Connecting William Bowdoin, Part 2:

Discovering the Relationship of William Bowdoin (b. 1802) of Autauga County, Alabama, to the Family of William Bowdoin (b. ca. 1740) through Machine Learning DNA Analysis

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https://www.jtrichardson.com/bowdoin

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Introduction

In the previous paper, I introduced **William Bowdoin (b. 1802)** of Autauga County, Alabama, and his sister, **Eliza (Bowdoin) Hackman (b. 1817)**.[1] William's and Eliza's ancestry has long been unclear from the records currently available, but their distinctive spelling of the name *Bowdoin* presents the possibility that they were connected to the family of William Bowdoin (b. 1740) of Randolph County, North Carolina, whose other descendants settled largely in central Georgia and South Alabama. Preliminary evidence from DNA results strongly supports the hypothesis that William and Eliza belong to this family.

Following a thorough investigation of **William Bowdoin (b. 1740)**, his children, and his grandchildren, we have found a possible candidate for being the father of William (b. 1802) and Eliza (b. 1817). **Josiah Bowdoin (b. 1780)**, the fourth son of William (b. 1740), tentatively meets the constraints we have placed: (1) he was married and having children by 1802, (2) he was living in North Carolina in 1802, and living in Georgia in 1817, and (3) he did not have another documented son named William Bowdoin. Pleasant Bowden (b. 1785), the youngest son of William (b. 1740), also meets the latter two conditions, but probably was too young to have been the father of William (b. 1802).

In this paper, I drill down into the autosomal DNA results of my grandfather, Robert P. Richardson, a descendant of William Bowdoin (b. 1802), in an effort to conclusively resolve the question of William's and Eliza's parentage. Through triangulation, clustering, and other algorithmic analysis, I attempt to give clarity to the genealogical questions and provide objective scientific evidence. With support not only from the initial DNA analysis, but also from a newly discovered and unexpected family connection this analysis revealed, I argue firmly that their father was indeed **Josiah Bowdoin**, and their mother was an unknown daughter of **Arthur Read** and **Martha Spinks** of Randolph County, North Carolina.

[1] Joseph T. Richardson, "Connecting William Bowdoin: The Problem of the Ancestry of William Bowdoin (b. 1802) of Autauga County, Alabama, Addressed through Records and DNA, and a General Overview of the Family of William Bowdoin (b. ca. 1740)," published online, November 2024, at https://www.jtrichardson.com/papers.

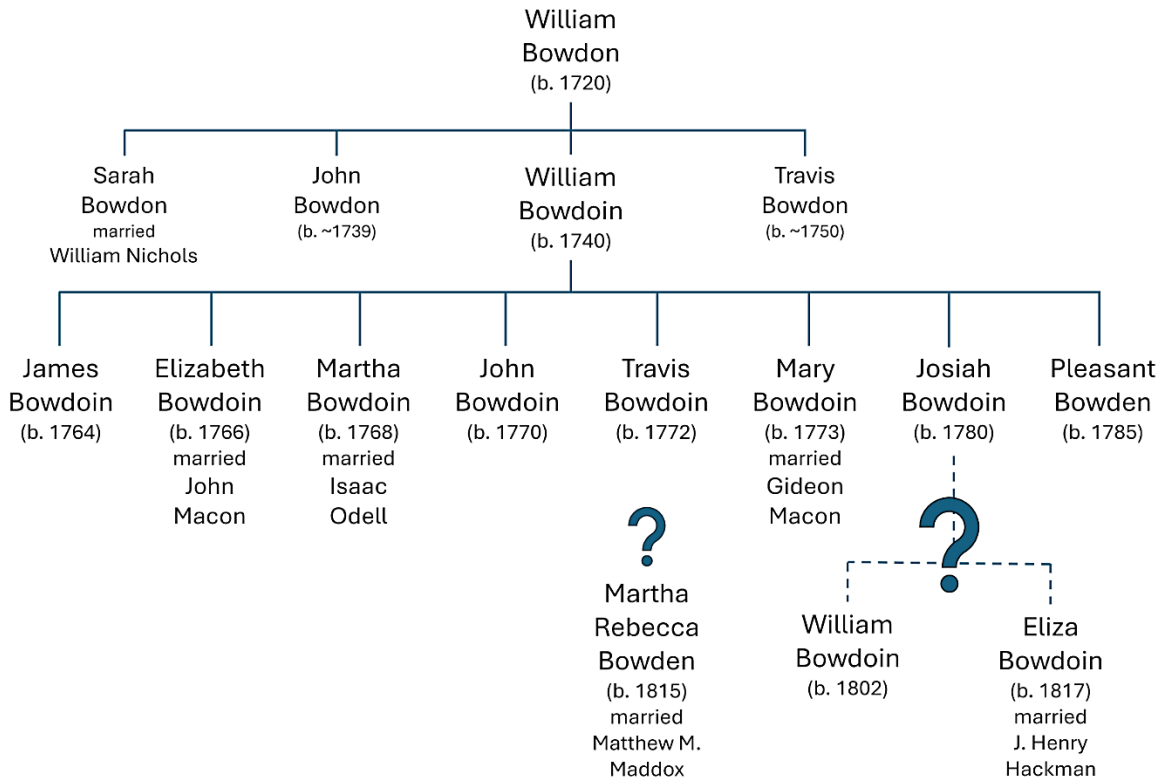

Figure 1: Family diagram of the William Bowdoin (b. 1740) family, as described in the first part of this paper.

Recapitulation

William Bowdoin (b. 1802 in North Carolina, d. 1870 in Autauga County, Alabama) was a pioneer of Alabama's early days of statehood, arriving in Alabama no later than 1824 and perhaps earlier. Where he came from and to whom he was kin are not documented. No other Bowdoins settled immediately in his vicinity, but by 1830, a young sister, Eliza Bowdoin (b. 1817 in Georgia, d. 1901 in Elmore County, Alabama) had come to live with William and remained nearby. The origins and ancestry of William and Eliza have been genealogical mysteries to their descendants for the past century and a half. Despite the exhaustive research of dozens of researchers, we have found no documents that offer proof of either's connection to anyone. Today, with the development of DNA genealogy, it is my hope that we can at last use its tools to break through our brick wall.

My grandfather, Robert P. Richardson (1926–2018), was a great-great-grandson of William Bowdoin (1802–1870), through his son Reddin Read Bowdoin (1831–1877) and Reddin's daughter Sarah Emily Elizabeth (Bowdoin) Richardson (1853–1912). Being only four generations separated from William Bowdoin, Robert shared an unusual degree of his DNA with the Bowdoin family, even greater than expected given that relationship. I have taken this genetic affinity as an opportunity to delve into the unanswered questions of our Bowdoin family's ancestry.

Early in this DNA exploration, we determined that the great majority of autosomal DNA matches between Robert and other people descended from families named Bowdoin, Bowdon, or Bowden, descend from **William Bowdoin** of Randolph County, North Carolina (b. ca. 1740, probably in Virginia, d. 1821 in Conecuh County, Alabama). William (b. 1740) was also the ancestor of the Bowdoin families in Coffee County, Alabama, of which a descendant, U. Bowdoin Marsh, wrote a groundbreaking genealogical study in 1982.[2] A direct male-line descendant of the Coffee County Bowdoins, D.B., also is the only Y-DNA match to W.B., a direct male-line descendant of our William Bowdoin (b. 1802).[3]

In the first part of this paper, I undertook a detailed reconstruction of the family of William Bowdoin (b. 1740) using historical methods and primary sources. The genealogical record has largely been clouded and obscured by poor documentation and bad assumptions, aggravated by the "suggestion" algorithms of popular Internet provider Ancestry.com. This is a very brief summary of some of the supposed "facts" I discovered were unsupported:

- William Bowdoin (b. 1802) and Eliza Bowdoin (b. 1817) were **NOT** the children of William Bowdoin (b. 1773) and Nancy Wiggins (b. 1776) of Coffee County, Tennessee, as a "consensus" of online family trees claims.[4]
- It is a common assumption, but **unproven**, that Elizabeth or "Betty," the wife of William Bowdon (b. 1720) and mother of William Bowdoin (b. 1740), was Elizabeth **Travis**.[5]
- There is **NO** basis for the common claim that the wife of William Bowdoin (b. 1740) was "Martha Elizabeth Macon." In fact, William's wife is identified in several primary sources as being named **Mary**. I have found no support for her being a Macon.[6]
- There is no evidence at all that William Bowdoin (b. 1740) was a "reverend" or any other kind of minister.[7]
- William Bowdoin (b. 1740) did not die in Oglethorpe County, Georgia, as many trees claim (this was a different William Bowden), but in Conecuh County, Alabama, in 1821.[8]

I detailed with primary sources the lives of the eight children of William Bowdoin (b. 1740) of Randolph County, North Carolina, as documented by an estate lawsuit which followed in the wake of his death:[9]

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[2] U. Bowdoin Marsh, *A Research of the Bowdoin Family in the United States* (Tallahassee, Fla.: Self-published, 1982). Available on FamilySearch.org at https://www.familysearch.org/library/books/records/item/547811-a-research-of-the-bowdoin-family-in-the-united-states (accessed 23 Aug 2024).
[3] Richardson, ibid., 23–26.
[4] Richardson, *ibid.*, 19–23.
[5] Richardson, *ibid.*, 28.
[6] Richardson, *ibid.*, 29–30.
[7] Richardson, *ibid.*, 31–32.
[8] Richardson, *ibid.*, 34, 73.
[9] See my edition of the lawsuit, See my transcription and edition of the lawsuit, "William Bowdoin Estate Suit, 1821–1839," available at https://jtrichardson.com/wp-content/uploads/2024/09/WilliamBowdoinEstate.pdf

1. **James Bowdoin** (b. ca. 1764) settled in Monroe County, Georgia, and became the ancestor of the Bowdoins who went to Coffee County, Alabama.
2. **Elizabeth (Betsy) Bowdoin** (b. ca. 1766) married **John Macon**. Many of her descendants continued to Georgia and Alabama.
3. **Martha (Patsy) Bowdoin** (b. ca. 1768) married **Isaac Odell** and remained in Randolph County.
4. **John Bowdon** (b. ca. 1770) settled in neighboring Richmond County, North Carolina. His descendants remained in North Carolina and went to Tennessee and Mississippi.
5. **Travis Bowdoin** (b. ca. 1772), called Travis "Westward" Bowdoin by some descendants, moved to Maury County, Tennessee, and later Graves County, Kentucky.
6. **Mary (Molly) Bowdoin** (b. ca. 1773) married **Gideon Macon**. Most of their descendants remained in North Carolina.
7. **Josiah Bowdoin** (b. ca. 1780) followed his brother James to central Georgia, settling in Jasper County and later Meriwether County. His oldest son, Enoch, moved to Indiana, while other children remained in Georgia.
8. **Pleasant Bowden** (b. ca. 1785) was a pioneer to Alabama, settling in Conecuh County about 1819. His known children remained in Alabama.

Because of the predominance of the descendants of William Bowdoin (b. 1740) in my grandfather R.P.R.'s autosomal DNA matches, we concluded that one of the sons (or grandsons) of William (b. 1740) was the likely father of William (b. 1802) and Eliza (b. 1817). Based on four major criteria, I judged the likelihood of each being the father: (1) whether he had another documented son named William; (2) whether he was married and having other children around the same times William and Eliza were born, to a wife of a childbearing age; (3) whether available census records were consistent with him having a son born in 1802 and a daughter born in 1817, and (4) whether he was living in North Carolina in 1802, where William was born, and in Georgia in 1817, where Eliza was born.

After examining each of the families of William's sons, I dismissed the older sons from possibility:

- James Bowdoin (b. 1764) had another documented son named William, William Bowdoin (b. 1768). James was living in South Carolina in 1802, and though living in Georgia in 1817, had no more children born after 1803. He and his wife were both in their fifties by that time and were "empty nesters" on the 1820 census with no children in the home.
- John Bowdon (b. 1770) lived his whole life in North Carolina and never went to Georgia. He had another documented son named William, William Bowdon (b. 1807, d. 1853), and had a will which named all his children, which did not include a daughter named Eliza.
- Travis Bowdoin (b. 1772) did live in North Carolina in 1802 but was still living there in 1820 and had never lived in Georgia. He did have children born throughout the period from 1800 to 1820, so he perhaps cannot be excluded completely.

Josiah Bowdoin (b. 1780) is the only son to completely meet the four criteria. He had a son, Enoch, born about 1801 in North Carolina, showing that Josiah was married, having children, and living in North Carolina at that time. He sold his North Carolina land in December 1816 and moved to Georgia, in time to have a daughter born there in 1817. His 1820 census entry in Putnam County, Georgia, shows him with three daughters under age 10.

The youngest son, Pleasant Bowden (b. 1785), may also meet the criteria, but whether he was old enough to have a son born in 1802, and was married at that time, is questionable. An 1810 census entry in Montgomery County, North Carolina, apparently shows him with a house full of children, but these may have included the children of his deceased sister Elizabeth Macon. Pleasant certainly had children born between 1816 and 1825 and was living in Georgia by 1817. The 1820 census in Conecuh County, Alabama, shows his household with two females under age 21.

I discovered no sources in my examination that referred to either William (b. 1802) or Eliza (b. 1817) by name or that brought any more direct light to the question of their parentage. Neither Josiah nor Pleasant, nor Travis nor James either, left a will. Based on census records of Travis, Josiah, and Pleasant, each appears to have had children who are yet unidentified.

So this brings us, in this second part of my research, to the DNA. We have a premise, that the father of William Bowdoin (b. 1802) and Eliza Bowdoin (b. 1817) was a son or grandson of William Bowdoin (b. 1740). We have several possibilities among William (b. 1740)'s descendants to fit that role, but our primary evidence is the lack of contradictions, rather than positive evidence in their favor. Based on preliminary examinations of the DNA evidence, we formed the hypothesis that Josiah Bowdoin (b. 1780) was the father of William and Eliza. We now turn to a deeper analysis of the DNA, in search of conclusive support of this hypothesis.

The case in DNA

Over the past few months, I have collected and catalogued the autosomal DNA matches of my grandfather, Robert P. Richardson, as they relate to his Bowdoin family. On account of the greater breadth and higher density of matches on AncestryDNA—some four to five more testers on Ancestry than on any other individual site—I have primarily used Ancestry as my matching base. I have used Ancestry's new "Pro Tools," released December 2023, which allow members to view the centimorgan (cM) match values of shared matches with one another, to create a pairwise matching matrix, showing not only the cM value of Robert's matches, but also of their matches with one another. (See appendix for a more detailed discussion.)

As of 3 Nov 2024, the full matching matrix contains 924 Bowdoin-related individuals from the AncestryDNA database who match my grandfather, Robert P. Richardson. Combined with the visible shared matches between those 924 testers and each other, there are 23,150 DNA matches total.

I have grouped these matching individuals into exclusive groups; that is, no tester is a member of more than one group. There are several cases where a tester is actually a descendant of more than one of the "head" ancestors—for example, one family of our closest cousins are descendants of both William Bowdoin (b. 1802) and of his sister Eliza Bowdoin (b. 1817)—and in those cases, I chose the group that made the most sense to me according to the objectives of the study. (See the further discussion of Eliza Bowdoin's family below.)

Below is a summary of these compiled match groups, considering in this chart only Robert's matches. In the "William Bowdoin (b. 1802)" group average, I included only Robert's matches with children of William Bowdoin other than Reddin Reid Bowdoin, Robert's great-grandfather, since obviously Robert's matches from his nearer ancestors—his father and his grandmother—will be much closer than average and not indicative of his shared DNA with William Bowdoin alone. In other groups, I have excluded several high matches with known endogamy (i.e., they are related to Robert on more than one family line).[10]

[10] For example, one of Pleasant Bowden's descendants, Willie Belle Richburg (b. 1881), married Thomas Samuel Casey (b. 1857), a descendant of William Casey (b. 1759), who was Robert's third great-grandfather on the Richardson side. The descendants of Willie Belle (Richburg) Casey have matches with Robert that are as much as 40 cM higher than his matches with other Pleasant Bowden descendants, owing to the combined matches from both Bowdoin and Casey. (A maximum match of 63 cM, vs. 26 cM, the highest match with any other descendant of Pleasant.)

Robert P. Richardson's matches with test groups

Match group (descendants of)	*# Matches*	*Highest match*	*Average match*
William Bowdoin (b. 1802)	134	77 cM	27.4 cM
Eliza Bowdoin (b. 1817)	13	32 cM	13.5 cM
Martha Rebecca Bowden Maddox (b. 1815)	128	59 cM	19.8 cM
Josiah Bowdoin (b. 1780)	108	61 cM	19.4 cM
Pleasant Bowden (b. 1785)	80	26 cM	14.0 cM
James Bowdoin (b. 1764)	74	28 cM	15.1 cM
John Bowdon (b. 1770)	15	23 cM	15.0 cM
Travis Bowdoin (b. 1772)	52	30 cM	14.1 cM
Elizabeth Bowdoin Macon (b. 1766)	38	36 cM	16.3 cM
Martha Bowdoin Odell (b. 1768)	13	21 cM	13.7 cM
Mary Bowdoin Macon (b. 1773)	30	34 cM	16.5 cM
William Bowdon (b. 1720)	19	16 cM	13.1 cM

Table 1: Summary of R.P.R.'s Bowdoin matches, as of 3 Nov 2024.

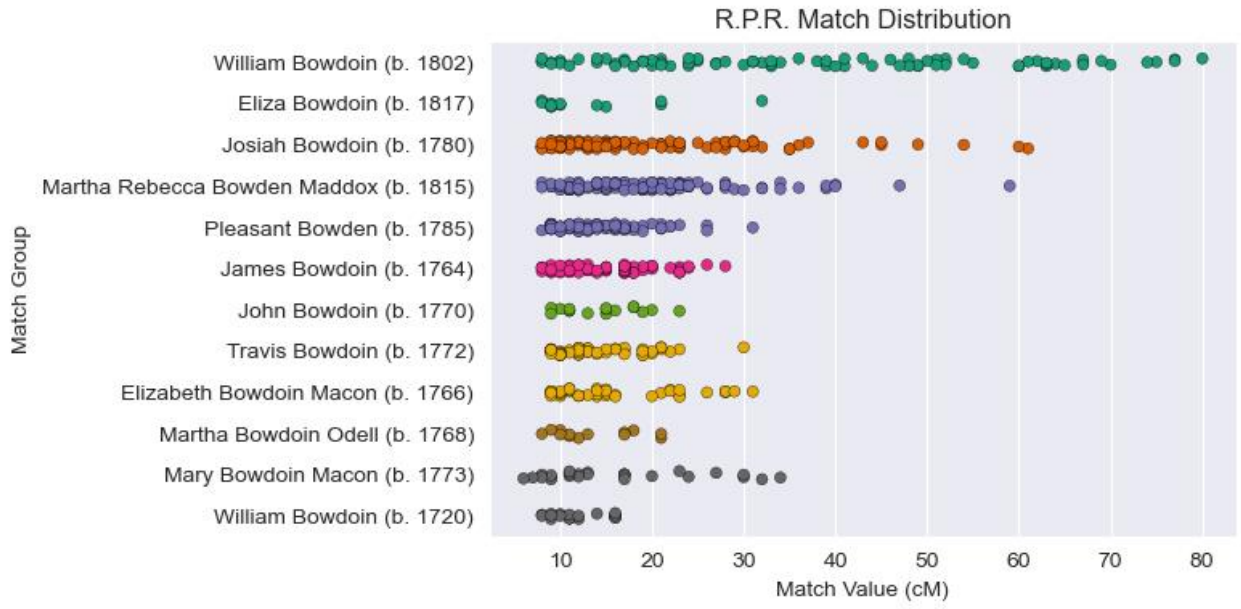


Figure 2: Strip plot of R.P.R.'s matches with each match group. Each bubble represents a match, placed on the X-axis according to its cM value. (Only matches below or equal to 80 cM are shown. He has 50 matches in the William (b. 1802) group above 80 cM.)

Even this summary shows early indications of my conclusion. I could make a strong argument based on Robert's matches alone that Josiah Bowdoin was the father of William Bowdoin, with the highest match to Josiah's descendants being more than 30 cM higher, and

the average (mean) across all matches being more than 4.0 cM higher, than with any other son of William Bowdoin (b. 1740). But let us not put our cart before our horse. There appear to be a lot of matches, yes, but what do the matches of only one person really prove? How can we even be sure in the first place that William Bowdoin (b. 1740) was the ancestor of William Bowdoin (b. 1802), and that it is valid to connect him to one of the sons of William (b. 1740)?

Proving the premise

We have stated as a premise that William Bowdoin (b. 1802) and his sister Eliza (b. 1817) were descendants of William Bowdoin (b. 1740), and that one of William (b. 1740)'s sons or grandsons had to be their father. But are we assuming too much? Do we have conclusive evidence connecting William (b. 1802) to William (b. 1740)?

From the beginning, we have strong circumstantial evidence. William Bowdoin (b. 1802) consistently spelled his own name *Bowdoin*, which I have shown previously is characteristic of the descendants of William Bowdoin (b. 1740), especially of his sons James and Josiah in Georgia and Travis in Tennessee and Kentucky. The father of William, William Bowdon (b. ca. 1720), and his brothers, John Bowdon (b. ca. 1739) and Travis Bowdon (b. ca. 1750), spelled their name *Bowdon* in most records. Though I have not studied other southern Bowden-Bowdon-Bowdoin families to the same depth as these, I have not seen the spelling *Bowdoin* held consistently in any other family.

The descendants of William Bowdoin (b. 1740), especially the families of James, Josiah, and Pleasant, exhibited a pronounced religious tradition of Methodism, which William Bowdoin (b. 1802) and his family adhered to. William himself served as a Methodist class leader and later an exhorter. Josiah Bowdoin's tombstone announces his membership in the Methodist Church. The Methodism of James's descendants is held forth in family obituaries, and a grandson, William A. Bowdoin, was likely a pioneering Methodist minister in Alabama.

Approaching the DNA, we have, most importantly, the Y-DNA match. W.B., a third great-grandson of William Bowdoin (b. 1802), matches D.B., a seventh great-grandson of William Bowdoin (b. 1740) by his son James Bowdoin (b. 1764). Both the Y-111 test and the advanced Big Y-700 test indicate a very close match between the men, giving time-to-more-recent-ancestor (TMRCA) estimates of 1755 and 1778 respectively. These tests prove conclusively that the two men share the same paternal line and a common paternal ancestor within a recent genealogical timeframe. I have shown previously that neither James Bowdoin (b. 1764) nor his son William Bowdoin (b. 1786), the more recent common ancestors of D.B., was the ancestor of William Bowdoin

(b. 1802). The very late TMRCA estimates, then, point strongly to William Bowdoin (b. 1740) as the most likely common ancestor.[11]

Figure 3: Identified DNA segments matching between R.P.R. and descendants of William Bowdoin (b. 1740).

For additional evidence, we can turn to autosomal DNA. I have exhaustively searched my grandfather Robert Richardson's autosomal DNA matches, as well as those of my father and myself and two of Robert's nieces. Though privacy concerns prevent me from sharing the full results of this search publicly, I have shared my match matrix in a anonymized form to demonstrate the more than five hundred matches which Robert shares with descendants of William Bowdoin (b. 1740). The raw *number* of matches, of course, is not necessarily indicative in itself. It is possible for hundreds of matches to overlap on a single, small segment of DNA, simply because a family had a large number of descendants, and these matches not to be representative of one's whole DNA. But this is not the case with R.P.R. and the Bowdoin family. The descendants of William Bowdoin (b. 1740), from all various branches of his family, from all eight of his children and some forty of his grandchildren, match Robert in identified regions on 9 chromosomes, matching on a total of about 6.2% of his DNA. This is about the right number to represent the DNA Robert would have inherited from William Bowdoin (b. 1802), his great-great-grandfather.[12]

The fact that Robert does have such an extraordinary number of matches from William Bowdoin (b. 1740), over such a wide range of DNA segments, and from such a broad range of families, all with clear triangulation of shared matches, and combined with an immediate Y-DNA match, does indicate with certainty that William was his ancestor. When compared to alternatives, there is simply no other likely possibility. I have identified fewer than twenty valid matches from other children of William Bowdon (b. 1720), the next ancestor in the paternal line: twelve from his son

[11] Richardson, *ibid.*, 23–26.

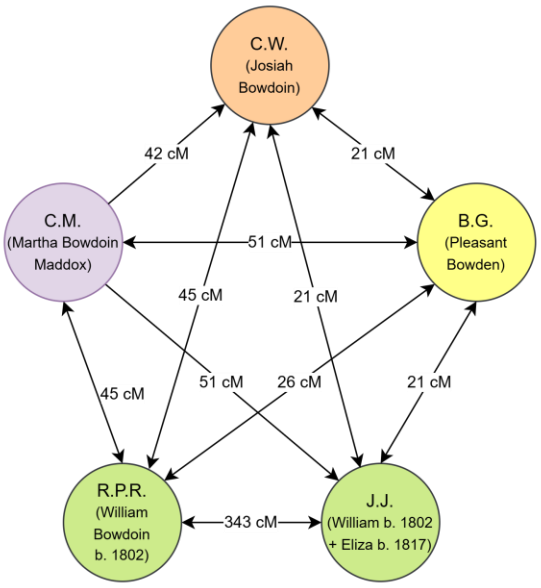
[12] If Robert inherited 50% of his DNA from each parent, 25% from each grandparent, and 12.5% from each great-grandparent, he would have inherited a theoretical 6.25% from a great-great-grandparent. 6.2% is in fact an *over*-representation of what we would expect him to share with descendants of William Bowdoin (b. 1740), in theory a 4th great-grandfather; but this characterization is also oversimplified. What I am calling "matches from descendants of William Bowdoin (b. 1740)" includes the matches from both Josiah Bowdoin and Martha Rebecca Bowden Maddox, whom, as you will see, I believe are closer relatives. 6.2% is about the expected amount to represent the contributions of both the parents of William Bowdoin (b. 1802). This total includes at least some DNA from his mother that I have not yet differentiated from Bowdoin. Also, this chromosome mapping is unfinished, incomplete, and ongoing. So far, I have mapped about 150 matches from the Ancestry matrix, not all of whom are descendants of William Bowdoin (b. 1740). The 6.2% total consists of 80 matches, identified from GEDmatch, MyHeritage, and Family Tree DNA, including some who were not part of the Ancestry matrix.

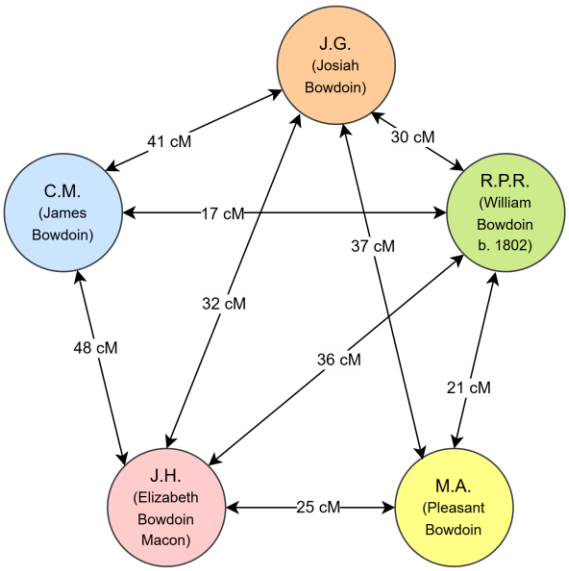
John Bowdon (b. ca. 1739), five from son Travis Bowdon (b. ca. 1750), and two from daughter Sarah (Bowdon) Nichols. Apart from one outlier at 34 cM, these matches all fall between 8 and 16 cM. No other Bowdoin, Bowdon, or Bowden family has matches to Robert that are as close or as numerous as the descendants of William (b. 1740), or who have clear triangulation with other Bowdoin matches.

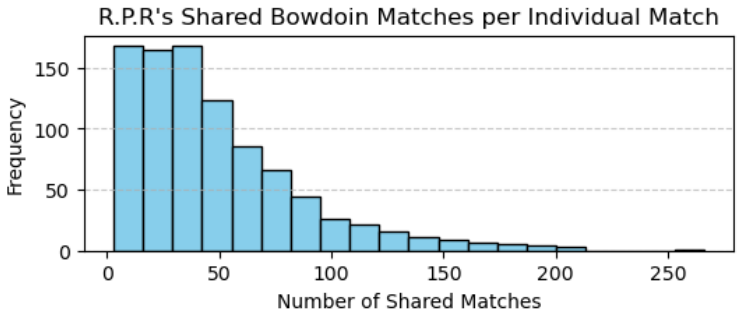
We can therefore move forward with confidence that we are on the right path, that William Bowdoin (b. 1740) was the ancestor, likely the grandfather, of William Bowdoin (b. 1802). William (b. 1802)'s other descendants show the same affinity as Robert with William (b. 1740)'s descendants and the same consistent triangulation. William (b. 1802)'s descendants, matching as a group, can demonstrate for us other affinities as well. We turn next to their combined results.

Example Triangulations

Some examples of triangulation between descendants of different families from William Bowdoin (b. 1740). These are illustrative simplifications. I collected on average 50 Bowdoin-related shared matches per individual match (often out of many more shared matches I could not identify), so these clusters are generally much larger (and less graphable) than these diagrams.







William Bowdoin (b. 1802), matching as a group

I identified 134 fellow cousins of William Bowdoin (b. 1802) whom R.P.R. matches. These range from his closest relatives, his son and grandson and nieces, with cM values measuring between 1500 and 3500 cM, to far-separated descendants of Reddin Bowdoin's brother Joseph Arthur Bowdoin in Oregon, with matches as small as 8–10 cM, barely registering on Ancestry's scale.

Descendants of William Bowdoin (b. 1802) matching descendants of William Bowdoin (b. 1740)		
Who match…	**Count**	**%**
At least 1	106	78.5%
At least 2	94	69.6%
At least 5	66	48.9%

Considering the matches of the combined group of William's descendants demonstrates that the trend of Robert's matches—with a dominance of matches from descendants of William Bowdoin (b. 1740), and the highest of these matches from Josiah Bowdoin—holds true for other cousins as well. Of the 135 descendants of William (b. 1802), 106 (78.5%) matched at least one descendant of William Bowdoin (b.1740). 94 (69.6%) matched at least two William (b. 1740) descendants, and 66 (48.9%) matched at least five. The average cM value among all matches between a William (b. 1802) descendant and a William (b. 1740) descendant was 26.6 cM. So we can definitely state that the descendants of William Bowdoin (b. 1802) as a whole match the descendants of William Bowdoin (b. 1740).[13]

The table below presents a summary of the descendants of William Bowdoin (b. 1802) matching with descendants of each branch of the William Bowdoin (b. 1740) family. The first column shows the number and percentage of William (b. 1802)'s descendants who match at least one member of each other group. The second column is the total number of documented matches between the two groups. The third and fourth columns show the highest and average matches.

[13] These statistics are biased in several respects by factors outside my control. First, the descendants of William (b. 1740) whom Robert matches and the descendants of William (b. 1802) whom Robert matches are predisposed to match each other, since they match each other on the same DNA segments they match Robert on. Second, only shared matches with a cM value over 20 cM appear in the shared matches, so this average match value of 26.6 cM is naturally weighted toward higher matches. Still, the fact that the two groups match each other shows that Robert definitely received his William Bowdoin (b. 1740) DNA from the same Bowdoin ancestors as his cousins. The majority of descendants of William Bowdoin (b. 1802)—which I do believe Robert's matches account for—definitely do have matches with William (b. 1740) descendants that are large enough to appear. Finally, I have included in these statistics the matches with descendants of Josiah Bowdoin, since they *are* descendant of William (b. 1740), even though I believe these matches are closer than the rest. (By an oversight, I did not include Martha Rebecca Bowden Maddox's descendants, but in the interests of remaining unbiased, it may just as well that I did not.) Without Josiah's descendants, 99 out of the 135 William (b. 1802) descendants (73.3%) match at least one William (b. 1740) descendant. 73 (54.1%) matched at least two, and 35 (25.9%) matched at least five.

Descendants of William Bowdoin (b. 1802) matching with …				
Match group (descendants of)	**# who match at least one**	**Total matches**	**Highest match**	**Average match**
Eliza Bowdoin (b. 1817)	14 (10.4%)	31	34 cM	20.3 cM
Martha Rebecca Bowden Maddox	**110 (81.5%)**	**1076**	**73 cM**	**27.8 cM**
Josiah Bowdoin (b. 1780)	**86 (63.7%)**	**517**	**71 cM**	**26.4 cM**
Pleasant Bowden (b. 1785)	43 (31.9%)	232	53 cM	22.6 cM
James Bowdoin (b. 1764)	69 (51.1%)	243	35 cM	20.9 cM
John Bowdon (b. 1770)	25 (18.5%)	46	50 cM	21.7 cM
Travis Bowdoin (b. 1772)	26 (19.3%)	97	38 cM	19.1 cM
Elizabeth Bowdoin Macon (b. 1766)	31 (23.0%)	112	35 cM	21.3 cM
Martha Bowdoin Odell (b. 1768)	10 (7.4%)	22	35 cM	18.8 cM
Mary Bowdoin Macon (b. 1773)	19 (14.1%)	71	38 cM	21.3 cM
William Bowdon (b. 1720)	14 (10.4%)	46	39 cM	20.6 cM

Table 2: Summary of matches between descendants of William Bowdoin (b. 1802) and other match groups. The first column represents the number and percentage of William (b. 1802) descendants who match at least one member of each match group. The second column is the total number of matches with each group among all members of the William (b. 1802) group.

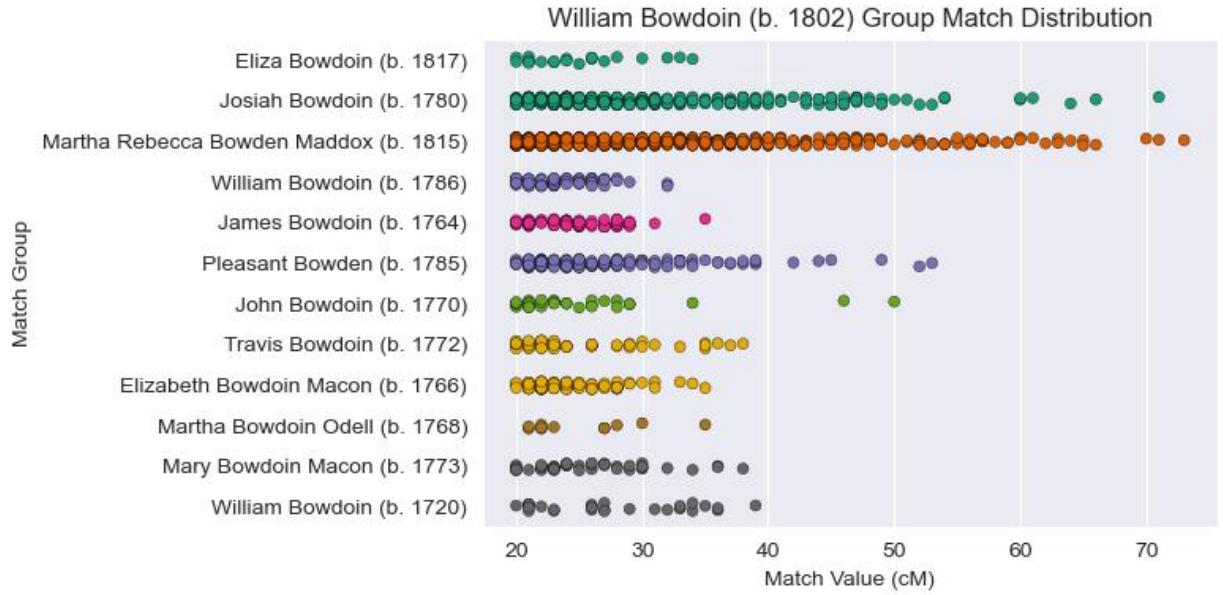


Figure 4: Strip plot of William Bowdoin (b. 1802) group matches with other Bowdoin match groups.

The table shows clearly that two classes stand out from the rest in both their likelihood of matching with William (b. 1802)'s descendants and the number and strength of their matches:

Josiah Bowdoin (b. 1780), the son of William Bowdoin (b. 1740), and Martha Rebecca Bowden Maddox (b. 1815). This implies a close relationship distance—that these people are somehow more closely related to the family of William (b. 1802) than the rest. All the other classes stand back as a pack, with high matches all within 10 cM of each other (a median 45 cM) and average matches within about 4 cM (a median 20.7).

I believe Josiah Bowdoin was the father of William Bowdoin (b. 1802) and Eliza Bowdoin (b. 1817). Unfortunately, the DNA findings do not show the same closeness between William's descendants and Eliza's descendants. I will examine this problem in the next section.

Eliza Bowdoin (b. 1817)

After admiring the close relationship of William Bowdoin and Eliza Bowdoin as siblings for so long, I was disappointed to discover how distant Eliza's matches are from us today. I don't know if it is the case for all William Bowdoin descendants—the only descendants whose complete matches I have access to are Robert P. Richardson and his immediate family, and two of his nieces—but the matches I have found between William's and Eliza's descendants are few and weak. At present, I have only identified thirteen descendants of Eliza Bowdoin (b. 1817), the sister of William Bowdoin (b. 1802), who match the Richardson-Bowdoin family. The highest observed cM-value match any of these thirteen descendants of Eliza Bowdoin has with a descendant of William Bowdoin is 34 cM.[14]

This is, I must admit, not only disheartening, but more than a little concerning for my conclusions. I have wondered more than once if William and Eliza were even full biological siblings. But when I back up and examine the facts and probabilities scientifically, I realize that these findings are not at all unusual for the relationship distances and are completely within expected ranges. I have grown accustomed to the extraordinarily numerous and high matches that Robert enjoys with other descendants of William Bowdoin (b. 1740), and it seems incongruous to have such low and few matches with a line that should be one or two generations closer than these. But after all, the relationships we are dealing with are quite distant, fourth cousins, removed once, twice, or even three times (4C1R, 4C2R, and 4C3R).

Relationship	R.P.R. value	Average value	Histogram Probability	Histogram Percentile
4C2R	32 cM	22 cM	10.5%	88.7%
4C1R	21 cM	28 cM	22.3%	64.5%
4C1R	21 cM	28 cM	22.3%	64.5%
4C2R	15 cM	22 cM	33.2%	56.4%
4C2R	14 cM	22 cM	33.2%	56.4%
4C1R	10 cM	28 cM	14.1%	14.1%
4C3R	10 cM	19 cM	24.7%	24.7%
4C2R	9 cM	22 cM	23.2%	23.2%
4C3R	9 cM	19 cM	24.7%	24.7%
4C2R	9 cM	22 cM	23.2%	23.2%
4C3R	9 cM	19 cM	24.7%	24.7%
4C2R	8 cM	22 cM	23.2%	23.2%
4C2R	8 cM	22 cM	23.2%	23.2%

Table 3: Matches between R.P.R. and descendants of Eliza Bowdoin (b. 1817) by her daughter Martha Catherine (Hackman) Rogers. Average (mean) match values and histogram probabilities from the Shared cM Project 4.0 tool v4 (https://dnapainter.com/tools/sharedcmv4).

The paucity of matches is probably due to several factors. Most importantly, Eliza probably had much fewer descendants than William, on account of the fact that she had only three children, and only two who lived to adulthood. We do, in fact, have nearer and closer matches to Eliza, but

[14] This view is limited by the matches Robert himself has. Other descendants of William Bowdoin (b. 1802), even those whom Robert matches, may very well have other and stronger matches with Eliza's descendants. In my limited view from Robert's matches, I have not seen any closer matches.

they get lumped into the larger pile of Richardson-Bowdoin matches. Because Sallie Ann (Hackman) Cooper, Eliza's youngest daughter, herself had only one child who lived to have her own family: and that was Nettie Cooper, who married Benjamin Read Richardson, Robert's uncle. Their granddaughter is in Robert's top ten matches.

Eliza's other child who lived to adulthood, Martha Catherine (Hackman) Rogers, moved to Texas. She appears to have had a fair number of descendants. Their matching so poorly with the descendants of Emily (Bowdoin) Richardson is more than likely due simply to the two lines "drawing" different DNA over a period of successive generations. The matches Robert shares with Martha Catherine's descendants do appear to triangulate as they should, sharing matches from both William Bowdoin (b. 1802) and William Bowdoin (b. 1740) in common.

Even with the apparent low matching between the Richardson-Bowdoin family and Eliza's Texas descendants, this compilation of matches nonetheless shows an affinity between the groups, with Eliza's descendants showing more matches to William's descendants and a greater likelihood of matching them than other groups. Eliza's descendants also share the same affinity

Descendants of Eliza Bowdoin (b. 1817) matching with …[15]

Match group (descendants of)	**# who match at least one**	**Total matches**
William Bowdoin (b. 1802)	**13**[16] **(100.0%)**	**31**
Martha Rebecca Bowden Maddox (b. 1815)	**9 (69.2%)**	**34**
Josiah Bowdoin (b. 1780)	**6 (46.2%)**	**16**
Pleasant Bowden (b. 1785)	3 (23.1%)	3
James Bowdoin (b. 1764)	2 (15.4%)	4
John Bowdon (b. 1770)	3 (23.1%)	3
Travis Bowdoin (b. 1772)	4 (30.8%)	8
Elizabeth Bowdoin Macon (b. 1766)	0 (0%)	0
Martha Bowdoin Odell (b. 1768)	0 (0%)	0
Mary Bowdoin Macon (b. 1773)	2 (15.4%)	6
William Bowdon (b. 1720)	1 (7.7%)	1

Table 4. Summary of matches between descendants of Eliza (Bowdoin) Hackman (b. 1817) and other match groups.

with Josiah Bowdoin's descendants that William's do, and also with Martha Rebecca Bowden Maddox's.

[15] Because these figures come from a very small sample size, only 13 individuals and 111 total shared matches, they were not enough for a meaningful statistical analysis. The match numbers are inconsistent and not representative of any observable distribution. I did not consider the max and mean values helpful or indicative.

[16] These 13 matches are all matches to Robert, so all match "at least one William (b. 1802) descendant." 6 of them (46.2%) also match at least one other William (b. 1802) descendant besides Robert.

So who is Martha Rebecca Bowden? Why does she appear so strongly in our matches? I wondered the same thing. I did not find the answer until late in this research, when everything else began to fall into place.

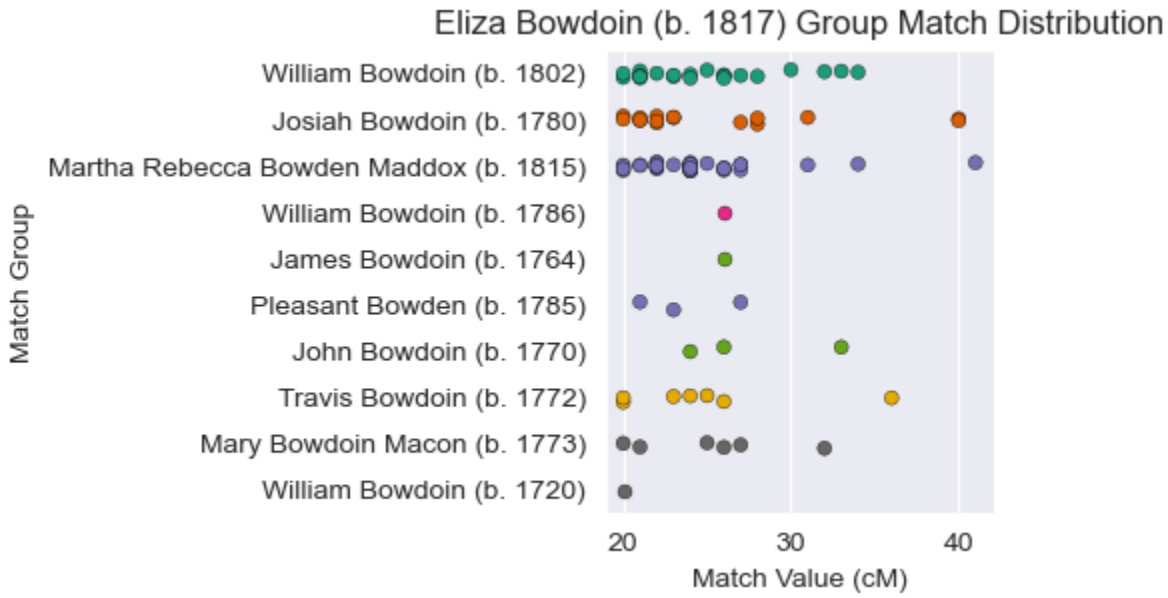


Figure 5: Strip plot of Eliza Bowdoin (b. 1817) group matches.

Martha Rebecca Bowden Maddox

In the first part, I briefly introduced Martha Rebecca Bowden (this is the spelling of the surname on her tombstone). She was born 6 Dec 1815 in either Georgia or North Carolina; census records are inconsistent as to her birthplace. She married her husband, Matthew M. Maddox, on 24 Dec 1835 in Monroe County, Georgia. By 1860, the Maddoxes had moved to Coffee County, Alabama, where they lived the rest of their lives. The "consensus" of online trees holds Martha to be a daughter of William Bowdoin (b. 1786), the son of James Bowdoin (b. 1764). As I have shown previously, this is not correct. An 1866 Monroe County deed listing the heirs of William does not include Martha Rebecca.[17] William had another daughter named Martha W. who was born in 1814. Martha Rebecca was not his daughter.

So Martha Rebecca Bowden, like William Bowdoin (b. 1802), is a genealogical "orphan," whose parents are unclear from available records. As with William, DNA may be our best resort for determining where in the family tree she belongs.

The DNA matches between William Bowdoin (b. 1802)'s descendants and the descendants of Martha Rebecca Bowden Maddox are numerous and overwhelming, at least so far as I can "see" through the lens of R.P.R.'s matches. Among the whole William group, there are more than twice as many matches to Maddox descendants as there are to Josiah Bowdoin's (currently 1076 matches versus 517). As I delved into and catalogued Robert's matches, I was, to be honest, quite perturbed by the sheer number and size of his matches with Martha Rebecca's descendants—dozens of them, cropping up everywhere, even among his very closest matches; every match I looked at seemed to be a Maddox. When I still assumed she was James Bowdoin's granddaughter, this seemed to be pulling the compass needle back in the direction of James when all the rest of the evidence was mounting in favor of Josiah. Why were so many of our closest matches to the Maddoxes? Try as I might, I could not dismiss the genetic proximity between our William Bowdoin (b. 1802) and Martha Rebecca Bowden (b. 1815) as a mere happenstance, as cousins who by some weird chance ended up sharing a lot of DNA. William's descendants did not have a comparable closeness to any other descendants of James Bowdoin.

And, as I eventually realized, neither did Martha Rebecca's. Just as William's descendants showed a closer relationship to Martha's than to any other branch of the family, likewise Martha's descendants showed the same closeness to the descendants of William (b. 1802)—and not to those of William (b. 1786) or James.

[17] Monroe County, Georgia, Deed Book O, 794, Alfred Bowdoin et. al. to Simeon T. Bowdoin, on FamilySearch, "Monroe County, Georgia, Deeds, 1822–1901," Image Group #008188800, https://www.familysearch.org/ark:/61903/3:1:3Q9M-CSLZ-5CV1 (Image 451 of 456) (accessed 10 Sep 2024).

Descendants of Martha Rebecca Bowden (b. 1815) matching with …[18]

Match group (descendants of)	# who match at least one	Total matches	Highest match	Weighted average match
William Bowdoin (b. 1802)	**128 (100%)**	**1076**	**104 cM**	31.7 cM
Eliza Bowdoin (b. 1817)	24 (18.9%)	34	41 cM	25.3 cM
Josiah Bowdoin (b. 1780)	**117 (91.4%)**	**1034**	**126 cM**	**36.3 cM**
William Bowdoin (b. 1786)	94 (73.4%)	317	64 cM	34.6 cM
James Bowdoin (b. 1764) (other branches)	38 (47.7%)	223	73 cM	35.5 cM
Pleasant Bowdoin (b. 1785)	93 (72.7%)	614	78 cM	32.8 cM
John Bowdon (b. 1770)	38 (29.7%)	57	52 cM	28.4 cM
Travis Bowdoin (b. 1772)	43 (33.6%)	125	60 cM	34.0 cM
Elizabeth Bowdoin Macon (b. 1766)	48 (37.5%)	130	51 cM	31.7 cM
Martha Bowdoin Odell (b. 1768)	18 (14.1%)	34	39 cM	26.6 cM
Mary Bowdoin Macon (b. 1773)	55 (43.0)%	125	42 cM	30.3 cM
William Bowdon (b. 1720)	35 (27.2%)	65	46 cM	33.0 cM

Table 5: Summary of matches between descendants of Martha Rebecca Bowden Maddox (b. 1815) and other match groups. Note that this table uses a weighted average (see footnote).

These graphs show the much greater proportion of the William Bowdoin (b. 1802) and Josiah Bowdoin groups in the Martha Rebecca Bowden group's matches, as compared to either the William Bowdoin (b. 1786) group or the James Bowdoin (b.1764) group. William Bowdoin (b. 1786) supposedly was Martha's father, if the Ancestry "consensus" be believed, and yet Martha's descendants have only a third of the matches to William (b. 1786)'s descendants that they have to Josiah's descendants, and only about half the highest match.

[18] I used a weighted average match for this match group to account for the heavily imbalanced classes. Because there are more than ten times as many matches in the Josiah and William (b. 1802) groups as in the other groups, and because DNA match groups are, as a rule, bottom-heavy (there are many more low matches than high matches), the weighted average was necessary to keep the greater volume of low matches in the larger groups from weighing down their averages. For example, more than half the matches (549) in the Josiah group were 28 cM or smaller, which was heavier than the whole of the James group combined; so in the unweighted average, the James group's average came out higher than Josiah's because of its relatively fewer small matches (in fact, fewer matches overall). In the weighted average, each match was given a weight equal to the match value divided by ten, such that a 10 cM match was weighted 1; a 50 cM was weighted 5; a 100 cM match was weighted 10. In this way, higher matches counted for more in the average than lower matches. Since I applied the same weighted average to all classes, the outcome remains unbiased. Figure 7 shows the relative size of the groups by match count. Figure 6 shows the distribution of the matches in each group.

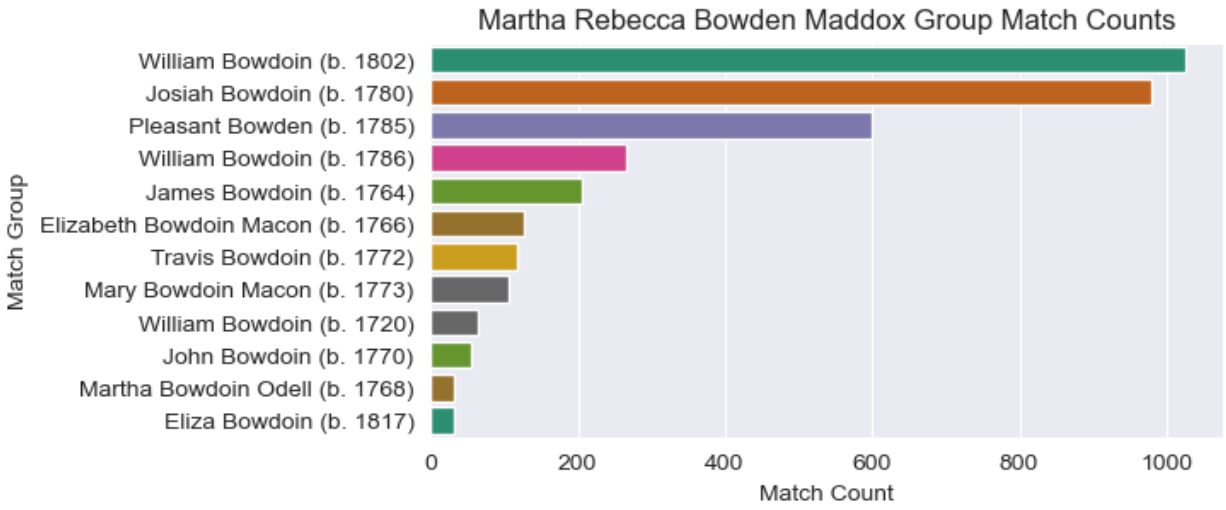


Figure 7: Group match counts for the Martha Rebecca Bowden Maddox group. This graph shows the proportions of the heavily imbalanced match groups.

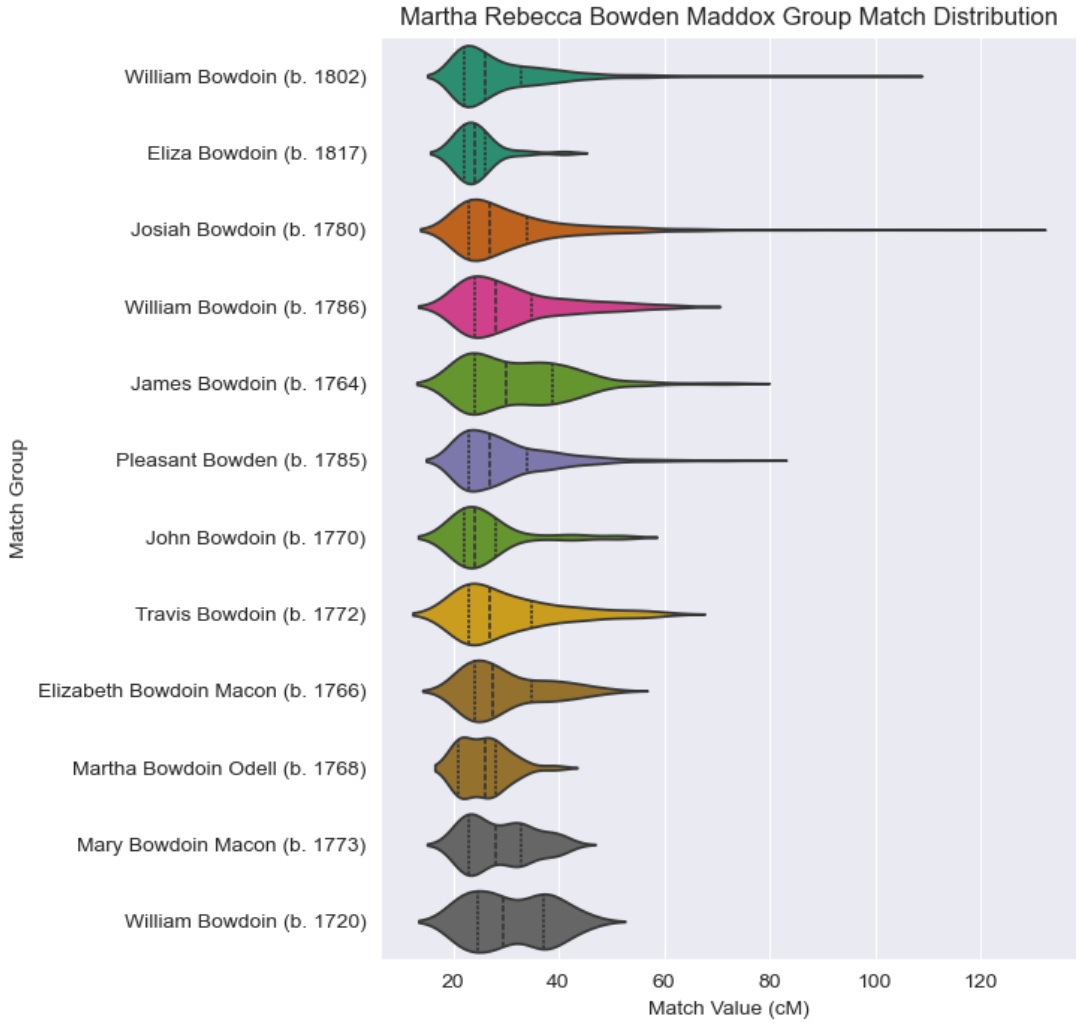


Figure 6: Violin plot showing distribution of group matches for Martha Rebecca Bowden Maddox Group. Dotted lines within violins show data quartiles. Width of violins shows the relative volume of matches in each cM range. In most classes, the largest proportion of matches is in the second quartile.

Even before I discovered the 1866 deed listing the children of William Bowdoin (b. 1786), and not listing Martha—and even before I discovered that U. Bowdoin Marsh did not include Martha in his list of William (b. 1786)'s children[19]—I had begun to suspect that something wasn't right. Martha's matches were too numerous, too high, and too close to my family's, for her to be a second cousin. I asked more than once if the Ancestry "consensus" for her parentage was verified. My unease became even more pronounced when I began to discover the Read and Spinks matches.

The Reads and Spinkses were two early neighbors to William Bowdoin (b. 1740) on the Deep River in southeastern Randolph County, North Carolina. When I first began to see the Spinks matches, I dismissed them as coincidence, figuring a DNA match from the same neighborhood was likely to be related to other area families too. But the first time I found the name of **Arthur Read** in a match's tree, it immediately set off alarm bells. Because with that name—I was already expecting such a connection.

And the Read and Spinks matches appeared to triangulate with Josiah Bowdoin's descendants, and with William (b. 1802)'s—and also with a third group, Martha Rebecca's. As long as I believed Martha Rebecca was a descendant of James Bowdoin (b. 1764), I did not know what to make of this; but as soon as I realized she was not, it clicked into place: **Martha Rebecca was a sister to William and Eliza, too.**

Read and Spinks

I had been suspecting a connection to a **Read** family for some time. The name *Reid* or *Read* —we were never sure how to spell it—in my ancestor's name, **Reddin Read Bowdoin**, and handed down to his grandson, **Benjamin Read Richardson**, and then on to his daughter, **Readie Ray Richardson**—was not a common one.[20] It had to be a family name, I had long thought. And then I discovered that John Culpepper Bowden, son of Josiah Bowdoin, also named a son **Enoch Reid Bowden**.

I found the first Arthur Read match by chance, examining triangulated matches between Robert and a Josiah Bowdoin match. Searching the Ancestry matches by surname for the name *Read*, I only found a few more matches at first. They appeared to triangulate, with Read matches having other Read matches in common, and with Josiah Bowdoin descendants. There was an **Isaac Washington Read**, son of Arthur Read, who kept cropping up. But in many people's trees, the connection was not immediately clear.

[19] Marsh, 68–69.

[20] Benjamin Read Richardson's name is spelled just so, *Benjamin Read*, on his tombstone. Documents from when he was alive, spell it variously both *Read* and *Reid.* I know of no contemporary documents of Reddin Read Bowdoin's middle name being spelled out. In the Enoch Bowdon family, the name is most often spelled *Reid*.

It was not until I joined the Randolph County Genealogical Society, in early October 2024, and gained access to their *Genealogical Journal*, that the dam broke. I quickly found a series of records that showed that Arthur Read was a close neighbor to William Bowdoin (b. 1740) in Randolph County—and that Arthur Read was married to **Martha Spinks**, daughter of **Enoch Spinks**.

> Guilford County, North Carolina, Marriage Bonds
> **Arthur Reade** to **Matty Spinks**, 23 Feb 1773
> **William Reade Sr.** {his mark}, bondsman.
> **Rt. Hall**, **William Searcy**, witnesses.

> Randolph County, North Carolina, Deed Book 8:26 (11 May 1798) Ransom SUTHERLAND of Wake Co., NC to **Lewis SPINKS**, for 40 shillings, a lot or acre of land surveyed out of the land on which **Enoch SPINKS**, dec'd, formerly lived, which contained the storehouse which SUTHERLAND then occupied, and which was devised to **Martha REID** by **Enoch SPINKS**. w/ **William BOWDOWN** who proved Aug 1798.

> Randolph County, Court of Pleas and Quarter Sessions
> February Term 1814
> Ordered that William Carr, **Arthur Read**, Thomas Golston, **William Armstead**, **Travis Bowdown**, Reuben Pierce, **William Bowdown**, Richard Tomlinson**, Josiah Bowdown**, James Johnson, William Pierce & Joel Henry be appointed a Jury to turn the Hillsborough road into the Chatham road about a mile from where Moors road crosses the same, leading directly into the Hillsboro road again at the old store where William Searcy now lives & report to next court.

Following my hunch, I suggested that we leverage the ThruLines tool, and add Arthur Read and Martha Spinks as the parents of Josiah Bowdoin's unknown first wife. Within a day, the tool had discovered more than 70 people among Robert's matches who were descended from Arthur Read and Martha Spinks, and more than 100 descended from Enoch Spinks.[21]

Most of these Read and Spinks matches, the ones I have included in my findings below, are strongly triangulated with each other and with the descendants of Josiah Bowdoin—and with us, the descendants of William Bowdoin (b. 1802). Only a few descendants of the other children of William Bowdoin (b. 1740) appear among the matches shared with Read and Spinks, and several of these have clearly identified Read and Spinks in their ancestry. It appeared strongly that the descendants of Josiah Bowdoin, and they exclusively, had Read-Spinks ancestry. Guided by these

[21] Because we have departed from the "orthodoxy" of having Arthur Read born in 1748 and dying in 1853 (see below), ThruLines shows exactly 1 descendant from Arthur Read himself, with the flock of 73 attached to his wife Martha. The 106 currently shown for Enoch Spinks (d. 1772), as of 29 Oct 2024, currently includes only 33 of the 73 grouped with Martha (Spinks) Read.

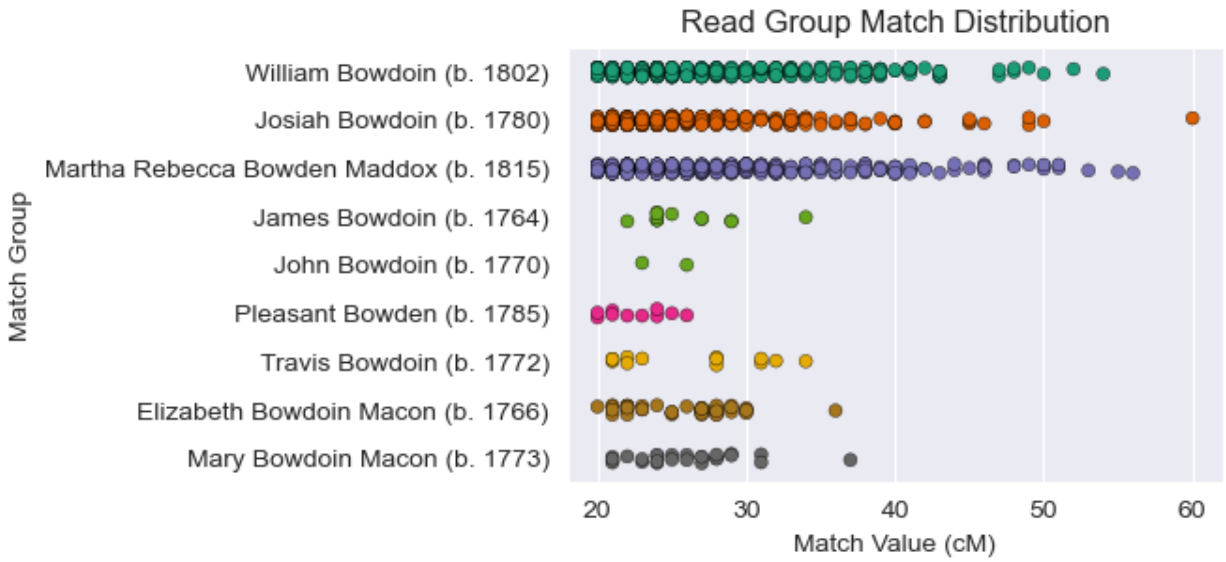
matches, my conviction began to mount that **Josiah Bowdoin's first wife was a daughter of Arthur Read and Martha Spinks**.

There was one major, glaring exception to the observation that no other branches of the Bowdoin family had consistent Read-Spinks shared matches: Martha Rebecca Bowden Maddox. Her descendants shared matches with Read and Spinks in even greater frequency than we of William (1802) did; greater even than Josiah's descendants did:

Match groups matching with Read and Spinks

Match group (descendants of)	**# who match at least one Read**	**Total Read matches**	**# who match at least one Spinks**	**Total Spinks matches**
William Bowdoin (b. 1802)	**64 (47.4%)**	**533**	12 (8.9%)	**30**
Eliza Bowdoin (b. 1817)	0 (0.0%)	0	**3 (23.1%)**	3
Martha Rebecca Bowden Maddox	**104 (81.9%)**	**461**	**27 (21.3%)**	**30**
Josiah Bowdoin (b. 1780)	**64 (61.0%)**	**339**	**14 (13.3%)**	**15**
Pleasant Bowden (b. 1785)	10 (12.5%)	10	3 (3.8%)	3
James Bowdoin (b. 1764)	10 (12.5%)	10	0 (0%)	0
John Bowdon (b. 1770)	2 (13.3%)	2	1 (6.7%)	3
Travis Bowdoin (b. 1772)	9 (17.3%)	13	1 (1.9%)	1
Elizabeth Bowdoin Macon (b. 1766)	14 (37.8%)	45	5 (13.5%)	12
Martha Bowdoin Odell (b. 1768)	0 (0.0%)	0	0 (0%)	0
Mary Bowdoin Macon (b. 1773)	9 (30.0%)	26	0 (0%)	0
William Bowdon (b. 1720)	0 (0.0%)	0	0 (0%)	0
Read	—	—	**27 (23.7%)**	**59**
Spinks	**11 (78.6%)**	**59**	—	—

Table 6: Summary of matches between descendants of Read and Spinks families with other match groups.



And the reverse, the number and percentage of members of the Read and Spinks groups who match at least one member of the other groups:

Read and Spinks groups matches with other groups

Match group (descendants of)	**Read (of 115) who match at least one of group…**	**Total Read matches**	**Spinks (of 14) who match at least one of group…**	**Total Spinks matches**
William Bowdoin (b. 1802)	**114 (100.0%)**	**533**	**14 (100.0%)**	**30**
Eliza Bowdoin (b. 1817)	0 (0%)	0	1 (7.1%)	3
Martha Rebecca Bowden Maddox	**75 (64.9%)**	**461**	**7 (50.0%)**	**30**
Josiah Bowdoin (b. 1780)	**74 (65.8%)**	**339**	**7 (50.0%)**	**15**
Pleasant Bowden (b. 1785)	10 (8.7%)	10	0 (0%)	3
James Bowdoin (b. 1764)	7 (6.1%)	10	0 (0%)	0
John Bowdon (b. 1770)	2 (1.7%)	3	1 (7.1%)	3
Travis Bowdoin (b. 1772)	12 (10.5%)	13	1 (7.1%)	1
Elizabeth Bowdoin Macon	12 (10.5%)	45	4 (28.6%)	12
Martha Bowdoin Odell (b. 1768)	0 (0%)	0	0 (0%)	0
Mary Bowdoin Macon (b. 1773)	8 (7.0%)	26	0 (0%)	0
William Bowdon (b. 1720)	0 (0%)	0	0 (0%)	0

Table 7: Summary of matches Read and Spinks groups have with other groups.

These tables illustrate clearly that the shared affinity shown between the William Bowdoin (b. 1802), Josiah Bowdoin, and Martha Rebecca Bowden Maddox extends to an affinity shared by all three groups with the Read and Spinks families of Randolph County, North Carolina. These matches center on the marriage between Arthur Read and Martha Spinks, with the majority of Read matches to their descendants. Matches I am categorizing as Spinks descend from Martha (Spinks) Read's siblings, the other children of Enoch Spinks Sr. As such, they represent an additional generation past the Read matches, and so are rarer to find.

Summary of catalogued Read and Spinks matches by known lineage

Lineage	# of matches
William Read (b. 1730)	—
Arthur Read (b. 1748)	—
Amy Read (b. 1787, married Lawler)	30
Isaac Washington Read (b. 1797)	37
Absalom Read (b. 1790)	3
William A. Read (b. 1795)	2
Raleigh Read (b. 1799)[22]	1
John Read (b. 1763)	3
William Isaac Read (b. 1756)	13
Annis Reid (b. 1773, married McDavitt)	4
Triangulated Read but undocumented or uncertain lineage	22
Enoch Spinks Sr. (d. 1772)	—
Lewis Spinks (b. 1756)	6
Enoch Spinks Jr. (b. 1762)	2
Jess Garrett Spinks (b. 1747)	1
Raleigh Spinks (b. 1763)	2
Sarah Spinks (b. 1766, married Hunsucker)	1
John Carpenter Spinks (b. 1747)	2

Table 8. Summary of catalogued Read and Spinks matches by known lineage. The value in the right column is the total of catalogued matching individuals descending from each lineage.

There are other Read and Spinks matches too that I have not yet catalogued. I have been especially conservative about adopting Read and Spinks matches from ThruLines' list of descendants without verifying their lineage and triangulation. Many of the matches suggested in ThruLines, especially from Spinks, have proved to be invalid, either having Spinks lineage but being maternal matches to R.P.R. rather than paternal, or otherwise lacking in triangulation. The proposed Spinks connection is a distant one—Enoch Spinks would be Robert's fifth great-grandfather, if my hypothesis about William Bowdoin (b. 1802)'s mother being a Read is

[22] Raleigh Read is identified in many family trees as "Isaac Raleigh Read," but he appears in records as Raleigh Read. Given that Arthur Read already had an older son named Isaac, Raleigh also being named Isaac is questionable.

correct—so even if his matches do have Spinks ancestry, that ancestry being visible in an autosomal DNA match is near the limits of autosomal matching.

Another sister

Based on these DNA findings, it appears likely to me that Martha Rebecca Bowden Maddox (b. 1815) was another daughter of Josiah Bowdoin and his first wife, Ms. Read. I have already shown through documents that she was not the daughter of William Bowdoin (b. 1786), as most trees claim, since she was not listed among his heirs. The DNA evidence shows clearly that Martha's descendants do not have either close or numerous matches to the descendants of William (b. 1786) or his father James (b. 1764). Instead, they have an overwhelming number of matches, and closer matches, to the descendants of Josiah Bowdoin and William Bowdoin (b. 1802). The clear triangulation with Josiah's and William's descendants on the Read and Spinks matches clinches the case for me. The weight of this combined evidence is too heavy for any other conclusion.

Josiah Bowdoin, on the 1820 census of Putnam County, Georgia, did have unidentified daughters under the age of ten living in his household:

> 1820 Federal Census, Putnam County, Georgia[23]
>
> - Josiah Bowdin
> - 1 white male, age 26 to 44 (born 1776 to 1894) *[Josiah]*
> - 1 white female, age 26 to 44 (born 1776 to 1894) *[wife of Josiah]*
> - 3 white males, age 10 to 16 (born 1804 to 1810) *[both unknown]*
> - 3 white males, age under 10 (born after 1810) *[John C.; 2 unknowns]*
> - 3 white females, age under 10 (born after 1810) *[Martha (b. 1815), Eliza (b. 1817), other ?]*

There are few other possibilities for Martha's parentage, judging by the 1820 census. William Bowdoin (b. 1786), Martha's reputed father in the "consensus" of trees, had only one daughter under the age of ten in 1820, his documented daughter, Martha W.[24] Travis Bowdoin (b. 1795), son of James (b. 1764), had one daughter under ten who was probably Sarah A. Bowdoin (b. April 1820).[25] Pleasant Bowden (b. 1785), son of William (b. 1740), had unidentified daughters in that age range, but was already in Alabama by 1820.[26] Travis Bowdoin (b. 1772), son of William (b. 1740), likewise had unidentified daughters in that age range, but was still in North Carolina in

[23] "Josiah Bowdin" on 1820 U.S. Federal Census, on FamilySearch, "United States Census, 1820," https://www.familysearch.org/ark:/61903/1:1:XHLX-RG9 (accessed 23 Sep 2024).
[24] "William Bowdin" on 1820 U.S. Federal Census, on FamilySearch, "United States Census, 1820," https://www.familysearch.org/ark:/61903/1:1:XHLX-5TC. See part one of this report, 44–48.
[25] See Marsh, 50–51.
[26] See part one of this report, 87.

1820 and already in Tennessee by 1825.[27] It would seem unlikely in either case for a daughter to have traveled to Georgia to be married in 1835.

I have not identified Josiah Bowdoin on the 1830 census. In 1840, he was still living in Jasper County, Georgia, not yet having moved to Meriwether County, his final place of residence.[28] Jasper County borders Monroe County, so it is not unreasonable that a child of Josiah Bowdoin would have married someone there.

It is unfortunate that Josiah Bowdoin did not leave more of a paper trail. He left no will or other estate record, and I have not found an obituary. But I did find a deed that proves a connection between Josiah Bowdoin and Matthew M. Maddox, the husband of Martha Rebecca Bowden:

> Georgia, Monroe County. 26 Jul 1848, Mathew M. Maddox to Mark M. Maddox. $700 for a 180-acre parcel of land in the eleventh and twelfth districts of Monroe County. Signed Mathew M. Maddox. Witnesses, J. R. Maddox, **Josiah Bowdoin**, Jona Johnston J.P. Recorded 11 Mar 1880.

This deed was recorded in 1880, many years after Josiah Bowdoin's death in 1857. The connection it presents is circumstantial, but it is entirely plausible that Josiah Bowdoin witnessed a deed for his son-in-law. Combined with the DNA evidence, this deed begins to be persuasive.

Martha Rebecca Bowden (b. 1815) being a sister to William (b. 1802) and Eliza (b. 1817) does explain the DNA results showing her descendants to be so closely related to William's and to Josiah Bowdoin's other descendants. It also fits the available genealogical evidence better than the "consensus" view that she was the child of William (b. 1786), which is contradicted by other evidence.

In all, I have catalogued 128 individuals descended from Martha Rebecca Bowden Maddox who match R.P.R., with more than 5,000 shared matches across all groups. There are still dozens more individual Maddox matches I have not harvested. This bumper crop is owed largely to the fact that the Maddoxes themselves had a prodigious number of children, at least fifteen; and their children continued to be fruitful and multiply. The vast number of descendants means not only that there are that many more to match, but that in the wide distribution of DNA, the likelihood of descendants having the same DNA that Robert received is greatly increased.

This trend, in fact, accounts in large part for the high matches the Martha Rebecca group shows across the board with other groups as well. Since there are so many catalogued descendants, the likelihood increases that at least one match out of the many will have a high match value with each group.

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[27] *Ibid.*, 63–65.

[28] "Josiah Bowdoin" on 1840 U.S. Federal Census, on FamilySearch, "United States Census, 1840," https://familysearch.org/ark:/61903/1:1:XHBN-CWM (accessed 23 Sep 2024).

Read and Spinks naming patterns among Josiah Bowdoin descendants

As I mentioned before, what caused me to take notice of the Read family to begin with was the name *Read* that had been repeated in my branch of the Bowdoin and Richardson family—Reddin **Read** Bowdoin, Benjamin **Read** Richardson. Mine is not the only one. Knowing now of the connection to both the Read and Spinks families, I can note both Read and Spinks names being handed down in the families of several of Josiah's children. Below I list them with their namesakes.

- **Enoch** Bowdon (b. 1801) — Enoch Spinks
  - William T. Bowdon[29]
    - Henry **Arthur** Bowden — Arthur Read
  - **Enoch** Manson Bowdon — Enoch Spinks
  - **Raleigh** Bowdon — Raleigh Spinks[30]
- William Bowdoin (b. 1802)
  - William A. Bowdoin
    - Edward **Read** Bowdoin — Read family
    - James **Arthur** Bowdoin — Arthur Read
    - **Isaac** J. Bowdoin — Isaac Washington Read[31]
  - Joseph **Arthur** Bowdoin
  - Reddin **Read** Bowdoin
    - Sarah Emily Elizabeth (Bowdoin) Richardson
      - Benjamin **Read** Richardson — Read family
        - **Readie** Ray Richardson — Read family
  - **Isaac** Butcher Bowdoin — Isaac Washington Read
- John Culpepper Bowden (b. 1813)
  - **Enoch Reid** Bowden — Enoch Spinks, Read family
  - **Raleigh Spinks** Bowden — Raleigh Spinks
- Martha Rebecca Bowden (b. 1815)
  - Alfred **Reed** Maddox — Read family

With names as specific as **Enoch Reid** and **Raleigh Spinks**, the repetition of these names in common with the Read and Spinks families—names not found anywhere else in the Bowdoin family—becomes hard to dismiss as mere coincidence.

[29] William T. Bowdon (1828–1904) is an ancestor of author Stephen King (as featured on PBS's *Finding Your Roots*, Season 2, Episode 1).

[30] There were several men named Raleigh Spinks (often spelled phonetically *Rolley*) in the Spinks family, and the name may have preceded Enoch and Amy Spinks.

[31] The name *Isaac* likely preceded Isaac Washington Read. A man named William Isaac Read (b. ca. 1756) appears to have been Arthur Read's brother.

Triangulation, clustering, and chromosome mapping

In previous papers, where matches showing a connection to a distant ancestor were few and far between, I presented examples of triangulation and clustering among the different testers as support for the connection.[32] In this case, where there and hundreds of testers, dozens of people in a local cluster, and all are truthfully part of one very large cluster, presenting evidence of it is a more difficult task, in terms of *narrowing down* the data to present. I have already shown examples of triangulation between matches earlier in the paper (see page 11).

I hope that my presentation of matching between the match groups demonstrates the connection between these groups and their common ancestor. Bear in mind that when I show that there are, for example, 517 matches between the William Bowdoin (b. 1802) group and the Josiah Bowdoin group, these are not just matches between "any" descendant of William Bowdoin and "any" descendant of Josiah Bowdoin, but 517 specific, catalogued matches between the 135 collected members of the William Bowdoin group and the 108 collected members of the Josiah Bowdoin group. The matches cross and overlap, with most testers matching multiple others in the other groups.

One concrete and definite way to demonstrate shared ancestry is through graphing and triangulating matches in a chromosome browser and charting these matches on a chromosome map. If Ancestry featured a chromosome browser, all of this work would have been a lot easier. It would also be a lot easier if more people, on Ancestry as well as on other sites, posted family trees along with their DNA tests. As it stands, chromosome mapping involves painstaking, time-consuming work of cross-referencing testers on Ancestry, GEDmatch, MyHeritage, and Family Tree DNA, and then trying to identify their family connection to mine.

Chromosome mapping, despite its toils, can be rewarding and can provide especially powerful evidence of an ancestral connection. Below, I will demonstrate the mapped matches at several of R.P.R.'s major Bowdoin matching locations and show how they prove my conclusions about Bowdoin-Read ancestry.[33]

Chromosome 4 Cluster

One of Robert's largest and most prominent Bowdoin locations is on Chromosome 4, beginning about 40M mb and ending about 100M mb.[34] The graph of the location is below.

[32] I gave some background information on the principles of triangulation and clustering in the appendix. See "Triangulation and clustering" on page 51.

[33] I can provide more identifying information about the matches upon request. R.P.R. is ZN108173C1 at GEDmatch.

[34] The unit here, mb, is *megabases*, measuring the physical location on a chromosome. These numbers are the start and end locations given for a match on GEDmatch, Family Tree DNA, MyHeritage, or other sites. *M* here stands for *million*, that is, the location begins at about 40,000,000 megabases and ends at about 100,000,000.

- The **goldenrod** color denotes matches with descendants of Reddin Read Bowdoin, R.P.R.'s great-grandfather, son of William Bowdoin (b. 1802). The three goldenrod matches shown at the top are close cousins of Robert, his closest cousins from William Berry Bowdoin (b. 1855), R. R. Bowdoin's oldest son—including W.B., the Y-DNA tester, and two of his close relatives, M.B. and K.B. These matches measure at about 54 cM.
- The **burnt orange** color denotes matches from Josiah Bowdoin, from children other than William (b. 1802), Martha Rebecca (b. 1815), or Eliza (b. 1817). In this case, I believe J.R.M. was most likely a descendant of Enoch Bowdoin (b. 1802).
- The **forest green** matches are unidentified matches that I have assigned to Sarah Emily Elizabeth Bowdoin, Robert's grandmother, meaning that even though I have not yet determined how they connect, I believe the DNA segment descends to Robert from her.

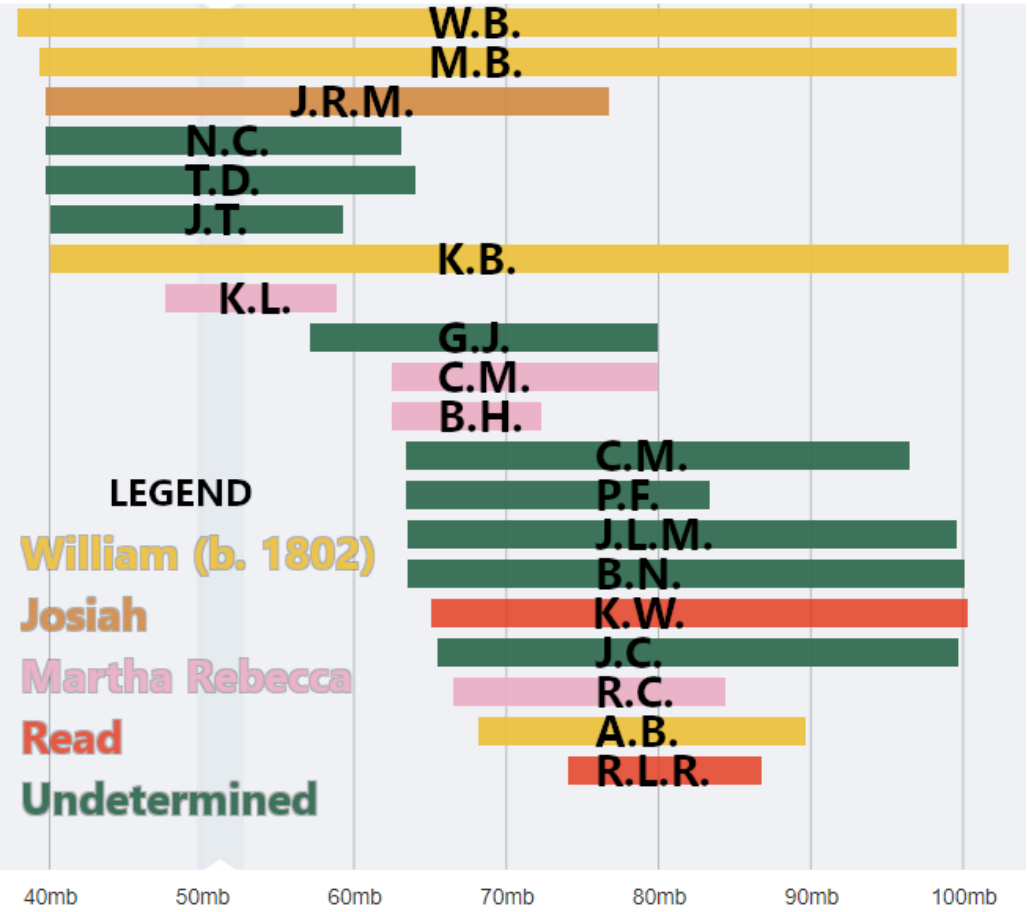

Figure 8: Bowdoin match cluster on Chromosome 4 (40M–100M). (Graphed at DNA Painter, https://www.dnapainter.com/)

- The **pink** color denotes matches with descendants of Martha Rebecca Bowden Maddox (b. 1815). Several of these matches shown here are among those used in the Ancestry matrix of this study. These matches measure between 8 and 16 cM.
- The **red** color marks confirmed Read descendants. The larger of the two Read matches here, K.W. with 32 cM, is a confirmed descendant of Amy (Read) Lawler (b. 1787).

The intersection of R.P.R.'s DNA with descendants of another child of Reddin Read Bowdoin, with a match value of about 54 cM, indicates that this DNA came from either Reddin Read Bowdoin or his wife, Ann Elizabeth Caroline Green.

The matches with a probable Enoch Bowdon descendant and Martha Rebecca Bowden Maddox's descendants clarify that this DNA segment did come from Reddin Read Bowdoin and from his father, William Bowdoin (b. 1802). The match could have come from either of William's parents, either from his father (whom I believe to be Josiah) or from his mother (whom I believe to have been Ms. Read). Since William, Enoch, and Martha Rebecca were all Bowdoins, the intersection of these segments does not necessarily demand that they were siblings. They could have been cousins and received the same DNA from their respective fathers.

But with the addition of the Read matches—from two different branches of the Read family—the origins of the segment narrow. If William (b. 1802) had the segment, and it came from the Read family, then he must have had a Read ancestor. If both Enoch and Martha Rebecca also had the segment, they must also have had a Read ancestor. The Ancestry clustering has already shown that only the William (b. 1802), Martha Rebecca, and Josiah groups had Read matches as a rule; descendants of the other children of William Bowdoin (b. 1740) did not. So this intersection excludes the possibility that the Read ancestry came from the paternal, Bowdoin side.

We have argued that Josiah Bowdoin, the father of Enoch Bowdon, was also the father of both William Bowdoin (b. 1802) and Martha Rebecca Bowden (b. 1815) and that their mother was a Read. This triangulation of matches is consistent with that. It is proof that all three lines, Enoch, William, and Martha Rebecca, received Read DNA. Since only these three lines occur here, and not any matches from other branches of William Bowdoin (b. 1740), this stands as evidence that the Read ancestry came from their maternal side—the same mother for all three.

Chromosome 3 Cluster

This cluster on Chromosome 3 contains more large Bowdoin matches for R.P.R., this time on the paternal side.

- In this case, **goldenrod** again indicates Reddin Read Bowdoin descendants. There is only one R. R. Bowdoin match in this set, G.P., the third from the bottom, a descendant of Reddin's daughter Mary Catherine (Bowdoin) Norris (b. 1857), measuring 20 cM.

- The **burnt orange** color denotes matches from Josiah Bowdoin, from children other than William, Eliza, or Martha Rebecca. As it happens, all of these matches are from Josiah's oldest son, Enoch Bowdon, by three different children of Enoch:
    - Mary Jane (Bowden) Sullivan (b. 1827) – 3 testers: L.H., P.K.H., and S.K.F., 27–28 cM, all close relatives to one another.
    - Rebecca Ann (Bowden) Maness (b. 1831 – 1 tester, L.R., 16 cM.
    - Ellen (Bowden) Chenoweth (b. 1843) – 1 tester, P.I.B., 28 cM.
- The **forest green** color again shows unidentified matches that I have assigned to Sarah Emily Elizabeth Bowdoin.
- The **lemon yellow** color marks matches from descendants of William Bowdoin (b. 1740) from other children than Josiah. In this case, I have identified two testers, R.D.F. (27 cM) and T.H. (18 cM), with separate lines from Mary (Bowdoin) Macon:
    - Thomas Macon (b. 1793) > Mary Macon (b. 1823, married Fesmire) > Simon Macon Fesmire (b. 1852)
    - Thomas Macon (b. 1793) > Mary Macon (b. 1823, married Fesmire) > Martha Jane Fesmire (b. 1853, married Chance)

The frequency of these matches to Josiah Bowdoin's descendants, as compared to other children of William Bowdoin (b. 1740), supports the connection of William (b. 1802) to Josiah.

I have poked and prodded at this cluster in search of matches to other children of William Bowdoin (b. 1740), but they are not easily forthcoming. The problem with matches to Macon-Bowdoin lines is I can foresee someone claiming them as the elusive evidence of William Bowdoin's wife being a Macon (see the "William Bowdoin (b. 1740)" section in part one of this

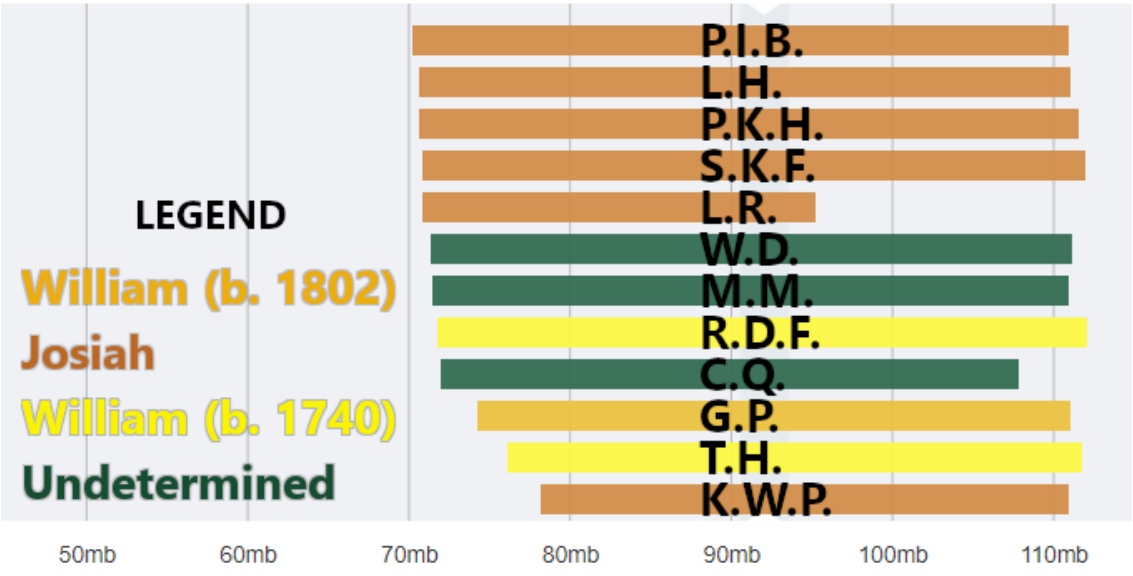

Figure 9: Bowdoin match cluster on Chromosome 4 (70M–110M).

paper). Without additional triangulation, either from another Bowdoin or another Macon, I cannot completely exclude that, but the default assumption, given that both Josiah Bowdoin and Mary (Bowdoin) Macon are well documented children of William Bowdoin and his wife and were full siblings, is that the DNA here comes from their shared parentage, not from some more distant Macon connection. I know of no other firm evidence, either documentary or genetic, to support William's wife Mary being a Macon.

Given the frequent and large matches here from Josiah Bowdoin—I found another one while writing this section—and that the matches from Mary (Bowdoin) Macon are close to the same length, this cluster appears to come from one of their parents, either William Bowdoin (b. 1740) or his wife Mary. It offers strong support for Josiah Bowdoin being the father of William (b. 1802).

Chromosome 2 Clusters

On Chromosome 2, Robert has two different, nearby Bowdoin-Read-related clusters. This is one of the most complex but potentially important regions I have come across in Robert's mapping. I feel I am only beginning to unravel it. Still, I think there are several valuable observations I can make immediately.

Colors are the same as in previous cases:

- **Burnt orange** matches are from descendants of Josiah Bowdoin, from children other than William (b. 1802), Martha Rebecca (b. 1815), or Eliza (b. 1817). P.K.H., L.H., and S.K.H. are the same individuals, descended from Enoch Bowdon, who appeared previously in the Chromosome 3 cluster.
- **Pink** matches are from descendants of Martha Rebecca Bowden Maddox (b. 1815). C.M. appeared previously in the Chromosome 4 cluster. I have mapped several of the most frequently shared Maddox matches from Ancestry to this region and feel this may be the matching site of a large number of the Maddox matches.
- **Lemon yellow** matches are from descendants of William Bowdoin (b. 1740) other than Josiah Bowdoin. Six of these matches are from Pleasant Bowden (b. 1785):
    - Ellender Bowden (b. 1822, married Bell) > Rebecca Jane Bell (b. 1844, married Garrett) – 1 tester, K.H.
    - Alvaney Bowden (b. 1826, married Smith) > Mary Elizabeth Smith (b. 1845, married Chavers) – 1 tester, B.Y.B.
    - Alvaney Bowden (b. 1826, married Smith) > Ann Lucinda Smith (b. 1851, married Chavers) – 3 testers, D.B.C., R.C., and D.C.D. two from James Bowdoin (b. 1764).

  And two matches are from James Bowdoin (b. 1764):
    - William Bowdoin (b. 1786) > Alfred Benjamin Bowdoin (b. 1822) – 2 testers, D.C. and M.C.H.
- **Red** marks matches I have assigned to the Read-Spinks families.

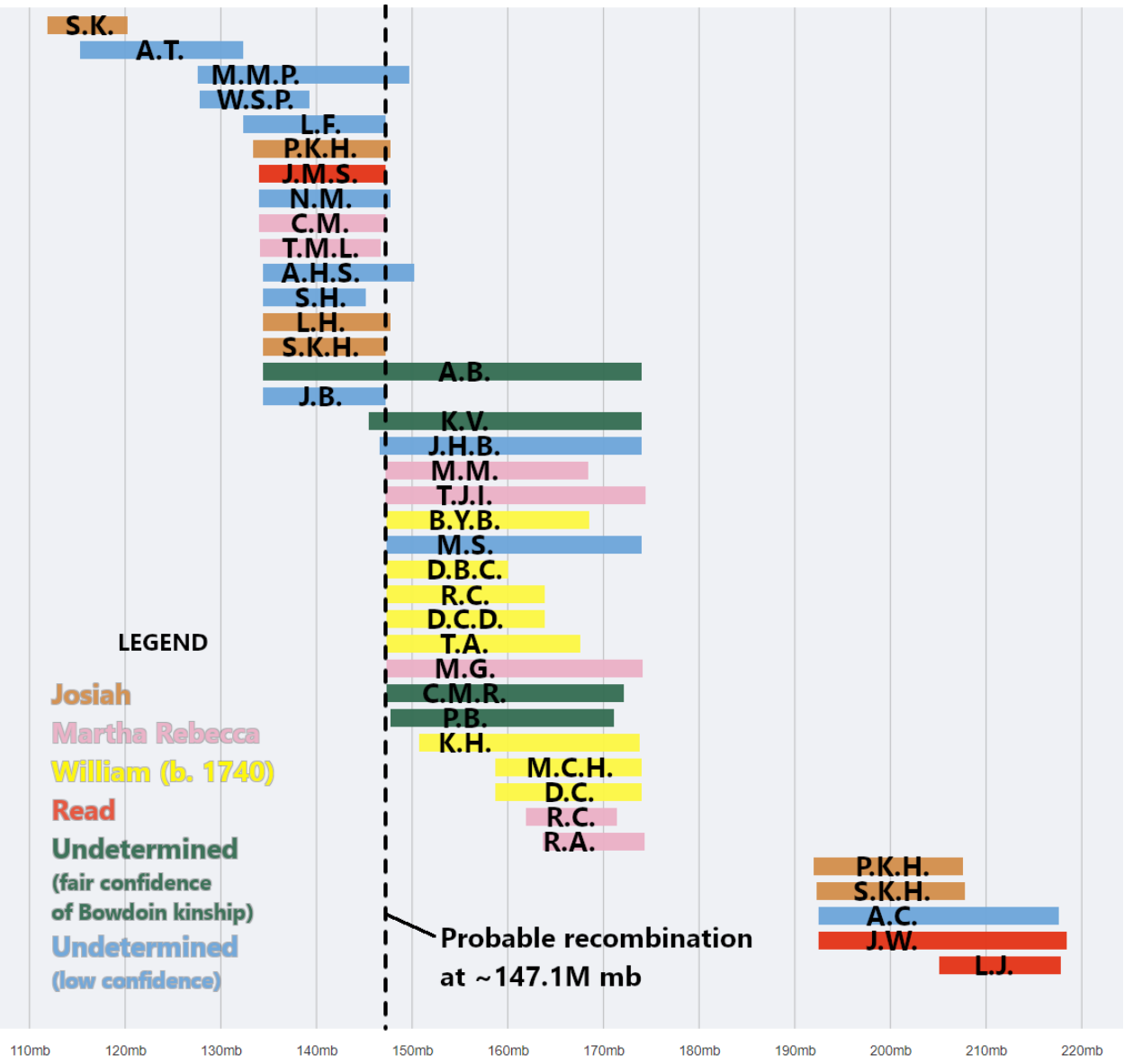

Figure 10: Two Bowdoin-Read clusters on Chromosome 2, about 130M–175M and 190M–220M.

- **Forest green** matches are matches I have not identified past assigning them to Sarah Emily Elizabeth Bowdoin's branch of the family.
- **Sky blue** matches are matches I have not identified past assigning them to Robert's paternal side. Their being sky blue means I have even less certainty about them than I have about the forest green matches. I have been turning these invisible for previous screenshots, but in this case, I left them in place to show how complicated these clusters are becoming.

The blue matches here are so uncertain because their linked trees contain names I have never seen before, with no common place names and no obvious place where they might connect to

our known ancestors. I suspect this cluster contains very old DNA from ancestors beyond what we know–which, admittedly, in the case of both the Bowdoin and Read families, is not very much.

It does appear that the left side of the first cluster is probably from Read-Spinks ancestry, since it intersects the red Read match; and the right side, containing matches with the Pleasant Bowden family, from Bowdoin ancestry. There is an apparent recombination point at about 147M, which I marked. You can tell this because of the "split", where a whole set of matches abruptly ends and a new set picks up on the other side of it. A recombination point is the point at which, for some ancestor, his or her DNA "crossed over" during meiosis, the stage of cell reproduction at which their parents' DNA divided in half during the formation of their egg or sperm cell. This means that the parental DNA in the cell switched at that point from the parent's mother to the parent's father.

The fact that there are pink matches—from Martha Rebecca Bowden—on both sides of the recombination is extremely important. This means that, for whichever ancestor whose DNA experienced the recombination, **both his or her parents were closely related to Martha Rebecca Bowden**. The **only** common situation in which this should occur is if Martha Rebecca Bowden were a full sibling to the owner of the DNA—that is, **if both his parents were also Martha Rebecca's parents**.

This DNA region, the whole segment from 110M to 175M, almost certainly came down to Robert unbroken from Reddin Read Bowdoin (b. 1831), his great-grandfather. The recombination visible here would have occurred when his father William Bowdoin (b. 1802)'s sperm cell was formed, which later went on to create Reddin's DNA when he was conceived. William had, on his *paternal* Chromosome 2, the segment on the right side, which he received from his father, matching Pleasant Bowden (his father's brother) as well as Martha Rebecca Bowden (his father's daughter). And William had, on his *maternal* Chromosome 2, the segment on the left side, which he received from his mother, matching the Read family, from her ancestors, as well as Martha Rebecca Bowden (his mother's daughter) and Enoch Bowdon (his mother's son). This whole region became part of Reddin Bowdoin's paternal chromosome, which he in turn passed on to his daughter, Sarah Emily Elizabeth (Bowdoin) Richardson.

The appearance of this recombination point, with Read matches combined with both Enoch Bowdon and Martha Rebecca Bowden descendants on one side, and Bowdoin matches combined with more Martha Rebecca Bowden descendants on the other side, is perhaps the clearest, most demonstrable evidence yet that William Bowdoin (b. 1802) was the son of Josiah Bowdoin and an unknown Ms. Read, who were the parents of all of Josiah Bowdoin's older set of children.

The one match that spans both sides of the recombination point, A.B. at 34 cM, I have not been able to identify, to my extreme frustration. I can only conjecture that it must be a descendant of Reddin Read Bowdoin who, like Robert, received the segment of DNA containing both sides of

this recombination. Any other descendant of William Bowdoin (b. 1802) would have matched only one side or the other, but not both sides continuously.[35]

The second cluster here, from about 190M to 220M, appears to be more DNA from Ms. Read, with one of the longest single Spinks segments I have mapped. The match with J.W., at 25 cM, is a descendant of John Spinks (b. 1747), the older brother of Martha (Spinks) Read, Ms. Read's mother. That Read-Spinks matches again coincide here with Enoch Bowdon matches is further evidence that Ms. Read was the mother of both Enoch Bowdon and our ancestor, William Bowdoin (b. 1802).

Agglomerative clustering

Agglomerative clustering, a type of hierarchical clustering, is a machine-learning (ML) algorithm that groups data points into clusters based on their distance from each other, and then from the bottom up, iteratively merges together the closest clusters to one another, forming a hierarchy. The resulting diagram, called a **dendrogram** (from Greek δένδρον, "tree" + γράμμα, "drawing") resembles, appropriately, a tree.

This dataset is uniquely suited to agglomerative clustering and to a dendrogram, since what we are doing is in fact grouping matches together into families based on their relationship distance and attempting to create a family tree. The cM value of matches is already a measure of distance, that is, the higher the value, the closer the relationship.

A greatly reduced and oversimplified rendition of the dendrogram is on the next page, for purposes of illustration. Many leaves (that is, the nodes at the ends of the branches) have been truncated, collapsed into the larger branches. And this is only a subset of the whole matrix; this is only the (supposed) descendants of Josiah Bowdoin, with 383 nodes. The dendrogram of the full matrix, with 924 nodes, I had to export to a Scalable Vector Graphics (SVG) file 80 inches wide just to make the branches and labels legible.

You will see in the dendrogram that the William Bowdoin (b. 1802) nodes merge together with each other, and then merge with the branches from Martha Rebecca Bowden and John Culpepper Bowden, and then eventually with the branches from Enoch Bowdon, Catherine Bowden, and eventually Eliza Bowdoin. This demonstrates visually that the matches for each tester from these respective branches do form clusters with one another and do eventually converge.

The true value of agglomerative clustering for this study is something this version of the diagram cannot show. In the full dendrogram, the fact that William Bowdoin's branches merge with Josiah

[35] In some rare cases, two children can have recombination events at nearly the same point and crossing onto the same two chromosomes, such that they can have matches that appear in DNA tests to match across the recombination point.

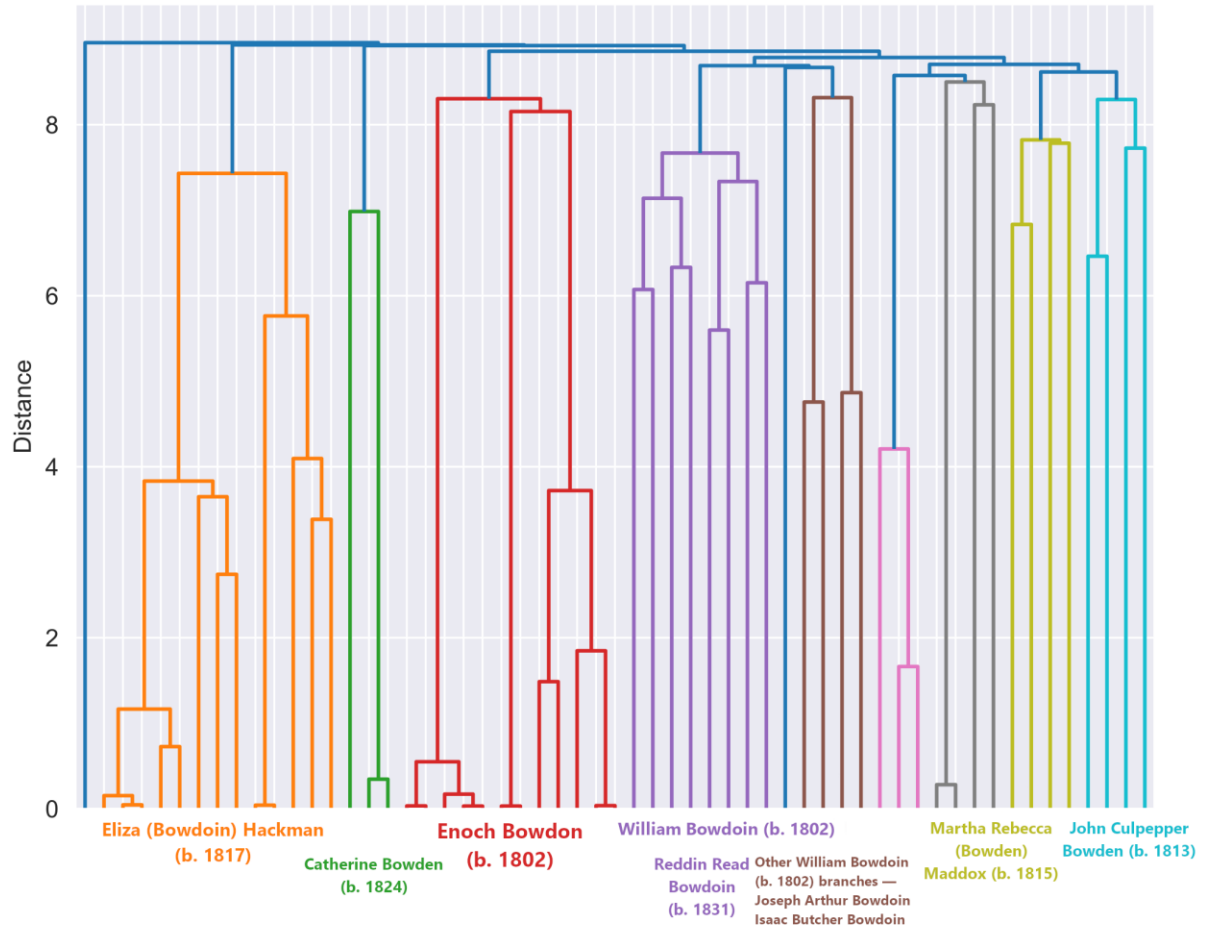

Figure 12. Agglomerative clustering dendrogram for Josiah Bowdoin family.

Bowdoin's branches, rather than James Bowdoin's or Pleasant Bowden's or anyone else's, serves to confirm our observation that the William Bowdoin family is closer genetically to the Josiah Bowdoin family than to any other.

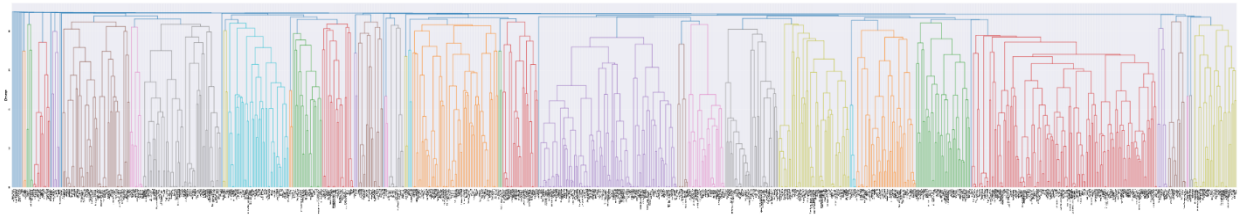

Figure 11: Zoomed-out view of dendrogram for full matrix.

Bayesian probability

Bayesian probability is a concept of probability that allows an initial assessment of the probability of a hypothesis to be reevaluated with evidence from new observations, giving a new mathematical estimate of the overall probability. For a very basic example, suppose you know that on a typical day, there is about a 20% chance that it will rain. Additionally, when it is sunny, nine times out of ten it won't rain, and only one time out of ten it will rain, while if it's not sunny, there's about a 50-50 chance either way. Even further—you know that there is a 99% chance that it will rain if you just washed your car, and if you didn't wash your car, only a 1% chance.

	Will rain	**Won't rain**
Prior probability	0.2	0.8

	Will rain	Won't rain
Sunny	0.1	0.9
Not sunny	0.5	0.5

	Will rain	**Won't rain**
Washed car	0.99	0.01
Didn't wash car	0.01	0.99

Now, suppose on a given day, it's sunny and you've just washed your car. We can start with the basic fact that on any given day, there's only about a 20% chance that it will rain. This is called the **prior probability**. And we can combine that with the **conditional likelihood** of the other facts that we observe. We multiply together the probability estimates:

Will rain:	0.2 × 0.1 × 0.99 = **0.0198**	Normalized:	**73%**
Won't rain:	0.8 × 0.9 × 0.01 = 0.0072		27%

Looks like you just washed your car for no reason.

Bayes' theorem tells us that:

$$\text{Posterior probability} = \frac{\text{Prior probability} \times \text{Likelihood}}{\text{Total evidence}}$$

The point of all this is that we can apply it to chaining together genealogical evidence as well, particularly to DNA.

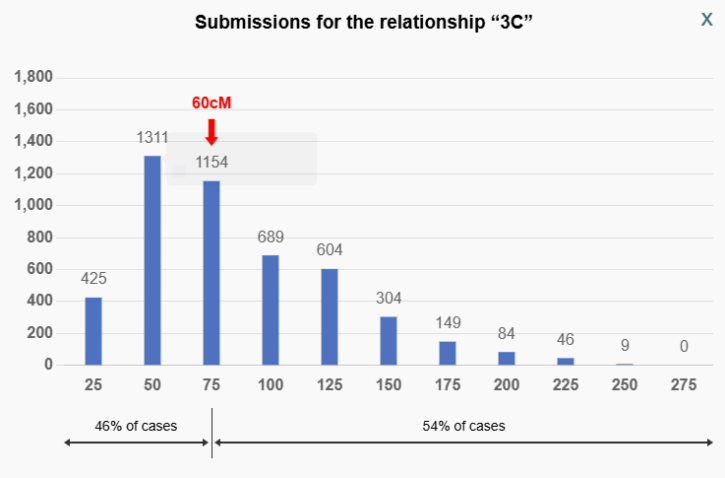

Figure 13: Histogram for 3C. Original from Shared cM Project Version 4.0. Annotations generated by Shared cM Project 4.0 tool v4 at DNA Painter (https://dnapainter.com/tools/sharedcmv4)

Relationship probability

Based on the shared cM value of a DNA match, experts have drawn probabilities of what relationship the DNA match represents. Ancestry, MyHeritage, Family Tree DNA, and other sites all give their statistical estimates of the probable relationship given a match.

We have, based on thousands of observed DNA tests, a series of relationship probabilities based on the shared cM value of a DNA match, published as part of the **Shared cM Project Version 4.0**, by Blaine T. Bettinger of the *Genetic Genealogist*.[36] Jonny Perl of DNA Painter has produced a handy online tool for dispensing these probabilities. Given, say, a 60 cM DNA match, we can see (see Figure 14) that there is a 30% probability of the match being from a third cousin once removed (3C1R) or second cousin three times removed (2C3R), a 22% probability of the it being from a third cousin (3C) or second cousin twice removed

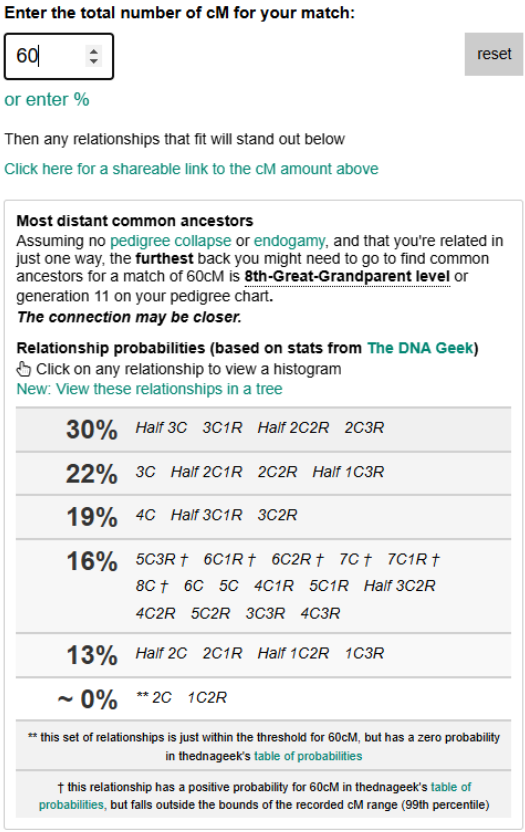

Figure 14: Relationship probability estimator from Shared cM Project Version 4.0 Tool at DNA Painter (https://dnapainter.com/tools/sharedcmv4).

[36] Blaine T. Bettinger, "Shared CM Project Version 4.0," *The Genetic Genealogist*, 27 Mar 2020, https://thegeneticgenealogist.com/wp-content/uploads/2020/03/Shared-cM-Project-Version-4.pdf (accessed 15 Nov 2024).

(2C2R), a 19% chance of it being from a fourth cousin (4C) or third cousin twice removed (3C2R)—and so forth.

These relationship probabilities are drawn in part from histograms of shared cM distributions from observed DNA tests, part of the Shared cM Project as mentioned above. Based on the histogram for third cousins (3C) (see Figure 13), there have been, as of the release of Version 4.0 in 2020, 4775 submitted examples of matches between third cousins. 1154 of those samples fell into the histogram bucket containing samples between 51 cM and 75 cM. Based on this ($4775 \div 1154 = 0.26$), we can say that a 60 cM match has a 26% probability of being a 3C.

The match matrix does its work

As I said earlier, I have compiled for my match matrix a total of 23,150 DNA matches between 924 individuals. Of these, I have narrowed down 2,203 matches that are from descendants of the individuals whose ancestry is in question—William Bowdoin (b. 1802), Martha Rebecca Bowden (b. 1815), and Eliza Bowdoin (b. 1817)—matched with descendants of the other groups.

As you have probably gathered, I'm personally pretty convinced of the conclusion that Josiah Bowdoin (b. 1780) was the father of our siblings. But in order to conduct a fair test, I've arranged five hypotheses, based on what is possible, plausible, or what has been claimed:

1. William Bowdoin (b. 1802), Martha Rebecca Bowden (b. 1815), and Eliza Bowdoin (b. 1817) were the children of **Josiah Bowdoin** (b. 1780), son of William Bowdoin (b. 1740).[37]
2. William Bowdoin (b. 1802), Martha Rebecca Bowden (b. 1815), and Eliza Bowdoin (b. 1817) were the children of **William Bowdoin** (b. 1786), son of James Bowdoin (b. 1764), son of William Bowdoin (b. 1740).
3. William Bowdoin (b. 1802), Martha Rebecca Bowden (b. 1815), and Eliza Bowdoin (b. 1817) were the children of **William Bowdon** (b. 1773), son of Travis Bowdon (b. 1750).
4. William Bowdoin (b. 1802), Martha Rebecca Bowden (b. 1815), and Eliza Bowdoin (b. 1817) were the children of **Pleasant Bowden** (b. 1785), son of William Bowdoin (b. 1740).
5. William Bowdoin (b. 1802), Martha Rebecca Bowden (b. 1815), and Eliza Bowdoin (b. 1817) were the children of **Travis Bowdoin** (b. 1772), son of William Bowdoin (b. 1840).

Of course, I have already considered each of these hypotheses in the first paper and throughout this one from a genealogical perspective and shown why the latter four are unlikely. Now, I will consider each case through the lens of DNA relationship likelihood.

[37] This test considers only if Josiah Bowdoin were the father. It does not take any of the Read evidence into consideration.

For each of these five cases, I have assembled a series of conditional likelihoods for each DNA match based on if each hypothesis were true. For example, depending on whether William Bowdoin (b. 1802) were the son, nephew, great-nephew, or first cousin once removed of Josiah Bowdoin—as would be the case for the various hypotheses—R.P.R.'s relationship with C.M., a descendant of Enoch Bowdon and a 45 cM match, would be a 4C2R, 5C2R, 6C1R, or 6C2R.

Figure 15: Relationship chart showing conjectural relationships of R.P.R. to C.M. (45 cM).

R.P.R to C.M. (45 cM, Josiah)	(1) Josiah (b. 1780)	(2) William (b. 1786)	(3) William (b. 1773)	(4) Pleasant (b. 1785)	(5) Travis (b. 1772)
Relationship	4C2R	6C1R	6C2R	5C2R	5C2R
Probability	0.303509	0.143655	0.087442	0.232697	0.232697

R.P.R to B.G. (26 cM, Pleasant)	(1) Josiah (b. 1780)	(2) William (b. 1786)	(3) William (b. 1773)	(4) Pleasant (b. 1785)	(5) Travis (b. 1772)
Relationship	4C	5C1R	6C	5C	5C
Probability	0.223380	0.187328	0.148912	0.217001	0.223380

R.P.R to F.P. (28 cM, William 1786)	(1) Josiah (b. 1780)	(2) William (b. 1786)	(3) William (b. 1773)	(4) Pleasant (b. 1785)	(5) Travis (b. 1772)
Relationship	5C2R	5C1R	6C2R	5C2R	5C2R
Probability	0.216844	0.203836	0.145632	0.216844	0.216844

Table 9. Conditional likelihoods for five hypotheses over three matches with R.P.R.

I have collected three example cases here. The first is C.M., the Josiah Bowdoin descendant whose relationship is shown in Figure 15. The second is B.G., a descendant of Pleasant Bowden by his daughter Alvaney (Bowden) Smith. The third is F.P., a descendant of William Bowdoin (b. 1786) by his son Daniel Wesley Bowdoin. You can see that each hypothesis puts the match in a different relationship to R.P.R., and each gives a different probability of a match with that cM value fitting that relationship. These probabilities do not necessarily favor the same hypotheses in every case—some may appear more likely for Josiah, others for Pleasant or Travis or one of the Williams.

As in the "will it rain?" example at the start of this chapter, we can combine the probabilities by multiplying them:

Hypotheses	Likelihoods	Normalized[38]
(1) Josiah	$0.2 \cdot 0.303509 \cdot 0.223380 \cdot 0.216844 = 0.029403$	$34.328\ \%$
(2) William (b. 1796)	$0.2 \cdot 0.143655 \cdot 0.187328 \cdot 0.148912 = 0.008014$	$9.357\ \%$
(3) William (b. 1773)	$0.2 \cdot 0.087442 \cdot 0.148912 \cdot 0.145632 = 0.003793$	$4.428\ \%$
(4) Pleasant (b. 1785)	$0.2 \cdot 0.232697 \cdot 0.217001 \cdot 0.216844 = 0.021899$	$25.568\ \%$
(5) Travis (b. 1772)	$0.2 \cdot 0.232697 \cdot 0.223380 \cdot 0.216844 = 0.022543$	$26.319\ \%$

[38] The normalization step is the part of Bayes' theorem where we divide the multiplied likelihoods by the total evidence. In this case, we add all the probabilities together and divide by the sum, so that each posterior probability is a percentage of the total—in other words, so that all the final probabilities add up to 1.0 (100%).

You can see that with the combination of each new likelihood, the *posterior* probability for each hypothesis—the probability with each item of additional evidence considered—increases or decreases in relation to the others. In this way, each new observation can inch along the overall probability towards or away from a particular hypothesis. At this point, after three observations, the Josiah Bowdoin hypothesis is 34% likely. What will happen after more than 2,000 observations?[39]

Chaining together more than 2,000 observations makes us very glad for computers.[40]

Prior probabilities

In order to be as fair and objective as possible, I set the prior probability of each of the five hypotheses to an equal value of 0.2. (That is, 20% each, together summing to 100%.)

Zero probabilities

DNA genealogy is not an exact science. In the cases of all five of these hypotheses, even Josiah's, there are instances where the probability of a DNA match fitting the projected relationship is estimated to be zero. It is not actually zero, but a number so small that my sources do not give a value. For example, R.P.R. has a 20 cM match with a James Bowdoin (b. 1764) descendant who is calculated to be a 5C4R—which is "off the chart" for the Shared cM Project, a relationship so distant that statistics were not published for it, and a match value so small that it is off the scale even for the DNA Geek's probability chart.

In other cases, a match value may be unusually small or unusually large for a projected relationship and fall outside the predicted range for that relationship. This often indicates that our assumptions about the relationship may be wrong; the person is not related how we thought they were. I am prone to mistakes and could have mis-entered the data or misread the person's family tree or made an incorrect conclusion based on triangulation. Or sometimes DNA naturally produces outliers, the person in the statistical 1% who does not fit into the expected range. In the compiled statistics of the Shared cM Project, there may only be a few samples for a particularly distant or obscure relationship and the data may not be sufficient.

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[39] You can see the multiplied products are very quickly becoming very small. After a few hundred steps, they become too small even for a computer algorithm to handle, and underflow most computers' double-precision floating-point representation of decimal numbers—that is, the computer can't store a number so small, and it flattens it to zero. To alleviate this problem, we will utilize a common method in machine-learning applications and convert the likelihoods to logarithms (log). Using logarithms, we also can add the likelihoods together rather than multiplying them, since by the product property of logs, $\log(MN) = \log M + \log N$. This means that in the final calculation, to transform the figure back to the original probability scale, we will use the exponential function (e^x).

[40] Even using logarithms, this algorithm hits an arithmetic underflow, reaching values too small for the computer to store under normal circumstances. I made use of `mpmath`, a Python module that enables floating-point arithmetic with arbitrary precision, that is, with no effective limit to how many decimal digits it can calculate and store. See `mpmath` development team, 2023, https://mpmath.org/ (accessed 15 Nov 2024).

Or, as I think is the likely explanation in many cases, a zero-probability really does indicate that there is very low probability of a hypothesis being true. Since there are zero-probability instances even for my preferred conclusion, I do not allow the existence of such instances to disqualify a hypothesis. But there are notably a lot more zero-probability instances for some hypotheses than others:

Hypothesis	# Zero-probability instances
(1) Josiah Bowdoin (b. 1780)	27 (1.2%)
(2) William Bowdoin (b. 1786)	136 (6.2%)
(3) William Bowdon (b. 1773)	208 (9.4%)
(4) Pleasant Bowden (b. 1785)	30 (1.4%)
(5) Travis Bowdoin (b. 1773)	32 (1.5%)

Table 10. Number of zero relationship probability instances for hypothesis.

I had the option to penalize a hypothesis for each zero-probability instance—add an extremely small probability like 1×10^{-10} to the log-likelihood sum when other hypotheses received actual values, which would hurt the likelihood but not completely disable it—but as it turned out, that wasn't even necessary.

Posterior probabilities

Honestly, the results of this experiment are a little embarrassing to show. It looks very much like I "rigged" the answer or did a parlor trick with numbers. I had a difficult time believing it myself at first:

Hypothesis	Posterior probability
(1) Josiah Bowdoin (b. 1780)	$99.999\ \%$
(2) William Bowdoin (b. 1786)	$3.829 \times 10^{-1109}\ \%$
(3) William Bowdon (b. 1773)	$1.239 \times 10^{-1896}\ \%$
(4) Pleasant Bowden (b. 1785)	$3.358 \times 10^{-63}\ \%$
(5) Travis Bowdoin (b. 1773)	$2.705 \times 10^{-95}\ \%$

Table 11. Posterior probabilities for compiled DNA relationship probabilities for each of five hypotheses.

What did I even do? *Did* I play a game with numbers? No, I promise very solemnly, and have shared both my code and my raw data to demonstrate it, I did nothing at all to manipulate these numbers.

For anyone less familiar with scientific notation, 10^{-1109} means a decimal value with more than 1,000 zeroes in front of it. And 10^{-1896} is 10^{786} times smaller than that. For all practical purposes, these numbers round to zero; I leave them intact only as comparative values. The posterior probability for Josiah Bowdoin came out as $99.999\ \%$—with 62 more digits of 9 behind that. This

number is about 3×10^{62}—3 with 62 zeroes—times more probable than the second-place contender, Pleasant Bowden.

How is this even possible? Let me say, as a major caveat, that this is **not** intended as a triumphant declaration that "I was right!" This is not meant as a statement that I have provided absolute proof of Josiah Bowdoin being the father of William Bowdoin (b. 1802) and the rest. This is a closed mathematical experiment defined within a very narrow set of parameters. Within those parameters, within the set of evidence considered, and within the narrow hypotheses considered, yes, it is overwhelmingly *more* probable that Josiah Bowdoin was the father of William Bowdoin (b. 1802), Martha Rebecca Bowden (b. 1815), and Eliza Bowdoin (b. 1817), than any of the other named men.

Bayesian probability provides a method of considering the effects of many observations at once on the probability of hypotheses, and as a mathematical construct, it can be effective. But in real life, probabilities don't necessarily stack the way Bayes' theorem presumes they do. This experiment is based on algorithms we call in machine learning "Naïve Bayes"—*naïve* because they presume the probability of each evaluated observation is independent of each other. With DNA matching, this is definitely not the case, since each person's DNA descends from another person, and how much matching DNA one person has depends on how the DNA descended from his parents and grandparents and other ancestors. That is, in fact, the whole point.

Just because this Bayesian logic shows, within this domain of hypotheses and evidence, that Josiah Bowdoin being the father is overwhelmingly *more* probable than the other hypotheses, it does not mean that this is the absolute answer. Remember that I had mostly disproven the other hypotheses already. Just because I put *one* hypothesis in the set that is supportable with numbers, does *not* even mean for certain that it is the *best* answer. The posterior probabilities must all add up to 100%, regardless of the hypotheses and evidence considered. If I had taken the Josiah hypothesis out of consideration, then one of the others would have reached 99.999%—probably Pleasant.[41] I thought a consideration of combined probability was warranted here, given that these DNA matches do address relationship probability; but this is only one facet of the larger picture, and it does not abrogate the need to fully consider all the other evidence. I believe Josiah Bowdoin is the best explanation we have for our Bowdoins' ancestry, given the evidence we have; but it is conceivable, always, that a better explanation could come along and blow mine away.

[41] I ran the experiment again to verify this assertion, and it was the case. With the Josiah hypothesis removed, the Pleasant hypothesis was 99.999% likely (with only 27 additional 9s). Travis came next, with 8.054×10^{-31} %.

Conclusion

In the previous paper, I reexamined the family of William Bowdoin (b. 1740) and showed that based on records, William's son Josiah Bowdoin (b. 1780) was the most likely candidate for being the father of my ancestor William Bowdoin (b. 1802) and his sister Eliza Bowdoin (b. 1817). In this paper, I have continued my examination of William Bowdoin's ancestry through the lens of DNA genealogy. I have given evidence first demonstrating the premise of my arguments, that the DNA evidence shows overwhelmingly that William Bowdoin (b. 1740) was the ancestor of William Bowdoin (b. 1802). I have shown how the grouping of DNA matches by their common ancestor has allowed me to discover clear trends in how the descendants of William Bowdoin (b. 1802) match more closely with the descendants of Josiah Bowdoin (b. 1802) than with descendants of any of William (b. 1740)'s other children—and even more closely with the descendants of Martha Rebecca (Bowden) Maddox (b. 1815), whose ancestry, like that of William Bowdoin (b. 1802), has become unclear based on records alone.

Focusing on Martha Rebecca in closer detail, I showed how her descendants appear in overwhelming number and proportion in our matches. Their matches likewise show a strong affinity with William (b. 1802)'s descendants and with Josiah's descendants. Together with Martha's and Josiah's matches, I revealed how this shared matching led to the discovery of strongly clustered matches with descendants of the Arthur Read (b. 1748) and Enoch Spinks (d. 1772) families of Randolph County, North Carolina. These matches are shared only among the descendants of Josiah Bowdoin, William Bowdoin (b. 1802), and Martha Rebecca Bowden Maddox, and do not appear with observable regularity among the descendants of any other branch of the Bowdoin family. Together with observations about Read and Spinks naming patterns among descendants—names like *Read*, *Enoch*, *and Isaac* being handed down among William's and Josiah's descendants that do not occur in other Bowdoin branches—this strong pattern of Read-Spinks shared matches led to the conclusion that Josiah Bowdoin's first wife was a daughter of Arthur Read and his wife Martha Spinks, daughter of Enoch Spinks.

This Read-Spinks thesis unifies and strengthens the other arguments. The fact that William Bowdoin (b. 1802)'s descendants share something exclusive in common with Josiah Bowdoin's descendants, as well as both Eliza Bowdoin's descendants and Martha Rebecca Bowden's descendants—the shared matches with Read and Spinks descendants, as well as the clear genetic affinities between each group—demonstrates that William Bowdoin (b. 1802), Martha Rebecca Bowden (b. 1815), and Eliza Bowdoin (b. 1817) were all the children of Josiah Bowdoin and his first wife, Ms. Read. Close examinations of DNA match triangulations through chromosome mapping, as well as algorithmic analysis from agglomerative clustering and Bayesian probability, demonstrate and support the likelihood of this conclusion.

Appendix A

Read-Spinks Background

According to the "consensus" of trees online, **Arthur Read** was born about 1748 in North Carolina. Most trees have him born in Randolph County, which was not created until 1779, and even Guilford County, the parent county of Randolph, was beyond the frontier in 1748, and most of its lands not organized until 1752 as part of Orange County. The earliest actual record I can find of him is his marriage in Guilford County in 1773. He was the son of **William Reade**:

> Guilford County, North Carolina, Deed Book 1, p. 240. 4 Dec 1773. **Arthur READ**, Planter, and **Martha** to Ransom SUTHERLAND, 1 acre adjoining **Enoch SPINKS**, out of the Manor Plantation lying on Fork Creek, a branch of Deep River. Signed **Arthur READ**, **Martha** (her x mark) **READ**; wit: William SEARCY, Jr., Thomas COX.
>
> p. 240. 11 Oct 1773. **William REIDE, Sr.**, to his son **Arthur REID**, 150 acres (he hereunto moving) on the north side of Deep River adjoining Windsor PEARCE & SEARCY. Signed **William** (his R mark) **REIDE, Sr.**; wit: Windsor PEARCE, William SEARCY.

The same online trees also have Arthur Read dying in Henderson County, Tennessee, in 1853, at the incredible age of 105. This appears most unlikely. Several of Arthur and Martha's children did go to Henderson County, Tennessee, including their daughter Amy Read, who married Jehu Lawler. The 1850 census has Martha Read, age 93, living in Amy's household, so she at least did live to an advanced age. The 1840 census of the Lawler family included a woman aged between 80 and 90, but there was no aged man on either census. If Arthur Read had died in 1853, he should have been there with his wife in 1850 and 1840 too; so it would appear much more likely that he died prior to 1840. The last record I have found of him in North Carolina is the 1815 tax list.

Enoch Spinks Sr. signed his will in Guilford County, North Carolina, on 20 Mar 1772. He died probably in April, and the will was probated in May. The will names as heirs his wife Amy and children John, Martha, Enoch, Lewis, Garrett, and Sarah.[42] This was the year before Martha Spinks married Arthur Read, but the above records make clear that she was Enoch Spinks' daughter. The "consensus" of online trees identifies Amy Spinks' maiden name as Pearce, but I have found no

[42] Ancestry.com, "North Carolina, U.S., Wills and Probate Records, 1665–1998," Guilford, North Carolina, loose files, estate of Enoch Spinks, 1772, https://www.ancestry.com/search/collections/9061/records/1035699 (accessed 9 Nov 2024).

definite support for this.[43] I have also seen earlier postings that suggested she may have been a Lewis, noting that Enoch and Amy named a son Lewis Spinks.

The daughter of Arthur Read whom we propose married Josiah Bowdoin is unknown by name, either by record or family tradition. Online trees for Arthur Read and Martha Spinks do not include a daughter who married a Bowdoin. Amy (Read) Lawler, born 1787, is the earliest documented daughter in most trees. But before I even went very far with this hypothesis, I went to the census to see if Arthur Read had an unidentified older daughter in 1800. He did:

1800 Federal Census, Randolph County, North Carolina[44]

- Arthur Reede
  - 1 white male, age 45 and over (born before 1755) *[Arthur Read]*
  - 1 white female, age 26 to 44 (born 1756 to 1774) *[Martha Read]*
  - **1 white female, age 16 to 25 (born 1775 to 1784)** ***[older daughter]***
  - 1 white male, age 10 to 15 (born 1785 to 1790) *[Enoch Read]*
  - 2 white females, age 10 to 15 (born 1785 to 1790) *[Amy, Nancy]*
  - 4 white males, age under 10 (born after 1790) *[Isaac W., William A., Raleigh, other unknown]*

There may even have been more than one older daughter. The 1790 census shows:

1790 Federal Census, Randolph County, North Carolina[45]

- Arthur Rede
  - 2 white males, age 16 and over (born before 1774) *[Arthur Read, other ?]*
  - 1 white male, age under 16 (born after 1774) *[Enoch Read]*
  - 5 white females *[Martha, **older daughter**, Amy, Nancy, other ?]*

It appears likely to me that Josiah Bowdoin married his first wife late in 1800 or early in 1801. He was not the head of his own household in 1800, but it appears his oldest son, Enoch Bowdon, was born about 1801, and William Bowdoin was born about 1802.

[43] I have noticed some Pearce or Pierce DNA matches, but not followed through trying to verify or triangulate them.

[44] "Arthur Reede," on 1800 U.S. Federal Census, Randolph County, North Carolina, page 338, FamilySearch, "United States Census, 1800," https://familysearch.org/ark:/61903/1:1:XHRD-9LP (accessed 9 Nov 2024).

[45] "Arthur Reede," on 1790 U.S. Federal Census, Randolph County, North Carolina, page 291, FamilySearch, "United States Census, 1790," https://familysearch.org/ark:/61903/1:1:XHKB-12Y (accessed 9 Nov 2024).

Appendix B

This section was the first part of the paper I wrote. It was originally going to be part of the introduction, but I decided it was too long and better just to jump right into the argument. I thought there was still information here that might be useful, so I left it as an appendix.

An Introduction to Several DNA Genealogy Concepts

I will assume that most readers have a basic understanding of DNA genealogy. By way of a very brief introduction, I want to quickly present some basics of DNA, chromosomes, and inheritance, and describe several key DNA genealogy concepts I have used in this paper: relationship probability, triangulation, clustering, and chromosome mapping.

DNA genealogy basics

All living things on earth have DNA in the nucleus of their cells, which defines their genetic characteristics and passes down those characteristics to their offspring. With humans and other mammals, when a child is conceived by his or her parents, the parents' sex cells, the female's egg and the male's sperm, come together to produce the DNA of the new child. Each egg and sperm has exactly half of the parent's DNA, 23 *chromosomes*. The two halves make a whole, with each of the mother's 23 chromosomes meeting its mate in the paired chromosome from the father. In every person's 46 chromosomes, he or she received one each out of the 23 pairs from his mother, and the other from his father.

Rather than simply being one of the parent's existing two chromosomes, each chromosome in an egg or sperm cell is produced by the *recombination* of the parent's paired chromosomes—which means that the child produced by the combined cells will have DNA inherited from *all four* of his or her grandparents. A child receives about half, 50%, of his or her DNA from each parent, and roughly a quarter, 25%, from each of her four grandparents. Since this same process was repeated for each parent and grandparent, the new child also has about 12.5% of her DNA from each of eight great-grandparents, about 6.25% from each great-great-grandparent, and so on.

Other people descended from the same parents, grandparents, and so forth, will have at least some of the same DNA as this new child. Because of recombination, no two children of the same two parents (other than identical twins) will have exactly the same combination of their parents' DNA. In general, full siblings are expected to share between 32% and 54% (average 37%) of the same DNA with one another. Similarly, a full aunt or uncle—the full sibling of their mother or father—is expected to have between 18% and 32% (average 25%) of the same DNA as the child.

And this is how autosomal DNA matching works: On the twenty-two pairs of non-sex chromosomes—each pair numbered 1 through 22, with the 23rd pair being the X and Y sex

chromosomes—DNA testing maps a series of many thousands of genetic markers which can be compared from person to person. This testing can show what portions (segments) of DNA one person shares with another, and what total amount of DNA they share. The amount of shared DNA is given either as a percentage or in a unit called *centimorgans*.

Relationship probability

Based on this total value of shared DNA in centimorgans, we can determine the likely family relationship that two people have to one another. Parents and children share on average 3485 centimorgans (cM) with each other; full siblings on average about 2613 cM; first cousins on average about 866 cM; and so forth. For each possible relationship, there is a range of expected centimorgan values, based on observed occurrences. First cousins (1C) typically share, for example, a range between about 396 and 1397 cM, with the distribution of observed samples resembling a bell curve (normal distribution), with the vast majority of first cousins sharing between 700 and 1000 cM. Scientists have used these observations to produce histograms and probability tables for each relationship.

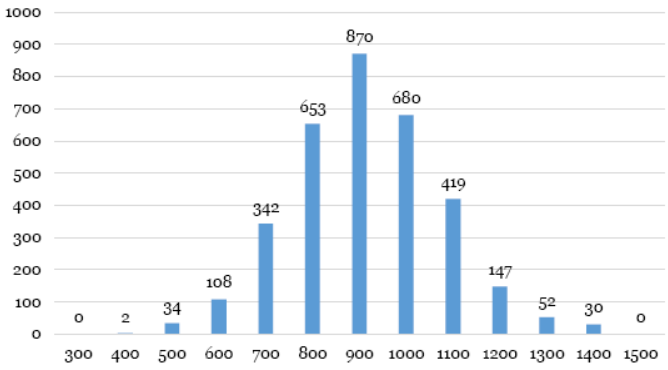

Figure 16. Histogram of 3,337 submitted samples for relationship "1C" (first cousins), from Blaine Bettinger's Shared cM Project Version 4 (2020)

For shared cM values of close relationships—greater than about 200 cM, typical of second cousins (2C)—relationships are fairly simple to interpret. Interpretation becomes increasingly difficult as relationships get further apart and the shared cM values get smaller, largely because there is a great deal of overlap between possible relationships. For example, two people sharing 70 cM could be second cousins once removed (2C1R), third cousins (3C), very lucky fourth cousins (4C), or even very unlucky second cousins (2C) (see Table 12).

Probability	***Possible relationships***
37%	1C3R, 2C1R, Half 2C, Half 1C2R
36%	3C, 2C2R , Half 2C1R, Half 1C3R
15%	3C1R, 2C3R, Half 3C, Half 2C2R
7%	2C, 1C2R, Half 1C1R, Half GG-Aunt/Uncle/Niece/Nephew
4%	4C, 3C2R, Half 3C1R
0.75%	4C1R, 3C2R, Half 3C2R
0.50%	5C, 4C2R

Table 12. Relationship probabilities for 70 shared cM, from Jonny Perl's Shared cM Project 4.0 tool beta (https://dnapainter.com/tools/sharedcmv4-beta). Each set of grouped relationships shares a similar degree of genetic relationship.

Since my grandfather, Robert P. Richardson, was the great-great-grandson (2G grandson) of William Bowdoin (b. 1802), his cousins of his generation from William were his third cousins (3C).

In this project, I will be examining his genetic relationships with descendants of William's potential ancestors—who will be Robert's fourth cousins (4C), fifth cousins (5C), and greater. Consequently, I have had to find ways to effectively interpret the relationship probabilities of shared cM values under 100 cM.

Shared cM as relationship distance

Another way I will be looking at the shared cM value between two people is as a measure of *relationship distance*—that is, not necessarily as representative of a particular relationship, but reflecting the distance of the two people from a shared ancestor. The higher the shared cM value, the more DNA they share, and the closer they are to their ancestor or ancestors. For example, I don't necessarily have to know the exact relationship of my grandfather with a cousin who shares 149 cM with him, to know that, in this project, since I selected only Bowdoin cousins, they more than likely both descend from William Bowdoin (b. 1802).

Triangulation and clustering

Triangulation is the property of DNA matching that indicates three or more individuals share a match. If ***A*** matches ***B*** and ***A*** matches ***C***, the match can be said to be triangulated if ***B*** also matches ***C***. Simple triangulation of matching does not necessarily demonstrate that the three people share the same segments of DNA, but it at least takes a step toward showing that the shared match is not merely coincidence. ***A*** and ***B*** could share a different family in common than ***A*** shares with ***C*** or ***B*** shares with ***C***, so the three being matches to each other does not necessarily indicate they all share the same ancestor.

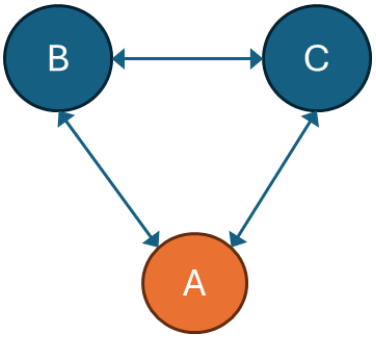

Figure 17: An illustration of triangulated DNA matching.

For example, in this project, I discovered that some of the South Alabama Bowdoins had intermarried with the William Casey family, which my grandfather Robert also descends from.[46] So Robert (suppose he is ***A***) has a match who also descends from both Bowdoin and Casey (this is ***B***), and both ***A*** and ***B*** have a shared match (***C***) who descends from only Casey. It is a mistake to assume that ***C*** is also a Bowdoin descendant, just because she matches ***A*** and ***B***. It is even possible for each to share a completely unrelated family, and still be shared matches with each other; for example, for ***A*** and ***B*** to share Bowdoin, ***A*** and ***C*** to share Casey, and ***B*** and ***C*** to share Gray, which ***A*** is not even kin to.

[46] Peter B. Richardson, Robert's great-great-grandfather, married Delaney "Delila" Casey, daughter of William Casey, a Revolutionary War veteran.

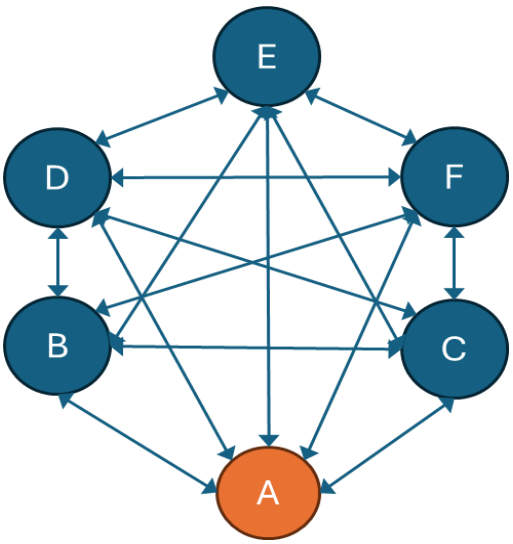

Figure 18: An illustration of clustered DNA relationships.

So there is strength in numbers: If we add ***D***, who also matches ***A***, ***B***, and ***C***, then we can have greater assurance that all share the same ancestor and the same DNA segment. And even more so if we add an ***E*** and ***F***, and all match each other. And this is the essence of *clustering*. We want to identify as many people as possible who all match each other—called a *cluster*—with the supposition that this implies they all share the same ancestry and DNA segments.

The *strength* argument applies as well to the *strength* of matches. If two or more people have large shared cM values with each other, it indicates they share *close* ancestry and are unlikely to match each other only by coincidence.

In this project, I have made use of Ancestry.com's new "Pro Tools," released in December 2023. The most important feature of this, to me, is the advanced access it gives to shared DNA matches. Where previously, I was only able to view the shared cM values of my grandfather with each of his DNA matches, I can now also see their shared cM with each other. This has enabled me to discover DNA clusters I otherwise might not have seen; for example, to see that ***B***, ***C***, and ***D*** each share 800 cM or greater with each other. I can even determine their relationships to each other based on these values, that ***B*** is the mother of ***C*** and the sister of ***D***, because ***B*** and ***C*** share 3448 cM and ***B*** and ***D*** share 2402 cM.

In addition to clustering matches manually, clustering can be done algorithmically. In fact, clustering is a major application of machine learning or artificial intelligence. I have used several different methods, both manual and algorithmic, to cluster the DNA matches in this project, as a means to discovering and clarifying family connections. I will share more details on that below.

Triangulation of segments: The chromosome browser

The triangulation and clustering of matches—noting that ***A***, ***B***, ***C***, and ***D*** all match each other—is an indirect but still powerful method of hypothesizing shared ancestry. It offers strong circumstantial evidence that all members of the cluster share the same ancestry and likely the same DNA segment. It serves as a limited substitute for the ability to confirm shared DNA segments directly through the use of a chromosome browser, which AncestryDNA does not offer. I have identified as many Bowdoin matches as possible on other genealogy DNA matching sites such as GEDmatch, MyHeritage, and Family Tree DNA, in an effort to show the triangulation of shared DNA segments. Each of these sites allows users to upload their raw DNA data from other testing sites, including Ancestry, so I have been able to identify some of the same matches I used on Ancestry on these other sites.

A chromosome browser, which most other genealogy DNA sites do offer, allows the visualization of a DNA match on a model of the 23 pairs of chromosomes. In addition to knowing that ***A*** and ***B*** share 102 cM across 8 segments, a chromosome browser graphs each of those segments on the sections of chromosome that they occur. If we believe that ***A*** and ***B*** have shared Bowdoin ancestry, then finding that ***C***'s DNA match occurs on one or more of the same segments supports the hypothesis that it is Bowdoin they share. Seeing that a whole cluster of Bowdoin matches occurs on the same segment is clear verification that this DNA descends from the same common ancestor for all cluster members. This is the most powerful tool in our toolbox for proving the parentage of William Bowdoin (b. 1802) and Eliza Bowdoin (b. 1817)—so Ancestry's lack of a chromosome browser is a serious deficiency.

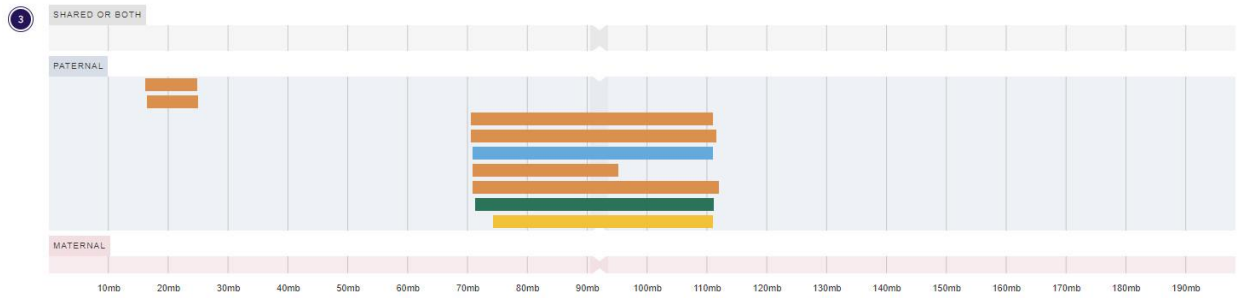

Figure 19. A major Bowdoin cluster on Chromosome 3.

Using AncestryDNA anyway

Where AncestryDNA is limited by its lack of a chromosome browser, it also has a great strength over other genealogy DNA matching sites: sheer, overwhelming numbers. As of 2023, over 25 million people have taken the AncestryDNA test and added their DNA to the database of potential matches. As of this writing, my grandfather Robert has four to five times as many matches on Ancestry as he has on the other testing sites where we tested his DNA.

Testing/Matching Site	# Matches
AncestryDNA	90,234
MyHeritage	19,620
Family Tree DNA	7,465
GEDmatch	45,095

Table 13: Major DNA testing and matching sites, with the number of matches my grandfather, Robert P. Richardson, has as of 1 Oct 2024.

Because Ancestry's matching base represents a major sample of the U.S. population, there are higher odds that Robert's ancestral families, and the ancestors I want to connect to, will be represented by at least *some* matching descendants. If we suppose, out of AncestryDNA's 25 million tested users, 15 million of those were from the U.S., then that represents about 1 in 22 of the projected current population of the United States. And if we suppose that an average ancestor born in 1850 had an average five children, and at least some of those children went on

to have their own children, then over about five to six generations, the number of that ancestor's descendants today could easily be in the hundreds or even thousands, and the odds are good that at least a few out of that number will be picked up by the net of AncestryDNA's testing.

Even though many Ancestry testers are not active genealogists, do not post their family trees, and do not respond to messages, I can nonetheless identify their matches through triangulation with other known matches and in turn use them for triangulating and clustering other matches. So Ancestry has proved fertile ground for cultivating this study, for identifying a large number of Bowdoin DNA matches and using them to zero in on William Bowdoin's probable ancestry.

Data discovery, selection, and collection

So, beginning with my grandfather's closest matches and working outward, I began cataloguing Bowdoin matches, all the descendants of his grandmother, Sarah Emily Elizabeth (Bowdoin) Richardson, great-grandfather, Reding Reid Bowdoin, and great-great-grandfather, William Bowdoin (b. 1802), who I could identify. As I identified Bowdoin-Bowdon-Bowden matches I did not know, I made a note of their known lineage. I discovered matches in several ways:

- My dad, Tom Richardson, had already tagged and noted many Bowdoin-Bowden matches using Ancestry's group tagging and notes.
- I searched for testers who had the surnames *Bowdoin*, *Bowden*, and variations in their family trees with the surname search tool.
- I investigated any close shared matches of catalogued testers, as well as many unknown shared matches who consistently appeared in a cluster of matches.
- I followed and checked matches identified by Ancestry's ThruLines tool.

ThruLines

ThruLines, like the related "potential parent" algorithm, can be a misleading and even destructive tool, but if used with care and finesse, can be helpful and even powerful.

- **If you do not have an ancestor in a particular family line in the family tree linked to your DNA test, ThruLines follows the same "majority-rule" algorithmic suggestions as the "potential parent" algorithm in family trees**—basing suggestions of a "potential ancestor" on what a majority of other people's family trees contains. When we had no parents added to our tree for William Bowdoin (b. 1802), ThruLines put forward William Bowdon (b. 1773) and Nancy Wiggins of Coffee County, Tennessee (see "**Error! Reference source not found.**" on page **Error! Bookmark not defined.**), as "potential ancestors," based only on the self-reinforcing (and provably wrong) suggestion of this couple as our William's parents in a multiplicity of trees.
- **If you add your own researched ancestors to the family tree linked to your DNA test, ThruLines will follow *your* suggestions.** When we added William Bowdoin (b. 1740) as

the grandfather of William Bowdoin (b. 1802)—even with an "Unknown" Bowdoin as William (b. 1802)'s father—ThruLines did show William (b. 1740) as our ancestor and linked many DNA matches who were descendants of William with a "common ancestor" identification. In this way, I discovered many common descendants of William Bowdoin (b. 1740).

- **ThruLines's identification of a common ancestor only follows your family tree to the extent to that the facts in your tree match other people's trees.** After I researched William Bowdoin (b. 1740)'s estate case and changed his death place in our tree to Conecuh County, Alabama, and his birthplace to Virginia, it stopped identifying our posited ancestor as the supposed common ancestor of many of our DNA matches—since the "consensus" of family trees conflate William (b. 1740) with a William who died in Oglethorpe County, Georgia, and was born in Delmarva Peninsula, Maryland (see footnote **Error! Bookmark not defined.**).
- **Instead, ThruLines created *another* node for William Bowdoin (b. 1740) as a separate son of William Bowdoin (b. 1720)**, with the Delmarva and Oglethorpe facts above, and added many of our DNA matches from William (b. 1740) as descendants of him. William Bowdoin (b. 1720) now has *three* different sons named William Bowdoin in our ThruLines, each with different facts and different children. But we *can* still find many of the descendants ThruLines has identified with William (b. 1740) grouped with one of these other Williams.
- **ThruLines never has followed our directions that Eliza Bowdoin (b. 1817) was the sister of William Bowdoin (b. 1802).** Even though we placed Eliza in our family trees as William's sister, ThruLines still has her attached as the daughter of William Bowdon (b. 1773) of Coffee County, son of Travis Bowdon (b. 1750). ThruLines is precisely the reason for the "conflicting claims" for the parentage of Eliza and William that would make them not even siblings.
- **ThruLines *can* be used to test ancestral theories.** With several of the ideas I will explore below, we first put the theories in our DNA-linked family tree and added enough information for the algorithm to identify the supposed ancestor with the ancestor in other people's family trees. After a day or so, ThruLines then identified and collected descendants of the supposed ancestor and grouped them for us.
- **ThruLines can be especially helpful in linking DNA matches to potential ancestors who have private or very limited family trees.** If a person has a completely private family tree, even if they have only posted as little as their parents or grandparents, ThruLines can often identify those people from other people's family trees and link them for you as a match with a "common ancestor."
- **ThruLines often makes serious mistakes.** I was very careful not to take ThruLines's suggestions without verification, particularly in cases where a tree was private. I made sure to verify every link in the ancestral chain, from the match all the way up to the supposed common ancestor. Some of the most common mistakes I found were conflating

a husband-and-wife pair as the same person—linking a DNA match as a descendant of William Bowdoin (b. 1740), for example, when in fact the match descended from the *second* marriage of John Macon, not from Betsy Bowdoin.

- **ThruLines is based *solely* on the information in other people's family trees, *not* on any DNA analysis at all.** The algorithm works simply by (1) iterating through your DNA matches, (2) for each match, identifying any individuals in the match's family tree who match its "consensus" tree, and (3) placing the match as a descendant of a common ancestor if it can make *any* link to *any* common ancestor. It does not consider *at all* (a) how much DNA is shared and whether the relationship suggested by that shared cM value fits its algorithmic assertion of a common ancestor, (b) whether the match is identified with your paternal or maternal side and whether that identification fits with its algorithmic assertion, (c) whether the shared DNA segments of the match aligns in any way with the other matches grouped with that supposed common ancestor.

In short, ThruLines can be used advantageously to discover matches if we know how to work it, but we must also be aware of its limitations. Though misleadingly presented as having knowledge of DNA matches, it actually is a family tree tool, with the only connection to DNA analysis limited to the fact that you *have* a DNA match with someone. Paired with Ancestry's "potential parent" algorithm, ThruLines has led to rampant conflation and destructive propagation of numerous errors. It should only be used as a tool for exploration and discovery, not for building family trees apart from research.

Selection criteria

Discovering a match is only the first part. After this, I had to decide whether to select ("pick") it for analysis. After investigating a match's tree and shared matches, there are several reasons I might select the match for inclusion in the study:

- The tester presents a documented lineage to William Bowdoin (b. 1740), or to some other Bowdoin or Bowden family I think might be connected.
- The tester presents a *projected* lineage (through ThruLines) to a Bowdoin family that appears verifiable.
- The tester has a close match (over about 100 cM) to one or more matches already selected, that might be used to tighten an existing cluster or triangulate other tests.
- The tester appears consistently as a match to other selected matches, suggesting the possibility that he or she is descended from Bowdoin or a closely related family, or clustered with that family.

Biases

When I have to personally choose which data to select for inclusion and which to reject, there are naturally some biases that will appear in the data. Some of these biases are natural, more reflecting the data itself, and others may reflect my own goals and preferences.

The most important natural, data-driven bias is that **I have made no effort to balance the number of matches in each class**—"class" in this case referring to the family groups in which I have classified matches for the purpose of testing which family William Bowdoin (b. 1802) is connected to; which child of William Bowdoin (b. 1740) he belongs to. What you see in the selected data, the number of matches in each group, is mostly a product of what matches I was able to identify.

In data science, class imbalance is often viewed as a challenge that must be overcome, and in this project, I have tried to design experiments in such a way that they will not be overly influenced by class size or balance. That is to say, **I do not want a class with a large number of matches to outweigh other classes or dominate an experiment simply by the fact of its number**; for example, if I determined the probable father of William Bowdoin (b. 1802) by simply *summing* the centimorgans of my grandfather Robert's matches with descendants of potential fathers.

So I want to emphasize this key rule: **The raw number of matches in a family group should *not* necessarily be taken as indicative of that family's proximity to William Bowdoin (b. 1802) or of its relative importance to that conclusion.** The total amount of DNA that Robert shares with William Bowdoin's true father *will be* greater than what he shares with that father's brothers; and this *could be* reflected in his having more matches with that true father's descendants than with other branches of the family, since there is a wider ground of DNA for them to match against. But there are also several other factors at work:

- A family can have a large number of matches simply because they were "fruitful and multiplied" and have more descendants who are available to test. There is no limit to the number of people who can match on the same DNA segment, and having dozens of people match on that same segment could be simply because there were dozens of copies made. **The number of copies of the DNA that exists neither increases nor decreases the size of the match.**
- Conversely, some families and family branches have all but "died out," due to people having few surviving children, or to lines being "lost" and no longer identifiable (as, for example, in the case of Pleasant Bowden's possible older daughters whose maiden names are not documented).
- For whatever reason, people in some families, ethnicities, geographic regions, economic classes, or what have you, may be more inclined to take a DNA test than others. Similar factors could influence the likelihood of a person posting a family tree. Where a person

lives and the availability of records in that place can influence my ability to identify a tester.

Finally, the number of matches in a class or family group can be affected by the simple selection bias of my choices—the personal factors referenced above:

- I did not select a match if they had very few and very weak Bowdoin matches, *unless* they had a close match (parent-child or sibling) with another selected match.
- I selected very few people whose connection to the Bowdoin family I could not identify at all. In a few cases, I added people with an unknown connection who were part of an identified cluster, in the hopes of being able to triangulate that connection.
- I rejected any match whose tree proved irreconcilably wrong, to the point that I could not determine their correct lineage, or whose projected Bowdoin lineage through ThruLines could not be reconciled with their documented tree.
- I rejected any match who, even if they had a documented Bowdoin lineage, was identified as a match on Robert's maternal side. In most of these cases, the matches had few if any shared matches with other Bowdoins (since it was not Bowdoin they shared with Robert, but a maternal family), and more important, their shared cM with Robert did not represent Bowdoin.
- In some cases, I simply got tired of collecting matches in a particular group, and eventually, I decided I had all the data I needed to adequately prove my points.

Data collection

For data collection, I manually entered the voluminous data of shared matches between over 900 DNA tests, with more than 23,000 individual matches, into an Excel spreadsheet. I devised several measures to help reduce data entry errors, and several other data validation and correction routines to help ensure the data was correct after I entered it. I believe I have mostly eliminated any egregious errors in the data. Any remaining errors should be errors of *omission*—matches that I failed to enter—rather than incorrect match values or matches assigned to the wrong people. This form of error should have little impact on the outcome of experiments.

Data limitations

This dataset also has several limitations. On Ancestry, a test does not appear in the list of shared matches if the shared match shares less than 20 cM. Many smaller shared matches, then, are excluded from view. This potentially impacts several of the experiments, especially the group match percentages (the percentage of each group that has at least one match in another given group).

The view of shared matches through the lens of only one test is a necessarily narrow view. When I state, for example, that more than 80% of descendants of William Bowdoin (b. 1802) match at

least one descendant of William Bowdoin (b. 1740)—readers need to understand that I mean **80% of *Robert's matches*** who are descendants of William Bowdoin (b. 1802) also match at least one descendant of William Bowdoin (b. 1740), ***who are also Robert's matches.*** Though the view from Robert's DNA is exceptionally wide—he can "see" more than 600 matches from William Bowdoin (b. 1740), and I believe this only scratches the surface—the view nonetheless suffers from the tunnel vision of not being able to "see" either other descendants of William Bowdoin whom Robert does not match, or any other of the people Robert's matches match whom he does not.

Following from that, when I report what Robert's matches do match, since I am only seeing a very small portion of their overall matches, my statement should not be construed to report what those matches *do not* match.

It is a necessary assumption of this project that the limited view of Bowdoin DNA that we have from Robert Richardson's shared matches is still valuable and can be used to draw valid conclusions about William Bowdoin (b. 1802) and his descendants.

Data processing and analysis

In this paper, I will not go into heavy, technical detail about my coding and algorithms—if you are interested in that, I have posted my source code at GitHub and will write separate technical documentation.[47] Here I will give a brief overview.

I wrote my code for data analysis in the Python programming language, which is well suited to that task. For reading and manipulating the DNA matrix itself, I used the Pandas data analysis library. I modeled family relationships with a simple tree data structure.[48]

To analyze relationship probabilities based on shared cM values, I implemented two different probability models: one based on the histograms from Blaine Bettinger's Shared cM Project 4.0, and the other based on the DNA Geek's extraction of probability data from AncestryDNA's matching white paper.[49]

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[47] JosephTRIchardson, "DNAMatrix" on GitHub, https://github.com/JosephTRichardson/dnamatrix/ (accessed 27 Nov 2024).

[48] Python.org, https://www.python.org/; "pandas – Python Data Analysis Library," https://pandas.pydata.org/ (accessed 13 Oct 2024).

[49] Blaine T. Bettinger, "Shared CM Project Version 4.0," *The Genetic Genealogist*, 27 Mar 2020, https://thegeneticgenealogist.com/wp-content/uploads/2020/03/Shared-cM-Project-Version-4.pdf (accessed 30 Aug 2024); Leah Larkin, "The Limits of Predicting Relationships Using DNA," *The DNA Geek*, 19 Dec 2016 (updated 14 Oct 2022), https://thednageek.com/the-limits-of-predicting-relationships-using-dna/ (accessed 30 Aug 2024); "AncestryDNA White Papers," Ancestry.com, https://support.ancestry.com/s/article/AncestryDNA-White-Papers (accessed 11 Oct 2024); Catherine A. Ball, Matthew J. Barber, *et. al.*, "AncestryDNA Matching White Paper," 15 Jul 2020, probability graph on page 23, https://www.ancestrycdn.com/support/us/2020/08/matchingwhitepaper.pdf

Data validation

I used several algorithms to check and validate the match data in the DNA matrix. One routine checked each person in the tree and their DNA matches, noting especially persons who, according to the tree structure, should be close relatives but who lacked a recorded DNA match. This algorithm discovered cases of matches I overlooked or failed to enter. Another algorithm checked each DNA match against the matching persons' supposed relationship according to the tree structure and validated that each match value fit that known relationship, i.e., that the two people did not share more or less DNA than they should have if that known relationship were correct. This algorithm discovered cases of mis-entered data, mistakes I made entering lineages, or mistaken assumptions about how people were related.

Further work

The study has been a prototype for examinations and experiments using Ancestry's "Pro Tools" and a testbed for the development of a software framework for examining shared DNA matches in a match matrix. I plan to continue this work with the Bowdoins and with other families. I have shared my Python code under an open-source license and welcome any comments, criticisms, or contributions.[50]

(accessed 11 Oct 2024). A third model is based on my own extraction of probability data from the AncestryDNA white paper graph, following the DNA Geek's method and using the same extraction tool (Automeris.io's WebPlotDigitizer, https://automeris.io/). I extracted a much higher-resolution array of data points, but the models produce more or less the same predictions.

[50] See my Bowdoin family page at https://www.jtrichardson.com/Bowdoin, or my GitHub at https://github.com/JosephTRichardson/dnamatrix/ (accessed 27 Nov 2024).