

# DNA and the Family Tree

Some genetic-testing companies promise more than they can deliver

By **Jasen Lee**

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Nine years ago, improved technology revolutionized the science of genealogy through DNA testing, making the procedure of tracing one's genealogical lineage easier in many ways and creating a new industry in the process.

While the science is progressing rapidly, so is the business of DNA testing for genealogy, and two Utah companies, GeneTree and the Generations Network, have become industry leaders. But researchers are telling buyers to beware.

This past fall, 14 researchers from across the nation wrote a letter that was published in Science magazine, warning that "both scientists and consumers should approach genetic ancestry testing with caution."

"The tests can have a profound impact on individuals and communities; the assumptions and limitations of these tests make them less informative than many realize; and commercialization has led to misleading practices that reinforce misconceptions," the researchers said. "Many consumers do not realize that the tests are probabilistic and can reach incorrect conclusions."

The tests cannot pinpoint the place of origin or social affiliation of even one ancestor with exact certainty, and they should not be seen as determining the race or ethnicity of the test-taker, the scientists wrote.

Harvard University professor Henry Louis Gates Jr. has also expressed concerns, saying that consumers should supplement DNA testing for genealogy with historical research. Gates, who is director of Harvard's W.E.B. DuBois Institute for African and African American Research, recently launched a new company called AfricanDNA that helps blacks trace their genealogical roots.

He said the company was developed, in part, because a company that tested his DNA told him his maternal ancestry was of Nubian descent from Egypt. He later discovered through further genetic testing that his maternal lineage was most likely of European ancestry.

One of the researchers who wrote the Science letter is Deborah Bolnick, assistant professor of anthropology at the University of Texas at Austin. She says consumers should understand the nature of the information they are getting through DNA testing.

"In certain contexts, it can be very useful and give you a lot of very specific good information," she said in an interview. "Some of the more important limitations have to do with the fact that we can really only trace a very limited number of your ancestors with the available DNA tests."

She said people should be aware that information becomes less reliable the farther back in history you go. Answers in DNA testing and genealogical research are often based on probability rather than absolutes.

"Some companies are starting to recognize that," she said. "There has certainly been an effort by a number of companies in the last year or two to be a little bit more cautious about what they tell people and qualify what they tell consumers."

### **Linking the world**

More than two dozen companies now market "genetic ancestry tests," and more than 460,000 people have purchased those tests in the past six to seven years, the scientists' letter said.

Bolnick advises consumers to learn more about the science of DNA testing so they can better understand the results they receive.

"People should look at the information that's available on the Internet before making the decision to spend money on a particular test," she said. "There are very good sources out there, and they can help newcomers really figure out whether a particular test would be useful for them, given the questions they have."

Though the number of companies in the genealogy industry is growing, few do their own actual laboratory DNA testing.

Much of the DNA testing for the top genealogy companies is done in Utah at the Sorenson Genomics laboratories in South Salt Lake. The company does testing in three areas: forensics science, paternity and relationship testing, and ancestry DNA, said chief operating officer Douglas Fogg.

Fogg said the goal of the lab is to fulfill the dream of its founder, the late billionaire inventor and medical entrepreneur James LeVoy Sorenson.

"Mr. Sorenson's passion was to leave behind a legacy of peace," Fogg said. "That legacy was based on helping diverse cultures of the world understand how closely they are related biologically, and then perhaps they would treat one another with a little more civility."

Sorenson created the Sorenson Molecular Genealogical Foundation, and Sorenson Genomics was a laboratory formed primarily to process the samples that were being collected from around the world. The lab does a DNA analysis of those samples and sends the samples to the foundation for its genetic database.

The foundation, located on the same block as the Genomics lab in South Salt Lake, contains one of the largest correlative genetic and genealogical databases, Fogg said.

The foundation has collected approximately 100,000 DNA samples from 172 countries around the world, according to chief scientific officer Scott Woodward. He estimated the foundation has spent tens of millions of dollars developing its database and testing procedures in order to have the most accurate information available.

Funding for the nonprofit foundation's work comes primarily from the Sorenson Legacy Foundation, the charitable arm of the Sorenson Companies.

The foundation organizes study trips worldwide to various target countries, setting up cooperative arrangements with local universities or humanitarian groups, and then conducts door-to-door surveys with the people in the region, said MeiLani Hock, the foundation's director of public affairs.

Woodward said the samples tie to 6 million ancestors' pedigrees listed in the foundation's database, with collections currently running at 750 new samples each week worldwide.

"For every DNA sample, we also have the genealogical information that's associated with them," Woodward said.

### **Refining the tests**

Bennett Greenspan is the president and chief executive officer of Houston-based Family Tree DNA. He, along with Sorenson, has been one of the front-runners in the industry of DNA and genealogical research.

Greenspan said for the greatest accuracy in DNA testing for genealogy, the DNA markers examined should be fast-changing or high-mutating, which enables scientists to more precisely analyze familial lines.

According to Fogg, Y-chromosome DNA is high-mutating and therefore more precise in its resolutions, whereas mitochondrial DNA has slower mutating chromosomes that men and women inherit from their mother. Only males have Y-chromosomes, and that DNA is inherited by men from their fathers.

Sorenson Genomics examines 43 markers for its Y-chromosome DNA testing. An exact match (43 of 43 markers) correlates to common paternal lineage from one to five generations, said Fogg. Fewer matches decrease the precision with which results can be measured.

"The question is, how refined can we get in our testing?" he said. Figuring 20 years per generation, Fogg said being able to track lineage within 100 years "is pretty significant."

Samples are typically collected by using cheek swabs or by using a mouthwash-type solution that is swirled around in the mouth for about 45 seconds.

Fogg said companies are competing to identify and expand the number of relevant genetic markers that can offer higher resolution and establish more accurate family genealogy. But, he added, "depending on which markers you're selecting, you may not be getting better results."

The foundation's Sorenson Genomics, through Sorenson's for-profit family networking company GeneTree, offers DNA testing using mitochondrial sampling, said GeneTree CEO James Lee Sorenson. The company plans to offer high-resolution Y-chromosome testing by this spring.

Sorenson Genomics also contracts with African Ancestry and the Provo-based Generations Network, which operates the popular Web site [Ancestry.com](http://Ancestry.com).

### **Add historical research**

Researchers and companies are increasingly urging consumers to evaluate historical as well as DNA data when tracing genealogy. Greenspan said that in order to achieve more reliable results, analyzers

should look for more than one piece of evidence linking genealogical data. He suggests using DNA data along with the origins of surnames, for instance, to verify lineage.

Harvard professor Gates, who also is host and executive producer of African American Lives and African American Lives 2, which is now showing on PBS, credits [Ancestry.com](https://www.ancestry.com) for its efforts in digitizing thousands of archival records and making them available on the Internet. He says the digital format has streamlined the process of tracing one's ancestral roots.

But Gates said that people researching their family tree still must include searches of hard copies of historical records in order to be as thorough as possible. "They should also be prepared to do some old-fashioned archival research," he said.

His new company, AfricanDNA, has recently created a partnership with Family Tree to offer Y-chromosome, mitochondrial, and admixture tests.

Admixture tests examine the percentage of European, African, Asian and Native American ancestry that people have, he said.

Gates said his company has a panel of scholars who are experts in the African slave trade and African history and who review DNA test results to offer their insights on what the information means. He said the partnership operates in a way that can serve as a model to others in the DNA testing industry.

"Often with African-Americans, you'll get two or three identical matches with different people from different African tribes, so some services would just pick one," he said.

The price of researching one's family tree through various companies can run from \$99 to more than \$800. AfricanDNA charges \$189 for its premium testing package, GeneTree offers its most popular test for \$149, and Family Tree DNA tests start at \$129.

Some companies are making huge profits, Gates said. "There's a lot of price gouging in this area."

Greenspan and Gates also said some companies mislead clients by telling them information that is too exact, when today's available science does not offer such precision, particularly when tracking female lineage.

"Let's say that there is a 70 percent chance that two men would have shared a common male ancestor within the last 300 years," Greenspan said. "The equivalent for females would be a 70 percent chance that two women share a common female ancestor in 3,000 years."