

# Research Like a Pro with DNA

A Genealogist's Guide to Finding and Confirming  
Ancestors with DNA Evidence

Audiobook

Tables and Figures

**Diana Elder, Nicole Dyer, and Robin Wirthlin**



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Highland, UT

All websites were accessed 1 March 2021.

Cover image courtesy of Diana Elder.

Company	Transfer From	Transfer To	Autosomal DNA	Y-DNA	Mitochondrial DNA	Type of Sample
<i>23andMe</i>	Yes	No	Yes	Haplogroup estimate	Haplogroup estimate	Saliva
<i>AncestryDNA</i>	Yes	No	Yes	No	No	Saliva
<i>Family Tree DNA</i>	Yes	Yes	Yes	Yes, multiple marker levels Haplogroup or Haplogroup estimate given	Yes, multiple marker levels Haplogroup or Haplogroup estimate given	Swab
<i>Living DNA</i>	Yes	Yes	Yes	Haplogroup estimate	Haplogroup estimate	Swab
<i>MyHeritage</i>	Yes	Yes	Yes	No	No	Swab

Table 1.1. DNA testing company comparison

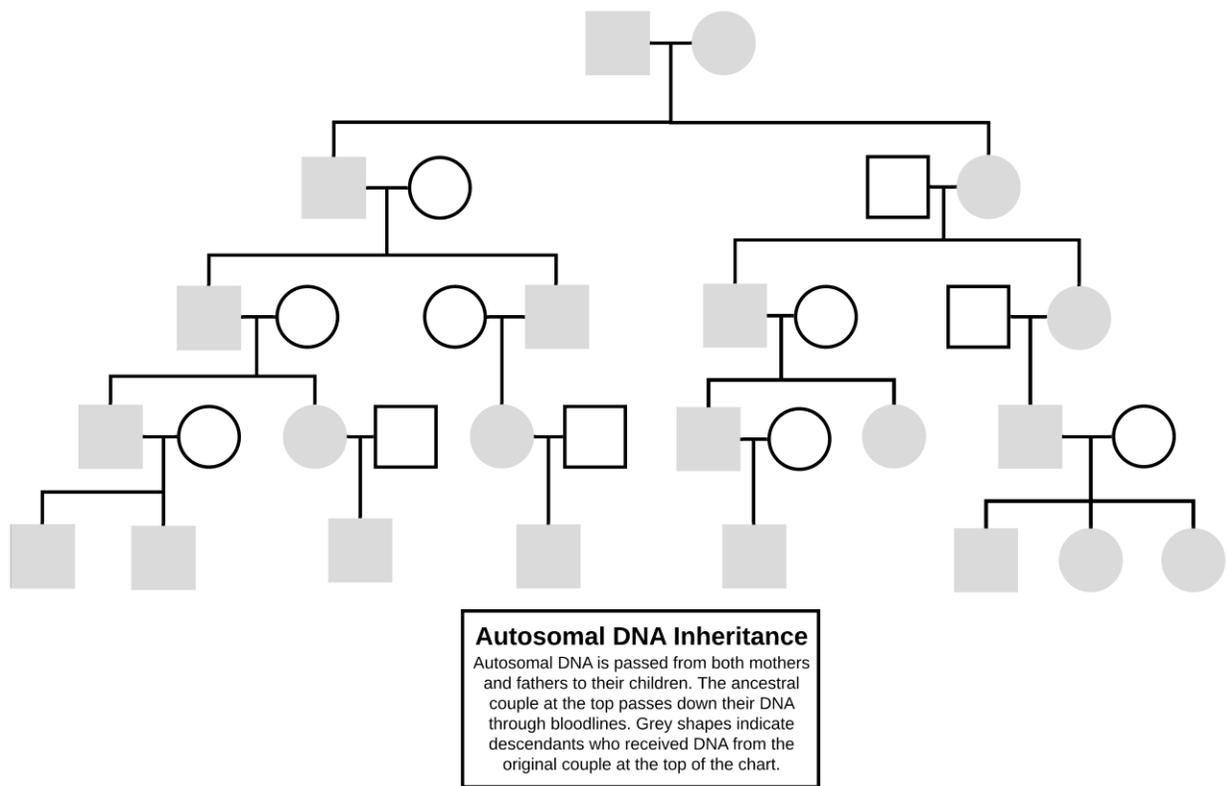


Figure 1.1. Inheritance pattern for autosomal DNA. Created by Robin Wirthlin.



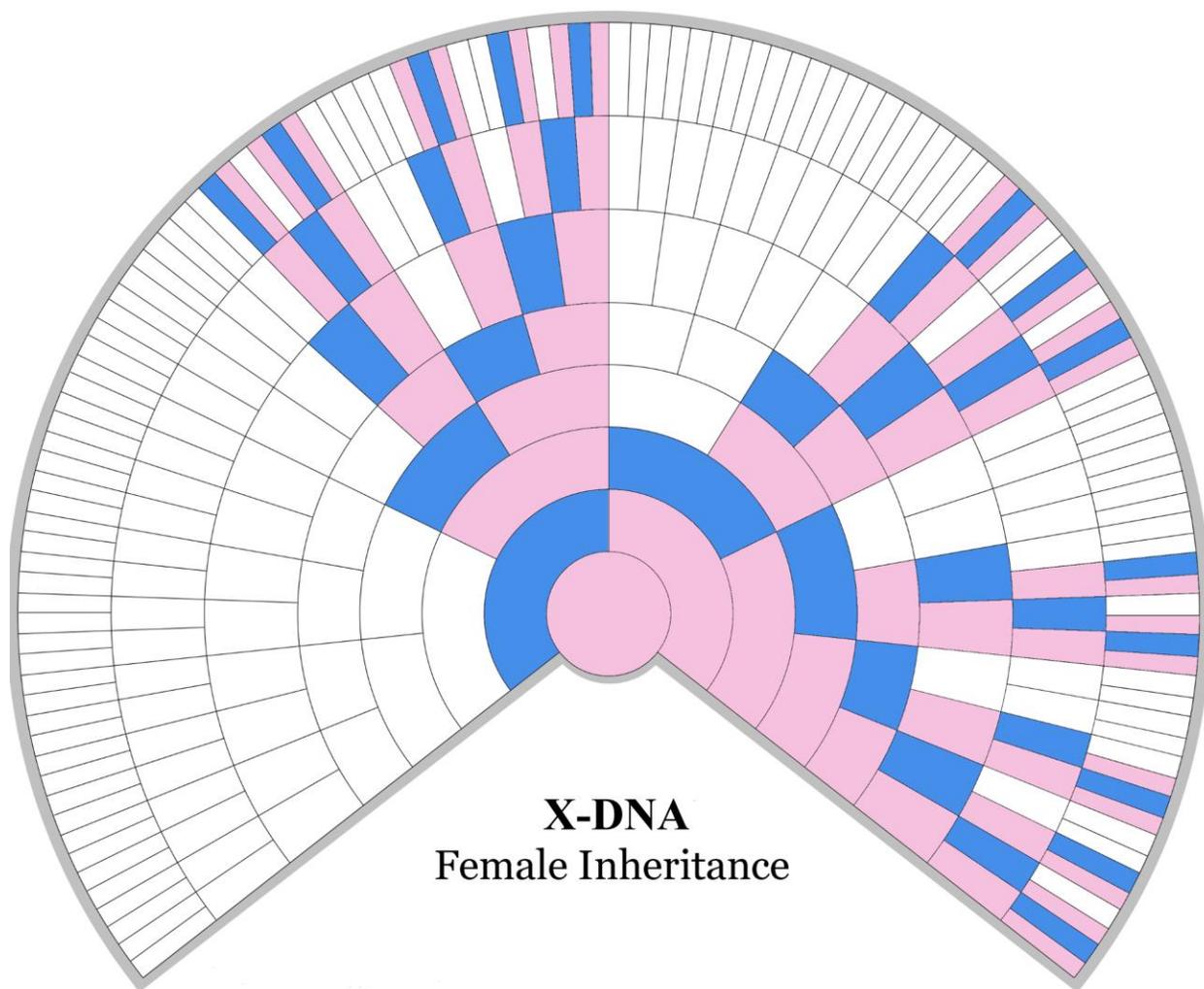
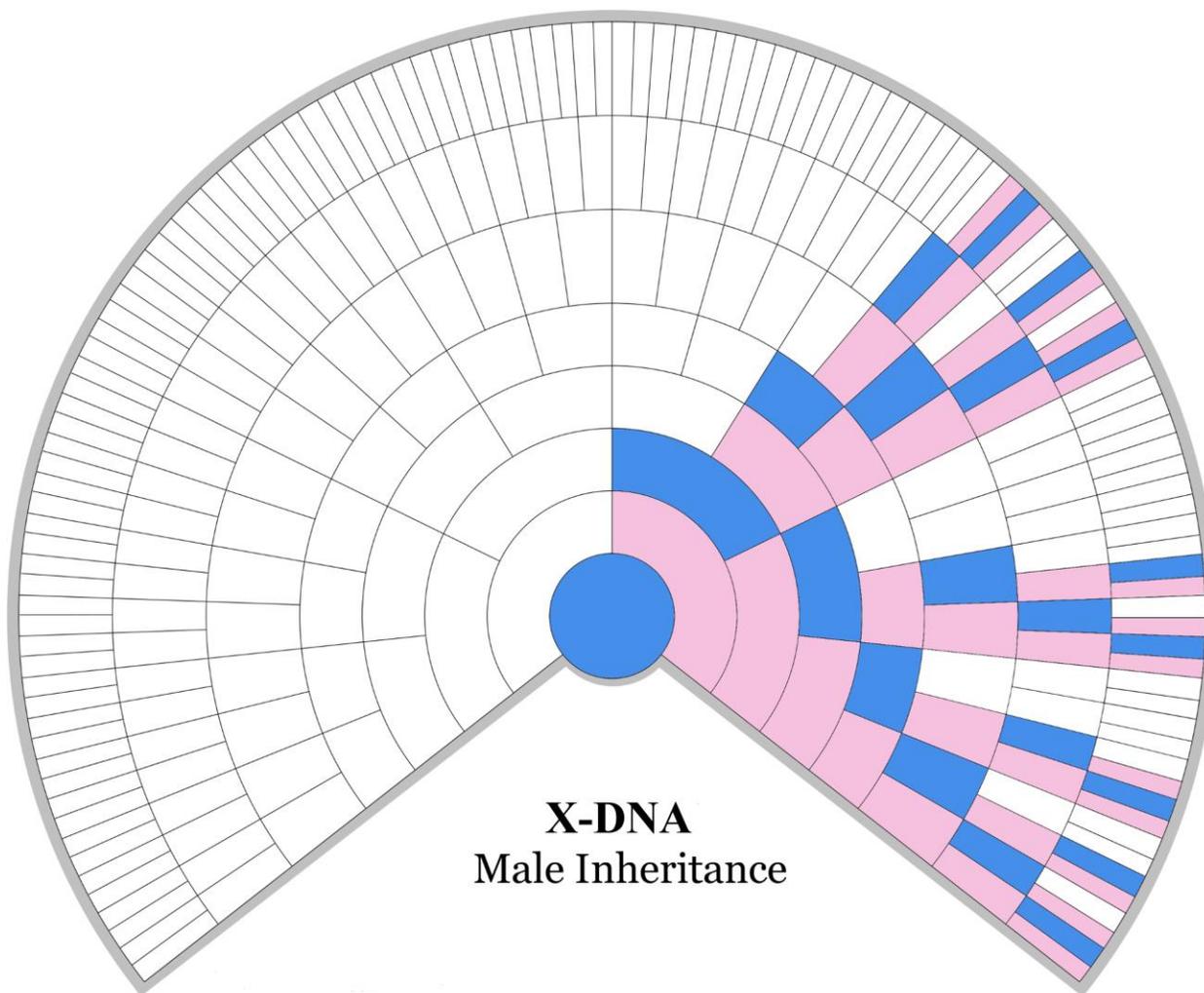


Figure 1.4. X-DNA female inheritance chart, annotated, courtesy of Blaine Bettinger, "Unlocking the Genealogical Secrets of the X Chromosome," 21 December 2008, *The Genetic Genealogist* (<https://thegeneticgenealogist.com/2008/12/21/unlocking-the-genealogical-secrets-of-the-x-chromosome/>).



## X-DNA Male Inheritance

Figure 1.5. X-DNA male inheritance chart, annotated, courtesy of Blaine Bettinger, "Unlocking the Genealogical Secrets of the X Chromosome," 21 December 2008, *The Genetic Genealogist* (<https://thegeneticgenealogist.com/2008/12/21/unlocking-the-genealogical-secrets-of-the-x-chromosome/>).

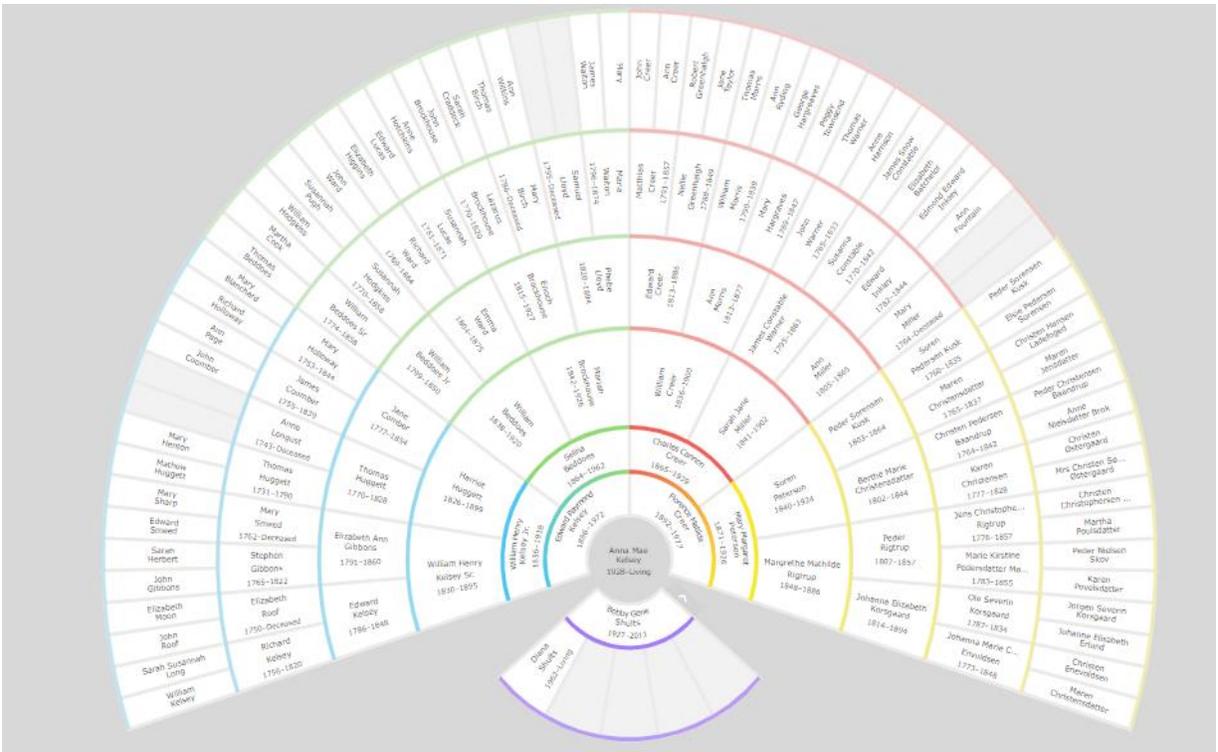


Figure 2.1. Fan Chart for Anna Mae Kelsey, FamilySearch (<https://www.familysearch.org/tree/pedigree/fanchart/LFZX-V49>).

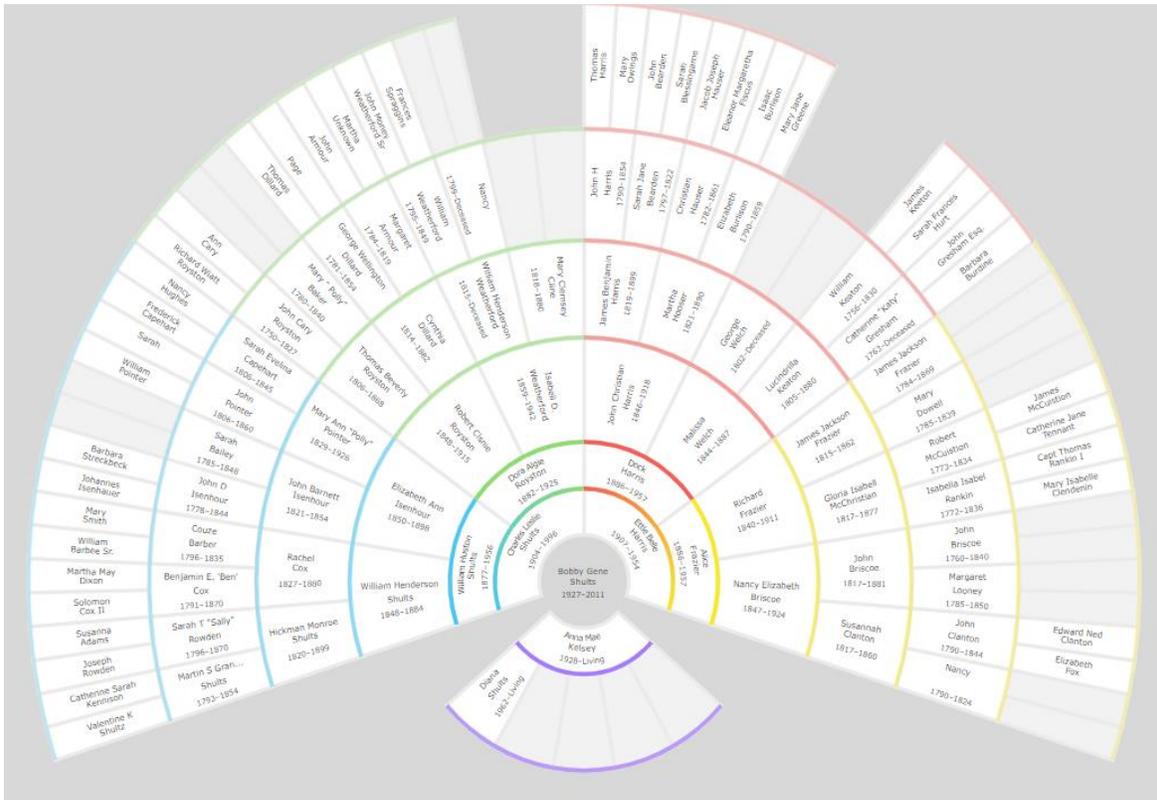


Figure 2.2. Fan Chart for Bobby Gene Shults, FamilySearch (<https://www.familysearch.org/tree/pedigree/fanchart/KWZM-TKN>).

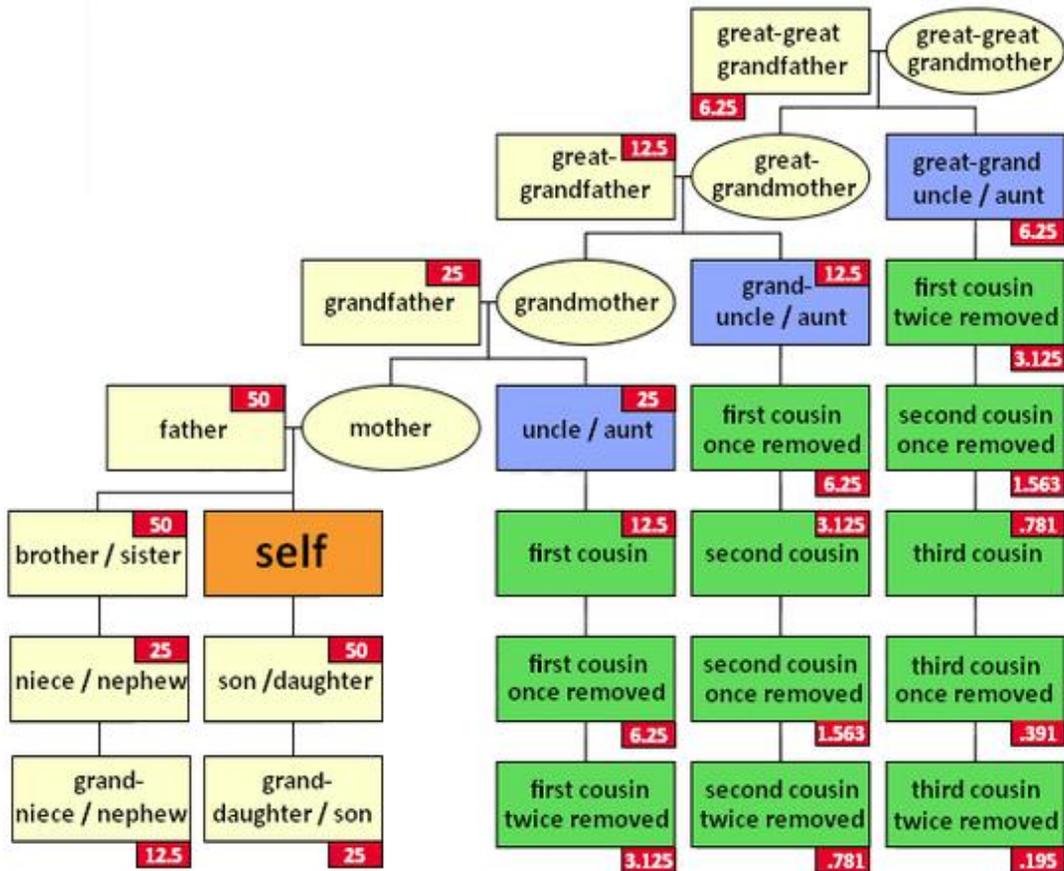


Figure 2.3. Cousin tree showing genetic kinship. *Wikimedia Commons*  
[https://commons.wikimedia.org/wiki/File:Cousin\\_tree\\_\(with\\_genetic\\_kinship\).png](https://commons.wikimedia.org/wiki/File:Cousin_tree_(with_genetic_kinship).png).

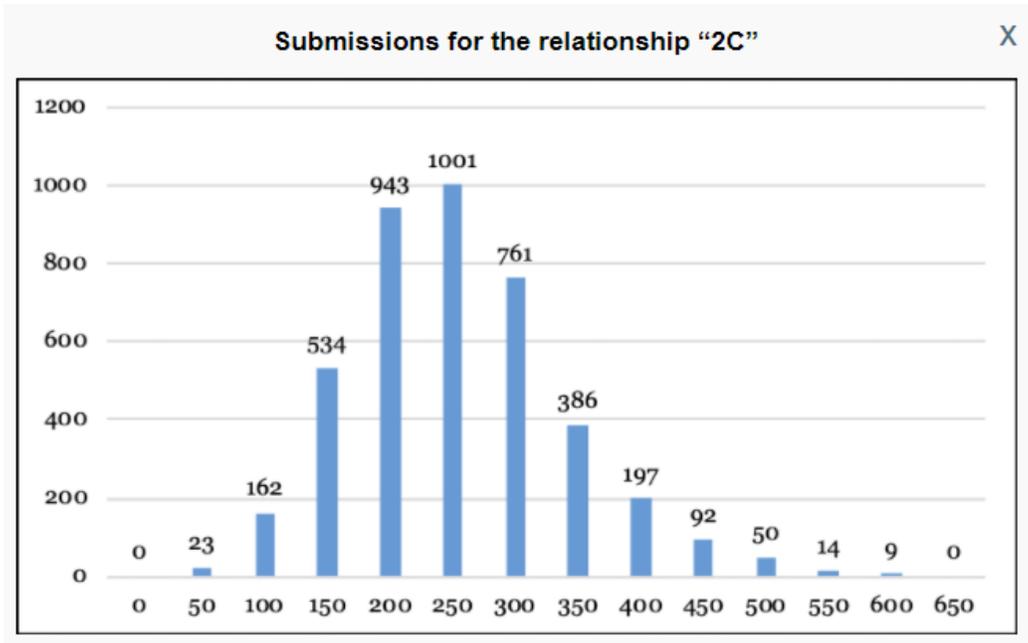


Figure 2.4. Histogram with submissions for the second cousin relationship. Shared cM Project Blaine T. Bettinger and Jonny Perl, "The Shared cM project 4.0 tool v4," DNA Painter (<https://dnainter.com/tools/sharedcmv4>), licensed under CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>).

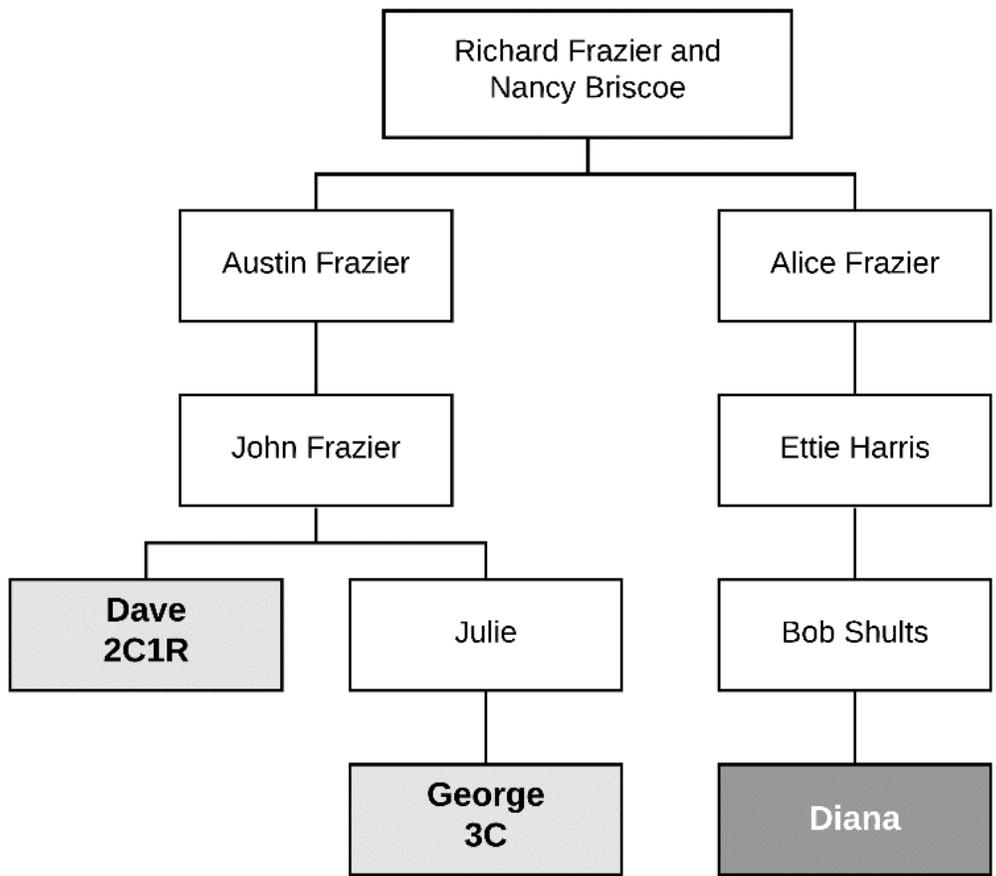


Figure 3.1. Diana's relationship to two DNA matches

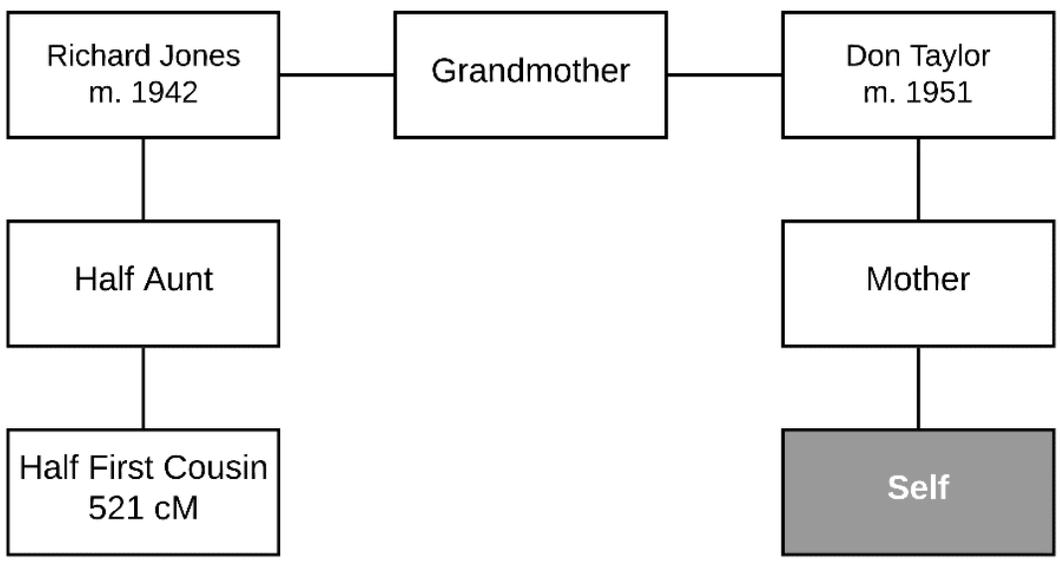


Figure 3.2. Half first cousin relationship

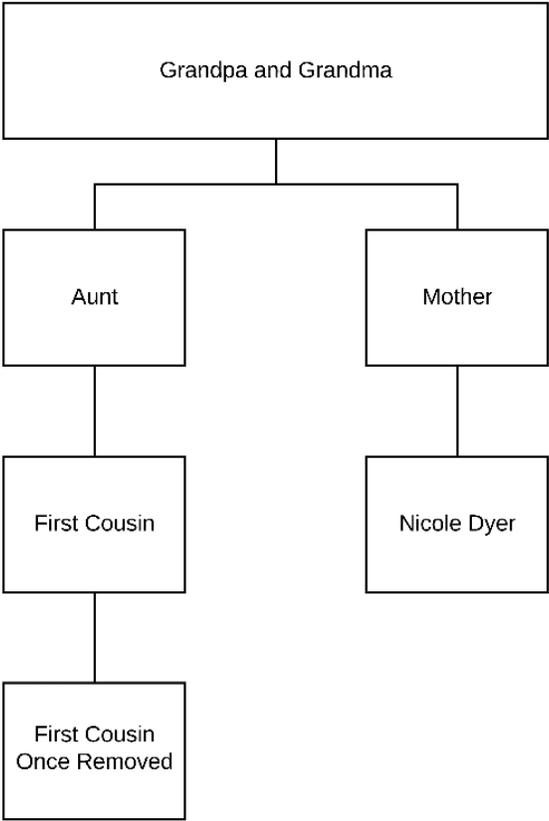


Figure 3.3. Lucidchart diagram showing a first cousin once removed

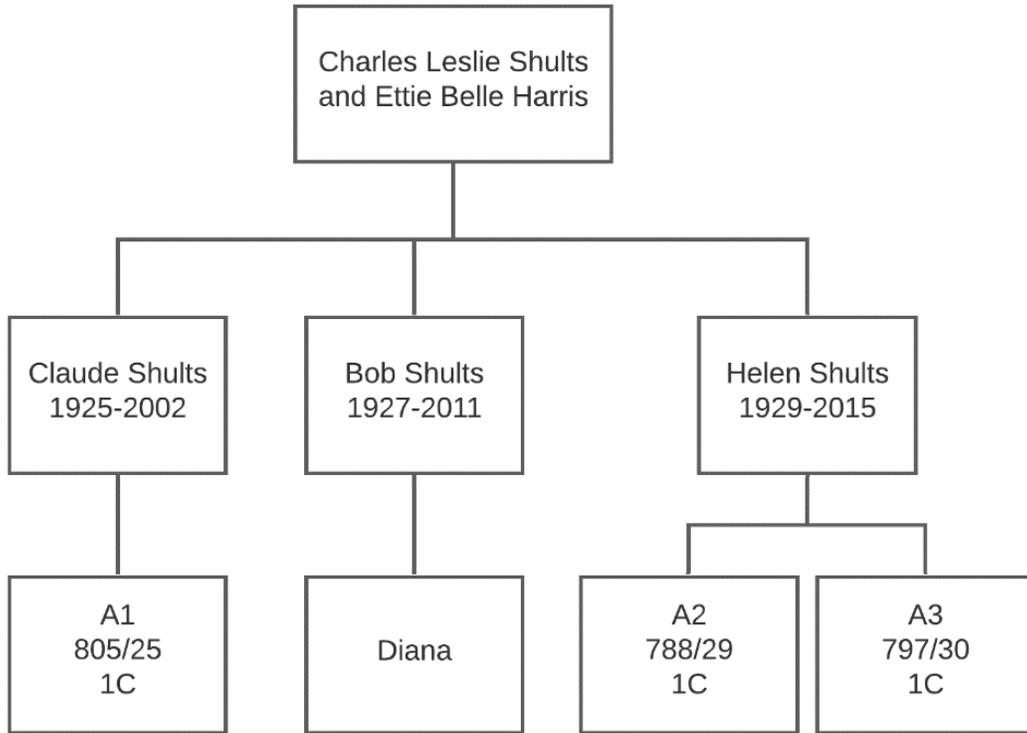


Figure 3.4. Diagram with shared cM, number of segments, and relationship shorthand

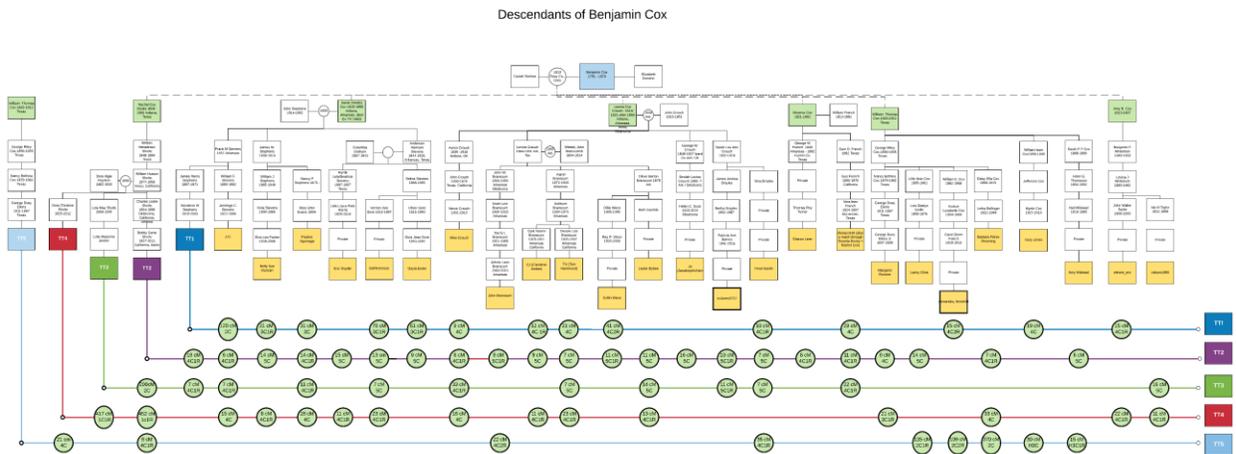


Figure 3.5. Descendants of Benjamin Cox, a McGuire chart created by Diana Elder

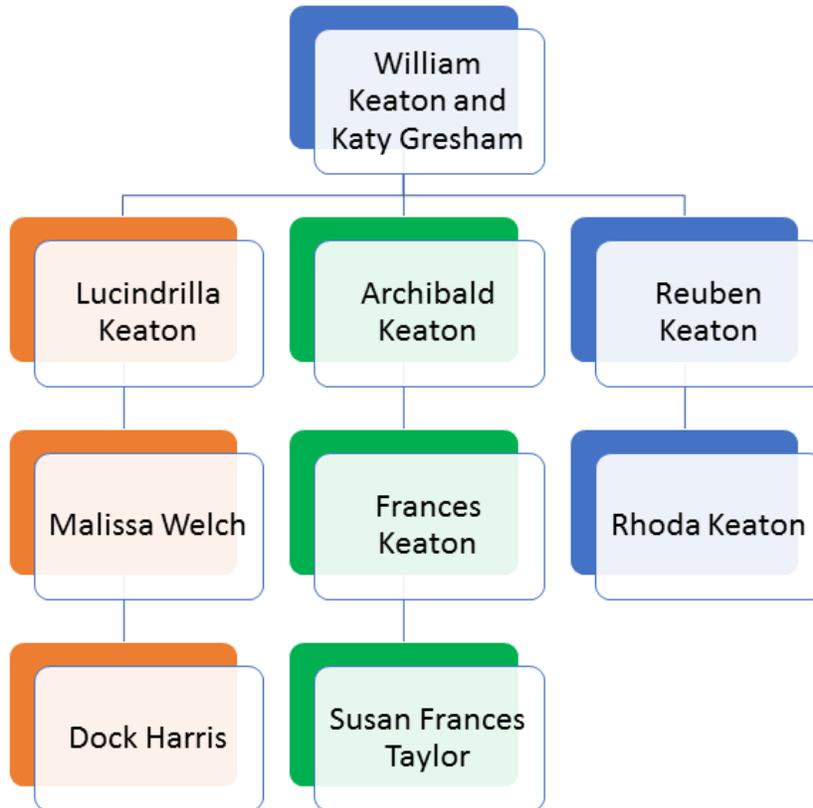


Figure 3.6. Descendency diagram created with PowerPoint Smart Art Hierarchy Template

ancestry Trees Search DNA Health Help Extras Upgrade 99+ 2

← Back to all ThruLines Provide feedback ?

## ThruLines™ for Jesse (RAMSEY) HOLLINGSWORTH

ThruLines uses Ancestry® trees to suggest that you may be related to 90 DNA matches through Jesse (RAMSEY) HOLLINGSWORTH.

Relationships List

**Jesse HOLLINGSWORTH** (EVALUATE)  
4th great-grandfather  
1795-1846

**Martin Hollingsworth** (EVALUATE)  
4th great-uncle  
1832-1905  
15 DNA Matches

**W HOLLINGSWORTH** (EVALUATE)  
4th great-uncle  
1836-1916  
8 DNA Matches

**Elam Hollingsworth**  
3rd great-grandfather  
1838-1905  
57 DNA Matches

4

  
Nicole Dyer

Figure 3.7. Ancestry ThruLines suggestion showing the dotted box around potential siblings of a known ancestor

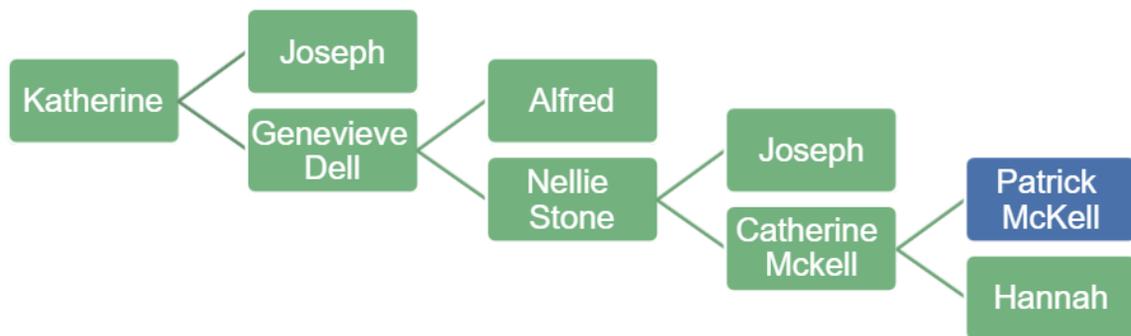


Figure 4.1. Katherine's line from Patrick and Hannah McKell



Figure 4.2. Steve's patrilineal descent from Ralph Bingham

# Chapter 5: Writing Source Citations for DNA & Documentary Sources

Diana Elder

## WHO Created the Source?

### Book, Article, or Blog Post

Answering the question "Who created the source?" is relatively easy, naming the author or authors as shown in the first and third examples.

**Blaine T. Bettinger and Debbie Parker Wayne**, *Genetic Genealogy in Practice* (Arlington, Virginia: National Genealogical Society, 2016), 23.

"Y chromosome DNA tests," rev. 4 September 2019, *International Society of Genetic Genealogy (ISOGG) Wiki* ([https://isogg.org/wiki/Y\\_chromosome\\_DNA\\_tests](https://isogg.org/wiki/Y_chromosome_DNA_tests) : accessed 21 October 2019), para. 2.

**Robin Wirthlin**, "Understanding and Using Your DNA Results – 4 Simple Steps," blog post, 22 February 2019, *Family Locket* (<https://familylocket.com/understanding-and-using-your-dna-results-4-simple-steps/> : accessed 8 February 2021).

### Reports and Company Tools

The example below highlights my genetic cousin, Donald Robert Royston, as the report's creator for a Y-DNA Royston project.

**Donald Robert Royston**, "The Results of the 46 Marker DNA Male Y Chromosome Tests," Y-DNA Royston project, showing matches for Bill Gene Royston & Donald Robert Royston matching 100% in all 46 markers, 24 October 2009 (revised 21 June 2010), report prepared for Diana Elder, Highland, Utah, privately held by Diana Elder, 2017.

The examples below highlight a DNA testing company or website as both the creator and the source's publisher. When the website and the author are the same, there is no need to cite both.

"Coon/Koontz/Kuhn/Coonts, etc. DNA/Genealogy Website – Y-DNA Classic Chart," Y-Chromosome DNA STR surname project results, *FamilyTree DNA* (<https://www.familytreedna.com/public/Coon?iframe=yresults> : accessed 22 October 2018).

"Review DNA Match for Robin Wirthlin," database report, *MyHeritage* (<https://www.myheritage.com/dna/match> : accessed 10 September 2019), estimated 2nd Cousin Once Removed relationship with [Private] sharing 2.3% DNA (165.7 cM) across 8 shared segments (largest segment 51.1 cM), DNA managed by [Private], (MRCA: J. E. Taylor and M. A. Ollerton).

"AutoCluster Visualization for Robin Wirthlin," database report, *Genetic Affairs* (<https://www.geneticaffairs.com> : accessed 13 September 2019), 23andMe data showing 5 members in Cluster 8, (MRCA E. Taylor and W. A. Spafford).

"Ethnicity Estimate report for Diana Elder," *AncestryDNA* (<https://www.ancestry.com/dna/origins> : accessed 21 October 2019), 81% England, Wales & Northwestern Europe, 11% Ireland & Scotland, 8% Norway.

## Online Family Tree

Because our genetic genealogy relies heavily on tracing generational links, we will often refer to an online tree to verify a specific family line. State the name of the tree's creator as shown on the website.

**Diana Elder**, "Shults\_Kelsey family tree," public member tree, *Ancestry* (<https://www.ancestry.com/family-tree/tree/58419748/family?> : accessed 17 June 2020), sourced data for the family of William Huston Shults and Dora Algie Royston.

**M. Romine**, "Elkins-Cox Family Tree," profile for William Thomas "Billy" Cox (1827-1912), public member tree, *Ancestry* (<https://www.ancestry.com> : accessed 11 June 2019).

## Digital Diagram

To answer the question of "who" for a diagram or graph, state the name of the creator.

**Jane Doe**, "Doe-Smith Descendant Diagram," digital diagram created with *Lucidchart* (<https://lucidchart.com>), DNA matches from MyHeritage AutoCluster Report for Jane Doe, cluster 8, generated 8 February 2021, privately held by Jane Doe, Anywhere, USA.

**Jane Doe**, "Gephi network graph for John Smith using Ancestry DNA data," digital diagram created with *Gephi*, files gathered with *DNAGedcom Client* using 25-250 cM shared DNA, gathered 18 October 2020, privately held by Jane Doe, Anywhere, USA.

## WHAT is the Source?

### Book, Article, or Blog Post

When citing a published book, article, or blog post, the question "What is the source" is answered by the title.

Blaine T. Bettinger and Debbie Parker Wayne, *Genetic Genealogy in Practice* (Arlington, Virginia: National Genealogical Society, 2016), 23.

"Y chromosome DNA tests," rev. 4 September 2019, *International Society of Genetic Genealogy (ISOGG) Wiki* ([https://isogg.org/wiki/Y\\_chromosome\\_DNA\\_tests](https://isogg.org/wiki/Y_chromosome_DNA_tests) : accessed 21 October 2019), para. 2.

Robin Wirthlin, "Understanding and Using Your DNA Results – 4 Simple Steps," blog post, 22 February 2019, *Family Locket* (<https://familylocket.com/understanding-and-using-your-dna-results-4-simple-steps/> : accessed 8 February 2020).

## Reports and Company Tools

When citing a report or tool, quotation marks inserted around the title or website's description signal to the reader the specific report.

Donald Robert Royston, "**The Results of the 46 Marker DNA Male Y Chromosome Tests, Y-DNA Royston project**, showing matches for Bill Gene Royston & Donald Robert Royston matching 100% in all 46 markers, 24 October 2009 (revised 21 June 2010), report prepared for Diana Elder, Highland, Utah, privately held by Diana Elder, 2017.

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"**X-DNA Comparison**" database, vers. 2.1.0(a)," database report, *GEDmatch* (<https://www.gedmatch.com> : downloaded 19 January 2019), kits A480154 (Nicole Dyer) and A279720 (Diana Elder), chromosome X, start-stop points 2321-154886292, 196.1 cMs.

"**Coon/Koontz/Kuhn/Coonts, etc. DNA/Genealogy Website – Y-DNA Classic Chart,**" Y-Chromosome DNA STR surname project results, *FamilyTree DNA* (<https://www.familytreedna.com/public/Coon?iframe=yresults> : accessed 22 October 2018).

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## Online Family Tree

Answering the question "What is the source" for an online family tree will include both the description of the broad collection and the family tree's exact name

Diana Elder, "**Shults\_Kelsey family tree,**" public member tree, *Ancestry* (<https://www.ancestry.com/family-tree/tree/58419748/family?> : accessed 17 June 2020), **sourced data for the family of William Huston Shults and Dora Algie Royston.**

M. Romine, "**Elkins-Cox Family Tree,**" profile for William Thomas "Billy" Cox (1827-1912), public member tree, *Ancestry* (<https://www.ancestry.com> : accessed 11 June 2019).

## Digital Diagrams

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Jane Doe, "**Gephi network graph for John Smith using Ancestry DNA data,**" digital diagram created with *Gephi*, files gathered with *DNAgedcom Client* using 25-250 cM shared DNA, gathered 18 October 2020, privately held by Jane Doe, Anywhere, USA.

## WHEN was the Source Published, Created, or Accessed?

### Book, Article, or Blog Post

With the field of DNA changing rapidly, the date of publication is essential.

Blaine T. Bettinger and Debbie Parker Wayne, *Genetic Genealogy in Practice* (Arlington, Virginia: National Genealogical Society, **2016**), 23.

"Y chromosome DNA tests," rev. **4 September 2019**, *International Society of Genetic Genealogy (ISOGG) Wiki* ([https://isogg.org/wiki/Y\\_chromosome\\_DNA\\_tests](https://isogg.org/wiki/Y_chromosome_DNA_tests) : **accessed 21 October 2019**), para. 2.

Robin Wirthlin, "Understanding and Using Your DNA Results – 4 Simple Steps," blog post, **22 February 2019**, *Family Locket* (<https://familylocket.com/understanding-and-using-your-dna-results-4-simple-steps/> : **accessed 8 February 2020**).

### Reports and Company Tools

Cite the date a DNA match report was created and downloaded. Although the information is not likely to change, the date will be necessary if the database updates the algorithm used to calculate the report.

Donald Robert Royston, "The Results of the 46 Marker DNA Male Y Chromosome Tests," Y-DNA Royston project, showing matches for Bill Gene Royston & Donald Robert Royston matching 100% in all 46 markers, **24 October 2009 (revised 21 June 2010)**, report prepared for Diana Elder, Highland, Utah, privately held by Diana Elder, **2017**.

"Ethnicity Estimate report for Diana Elder," *AncestryDNA* (<https://www.ancestry.com/dna/origins> : **accessed 21 October 2019**), 81% England, Wales & Northwestern Europe, 11% Ireland & Scotland, 8% Norway.

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"AutoCluster Visualization for Robin Wirthlin," database report, *Genetic Affairs* (<https://www.geneticaffairs.com> : **accessed 13 September 2019**), 23andMe data showing 5 members in Cluster 8, (MRCA E. Taylor and W. A. Spafford).

## Online Family Tree

Cite the specific day and year you accessed the tree, as online trees can change often.

Diana Elder, "Shults\_Kelsey family tree," public member tree, *Ancestry* (<https://www.ancestry.com/family-tree/tree/58419748/family?> : **accessed 17 June 2020**), sourced data for the family of William Huston Shults and Dora Algie Royston.

M. Romine, "Elkins-Cox Family Tree," profile for William Thomas "Billy" Cox (1827-1912), public member tree, *Ancestry* (<https://www.ancestry.com> : **accessed 11 June 2019**).

## Digital Diagram

DNA information changes continually as new matches become available, so note the date of creation for a digital diagram or graph.

Jane Doe, "Doe-Smith Descendant Diagram," digital diagram created with *Lucidchart* (<https://lucidchart.com>), DNA matches from MyHeritage AutoCluster Report for Jane Doe, cluster 8, **generated 8 February 2021**, privately held by Jane Doe, Anywhere, USA.

Jane Doe, "Gephi network graph for John Smith using Ancestry DNA data," digital diagram created with *Gephi*, files gathered with *DNAGedcom Client* using 25-250 cM shared DNA, **gathered 18 October 2020**, privately held by Jane Doe, Anywhere, USA.

## WHERE is the Source?

### Book, Article, or Blog Post

When citing a published source, the question "Where is the source" is answered by the place of publication.

For an article published online, cite the complete URL.

Blaine T. Bettinger and Debbie Parker Wayne, *Genetic Genealogy in Practice* (Arlington, Virginia: National Genealogical Society, 2016), 23.

"Y chromosome DNA tests," rev. 4 September 2019, *International Society of Genetic Genealogy (ISOGG) Wiki* ([https://isogg.org/wiki/Y\\_chromosome\\_DNA\\_tests](https://isogg.org/wiki/Y_chromosome_DNA_tests) : accessed 21 October 2019).

Robin Wirthlin, "Understanding and Using Your DNA Results – 4 Simple Steps," blog post, 22 February 2019, *Family Locket* (<https://familylocket.com/understanding-and-using-your-dna-results-4-simple-steps/> : accessed 8 February 2021).

## Reports and Company Tools

The location of a privately held report generally states only the city and state with the specific address withheld for privacy.

Donald Robert Royston, "The Results of the 46 Marker DNA Male Y Chromosome Tests," Y-DNA Royston project, showing matches for Bill Gene Royston & Donald Robert Royston matching 100% in all 46 markers, 24 October 2009 (revised 21 June 2010), report prepared for Diana Elder, **Highland, Utah**, privately held by Diana Elder, 2017.

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"Review DNA Match for Robin Wirthlin," database report, *MyHeritage* (<https://www.myheritage.com/dna/match> : accessed 10 September 2019), estimated 2nd Cousin Once Removed relationship with [Private] sharing 2.3% DNA (165.7 cM) across 8 shared segments (largest segment 51.1 cM), DNA managed by [Private], (MRCA: J. E. Taylor and M. A. Ollerton).

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## Online Family Tree

When citing an online tree, consider using the full URL for ease of access. If a tree is private, the generic URL would be sufficient.

Diana Elder, "Shults\_Kelsey family tree," public member tree, *Ancestry* (<https://www.ancestry.com/family-tree/tree/58419748/family?> : accessed 17 June 2020), sourced data for the family of William Huston Shults and Dora Algie Royston.

M. Romine, "Elkins-Cox Family Tree," profile for William Thomas "Billy" Cox (1827-1912), public member tree, *Ancestry* (<https://www.ancestry.com> : accessed 11 June 2019).

## Digital Diagram

The question of "where" for a diagram you create is answered by your physical residence.

Jane Doe, "Doe-Smith Descendant Diagram," digital diagram created with *Lucidchart* (<https://lucidchart.com>), DNA matches from MyHeritage AutoCluster Report for Jane Doe, cluster 8, generated 8 February 2021, privately held by Jane Doe, **Anywhere, USA**.

Jane Doe, "Gephi network graph for John Smith using Ancestry DNA data," digital diagram created with *Gephi*, files gathered with *DNAGedcom Client* using 25-250 cM shared DNA, gathered 18 October 2020, privately held by Jane Doe, **Anywhere, USA**.

## WHERE IN is the Item of Information?

### Book, Article, or Blog Post

When citing a specific detail within a book or article, identify the page or paragraph where the information is found. If you are citing the whole book or article, no specific page is needed.

Blaine T. Bettinger and Debbie Parker Wayne, *Genetic Genealogy in Practice* (Arlington, Virginia: National Genealogical Society, 2016), **23**.

"Y chromosome DNA tests," rev. 4 September 2019, *International Society of Genetic Genealogy (ISOGG) Wiki* ([https://isogg.org/wiki/Y\\_chromosome\\_DNA\\_tests](https://isogg.org/wiki/Y_chromosome_DNA_tests) : accessed 21 October 2019), **para. 2**.

Robin Wirthlin, "Understanding and Using Your DNA Results – 4 Simple Steps," blog post, 22 February 2019, *Family Locket* (<https://familyloket.com/understanding-and-using-your-dna-results-4-simple-steps/> : accessed 8 February 2021).

### Reports and Company Tools

Citing a user report or a specific DNA match on a testing company website requires adding specific information because the match can only be accessed by the user.

Donald Robert Royston, "The Results of the 46 Marker DNA Male Y Chromosome Tests," Y-DNA Royston project, **showing matches for Bill Gene Royston & Donald Robert Royston matching 100% in all 46 markers**, 24 October 2009 (revised 21 June 2010), report prepared for Diana Elder, Highland, Utah, privately held by Diana Elder, 2017.

"Ethnicity Estimate report for Diana Elder," *AncestryDNA* (<https://www.ancestry.com/dna/origins> : accessed 21 October 2019), **81% England, Wales & Northwestern Europe, 11% Ireland & Scotland, 8% Norway**.

"X-DNA Comparison" database, vers. 2.1.0(a)," database report, *GEDmatch* (<https://www.gedmatch.com> : downloaded 19 January 2019), **kits A480154 (Nicole Dyer) and A279720 (Diana Elder), chromosome X, start-stop points 2321-154886292, 196.1 cMs**.

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"Review DNA Match for Robin Wirthlin," database report, *MyHeritage* (<https://www.myheritage.com/dna/match> : accessed 10 September 2019), **estimated 2nd Cousin Once Removed relationship with [Private] sharing 2.3% DNA (165.7 cM) across 8 shared segments (largest segment 51.1 cM), DNA managed by [Private], (MRCA: J. E. Taylor and M. A. Ollerton)**.

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## Online Family Tree

A citation for an online tree could point to the entire tree with no specific "where in" item noted or to a specific profile within the tree.

Diana Elder, "Shults\_Kelsey family tree," public member tree, *Ancestry* (<https://www.ancestry.com/family-tree/tree/58419748/family?> : accessed 17 June 2020), sourced data for the family of William Huston Shults and Dora Algie Royston.

M. Romine, "Elkins-Cox Family Tree," **profile for William Thomas "Billy" Cox (1827-1912)**, public member tree, *Ancestry* (<https://www.ancestry.com> : accessed 11 June 2019).

## Digital Diagram

The citation for a digital diagram could include details about the specific matches or amount of cM used in gathering the data.

Jane Doe, "Doe-Smith Descendant Diagram," digital diagram created with *Lucidchart* (<https://lucidchart.com>), **DNA matches from MyHeritage AutoCluster Report for Jane Doe, cluster 8**, generated 8 February 2021, privately held by Jane Doe, Anywhere USA.

Jane Doe, "Gephi network graph for John Smith using Ancestry DNA data," digital diagram created with *Gephi*, **files gathered with DNAGedcom Client using 25-250 cM shared DNA**, gathered 18 October 2020, privately held by Jane Doe, Anywhere, USA.

## Citation Formats, Styles, and Standards

### Layered Citations

Montague County, Texas, "Delayed Birth Certificates, Event Date Ca. 1870-1933," entry for Alice Frazier, certificate 6-54, 1886 (1949), arranged alphabetically; digitized image 210 of 1926, *FamilySearch* (<https://www.familysearch.org/ark:/61903/3:1:3QS7-89VD-G42M?> : accessed 31 May 2020); citing DGS Film 007611604, FHL microfilm 1,435,324.

"Ireland, Petty Sessions Court Registers" entry for Patrick Savage, 8 February 1854, digital image, *Findmypast* (<https://www.findmypast.com> : accessed 10 June 2020); County Court, Ireland, Kerry, Tralee, Petty Sessions Order Books, National Archives of Ireland, Dublin, CSPPS 1/9609.

### Citation Formats

Examples:

**Full Reference Note:**

Blaine T. Bettinger and Debbie Parker Wayne, *Genetic Genealogy in Practice*, (Arlington, Virginia: National Genealogical Society, 2016), 23.

"Review DNA Match" for Robin Wirthlin, database report, *MyHeritage* (<https://www.myheritage.com/dna/match> : accessed 10 September 2019), estimated 2nd Cousin Once Removed relationship with [Private] sharing 2.3% DNA (165.7 cM) across 8 shared segments (largest segment 51.1 cM), DNA managed by [Private], (MRCA: J. E. Taylor and M. A. Ollerton).

**Shortened Reference Note:**

Bettinger, *Genetic Genealogy in Practice*, 23.

"Review DNA Match" for Robin Wirthlin, *MyHeritage*, September 2019, estimated 2C1R relationship with [Private] sharing 2.3% DNA (165.7 cM) across 8 shared segments (largest segment 51.1 cM).

**Source List Entry:**

Bettinger, Blaine T. and Debbie Parker Wayne. *Genetic Genealogy in Practice*. Arlington, Virginia: National Genealogical Society, 2016.

"Review DNA Match for Robin Wirthlin." Database report. *MyHeritage*.  
<https://www.myheritage.com/dna/match> : 10 September 2019.

Table 5.1 Citation Element Examples		
Citation Element	DNA Source Examples	Traditional Source Examples
<b>WHO created the source?</b>	DNA testing company Third-party DNA company Author of a DNA report	Author of a book, article, or blog post Government entity Church entity Informant
<b>WHAT is the source?</b>	Ethnicity estimate DNA Match Haplogroup Segment triangulation Online family tree	Book, article, or blog post title Record collection title Description of the item of interest (name of the individual(s) and type of record)
<b>WHEN was the source created or accessed?</b>	Date a DNA report was created Date a DNA match or online family tree was accessed	Date of publication for a book or microfilm Date a website was accessed. Date of the event
<b>WHERE IS the source?</b>	URL for an online DNA report Address of the creator of a DNA report	Publication location for a book Physical location of the repository URL for a record viewed online
<b>WHERE IN the source is the item of information?</b>	Specific details about a DNA match or ethnicity report	Volume, page number in a book Image number for a digitized film Identification of an order for unpublished materials

Relationship	23andMe	Ancestry	FTDNA	Most Recent Common Ancestors
First cousins	~100%	100%	>99%	grandparents
Second cousins	>99%	100%	>99%	great-grandparents
Third cousins	~90%	98%	>90%	2nd great-grandparents
Fourth cousins	~45%	71%	>50%	3rd great-grandparents
Fifth cousins	~15%	32%	>10%	4th great-grandparents
Sixth cousins and beyond	<5%	11%	Remote (typically less than 2%)	5th great-grandparents
Seventh cousins	1.1%	3.20%		6th great-grandparents
Eighth cousins	0.24%	0.91%		7th great-grandparents
Ninth cousins	0.06%			8th great-grandparents
Tenth cousins	0.002%			9th great-grandparents

Table 6.1. Probability that two cousins will share enough DNA for their relationship to be detected

## Understanding Admixture/Ethnicity Estimates

The following Ancestry DNA Ethnicity Estimate reflects this individual's known ancestry of Latin America, British Isles, and Scandinavian. The specific communities listed in Eastern Norway and Indigenous Americas - Mexico are useful clues for continuing the research in those locations.

- Norway 46%
  - Eastern Norway
  - Oppland
  - Etnedal, Nord Aurdal, and Nordre Land
- England, Wales & Northwestern Europe 11%
- Ireland 10%
- Scotland 7%
- Indigenous Americas – Mexico 7%
  - Michoacán & Southern Jalisco
    - Northern Michoacán
  - Central & Southern Mexico
- Sweden 6%
- Wales 5%
- Spain 4%
- Portugal 2%
- Indigenous Americas - Andean 1%
- Eastern Europe & Russia 1%

My genealogical family tree shows the following breakdown:

- Maternal line: ¾ English, immigrated in the mid-1800s
- Maternal line: ¼ Danish, immigrated in the mid-1800s
- Paternal Line: British Isles, Germany, France, immigrated in the 1600s and 1700s

## 23andMe – Ancestry Composition

- Northwestern European 97.7%
  - British & Irish 53.0%
  - French & German 18.7%
  - Scandinavian 7.9%
  - Broadly Northwestern European 18.1%
- Southern European 1.4%
  - Spanish & Portuguese 0.5%
  - Broadly Southern European 0.9%
  - Broadly European 0.5%
  - Trace Ancestry 0.3%
  - Unassigned 0.1%

## AncestryDNA – DNA Story and Ethnicity Estimate

For example, my AncestryDNA Ethnicity Estimate shows the following regions and percentages.<sup>1</sup>

- England, Wales & Northwestern Europe 63%
- Norway 12%
- Scotland 10%
- Ireland 6%
- Sweden 4%
- Germanic Europe 3%
- Wales 2%

Comparing my Ancestry DNA Ethnicity Estimate with that of my mother revealed a difference in Communities.<sup>2</sup> My estimate showed none, whereas she had several listed (represented in the list below with an “o”). I was interested to see her English and Danish ancestry represented in specific Communities that could hold clues to unknown ancestors or verify known ancestral lines. Interestingly, her roughly 25% Danish ancestry appears to come from the Norway and Germanic Europe regions.

- England, Wales & Northwestern Europe 54%
  - The Midlands, England
  - North West England & the Isle of Man
  - South East England
- Germanic Europe 19%
- Scotland 13%
- Norway 9%
- Wales 3%
- Ireland 2%

### Additional Communities

- Denmark
  - Jutland, Zealand, Funen, Lolland & Falster (from your regions England, Wales & Northwestern Europe; Germanic Europe)
- Mountain West Mormon Pioneers (from your regions England, Wales & Northwestern Europe)

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<sup>1</sup> "Ethnicity Estimate for Diana Elder," database report, *AncestryDNA* (<https://www.ancestry.com/dna/origins> : accessed 18 February 2021), 63% England, Wales & Northwestern Europe, 12% Norway, 10% Scotland, 6% Ireland, 4% Sweden, 3% Germanic Europe, 2% Wales.

<sup>2</sup> "Ethnicity Estimate for Anna Mae Shults," database report, *AncestryDNA* (<https://www.ancestry.com/dna/origins> : accessed 18 February 2021), 54% England, Wales & Northwestern Europe, 19% Germanic Europe, 13% Scotland, 9% Norway, 3% Wales, 2% Ireland.

## FamilyTree DNA – myOrigins

- Western Europe
  - Central Europe 55%
  - Ireland 40%
  - Scandinavia 5%
- Finnish
  - Finland <1%

## Living DNA – Ancestry

Living DNA provides a unique algorithm to show regional detail for your origins. This algorithm breaks Great Britain and Ireland into much smaller regions, and if you have ancestry in the British Isles, has potential for new discoveries.

The breakdown below illustrates my British Isles origins.<sup>3</sup>

- Europe (North and West) 62.6%
  - South Germanic 30.9%
  - Scandinavia 17.1%
  - Northwest Germanic 14.6%
- Great Britain and Ireland 37.4%
  - Southeast England 14.6%
  - South Central England 3.3%
  - South Yorkshire 3.1%
  - Northwest England 2.8%
  - Northumbria 2.4%
  - Central England 2.2%
  - East Anglia 2.1%
  - South Wales Border 1.9 %
  - Ireland 1.9%
  - Cumbria 1.6%
  - North Wales 1.6%

## MyHeritage – Ethnicity Estimate

- North and West European 43.9%
- English 38.6%
- East European 8.1%

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<sup>3</sup> “Your Recent Ancestry Results for Diana Elder,” *Living DNA* (<https://my.livingdna.com/ancestry/recent> : accessed 18 February 2021), 62.6% Europe (North and West), 37.4 % Great Britain and Ireland.

- Iberian 7.6%
- South Europe 7.6%
- Finnish 1.85

### GEDmatch Admixture Utilities

I used the Eurogenes K13 Model because of my European heritage. The program generated a list of percentages and a pie chart showing a large region labeled North Atlantic, reflecting my English and Danish ancestry. Interesting is the amount of DNA most commonly found in individuals residing in the Mediterranean region.<sup>4</sup>

- North Atlantic 55.40%
- Baltic 23.28%
- West Mediterranean 9.81%
- West Asian 5.77%
- East Mediterranean 2.62%
- Red Sea 1.10%

---

<sup>4</sup> "Admixture Utilities for Diana Elder," *GEDMatch* (<https://www.gedmatch.com/admixProp.php> : accessed 18 February 2021), Kit # CH2465632, Eurogenes K13 Model, 55% North Atlantic, 23% Baltic, 9% West Mediterranean, 5% West Asian, 2% East Mediterranean, 1% Red Sea.

# DNA TOOLS

Goals: Identify the MRCA & Relationships with DNA matches

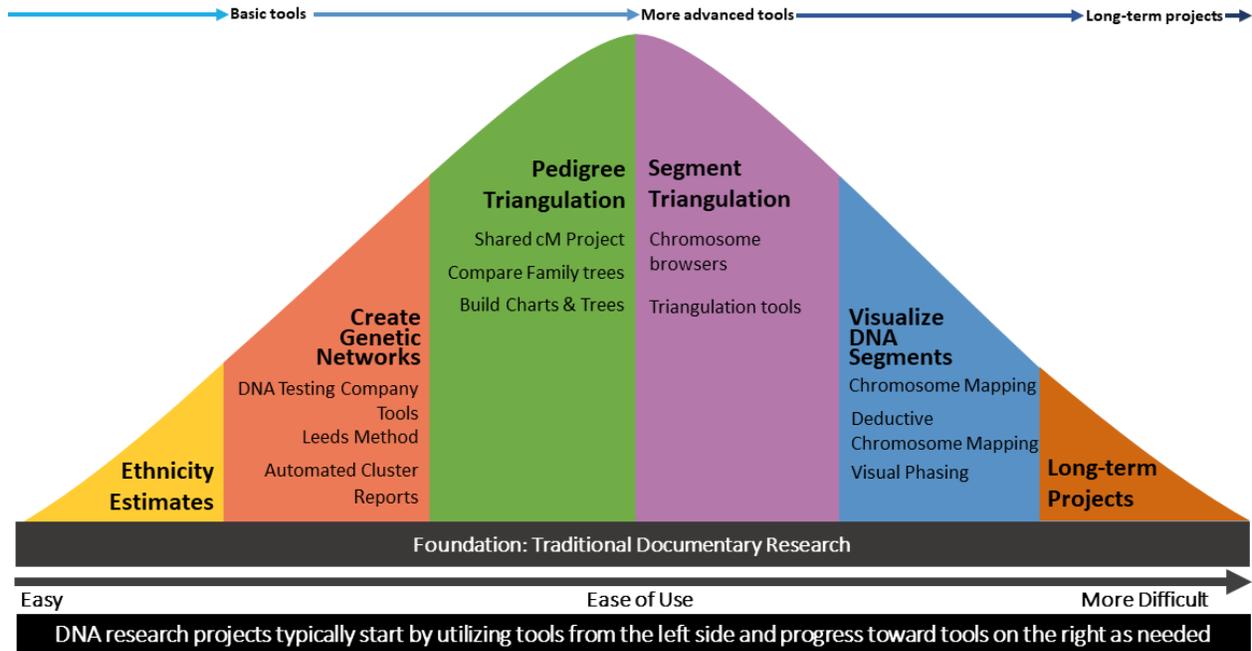


Figure 8.1. Bell Curve of DNA Tools, created by Robin Wirthlin

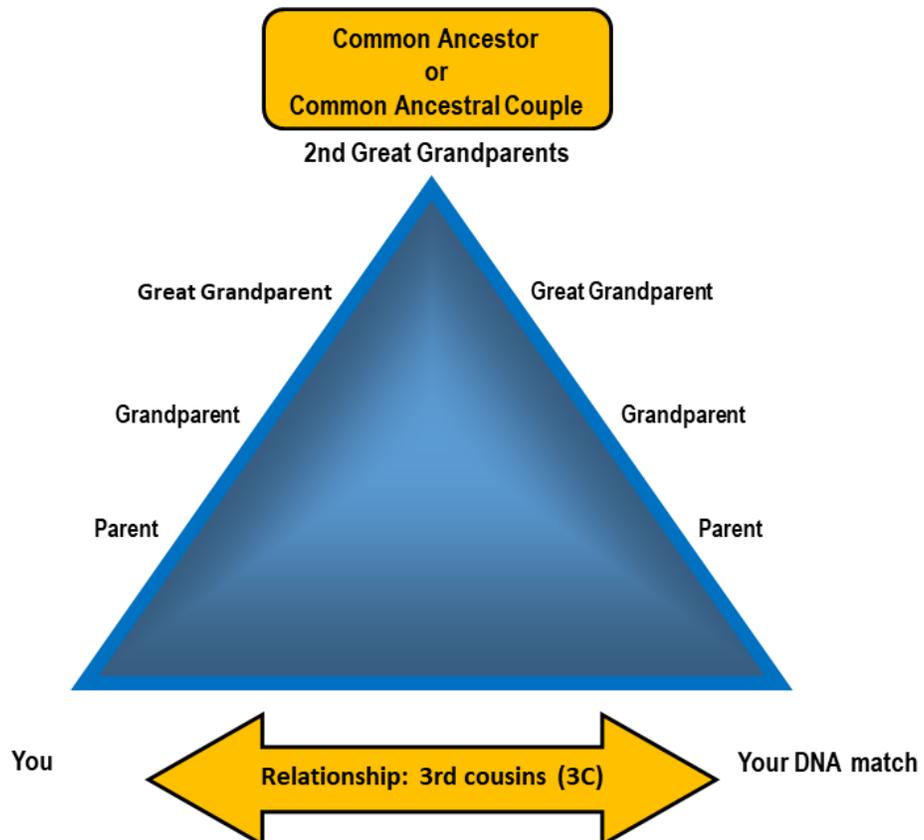


Figure 8.2. Diagram illustrating the relationship path to the shared common ancestor for third cousins (3C). Image created by Robin Wirthlin & Suzanne Chesney.

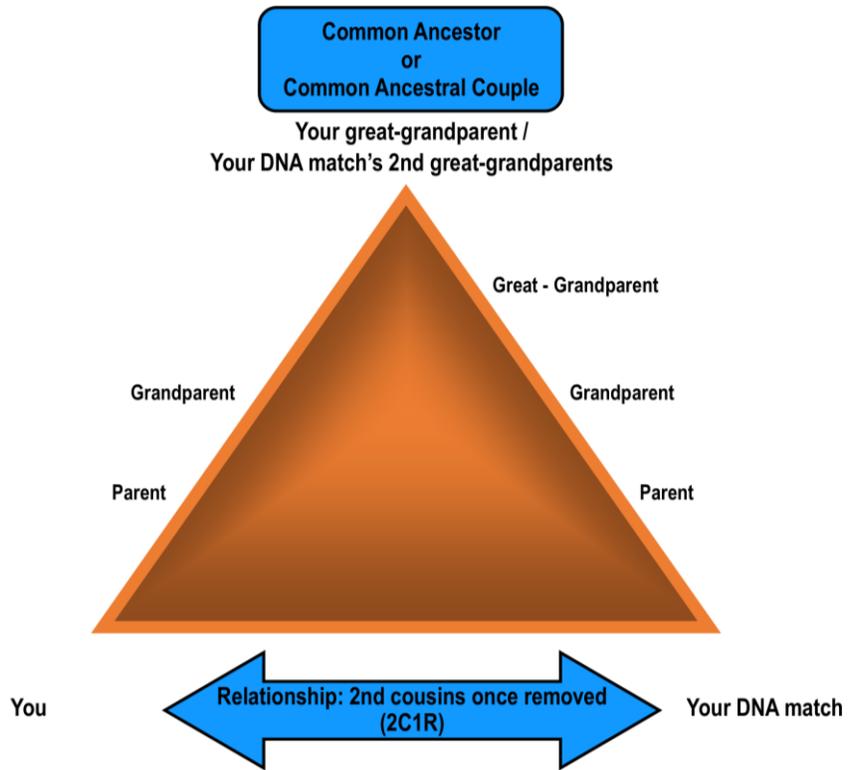


Figure 8.3. Diagram illustrating the relationship path to the shared common ancestor for Second Cousins Once Removed (2C1R). Image created by Robin Wirthlin & Suzanne Chesney.

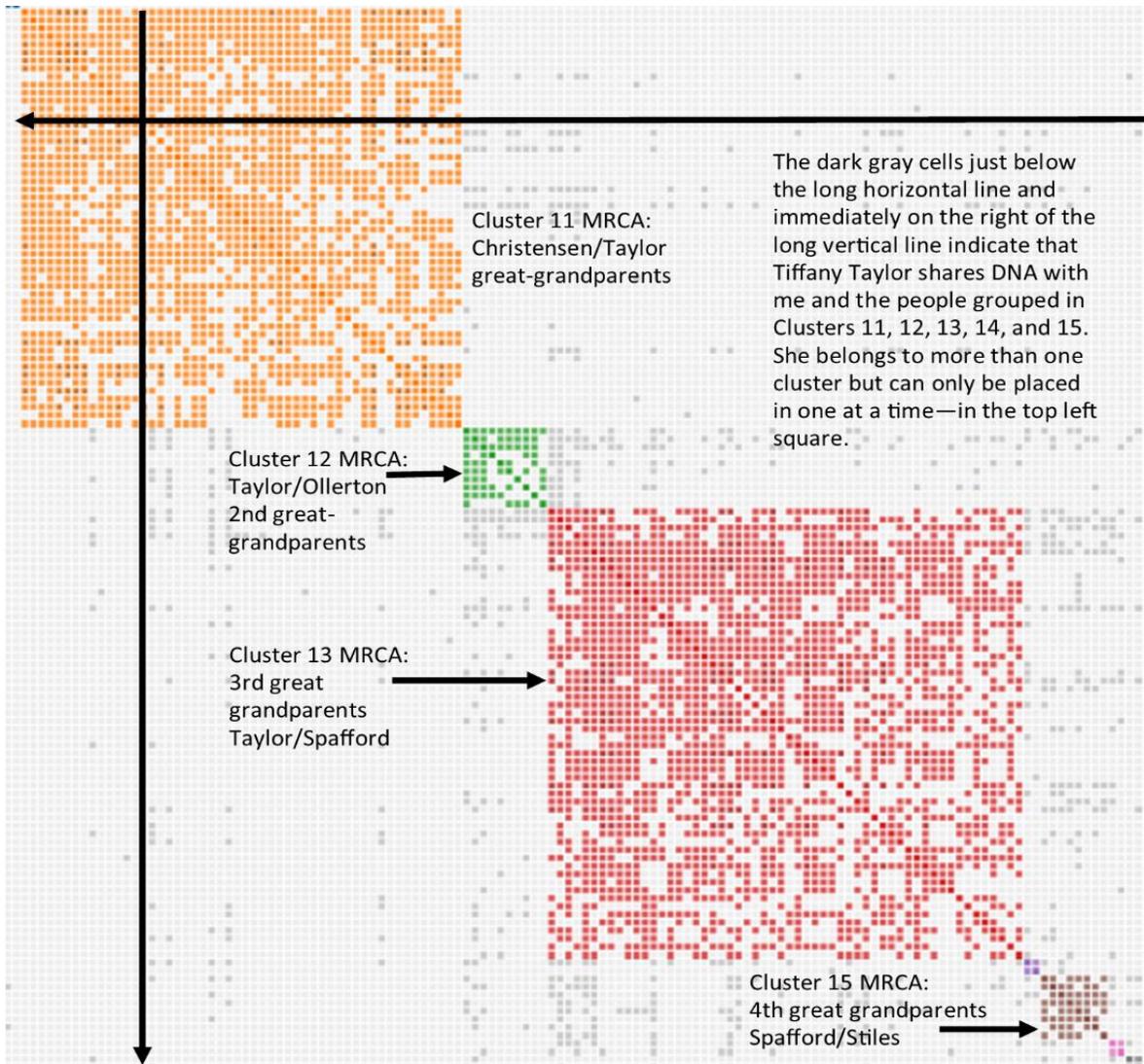
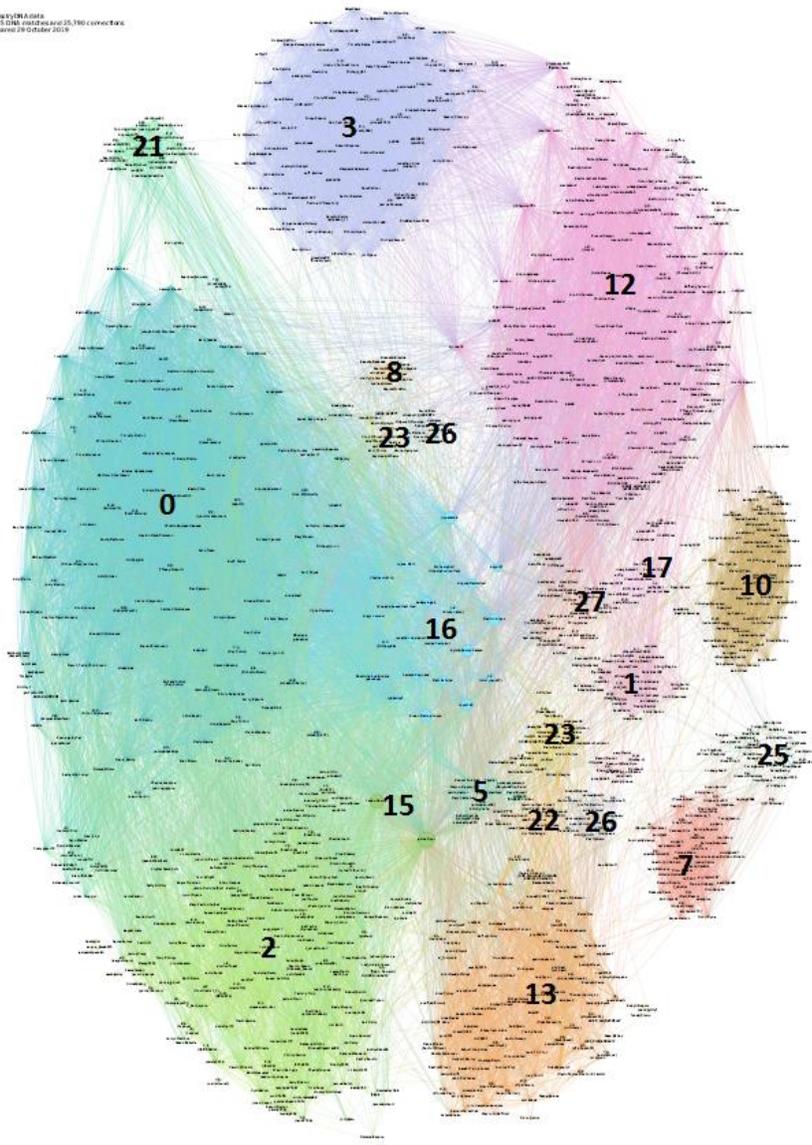


Figure 8.4. AutoCluster report from Genetic Affairs showing clusters from multiple generations

Network Graph

Autocentrality  
2,133,586 nodes and 25,190 connections  
Generated 28 October 2018



[www.connecteddna.com](http://www.connecteddna.com)

Figure 8.5. Network Graph for Dyer descendants, created by Shelley Crawford of ConnectedDNA, annotated

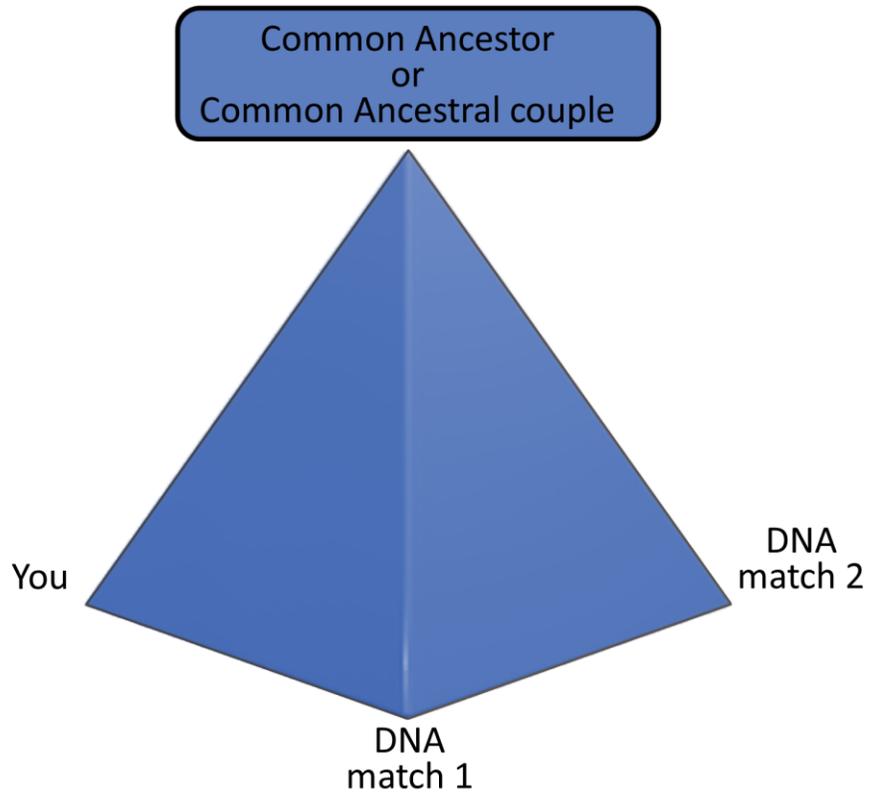


Figure 8.6. 3-D illustration of genetic genealogy triangulation

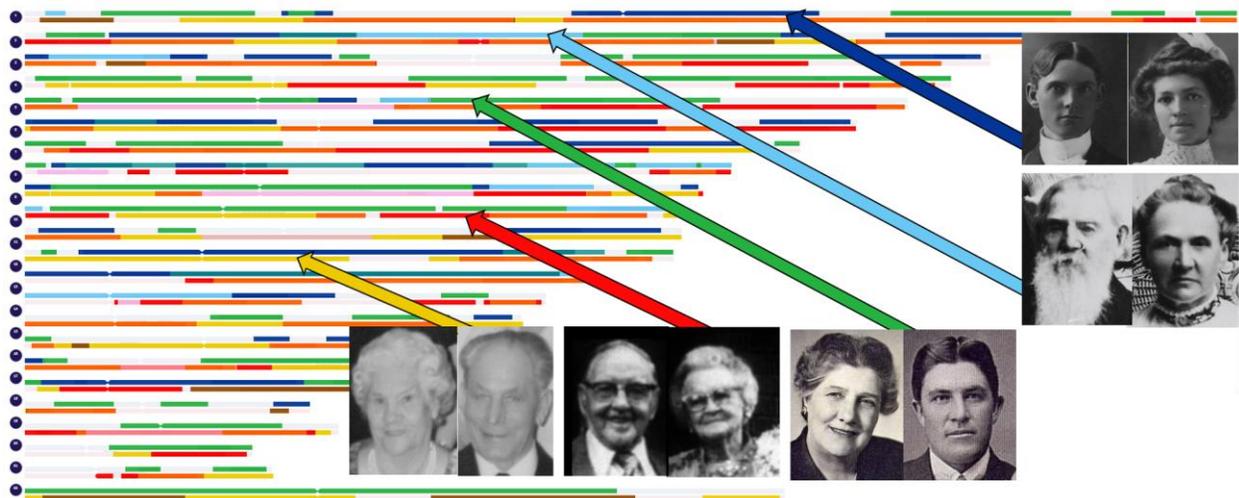


Figure 8.7. Chromosome Map screenshot created at DNAPainter.com. Annotated by Robin Wirthlin with photos of ancestors and arrows pointing to DNA segments inherited from them. Colored lines on the chromosome map indicate DNA segments shared with DNA matches that were inherited from the ancestral couples shown in the photos.

## Principal Research Question and Sub-Objectives

The overarching objective for your project, or principal research question, is the question of identity or relationship that you seek to answer. For example:

**Principal Research Question:** *Who was the father of John Robert Dyer, who was born about 1810-1813 and died in 1879 in Hawkins County, Tennessee, and married Barsheba Tharp about 1830?*

The sub-objectives are more specific questions for each phase of the research. They may be yes or no questions to help eliminate various hypotheses.<sup>5</sup> Each phase might include either documentary sources, DNA sources, or both. For example:

**Sub-Objective 1:** *When and where was John Robert Dyer born? (Documentary Sources)*

**Sub-Objective 2:** *Is Robert, the documented 2<sup>nd</sup> great-grandson of John Robert Dyer, a biological descendant of John Robert Dyer? (atDNA and Documentary Sources)*

**Sub-Objective 3:** *Which cluster of Robert's DNA Matches includes descendants of John Robert Dyer? Which cluster of DNA matches could include descendants of John Robert Dyer's father? Who is the MRCA for that cluster? (atDNA and Documentary Sources)*

**Sub-Objective 4:** *Was Robert Daugherty, who married Sarah Taylor, the father of John Robert Dyer? Who were his children? (Documentary Sources)*

**Sub-Objective 5:** *Was James Taylor, who married Sarah Daugherty, the father of John Robert Dyer? Who were his children? (Documentary Sources)*

Match Name	Relationship to Robert	Shared DNA	Shared cM Project 4.0 relationship range and average <sup>a</sup>
Julia	3C	28 cM <sup>b</sup>	0-234 cM, average 73 cM
Sarah	3C1R	60 cM <sup>c</sup>	0-192 cM, average 48 cM
Roy	Half 2C	268 cM <sup>d</sup>	10-325 cM, average 120 cM

a. Blaine T. Bettinger and Jonny Perl, "The Shared cM Project 4.0 tool v4," *DNA Painter* (<https://dnainter.com/tools/sharedcmv4>).

b. *AncestryDNA*, DNA match between Robert and Julia, sharing 28 cM (<https://ancestry.com>).

c. *AncestryDNA*, DNA match between Robert and Sarah, sharing 60 cM (<https://ancestry.com>).

d. *AncestryDNA*, DNA match between Robert and Roy, sharing 268 cM (<https://ancestry.com>).

<sup>5</sup> Catherine Desmarais, "Reconstructing the 18th Century Family - The Northamer Case," *Course 11: Meeting Standards Using DNA Evidence - Research Strategies*, 2020 Syllabus, Salt Lake Institute of Genealogy (Salt Lake: SLIG, 2020), 80.



Table 10.1  
Customers and Orders

<i>First Name</i>	<i>Last Name</i>	<i>Address</i>	<i>Phone</i>	<i>Date</i>	<i>Item</i>	<i>Amount</i>
Joan	Carter	185 Center St.	596-2049	6/1/2019	Blue Skirt #12	\$45
Lewis	Mann	300 5 <sup>th</sup> Ave.	596-3014	6/2/2019	Red Shirt #2	\$15
Joseph	Johnson	425 4 <sup>th</sup> St.	596-3068	6/2/2019	Brown Belt	\$20
Joan	Carter	186 Center St.	596-2049	6/15/2019	Yellow Shirt	\$18
Joan	Carter	185 Center St.	596-2049	7/1/2019	Black Pants	\$55

Table 10.2  
Example of Normalized Data

<b>Customer Information Table</b>				
<i>Customer ID</i>	<i>First Name</i>	<i>Last Name</i>	<i>Address</i>	<i>Phone</i>
504	Joan	Carter	185 Center St.	596-2049
505	Lewis	Mann	300 5 <sup>th</sup> Ave.	596-3014
506	Joseph	Johnson	425 4 <sup>th</sup> St.	596-3068
<b>Order Information Table</b>				
<i>Order ID</i>	<i>Customer ID</i>	<i>Date</i>	<i>Item</i>	<i>Amount</i>
32	504	6/1/2019	Blue Skirt #12	\$45
33	505	6/2/2019	Red Shirt #2	\$15
34	506	6/2/2019	Brown Belt	\$20
35	504	6/15/2019	Yellow Shirt	\$18
36	504	7/1/2019	Black Pants	\$55

	Tester	DNA Match	Username	Admin	cM	
1	Joanna Briscoe - Diana, 32cM	Diana	Joanna Briscoe	Joanna Briscoe	32.0	
2	Lucy Smith - John, 77.35cM	John	Lucy Smith	L.S.	rachel55	77.4
3	Debra Alderman - Jorge, 224.1cM	Jorge	Debra Alderman	DAlderman	Debra Alderman	224.1
4	Debra Alderman - , 190cM		Debra Alderman	DAlderman	Debra Alderman	190.0

Figure 10.1. Airtable base showing DNA match details table

Tester	Match Name	Shared cM	Segments	Company	Link to Match Page	MRCA
Aaron	Don	196.0	8	Ancestry	<a href="https://ancestry.com...">https://ancestry.com...</a>	John Watkins and Sue Parker
Aaron	Sue	112.0	7	Ancestry	<a href="https://ancestry.com...">https://ancestry.com...</a>	John Watkins and Sue Parker
Leila	Malcolm	70.0	4	MyHeritage	<a href="https://myheritage...">https://myheritage...</a>	Parker line?
Leila	Delilah	68.0	2	FTDNA	No match page	?

	Date	DNA Match Name	Admin	From	Type of Contact	Message Sent	Reply
44	9/6/2019	Daniel		Diana	Ancestry Message System	Hello! Ancestry DNA says that we share 115cM of DNA. That puts us in the range of 2nd to 3rd cousins. I think we connect through o...	1/4/2020
45	10/9/2019	Isabella		Diana	MyHeritage Message Sys...	Hello,  My Heritage says that we share 145 cM of DNA. That puts us in the range of 2nd ...	
46	10/9/2019	Michael	alexa	Diana	MyHeritage Message Sys...	Hi, I'm a DNA match and wanted to connect and see how we're related. I think it is through Margaret Harris, daughter of John C. Harris....	10/6/2020
47	8/29/2020	Joe		Nicole	Ancestry Message System	Hey Joe, thanks for sharing your tree! I was wondering about your great-grandparents on your father's side. Could you tell me more about them and their daughter Judy?	12/9/2020

Figure 10.2. Example of a correspondence log table in Airtable

	Short Description	Match Name	Date	Website/Repository	URL	Source Citation	Results	Comments
<div style="background-color: #f2f2f2; padding: 5px;"> <b>MATCH NAME</b>  <b>Jaxon</b> <span style="float: right;">Count 3</span> </div>								
5	Common Ancestor hint for Jaxon	Jaxon	7/31/2020	Ancestry	<a href="https://www.ancestry.com/discoveryui-geneticfamily...">https://www.ancestry.com/discoveryui-geneticfamily...</a>	Relationship to Jaxon, AncestryDNA (https://ancestry.com : accessed 31 July 2020), sharing 21 cM across 1 segment. ...	Common ancestor is June Welch	Hint seems accurate
6	Ancestors of Robert W. Jeffers	Jaxon	6/13/2020	FamilySearch	<a href="https://www.familysearch.org/tree/pedigree/landscape/L...">https://www.familysearch.org/tree/pedigree/landscape/L...</a>	Timothy Jeffers, ID L5RC-VLL, and Nellie May Hoover, ID L5RYTVP, landscape pedigree, Family Tree, FamilySearch ...	Timothy is the father of Robert W. Jeffers. He married Nellie May Hoover. Timothy was born in Illinois. His parents were born in ...	
7	Ancestors of Sarah Koonce b. 1793 Loudon, VA	Jaxon	6/13/2020	Ancestry	<a href="https://www.ancestry.com/family-tree/tree/113...">https://www.ancestry.com/family-tree/tree/113...</a>	Sarah Koonce 1793-1880, in Miles Family Tree, user tammiles	Sarah Koonce, daughter of Henry Koontz and Elizabeth Bowyer, of Pennsylvania and Virginia	

Figure 10.3. Example of a research log table showing searches for Jaxon's ancestors

Table 10.4  
Example Research Log Showing Negative Search Results

Date	Repository	Source Citation	Results
11/12/20	FamilySearch	Otsego County, New York, Wills and proceedings index, negative search for Clinton F. Anthony, 1792-1887; images, <i>FamilySearch</i> ( <a href="https://www.familysearch.org/ark:/61903/3:1:33SQ-GYC5-4F5">https://www.familysearch.org/ark:/61903/3:1:33SQ-GYC5-4F5</a> : accessed 23 Nov 2020).	Searched for Clinton F. Anthony. Reviewed each name in the A surnames for books A-F.
11/12/20	Ancestry	"New York, U.S., Wills and Probate Records, 1659-1999," negative search for Clinton Anthony, <i>Ancestry</i> ( <a href="https://www.ancestry.com/search/collections/8800">https://www.ancestry.com/search/collections/8800</a> : accessed 24 Nov 2020).	0 results for "Clinton Anthony" 3 results for Surname: Anthony, Probate location: Otsego (exact) – Rhoda, David, and Peter Anthony
11/13/20	Ancestry	"Anthony Family Tree DNA Project - Y-DNA Classic Chart," Y-Chromosome DNA STR surname project results, negative search for Joseph Anthony, <i>Family Tree DNA</i> ( <a href="https://www.familytreedna.com/public/anthony?iframe=yresults">https://www.familytreedna.com/public/anthony?iframe=yresults</a> : accessed 13 Nov 2020).	No descendants with Joseph Anthony listed as their earliest paternal ancestor; a Joshua/Joseph Pace was listed in the unrelated grouping.

Table 10.5 Example Research Log Showing Abbreviated Citations				
Date	Repository	URL	Abbreviated Source Citation	Results
12/14/20	FamilySearch	<a href="https://www.familysearch.org/ark:/61903/3:1:3QSQ-G9W5-XKC3">https://www.familysearch.org/ark:/61903/3:1:3QSQ-G9W5-XKC3</a>	Jefferson Co., NY Grantee index 1805-1885 A-E.	E:224 James Dole to Exrs of W. Constable
12/14/20	Ancestry	<a href="https://www.ancestry.com/family-tree/person/tree/71135853/person/36236292850/facts">https://www.ancestry.com/family-tree/person/tree/71135853/person/36236292850/facts</a>	Richard Fain Dyer (1839-1921), Dyer Family Tree by Nicole Elder Dyer.	Richard had eight children, including Robert Luster
12/15/20	FamilySearch	<a href="https://www.familysearch.org/tree/person/details/KW8H-Y9D">https://www.familysearch.org/tree/person/details/KW8H-Y9D</a>	Robert Luster (1893-1982), ID KW8H-Y9D.	Robert was the son of Richard Fain Dyer

Below are full citations created from the abbreviated citations in table 10.4.

“Public Member Trees,” Richard Fain Dyer (1839-1921), Dyer Family Tree created by Nicole Elder Dyer, database, *Ancestry* (<https://www.ancestry.com/family-tree/person/tree/71135853/person/36236292850/facts> : accessed 12/14/20).

Robert Luster (1893-1982), ID KW8H-Y9D, “Family Tree,” *FamilySearch* (<https://www.familysearch.org/tree/person/details/KW8H-Y9D> : accessed 12/15/20).

Table 10.6 Research Log Entries for DNA Tools			
Date	Tester	Source Citation	Results
3/12/19	Robert	Autoclusters for Robert, <i>MyHeritage</i> ( <a href="https://myheritage.com">https://myheritage.com</a> : generated 12 March 2019), 104 matches from 40 cM to 350 cM with shared matches min threshold of 20 cM.	Cluster 6, blue, includes William Anderson, descendant of Joe Anderson.
3/12/19	Robert	Autoclusters for Robert, <i>MyHeritage</i> ( <a href="https://myheritage.com">https://myheritage.com</a> : generated 12 March 2019), 104 matches from 40 cM to 350 cM with shared matches min threshold of 20 cM.	Cluter 8, orange, includes Maria Gomez, descendant of Jorge Martinez. This is probably the Martinez/Thacker cluster.
8/19/20	Greg	Greg Family Tree, <i>23andMe</i> ( <a href="https://you.23andme.com/family/tree/">https://you.23andme.com/family/tree/</a> : generated 19 Aug 2020).	Larry is shown as a first cousin, helping separate the paternal side; Kim is an estimated 2nd cousin on the paternal side.

Table 10.7  
File Naming Protocol

Date	Description	Place
1949	Delayed Birth Cert Alice Frazier	Montague Co TX
1949 Delayed Birth Cert Alice Frazier Montague Co TX.jpg		

● **Indigenous Americas—North** 1%

[See how we got these percentages >](#)

**Additional Communities**

- **Louisiana Creoles & African Americans**
  - Lafayette & Lake Charles, Louisiana, Creoles & African Americans
- **East Central Louisiana Acadians**
- **Southwestern Quebec French Settlers**

Figure 11.1. Example screenshot of an ethnicity estimate used in a report

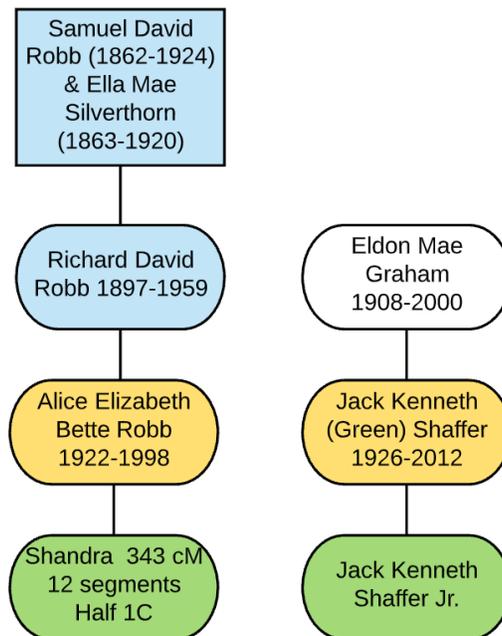


Figure 11.2. Example of a diagram used in a report

Table 11.1  
DNA Matches of John Smith to Confirm Biological Relationship to Daniel Smith

<b>DNA Match Name (MRCA)</b>	<b>Relationship to Bruce Arnold</b>	<b>Shared cM</b>	<b>Shared cM Prediction for Relationship<sup>6</sup></b>
Ben (Elbert Smith)	Uncle	1869 cM	1201-2282 cM (average 1741 cM)
Nancy (Elbert Smith)	1 <sup>st</sup> cousin	939 cM	396-1397 cM (average 866 cM)
George (Elbert Smith)	1 <sup>st</sup> cousin once removed	416	102-980 cM (average 433 cM)
Sally (George Smith)	1 <sup>st</sup> cousin once removed	210	102-980 cM (average 433 cM)
Marvin (George Smith)	2 <sup>nd</sup> cousin	73 cM	41-592 cM (average 229 cM)
Susan (George Smith)	2 <sup>nd</sup> cousin	354 cM	41-592 cM (average 229 cM)
Dan (George Smith)	2 <sup>nd</sup> cousin	308 cM	41-592 cM (average 229 cM)
Brad (Daniel Smith)	3 <sup>rd</sup> cousin once removed	29 cM	0-192 (average 48 cM)
Doug (Daniel Smith)	3 <sup>rd</sup> cousin	21 cM	0-234 (average 73 cM)

Source: "John Smith's DNA Matches," *Ancestry* (<https://www.ancestry.com> : accessed 23 Nov 2020), comparing with Ben, Nancy, George, Sally, Marvin, Susan, Dan, Brad, and Doug.

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<sup>6</sup> Blaine T. Bettinger and Jonny Perl, "The Shared CM Project 4.0 tool v4," *DNA Painter* (<https://dnainter.com/tools/sharedcmv4>), last updated 26 March 2020.

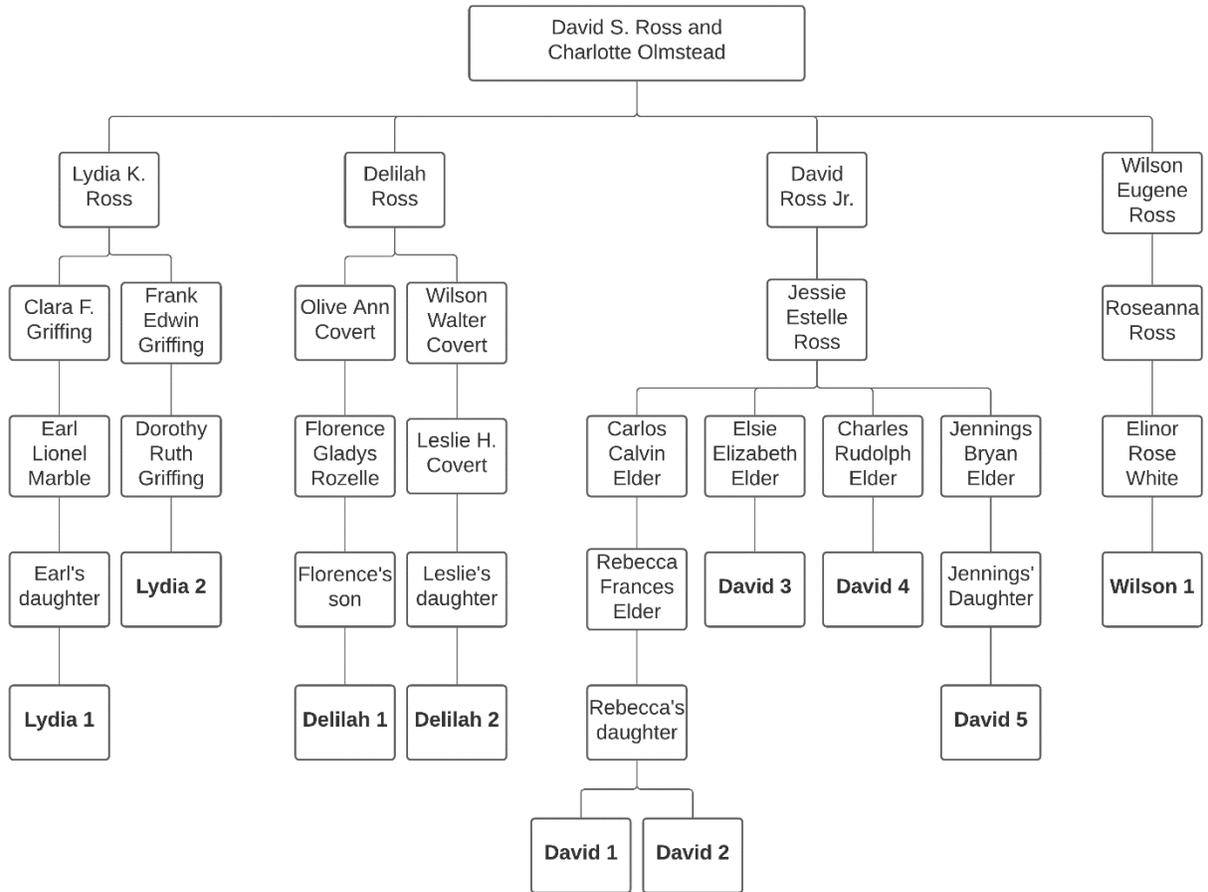


Figure 12.1. Anonymized DNA testers who descend from four children of David S. Ross and Charlotte Olmstead

## About the Authors



Diana Elder, AG, Robin Wirthlin, and Nicole Dyer