



MAKING MATCHES

Can't puzzle out how you're related to your autosomal DNA matches? Learn two approaches to analyze your match list and find where those genetic pieces fit.

BY DIAHAN SOUTHARD

🐞 SUPPOSE YOU ASK a genetic genealogist the question, “Are the Milners kin to the Mileners who lived nigh to the Millers on Mile Mine road?” How would she answer? She’d order up a few DNA tests from the various testing companies, hoping that the right Milners and Mileners and Millers have already been tested to create the perfect settings for the perfect match.

Many who’ve jumped into genetic genealogy started with the autosomal DNA test. It’s possible they didn’t even know that fancy name for the spitting and swabbing, but those who’ve tested at AncestryDNA <ancestrydna.com>, taken Family Tree DNA’s Family Finder test <www.ftdna.com> or spit for 23andMe <www.23andme.com> have completed an autosomal DNA test.

The autosomal DNA test is only one of three kinds of genetic genealogy tests. It can track both your mom’s and your dad’s sides of the family—anyone who contributed DNA to you. The other two available tests track just one line of inheritance. **The Y chromosome DNA (Y-DNA) test follows the male line** (your father’s father’s father and so on); only men can take it (see page 21 for more on this test). **The mitochondrial DNA (mtDNA) test traces just your direct maternal line** (your mother’s mother’s mother), and anyone can take it.

But let’s put this in easier-to-understand terms: If the Y-DNA test is like looking at just one blue crayon, and the mtDNA test is like looking at one green crayon, the autosomal DNA test is like dealing with a box of 96 crayons—including the ones with color names like Wisteria, Cerise and

Fuzzy Wuzzy, which don't give a hint as to the crayon's actual color. Likewise, your autosomal DNA matches can't immediately divulge which ancestral line they share with you. How's a test like that supposed to help you trace your family tree? We'll show you two approaches to analyzing your autosomal DNA matches and describe how DNA testing helped one man piece together a clearer picture of his family tree.

The right fit

People are always asking me which DNA test they should take and which company they should go with. When it comes to the three autosomal DNA testing companies, choosing just one can be as difficult as choosing your favorite child (though honestly, some days my kids make this easy for me, at least to pick the one I don't like). The table on page 20 points out many of the differences between the testing companies, but here, we'll focus on their similarities.

All three companies provide two different kinds of results from your cheek swab or saliva sample: your admixture (or ethnicity results) and your match list. Admixture results are usually displayed as visually pleasing charts and maps. While this can confirm basic origins, such as British or Middle Eastern roots, and point out American Indian or African-American heritage you might've been wondering about, your match list is much more likely to lead to research breakthroughs. See the July/August 2015 *Family Tree Magazine* <shop.familytree.com/family-tree-magazine-july-august-2015> for help understanding your admixture map. But let's turn our focus today to making the most of your match list.

Do you remember those shape-sorter toys? The ones with different-shaped holes, and you had to find the right-shaped block to go inside? DNA matching should be a similarly simple principle: Either it matches or it doesn't. Unfortunately, it isn't nearly so straightforward. Get out your box of crayons again. You might expect that if you have blue DNA, you can find other blues that match, and all of you share a common blue ancestor (Cookie Monster?). People with green DNA find the other greens, thereby connecting to their common ancestor (Kermit the Frog?).

The problem with DNA is that it comes not only in blue and green, but also in aquamarine. Does that match the blue or the green? (Are you imagining a Cookie Monster/Kermit hybrid ancestor?) These are the kinds of questions geneticists face as they try to decide whether two people share a



Tip: Remember that the GEDMatch <www.gedmatch.com> website is run by volunteers and supported by donations. Allow several days for your DNA test data to be processed.

Even though the testing company might say you're third cousins, you could instead have a genetically equivalent relationship, such as second cousins twice removed.

common ancestor based solely on their DNA results. Different testing companies treat this problem differently, and so far, there isn't one right answer.

But autosomal DNA match lists do have common elements across companies: When your results are in, you log into the company's website to view matches' names, relationship ranges (such as "third to fifth cousins"), ways to search and sort the list, and family tree information. As more people are tested over time, your list is updated with new matches. Note that the relationship range assigned to each match is just a suggestion. It's based on the estimated amount of DNA that's identical in you and your match. But because we inherit varying amounts of DNA from each ancestor, it's possible the actual relationship between two matches is different from the one the testing company predicts, or that the identical DNA is coincidental and doesn't indicate a relationship. It's like saying, "Hey, you have a blue block with some angular sides? Try it in one of these three holes over here and see if it fits. Maybe it will, maybe it won't."

Also keep in mind that even though the testing company website might say you're third cousins, you could instead have a genetically equivalent relationship, such as second cousins twice removed. Or you might have multiple shared ancestors who lived further back in time, giving you enough DNA in common to look like third cousins. Keep in mind that many in the genetic genealogy community have found that Family Tree DNA overestimates relationships, Ancestry DNA underestimates, and 23andMe is somewhere in the middle. What were we just saying about the complexity of puzzling out autosomal DNA relationships?

Cousin connections

But in the end, you're coming to the match list to find ancestors, not cousins. Your best matches are those that lead you to ancestors. Your match list may contain thousands of genetic cousins, with the closest matches first. Scan their posted genealogical information for surnames and locations you recognize. If you find your relatives named on their trees, send a message and exchange genealogical information.

The amount of genealogical information each match provides varies depending on the person and the genealogy



tools of the testing company. Currently, the genealogy tools at 23andMe and Family Tree DNA could use some improvement, though a developing partnership with family tree site MyHeritage.com <www.myheritage.com> will likely bring changes for the better.

AncestryDNA leads the pack in genealogical tools, but this site isn't perfect. Test-takers can share genealogical information only by linking a public tree to their DNA test profile. Many don't feel comfortable sharing their entire pedigrees and end up sharing nothing. This makes it difficult for matches to make connections and restricts the test-taker's access to DNA Circles and the New Ancestor Discoveries tool (see below).

You'll get the most out of your DNA test by including as much genealogical information as possible in your DNA profile. If you can create only a list of surnames and locations, do it. If you can link a family tree to your DNA profile, please do. If you're uncomfortable sharing your whole family tree, set up a separate skeleton tree with just names and birth, marriage, and death dates and places. Then be sure to log in every so often and respond to any messages from potential cousins.

If you've tested with AncestryDNA, your best matches may be gathered into DNA Circles. A DNA Circle is a group of matches based on a common ancestor named in test-takers' family trees. Each circle member matches at least one other person in the circle, making it easy to see how you're related to other matches in the circle (learn more at <c.ancestry.com/cs/media/exploring-your-dna-circles.pdf>). You also might see New Ancestor Discoveries (suggested ancestors based on whom you match) for folks not already named in your tree; see the details at <blogs.ancestry.com/ancestry/2015/04/09/new-ancestor-discoveries-clues-not-proof-to-your-past>).

When you're viewing an AncestryDNA match, it's also useful to click the Shared Matches tab, which shows you other matches (if any) that you and the person you're viewing both share. By examining any tree data the matches have posted, you can narrow down how you might be related.

Sorting the pieces

What's left once you've figured out the obvious matches? An abundance of UFOs—Unidentified Familial Offspring—whose trees don't name the same ancestors as your tree. I'll let you in on a secret: It's hard work to turn cousins into ancestors. Identifying UFOs takes persistent searching and a lot of traditional genealogy, with a smidgen of genetics thrown in.

Let's tackle two ways you can approach your DNA match list to get started turning those cousins into ancestors: The Ancestor Approach and the Match Approach. For either one, keep a spreadsheet so you can easily see the ancestral surnames and places you share, helping you narrow down a potential connection. Your spreadsheet could name each match, with columns for surnames, places and notes.

Mix and Match

We throw around a lot of generalities about what DNA does and doesn't do, and the rules usually hold. But as my clients (whose names I've changed here for privacy reasons) discovered when they put DNA testing into practice as part of their genealogy research, there are a frustratingly large number of exceptions. Those, however, led to a surprising turn in their family tree that helped them put together a family tree puzzle. Some of these maxims and how they fare in real research are listed here:

■ **PRINCIPLE:** DNA testing brings new information and insight to your research.

■ **IN PRACTICE:** Having her own small dog training business for 15 years, Liz Maxwell was no stranger to pedigrees. She started a family tree for her husband, Paul, but ran into a brick wall on his paternal line. After much research, their best guesses for the origins of Paul's paternal relative Cyrus Maxwell involved magic and aliens.

He tested with AncestryDNA, hoping for a lead. But there weren't any easy Maxwell connections among their matches. The closest match, Melvin Wheaten, was estimated to be a second cousin, but Melvin's and Paul's trees didn't overlap in the slightest. The couple eventually chalked up this "DNA testing thing" to a scientific mystery and returned to more traditional methods.

■ **PRINCIPLE:** Your admixture (ethnic heritage) results can confirm origins you already know or provide clues to places where you may have a genealogical connection.

■ **IN PRACTICE:** Paul's admixture—or ethnicity—results made him question the overall validity of the DNA test. His brother Vincent had tested with the same company and received a very different admixture. For example, Vincent had 87 percent ancestry from Great Britain, while Paul had only 42 percent.

■ **PRINCIPLE:** Talking to the testing company's customer service staff should provide you with more direction.

■ **IN PRACTICE:** Liz and Paul were so puzzled by the differences in Paul's and Vincent's admixture results that they called Ancestry DNA. A friendly voice reassured them that because of how DNA is shuffled and passed down, they shouldn't expect to see the same results for siblings. Everything she said is true. It just so happens that in this case, her good advice was misleading, dispelling what should've been a real concern about how Vincent and Paul are related.

If you need help with your autosomal DNA results, you can call the testing company's customer service team; turn to a professional, like me; or ask your questions in a forum such as the DNA Newbie <www.facebook.com/groups/dnaneewbie> and International Society of Genetic Genealogy <www.facebook.com/groups/isogg> groups on Facebook.

■ **PRINCIPLE:** A DNA test accurately predicts the relationship between two people.

■ **IN PRACTICE:** Vincent was listed among Paul's Ancestry DNA matches with a relationship of "close family—first cousin." That sounded like siblings to them, so all was right in the world. But they didn't realize that Ancestry DNA has a category above that called "immediate family," which is for parents and siblings. Even after transferring their results to Family Tree DNA <www.familytreedna.com/AutosomalTransfer>, where their relationship was "half sibling, aunt/uncle or grandparent," they didn't fully understand the implications of this label.

■ **PRINCIPLE:** A 37-marker Y-DNA test should be enough to answer basic questions of paternal line relatedness.

■ **IN PRACTICE:** Without any autosomal DNA leads on the Cyrus Maxwell mystery, a Maxwell family Y-DNA group member suggested they try Y-DNA testing.

Paul had a respectable number of matches at the 37-marker level, but none of them had the Maxwell surname, and there were no exact matches. Of the surnames on their match list, the most predominant were forms of Stewart or Stuart.

■ **PRINCIPLE:** Upgrading to 67 markers in a Y-DNA test provides a better comparison between matches for a better picture of your relationship.

■ **IN PRACTICE:** The 37-marker Y-DNA test wasn't clear enough about the relationships of those tested. An upgrade to more markers might show that Paul still matched closely with the Stewart or Stuart group, making a paternal connection to that family more likely. Or Paul could find that the additional markers provide more distinction between him and the Stewarts/Stuarts, meaning a connection was unlikely.

But it turned out that the 67-marker test results were still ambiguous. That test showed one additional mutation from the 37-marker test—not enough to make or break the relationship with the Stewarts/Stuarts.

■ **PRINCIPLE:** Searching your autosomal matches for common surnames and locations (the Ancestor Approach) can identify which ancestor may connect you to a match.

■ **IN PRACTICE:** Liz and Paul searched his Ancestry DNA match list for the Maxwell surname and Cyrus Maxwell's known locations. A couple of Maxwells were among the matches, but there were no clues how the matches might be related to Paul's Maxwell line. Vincent's matches included Lloyds, whom the family knew were related to the Maxwells. While they understood siblings wouldn't necessarily have the same matches, Liz and Paul still wondered why no Lloyds or Maxwells with obvious connections were among Paul's matches.

■ **PRINCIPLE:** Starting with your closest genetic match and looking for connections (the Match Approach) represents your best chance for success.

■ **IN PRACTICE:** After consulting with me, Liz and Paul realized they might be looking for Paul's biological father. Then they

took the genetics at its word: If Melvin Wheaten, Paul's best Ancestry DNA match, was truly Paul's second cousin, they'd share a pair of Melvin's great-grandparents.

A look at Melvin's tree revealed Furman and Nelly (Leipzig) McMurdy were the best targets. Liz had seen those surnames among Paul's matches on Ancestry DNA and Family Tree DNA. Traditional records revealed that these great-grandparents had a daughter, Sally McMurdy, who married Everett Buck Stuart.

And there it was: an autosomal DNA connection to a line that had shown promise in the Y-DNA arena. A web of genetics and genealogy was beginning to form. Further research showed the McMurdys had five sons, all about the right age to be Paul's father. But the McMurdy, Leipzig and Stuart families were from North Carolina. Liz and Paul had to place one son in Tacoma, Wash., about December 1943, when Paul would've been conceived.

Genealogy work revealed that two of the sons never left North Carolina.

A third was stationed in Tacoma during World War II, but he was killed before December 1943. That left two boys, Fritz and Simeon. A Google search on Simeon Stuart brought up a biography Simeon's son had written in college. Simeon had served honorably in the military and was stationed in Tacoma at the Fort Lewis Army base in 1943. Paul's mother had worked on base.

■ **PRINCIPLE:** DNA testing is a way to enrich family connections, encourage involvement in family history and provide meaning to distant relationships.

■ **IN PRACTICE:** When you submit that first swab, you can't predict how DNA testing might affect you and your family. Paul isn't alone in learning hard-to-swallow family information through DNA testing. There's nothing scientific about the emotions one might feel upon such a discovery. Vincent was upset, and Paul's sister said, "I don't want to hear that. The two parts of us together make a whole. I don't want to be a half sister." Two of Simeon's sons wouldn't even entertain the idea of Paul's existence.

"At first I took it in stride," Paul said. "Life is life; my parents aren't perfect." As time passed, he began to correspond with a Stuart cousin, Christine, who sent him pictures of his father. The resemblance is undeniable. From a letter Simeon wrote to a nephew years ago, Paul learned of his father's love of gardening, fruit trees and genealogy. Simeon wrote, "Every family should have a recorder of the family life so as not to have later additions wondering where the others came from."

Paul and his Stuart family began to form a relationship over these letters and pictures. "The more I communicated with these cousins, the sweeter and kinder they were," he says. He and Liz plan to travel to meet their newfound family.

■ **THE ANCESTOR APPROACH:** This four-step method is the way to go when you want to verify known ancestors in your pedigree and try to extend your line beyond that ancestor.

1. **Choose an ancestor** in your pedigree chart who's fewer than four generations back.

2. **Assemble a descendency chart** for this ancestor. It'll name that ancestor and all his or her descendants—that is, anyone who inherited the person's DNA. Include the life dates and places associated with each person on the chart. You may be able to easily generate a descendency chart from your family tree software.

3. **Perform searches for all those surnames and locations** in your autosomal DNA match list. All the genetic genealogy testing companies let you search your matches' genealogical information by surname or location. In Ancestry DNA, for example, you'd click in the search box at the top right of your match list and enter a name or place. Results are the surnames of the match's ancestors or the places those ancestors lived.

You're looking for overlap that could indicate the match shares ancestry with you via the person you selected in step 1.

4. **Verify any connection you find** with genetic information. For example, if you identify a likely common ancestor in the sixth generation back, but your testing company predicts that you and your match are second to fourth cousins, you may need to re-evaluate this potential connection. Evaluate connected lines for clues to point your genealogical research in a particular direction so you can look for evidence of the relationship in historical records.

■ **THE MATCH APPROACH:** With this method, you start with your matches and look for common names and places.

1. **Choose the highest-ranked match** on your list for whom you don't know your relationship.

2. **Note the predicted relationship range.** At 23andMe, clicking on the name of your match will bring up a more specific relationship estimate, such as third or fourth cousin, rather than a range such as "second to fourth

DNA Company Comparison

		23andMe <www.23andme.com>	Family Tree DNA <www.familytreedna.com>	AncestryDNA <dna.ancestry.com>
General Information	price	\$99	\$99	\$99
	database size	more than 1 million profiles	more than 700,000 profiles (autosomal, Y- and mtDNA)	more than 1 million profiles
	estimated message response rate of matches	low	medium	medium
	subscription required	no	no	yes, for most analysis tools
	accessibility to customer service	email only	phone or email	phone or email
	contact your match	yes, via email brokering	yes, directly	yes, via email brokering
Genealogy Tools	quality of pedigree viewer	poor	poor	excellent
	search by surname	yes	yes	yes
	search by location	yes	yes	yes
	integrate pedigree with DNA	no	no	yes
Genetic Tools	specific relationship suggested	yes	no	yes
	amount of shared DNA (in centimorgans)	yes	yes	no
	chromosome browser	yes	yes	no
	see matches' shared DNA with other matches	yes	no	no



cousins.” At Family Tree DNA, you can use the total number of shared centimorgans (a unit of measure for DNA; the more you share, the closer the relationship) and a table like the one at www.isogg.org/wiki/Autosomal_DNA_statistics to help you estimate how you’re related. If both you and a potential match have registered with the GEDMatch website www.gedmatch.com and exchanged GEDMatch kit numbers, you can perform a one-to-one comparison on the site and see a centimorgan count there. (See a GEDMatch tutorial in the July/August 2015 *Family Tree Magazine* shopfamilytree.com/family-tree-magazine-july-august-2015.)

3. Use this predicted relationship range to isolate which great- or great-great- or great-great-great- (I could keep adding *greats*) grandparents are your “target audience” when making a connection.

4. Evaluate the surnames and locations of your ancestors in that predicted range against those of your matches in the same range and choose the most likely couple. Then look for additional matches by employing the Ancestor Approach for this couple.

And that’s it, folks. No silver bullets. No magic wands. Just suggestions to use over and over again to evaluate your DNA matches. We tend to think of science as a cold, systematic method of finding conclusions based on hard facts. In this light, your DNA testing experience will be far from scientific. Instead, you might liken your genetic genealogy experience to a great class on literature. There’s a new language to learn, with key characters and a compelling plot. But what you really want to know is how it’ll end. This depends in part on your ancestors and how many of their descendants have been tested. In combination with traditional genealogical search strategies, your DNA can help you turn UFOs into BFFs. Or at least people you feel a connection to because of your shared family history. ■

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 DIAHAN SOUTHARD is the founder of the genetic genealogy consulting service Your DNA Guide yourdnaguide.com.

Is Y the Way for You?

If you’re feeling frustrated by the UFOs of autosomal DNA, switching over to the Y-DNA test might be for you. The simple, direct paternal inheritance pattern of Y-DNA—every man has the Y-DNA of his earliest known direct paternal line ancestor, with occasional mutations—makes relationship estimation so much easier.

One DNA testing company offers Y-DNA testing: Family Tree DNA www.ftdna.com. You can have as few as 12 and as many as 111 locations (markers) tested on your Y chromosome. For most people, the 37-marker test provides enough information to answer initial questions about relatedness. But if you have the cash, spring for the 67-marker test. In the example on page 18, you’ll see how this can give you a little more edge when you’re trying to figure out how you’re related to someone.

It’s also easier with Y-DNA to determine if you match someone. The test assigns a value to each marker. Most of the time, you compare your marker value to the other person’s value on the same marker. In matching, the Y-DNA really is like the shape-sorting toy: Either it fits, or it doesn’t.

Your exact matches, or those with a difference of up to three values on a 37-marker test, can probably start picking out T-shirts for your next family reunion. Those with two or three differences might or might not be related to you, and a match with four or more differences is most likely not related.

While the surname is the most obvious confirmation of a shared paternal lineage, many families have situations—adoption, an extramarital affair—in which the surname hasn’t been passed down as expected. Therefore, all the matches in your Best Match range, regardless of surname, deserve a second look. If the surname is different, look for locations in common with your ancestors.

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