander Hamilton. All four individuals match at 37 of 37 markers, with the exception of one individual who has a value of 15 for DYS19/394. The results suggest that Alexander Hamilton belonged to Y-DNA Haplogroup I1a.”
- ¹⁹ Hamilton, Gordon: “Hamilton Surname DNA Results and Discussion.” <http://www.personal.psu.edu/faculty/g/a/gah4/HamDNA/Results.html>.
- ²⁰ “Hamilton Family DNA Project.” http://clanhamilton.dyndns.org/clanhamilton/dna_project.htm.
- ²¹ “Founding Fathers’ DNA” (July 3, 2016). *Op. cit.*
- ²² ISOGG Wiki: “Presidential DNA.” International Society of Genetic Genealogy Wiki. https://isogg.org/wiki/Famous_DNA:US_Presidential_DNA#cite_note-1.
- ²³ “USA Founding Fathers DNA.” *Op. cit.*
- ²⁴ Bettinger, Blaine (November 1, 2007), *Op. cit.* According to this source, “So far, no known source of Benjamin Franklin’s Y-DNA or autosomal DNA has been discovered.”
- ²⁵ “Founding Fathers’ DNA” (July 3, 2016). *Op. cit.*
- ²⁶ Wikipedia: “Jefferson–Hemings controversy.” https://en.wikipedia.org/wiki/Jefferson%E2%80%93Hemings_controversy. As an example of an outdated and flawed DNA study, according to an initial report on the findings of a 1998 DNA study which tested the Y-chromosome of direct male-line descendants of Eston Hemings, and other related tests, there was reported to be a near 100% certainty that Thomas Jefferson was the biological father of Eston Hemings.

However, the initial claims that the DNA findings were definitive and conclusive proof of Thomas Jefferson's paternity were later retracted by the lead researcher, who acknowledged that the DNA testing itself proved only a one in eight (12.5%) genetic probability of Thomas Jefferson's paternity.

- ²⁷ Dr. Paull's previous Y-DNA research studies have focused mainly on the world's historic rabbinical lineages; see: Academia.edu: <https://independent.academia.edu/JeffreyMarkPaull>. This Y-DNA research study of John Hart's lineage represents the first in a series of Y-DNA research studies that Dr. Paull hopes to conduct for America's Founding Fathers, and he has created a research project of the same name on the Family Tree DNA (FTDNA) website specifically for this purpose.
- ²⁸ Dr. Paull has a family connection and interest in researching John Hart's lineage because his wife, Dr. Kara Riley-Paull, is John Hart's 6th-great-granddaughter, according to the following lineage: John Hart > Edward Scudder Hart > Susannah Hart > Nancy Ann Stalnaker > Martha Kittle > Lucinda Catherine Ward > Amy Belle Starcher > James.Starcher Riley > Kara Leigh Riley-Paull.
- ²⁹ There are different ways to define branches. The defining characteristic is that they each have a unique ancestral path from the tested pedigreed descendant back to the common ancestor. The common ancestor of interest is John Hart the Signer, and he is in the 2nd generation. The defining generation is therefore the 3rd generation, which is the generation of John Hart's sons. Looking across the 3rd generation, there are five unique branches.
- ³⁰ Some authors (e.g., Cook, Nora Lee, and Norman, Don: *Descendants of John Hart*, at <https://hackerscreek.com/norman/HART/JOHN.htm>) estimate the date of birth of John Hart Jr. as circa 1636.
- ³¹ Cooley, Eli Field, Cooley, William Scudder, and Cooley, Hannah Louise (1883): "The Hart Families of Hunterdon County, NJ," in *Genealogy of Early Settlers in Trenton and Ewing, "Old Hunterdon County, New Jersey"* W.S. Sharp Printing Co., Trenton, pp 95–112, at <https://archive.org/details/genealogyearlys00coolgoog>.
- ³² Bailey, Frederic W. (1895): "The Ancestry of the Hon. John Hart of Hopewell, N.J., Signer of the Declaration of Independence." *The New York Genealogical and Biographical Record* XXVI:170–177, at <https://books.google.com/books?id=y5syAQAAMAAJ&pg=RA1-PA170#v=onepage&q&f=false>.
- ³³ Cook and Norman state that John Hart Jr.'s father, John Hart Sr., "was born in England about 1600 and died in NY in 1672" (Cook and Norman, *Op. cit.*). Cooley *et al.* state that his (John Hart Sr.'s) son, "Edward Hart ... was of English origin" (Cooley *et al.* (1883, *Op. cit.*, p. 104).
- ³⁴ Bailey (1895), *Op. cit.*, p. 176.
- ³⁵ Cunningham, John T. (1977): "New Jersey's Five Who Signed." New Jersey Historical Commission, Trenton, NJ, p. 16. According to this source, 1712 was the same year that the Harts emigrated to New Jersey from Stonington, CT.
- ³⁶ Staller, Grace Keiper, and Lockwood, Thornton C. (2011): "John Hart," at Descendants of the Signers of the Declaration of Independence website: <http://www.dsdi1776.com/signers-by-state/john-hart>.
- ³⁷ Hammond, Cleon E. (1977): *John Hart: The Biography of a Signer of the Declaration of Independence*, Pioneer Press, Newfane, VT, cited by Glenn Valis (2007), in "John Hart: Signer of the Declaration of Independence," at <http://www.doublegv.com/ggv/JHart.html>.

³⁸ Authorities differ on John Hart’s place of birth. Some sources, including John T. Cunningham (1977, *Op. cit.*, p. 16) and Ferris and Morris (Ferris, Robert G., and Morris, Richard E. (1982): “The Signers of the Declaration of Independence.” National Park Service, Interpretive Publications Inc., Flagstaff, AZ, p. 72) claim that he was born in Stonington, CT.

Cooley *et al.* (1883, *Op. cit.*, p. 104) also claims that John Hart was born in Stonington, CT, and that he was a descendant of Deacon Stephen Hart of Farmington, CT, who arrived in Massachusetts Bay circa 1632. Cooley *et al.* base their assertion on the recollection of a descendant, Mrs. Axford, who recalled that her grandfather, John Hart the Signer, called himself a Yankee (Cooley *et al.* (1883, *Op. cit.*, p. 104).

However, Bailey (1895) states that the claim is based on an old family Bible, in which it is recorded (in a different handwriting from the rest of the record) that “Edward Hart, the father of John, came from Stonington, Connecticut.” Bailey’s research could find no conclusive proof of a connection of the Hart family of Stonington to the ancestors of John Hart (Bailey (1895, *Op. cit.*, p. 177).

Instead, Bailey provides evidence that John Hart the Signer’s paternal great-grandfather, John Hart Sr. (b. circa 1600), and his grandfather, John Hart Jr., were original settlers of Maspeth Kills, on Long Island, NY, and had large estates near Flushing. Unfortunately, most early town records of Flushing were destroyed by fire in 1789. However, he cites the *Annals of Newtown* and the Town Book of Newtown, which, in 1668, 1678, 1679, 1684, 1690, 1701, and 1703, detail land transfers in the Newtown area by John Hart Jr.

After 1704, when his homestead was sold, the Harts disappears from the records of Newtown (Bailey, 1895, *Op. cit.*, pp. 170–173). John Hart Jr.’s name first appears in New Jersey records on a document confirming the grant of Hopewell Township and signed August 26, 1703, by thirty or more citizens, including John Hart Jr. Many of the signers’ names match those in the records of Newtown, NY. A Maidenhead record dated 1710 and a 1713 land sale in Maidenhead also bear the signature of John Hart Jr. of Hopewell (Bailey (1895, *Op. cit.*, pp. 175–176).

Unfortunately, the will of John Hart Jr. has not been found, but Bailey points to the locations of the contiguous estates of John Hart Jr.’s sons (see map) as evidence that they inherited the land owned by their father, who died circa 1712–1713. Bailey thus establishes that the sons of John Hart Jr. were settled in Hopewell during the first decade of the 18th century (Bailey (1895, *Op. cit.*, pp. 173–177).

Therefore, Bailey concludes that John Hart the Signer was born in Hopewell, not Stonington, CT. Staller and Lockwood (2011, *Op. cit.*) also state that John Hart was born in Hopewell. Hammond (1977, *Op. cit.*) allows for the possibility that John Hart Jr. was born in Connecticut, but agrees that John Hart the Signer was born in Hopewell.

³⁹ Even the year of birth of John Hart the Signer is in dispute. Bailey dates it as 1713, based on a record of his baptism in the Presbyterian church in Maidenhead, NJ, on December 21, 1713 (Bailey (1895, *Op. cit.*, p. 175). Other authors give dates of birth ranging from 1706 to 1714.

⁴⁰ Map of Old Hopewell, NJ, in Hammond, Cleon E. (1977): “John Hart: The Biography of a Signer of the Declaration of Independence.” Pioneer Press, Newfane, VT, in “Descendants of John Hart,” at <https://www.facebook.com/groups/98884192073>.

⁴¹ Staller and Lockwood (2011), *Op. cit.*

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- 42 Ibid.
- 43 Cooley *et al.* (1883), *Op. cit.*, p. 110.
- 44 Cook and Norman, *Op. cit.*
- 45 Cooley *et al.* (1883), *Op. cit.*, p. 110.
- 46 Cook and Norman, *Op. cit.*
- 47 Bailey (1895), *Op. cit.*, p. 177.
- 48 Cooley *et al.* (1883), *Op. cit.*, p. 110.
- 49 Cook and Norman, *Op. cit.*
- 50 Hammond (1977), *Op. cit.*
- 51 Ibid.
- 52 Staller and Lockwood (2011), *Op. cit.*
- 53 Ibid.
- 54 “Revolutionary War Sites in Hopewell Borough, New Jersey.” http://www.revolutionarywarnewjersey.com/new_jersey_revolutionary_war_sites/towns/hopewell_borough_n\revolutionary_war_sites.htm.
- 55 Staller and Lockwood (2011), *Op. cit.*
- 56 Hammond (1977), *Op. cit.*
- 57 Ibid.
- 58 Staller and Lockwood (2011), *Op. cit.*
- 59 Cooley *et al.* (1883), *Op. cit.*, p. 106.
- 60 Staller and Lockwood (2011), *Op. cit.*
- 61 Hammond (1977), *Op. cit.*
- 62 Cunningham (1977), *Op. cit.*, p. 17.
- 63 Cooley *et al.* (1883), *Op. cit.*, p. 106.
- 64 Staller and Lockwood (2011), *Op. cit.*

⁶⁵ Cooley *et al.* (1883), *Op. cit.*, p. 106.

⁶⁶ Cunningham (1977), *Op. cit.*, p. 17.

⁶⁷ Ferris and Morris (1982), *Op. cit.*, p. 72.

⁶⁸ Cooley *et al.* (1883), p. 107.

⁶⁹ Signatures of the Signers of the Declaration of Independence from New Jersey: Richard Stockton, John Witherspoon, Francis Hopkinson, John Hart, and Abraham Clark. From Glenn Valis (2007): “John Hart: Signer of the Declaration of Independence.” <http://www.doublegv.com/ggv/JHart.html>.

⁷⁰ Staller and Lockwood (2011), *Op. cit.*

⁷¹ *Ibid.*

⁷² Wikipedia: “Sourland Mountain.” https://en.wikipedia.org/wiki/Sourland_Mountain.

⁷³ Staller and Lockwood (2011), *Op. cit.*

⁷⁴ Cooley *et al.* (1883), *Op. cit.*, p. 108.

⁷⁵ Hammond (1977), *Op. cit.* Not all authors agree that John Hart died a “broken man” from losing his wife and family. Cleon E. Hammond (according to the source at <http://www.doublegv.com/ggv/JHart.html>) provided the following interpretation of events in the months following the signing of the Declaration of Independence:

“John Hart did not have to hide for months from the British. They were not in the area but from December 8th, 1776, when Washington retreated into Pennsylvania, until at most December 26th, when he captured Trenton. In reality, the actual time was a few days when troops were in the area. They damaged his house and farm, but it was not destroyed. As the outline shows, his wife died in October, so the British did not drive him from her side.”

“Most of his children were grown, so he did not lose them. The two minors went to family nearby while he hid, then everything went back to “normal” after a few days. He did not die a “broken man” from losing his family — he did not lose them, he died of kidney stones after a long, very painful illness, surrounded by family, in his intact home, on his large, still working, farm.”

⁷⁶ Hammond (1977), *Op. cit.*

⁷⁷ Staller and Lockwood (2011), *Op. cit.*

⁷⁸ *Ibid.*

⁷⁹ Hammond (1977), *Op. cit.*

⁸⁰ Staller and Lockwood (2011), *Op. cit.*

⁸¹ Hammond (1977), *Op. cit.*

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- ⁸² Ibid.
- ⁸³ Staller and Lockwood (2011), *Op. cit.*
- ⁸⁴ *The New-Jersey Gazette* (Wednesday, May 19, 1779), Vol. II, No. 76, as reprinted in: William Nelson, Editor (1906): Archives of the State of New Jersey, Second Series, Vol III (Documents Relating to the Revolutionary History of the State of New Jersey/Extracts from American Newspapers relating to New Jersey). John L. Murphy Publishing Company, Trenton, p. 380.
- ⁸⁵ Cunningham (1977), *Op. cit.*, p. 17.
- ⁸⁶ Cleon E. Hammond (1977), cited in Staller and Lockwood (2011), *Op. cit.*
- ⁸⁷ Cook and Norman, *Op. cit.*
- ⁸⁸ Cooley *et al.* (1883), *Op. cit.*, pp. 111 and 113.
- ⁸⁹ Cunningham (1977), *Op. cit.*, p. 11.
- ⁹⁰ Paull, Jeffrey Mark, Steeble, Susan K., Briskman, Jeffrey, and Twersky, Yitzchak Meyer (November 21, 2016): “Challenges Involved in Conducting DNA Tests of Pedigreed Descendants of Rabbinical Lineages.” Avotaynu Online.
- ⁹¹ Frame, Katherine Hart (1976): “The Harts of Randolph: or, Mostly Descendants of Edward and Daniel Hart, Sons of John Hart the Signer, with Some Allied Families.” McClain Printing Company, Parsons, WV.
- ⁹² “Hacker’s Creek Pioneer Descendants, Inc.” <https://hackerscreek.com/>.
- ⁹³ “The Hart DNA Project.” <https://www.worldfamilies.net/surnames/hart>.
- ⁹⁴ “Hart Family Tree.” <https://www.ancestry.com/family-tree/person/tree/36420325/person/18932717089/facts>.
- ⁹⁵ FamilySearch.org: John Hart, <https://familysearch.org/tree/pedigree/L6TY-GZX/portrait>.
- ⁹⁶ Steeble, Susan K., and Paull, Jeffrey Mark (July 4, 2017): “Genealogical Source Document for John Hart the Signer, and his Patrilineal Lines of Descent.”
- ⁹⁷ Family Tree DNA Learning Center: “What Does Each Short Tandem Repeat (STR) Marker Mean?” <https://www.familytreedna.com/learn/y-dna-testing/y-str/short-tandem-repeat-str-marker-mean/>.
- ⁹⁸ Wikipedia: “Haplogroup.” <https://en.wikipedia.org/wiki/Haplogroup>. A haplogroup is comprised of similar haplotypes that share a common ancestor having the same single nucleotide polymorphism (SNP) mutation in all haplotypes. In human genetics, the haplogroups most commonly studied are Y-chromosome (Y-DNA) haplogroups and mitochondrial DNA (mtDNA) haplogroups, both of which can be used to define genetic populations. The special feature that both Y-DNA and mtDNA display is that mutations can accrue along a certain chromosome segment; these mutations remain fixed in place on the DNA, and the historical sequence of these mutations can be inferred.

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- ⁹⁹ Paull, Jeffrey Mark (Fall 2013): “Connecting to the Great Rabbinic Families through Y-DNA: A Case Study of the Polonsky Rabbinical Lineage.” AVOTAYNU: The International Review of Jewish Genealogy, Vol. XXIX, No. 3.
- ¹⁰⁰ Paull, Jeffrey Mark, and Briskman, Jeffrey (May 31, 2015): “Connecting to the Great Rabbinic Families through Y-DNA: The Savran-Bendery Chassidic Dynasty.” Surname DNA Journal.
- ¹⁰¹ Paull, Jeffrey, Rosenstein, Neil, and Briskman, Jeffrey (March 7, 2016): “The Y-DNA Genetic Signature and Ethnic Origin of the Katzenellenbogen Rabbinical Lineage.” Avotaynu Online.
- ¹⁰² Paull, Jeffrey Mark, and Briskman, Jeffrey (July 1, 2016): “Identifying the Genetic Fingerprint of a *Tzaddik* that Touched the World: The Shpoler Zeida.” Avotaynu Online.
- ¹⁰³ Paull, Jeffrey Mark, Briskman, Jeffrey, and Twersky, Yitzchak Meyer (September 11, 2017): “The Y-DNA Genetic Signature and Ethnic Origin of the Twersky Chassidic Dynasty.” Avotaynu Online.
- ¹⁰⁴ Paull, Steeble, Briskman, and Twersky (November 21, 2016): “Challenges Involved in Conducting DNA Tests of Pedigreed Descendants of Rabbinical Lineages.” *Op. cit.*
- ¹⁰⁵ ISOGG defines the term “genetic signature” as: “Another name for a haplotype,” a Y-DNA haplotype being the numbered results of a genealogical Y-DNA STR test. http://isogg.org/wiki/Genetics_Glossary. FTDNA defines it similarly. <https://www.familytreedna.com/learn/y-dna-testing/>. In our view, the haplogroup, a group of similar haplotypes that share a common ancestor having the same single nucleotide polymorphism (SNP) mutation in all haplotypes, is also an essential part of the Y-DNA genetic signature of a paternal lineage. Hence, STRs and SNPs serve as both essential and complementary components of the Y-DNA genetic signature.
- ¹⁰⁶ Wikipedia: “Modal Haplotype.” A modal haplotype is an ancestral haplotype derived from the DNA test results of a specific group of people, using genetic genealogy. https://en.wikipedia.org/wiki/Modal_haplotype.
- ¹⁰⁷ Wikipedia: “RecLOH.” <https://en.wikipedia.org/wiki/RecLOH>. “Recombinant Loss of Heterozygosity,” abbreviated RecLOH, is a type of mutation which occurs with DNA by recombination. From a pair of equivalent (homologous), but slightly different (heterozygous) genes, a pair of identical genes results. In this case, there is a non-reciprocal exchange of genetic code between the chromosomes. Recombination events can be observed if Y-STR databases are searched for twin alleles at 3 or more duplicated markers on the same palindrome (hairpin); e.g., DYS459, DYS464 and DYS724 (CDY) are located on the same palindrome P1.

Family genealogies have proven that parallel changes on all markers located on the same palindrome are frequently observed, and the result of those changes are always twin alleles. Hence, a 9-10, 15-16-17-17, 36-38 haplotype can change in one recombination event to a 9-9, 15-15-17-17, 36-36 haplotype, because all three markers (DYS459, DYS464 and DYS724) are affected by one and the same RecLOH event.

- ¹⁰⁸ This finding, reported as of November 23, 2018, is subject to change as additional people test, and the size of the Y-DNA database grows.
- ¹⁰⁹ Hockings, Greg (July 2, 2017): Email communication with Jeffrey Mark Paull. According to Mr. Hockings: “DYS464 has a fast mutation rate and CDY a very fast rate, so they would be given very little weight in the TiP calculations.”

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- ¹¹⁰ In this context, the time-to-most-recent common ancestor (TMRCA) is equivalent to the number of generations to the most recent common ancestor, the standard genealogical assumption being that a generation is equivalent to a period of approximately 25 years.
- ¹¹¹ The actual probability of a known ancestor living within a known number of generations is 100 percent.
- ¹¹² Wikipedia: “Haplogroup.” <http://en.wikipedia.org/wiki/Haplogroup>. A haplogroup is a group of similar haplotypes that share a common ancestor having the same single nucleotide polymorphism (SNP) mutation in all haplotypes.
- ¹¹³ ISOGG: “Haplogroup.” International Society of Genetic Genealogy (ISOGG). <http://isogg.org/wiki/Haplogroup>.
- ¹¹⁴ Ibid.
- ¹¹⁵ A clade is a branch on the Y chromosome tree that constitutes haplogroup and includes all the descendants of a single most recent common ancestor (MRCA). A subclade is a downstream (occurring later in time) branch or subgroup of the haplogroup. http://isogg.org/wiki/Y-DNA_project_help.
- ¹¹⁶ ISOGG: “Y-DNA Project Help.” International Society of Genetic Genealogy. http://isogg.org/wiki/Y-DNA_project_help.
- ¹¹⁷ ISOGG: “Y-DNA Haplogroup Tree 2017.” International Society of Genetic Genealogy. <http://isogg.org/tree/index.html>.
- ¹¹⁸ FTDNA: “The Methodology Behind the 2014 Y-DNA Haplotree.” <https://www.familytreedna.com/learn/y-dna-testing/introducing-2014-y-dna-haplotree/>.
- ¹¹⁹ YFull: “YTree, version 5.01.” <https://www.yfull.com/tree/>.
- ¹²⁰ Janet Billstein Akaha (February 7, 2017): Email correspondence with Jeffrey Mark Paull.
- ¹²¹ Sergey Malyshev: “R1b Basal Subclades Phylogenetic Trees.” <https://www.familytreedna.com/groups/r-1b-basal-subclades/about/results>.
- ¹²² McDonald, Ian: “The Big Tree R-Z18012.” <http://www.ytree.net/DisplayTree.php?blockID=147>.
- ¹²³ ISOGG Wiki: “Presidential DNA.” International Society of Genetic Genealogy Wiki. https://isogg.org/wiki/Famous_DNA:US_Presidential_DNA#cite_note-1.
- ¹²⁴ “Adams Family DNA: The Presidential Line.” <http://adamsfamilydna.com/the-presidential-line/>.
- ¹²⁵ Wikipedia: “Haplogroup R1.” https://en.wikipedia.org/wiki/Haplogroup_R1.
- ¹²⁶ Wikipedia: “Haplogroup R1b.” https://en.wikipedia.org/wiki/Haplogroup_R1b.
- ¹²⁷ Anthrogenica: “R1b-M343 Backbone SNP Pack FTDNA.” <http://www.anthrogenerica.com/showthread.php?5027-R1b-M343-Backbone-SNP-Pack-FTDNA>.

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- ¹²⁸ “YFull YTree v.5.04.” <https://www.yfull.com/tree/R-DF13/>.
- ¹²⁹ Riddell, Gail (June 24, 2017): Email correspondence with Jeffrey Mark Paull.
- ¹³⁰ “R L21, Z290 and Subclades, R1b-L21 Frequency map.” <https://www.familytreedna.com/groups/r-121/about/results>.
- ¹³¹ Hockings, Greg (June 24, 2017): Email correspondence with Jeffrey Mark Paull. According to Mr. Hockings: “Z2542 is currently listed as phylogenetically equivalent (*i.e.*, defining the same branch of the Y-chromosome tree) as DF13. These two SNPs are estimated to be very approximately 4500 years old and define the dominant branch of another SNP named L21, which has been extensively researched. L21 (aka S145) is the most common Y-haplogroup in men whose paternal ancestry is from Western Europe and is especially frequent in the British Isles, particularly Ireland, Wales and northern Scotland.”
- ¹³² Cooley *et al.* (1883), *Op. cit.*, p. 104.
- ¹³³ Bailey (1895), *Op. cit.*, p. 173.
- ¹³⁴ Cook and Norman, *Op. cit.*
- ¹³⁵ ISOGG: “Y-DNA Haplogroup R and its Subclades – 2017.” https://isogg.org/tree/ISOGG_HapgrpR.html.
- ¹³⁶ “The Big Tree: R-DF13.” <http://www.ytree.net/DisplayTree.php?blockID=4&star=false>.
- ¹³⁷ Riddell, Gail (January 26, 2018): Email correspondence with Jeffrey Mark Paull.
- ¹³⁸ Hockings, Greg: “Hart Haplogroup.” Email communication with Jeffrey Mark Paull, January 28, 2018.
- ¹³⁹ Sager, Michael: Email communication with Greg Hockings, January 30, 2018. According to Dr. Sager: Z18012 is not an SNP, but rather deletion of a single base, which are never called for tree/matching purposes. This presumably explains the inaccurate result.
- ¹⁴⁰ Hockings, Greg: “Hart Manuscript.” Email communication with Jeffrey Mark Paull, February 17, 2018.
- ¹⁴¹ *Ibid.*
- ¹⁴² See endnote #99 above.
- ¹⁴³ Paull and Briskman (May 31, 2015): “Connecting to the Great Rabbinic Families through Y-DNA: The Savran-Bendery Chassidic Dynasty.” *Op. cit.*
- ¹⁴⁴ Paull, Rosenstein, and Briskman (March 7, 2016): “The Y-DNA Genetic Signature and Ethnic Origin of the Katzenellenbogen Rabbinical Lineage.” *Op. cit.*
- ¹⁴⁵ Paull and Briskman (July 1, 2016): “Identifying the Genetic Fingerprint of a *Tzaddik* that Touched the World: The Shpoler Zeida.” *Op. cit.*

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- ¹⁴⁶ Paull, Briskman, and Twersky (September 11, 2017): “The Y-DNA Genetic Signature and Ethnic Origin of the Twersky Chassidic Dynasty.” *Op. cit.*
- ¹⁴⁷ Walsh, Mike: “Y STRs vs SNPs (was Question re Y-DNA and markers).” Rootsweb, an Ancestry.com community. <http://archiver.rootsweb.ancestry.com/th/read/GENEALOGY-DNA/2016-06/1467204170>.
- ¹⁴⁸ Hockings, Greg: “Hart Manuscript.” *Op. cit.*
- ¹⁴⁹ Taylor, Terry: “STR Analysis.” Sidebar to the article: “Extending the Time to Collect DNA in Sexual Assault Cases.” National Institute of Justice. <https://www.nij.gov/journals/267/pages/extending-str.aspx>. According to the author: “In the U.S., 13 autosomal STR loci are now accepted as the system used for forensic purposes. Given a robust crime scene DNA sample with good data for all 13 STRs, the likelihood of a person unrelated to the actual perpetrator having a perfect match for all 13 is typically around 1 in 1 billion. By contrast, experimental work with a very robust set of 30 Y-STR loci showed a probability of about 1 in 50,000 for a perfect match.”
- ¹⁵⁰ Hanson, Erin K., and Ballantyne, Jack (January 2004): “A Highly Discriminating 21 Locus Y-STR “Megaplex” System Designed to Augment the Minimal Haplotype Loci for Forensic Casework.” *Journal of Forensic Sciences*, Vol. 49, No. 1.
- ¹⁵¹ “American Surnames: Hart.” <http://www.americansurnames.us/surname/HART/>. There are approximately 132,466 people in the U.S. with the Hart surname. Undoubtedly, many of them do not know their ancestry back ten or more generations.
- ¹⁵² Paull (Fall 2013): “Connecting to the Great Rabbinic Families through Y-DNA: A Case Study of the Polonsky Rabbinical Lineage.” *Op. cit.*
- ¹⁵³ Paull and Briskman (May 31, 2015): “Connecting to the Great Rabbinic Families through Y-DNA: The Savran-Bendery Chassidic Dynasty.” *Op. cit.*
- ¹⁵⁴ Paull, Rosenstein, and Briskman (March 7, 2016): “The Y-DNA Genetic Signature and Ethnic Origin of the Katzenellenbogen Rabbinical Lineage.” *Op. cit.*
- ¹⁵⁵ Paull and Briskman (July 1, 2016): “Identifying the Genetic Fingerprint of a *Tzaddik* that Touched the World: The Shpoler Zeida.” *Op. cit.*
- ¹⁵⁶ Paull, Briskman, and Twersky (September 11, 2017): “The Y-DNA Genetic Signature and Ethnic Origin of the Twersky Chassidic Dynasty.” *Op. cit.*

Dr. Jeffrey Mark Paull was born and raised in Pittsburgh, PA. He earned his BS in Chemistry and Master of Science in Industrial Hygiene from the University of Pittsburgh, and his MPH and Doctorate of Public Health (DRPH) from the Johns Hopkins University Bloomberg School of Public Health. Dr. Paull's career as an environmental toxicologist and scientific expert in the field of occupational and environmental health spans over thirty years (1976–2008).

Since that time, Dr. Paull has devoted himself to his passion for genealogical research and writing. His first book, entitled: *A Noble Heritage: The History and Legacy of the Polonsky and Paull Family in America*, traces his family's ancestry over a millennium of history, and discovers their lost rabbinical heritage dating back to Rashi (1040–1105). His book was recently featured on the PBS website, "Finding your Roots, with Henry Louis Gates, Jr."

Dr. Paull is very active in the field of genetic genealogy and has published numerous pioneering autosomal and Y-DNA research studies in which he has identified the unique genetic signature of some of Eastern Europe's most renowned rabbinical lineages. In addition to his genealogical research studies of historic rabbinical lines, Dr. Paull is interested in conducting pioneering Y-DNA research studies of America's Founding Fathers. This Y-DNA research study of the patrilineal lineage of John Hart, signer of the Declaration of Independence, represents the first of these studies.

Jeff's many genealogy-related book chapters, research articles, and publications have surpassed 26,000 views, placing him in the top one percent of all researchers on Academia.edu: <https://independent.academia.edu/JeffreyMarkPaull>. Jeff is a highly sought-after speaker, and he has presented talks on his pioneering genealogical research studies to many genealogical societies, and International genealogy conferences across the world.

Susan K. Steeble was born and raised in Milford, CT, and has lived in Baltimore, MD, since 1966. She graduated with a degree of Bachelor of Arts Cum Laude from Mt. Holyoke College, where she was elected to Phi Beta Kappa, and she received a Master of Arts in Teaching degree from the Johns Hopkins University. After a brief stint teaching French in Baltimore high schools, she became a copy editor for Williams & Wilkins/Waverly Press, a publisher of medical journals and books. Later, she was employed as a production editor of medical journals for the same company, now called Lippincott Williams & Wilkins, a division of Wolters Kluwer Health, until she retired in 2005.

Susan has been conducting genealogical research on her family for more than 25 years and has performed surname studies on numerous family lines. In 2008, Susan created a web site about one of her ancestors and his mentor: <http://twotzaddiks.org>. Currently, Susan serves on the board of the Jewish Genealogy Society of Maryland as its chairperson for Publications and Public Relations, and she is the editor of its quarterly newsletter; in 2015, the publication won the International Association of Jewish Genealogical Societies' award for Outstanding Publication. She has collaborated with Dr. Jeffrey Mark Paull on several genealogical projects and genetic genealogy research studies.