

DNA FOR FAMILY HISTORIANS

Gene testing can provide a useful supplement to genealogical records or family history legends in researching our ancestry, in both the near and distant past, as *Christopher White* discovers

As we showed in the last issue of *Your Family Tree*, you can use records to take your family story back several centuries. However, unless you're descended from one of the major European royal houses or have other aristocratic connections, the paper trail may grow cold in some branches of your tree after 200 years' worth of records. Perhaps you'll find there's a mystery in the family history, an unusual bare patch in an otherwise leafy family tree. Fortunately, if the paperwork runs out there are other places to look for clues – in fact, they're in almost every cell of your body.

We inherit most of the DNA that makes us who we are – determining everything from height to eye colour – from our parents. The majority of it gets mixed together, creating a blend of physical features and other characteristics. So for example, a child might get its mother's hair and its father's ears. However, some DNA is inherited from just one parent and is passed down virtually unchanged: mitochondrial DNA comes solely from one's mother, and Y-chromosomal DNA only from one's father. This means that DNA provides an unbroken record of our lineage

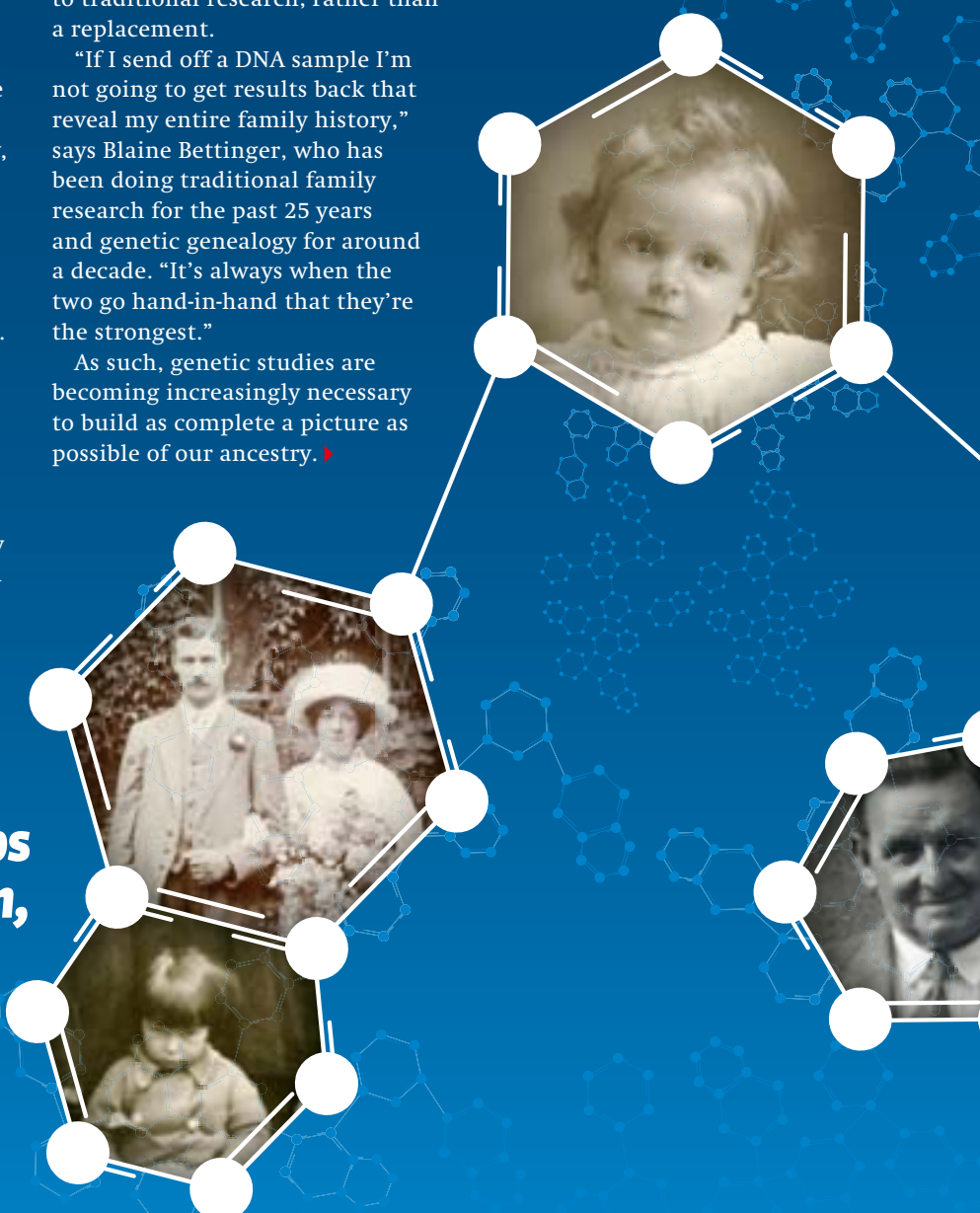
“Gene testing is increasingly being used to help fill in gaps in family tree research, and to investigate more distant relationships”

on both parental sides. Gene testing is increasingly being used to help fill in the gaps in family tree research, and to investigate much more distant relationships than is possible with paper records alone.

It's best employed as a complement to traditional research, rather than a replacement.

“If I send off a DNA sample I'm not going to get results back that reveal my entire family history,” says Blaine Bettinger, who has been doing traditional family research for the past 25 years and genetic genealogy for around a decade. “It's always when the two go hand-in-hand that they're the strongest.”

As such, genetic studies are becoming increasingly necessary to build as complete a picture as possible of our ancestry. ▶





CAN YOU ADAM AND EVE IT?

DNA testing can estimate the number of years passed since the time in which the most recent common ancestors of all currently living humans lived. Known as Y-chromosomal Adam and Mitochondrial Eve after the figures in Biblical mythology, they are thought to have lived 60,000-142,000 years ago and 200,000 years ago respectively. They weren't the first humans, or the only ones around at the time, but no others have an unbroken line of descent to everyone alive today.

► “I don't really think you can ultimately have one without the other,” adds Chris Pomery, a consultant for gene-testing company Family Tree DNA who has been involved in this type of research since around the year 2000. “Certainly ten years ago that would've seemed like an outlandish claim, but within the next ten years it's going to be absolutely the norm.”

Pomery adds that, ultimately, our family history concerns the people who were in it and the lives they led, and while the genetic element doesn't take that away, it does ensure you're covering the correct people.

He says: “If you think about it, traditionally there have been two pillars to family history – one has been oral history and the other has been documentary history. The latter could be anything, it could be a family Bible or a massive national database. But now there's a third one: genetic data. And to turn away from that would be as foolish as having a vibrant oral-history



DNA-TESTING COMPANIES

✦ **FAMILY TREE DNA:** The US-based firm is the biggest DNA-testing company and hosts the majority of the surname projects conducted by members of the Guild of One-Name Studies. They also sponsor the DNA workshop at Who Do You Think You Are? Live. Tests start at \$159 for a mitochondrial DNA test or \$289 for a full family-finding service. www.familytreedna.com

✦ **23ANDME:** Named for the number of chromosomes inherited from each parent and also based in the US, 23andMe primarily test

DNA for health-screening purposes but you can also use it to find genetic cousins. You can also use 23andMe to transfer results to the Family Tree DNA databases. Tests cost \$99, plus the price of shipping. www.23andme.com

✦ **OXFORD ANCESTORS:** Founded by Oxford University genealogist Professor Bryan Sykes, prices begin at £199 for testing on your maternal or paternal ancestry individually. If you want to analyse both the price rises to £369. www.oxfordancestors.com

✦ **INTERNATIONAL SOCIETY OF GENETIC GENEALOGY'S WIKI:** This shows a comparison of what services the various companies offer and is available. www.isogg.org.

Choice Many family historians are increasingly turning to DNA testing companies to give them clues to the gaps in their tree

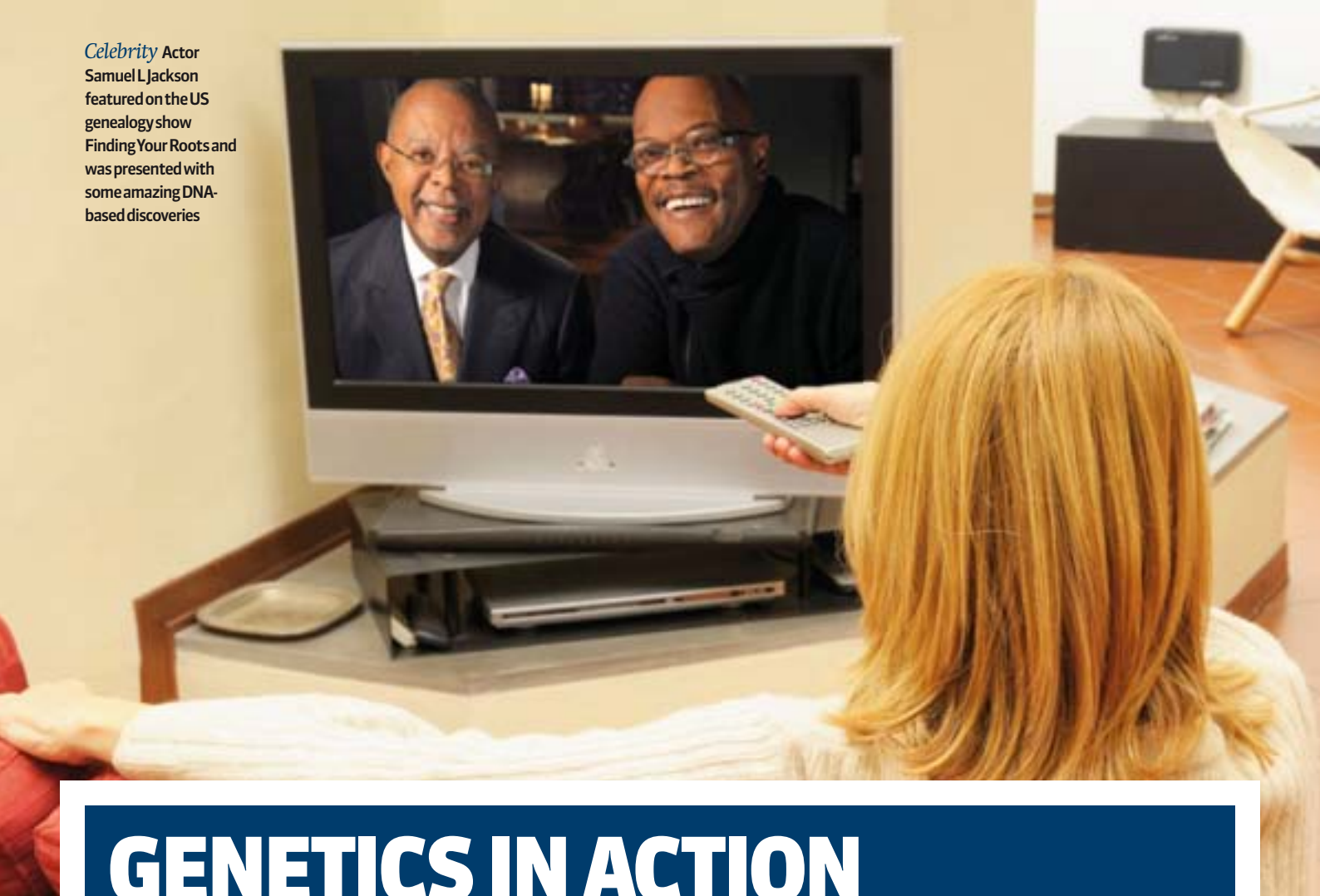
story and saying, ‘Well I'm not going to take any notice of that; I'm just going to ignore it'. Or likewise throwing documentary evidence away, it wouldn't make any sense. Now we have the chance to use all this genetic data, it makes sense to use it.”

So how does DNA testing work, and what can we do

with it? After taking a sample of DNA, usually via a cheek swab, it's sent to the lab and certain segments of DNA called markers are tested for comparison. If the DNA molecule is arranged in the same order, they're considered to match – and the more markers two people share in common, the more closely related they're likely to be. The most popular tests compare 37 genetic markers, and matching all of them suggests a very close relationship. Whereas if there is a wide mismatch then two people are probably not related within what's known as a

“After taking a sample of DNA, it's sent to the lab and certain segments of DNA called markers are tested for comparison”

Celebrity Actor Samuel L Jackson featured on the US genealogy show Finding Your Roots and was presented with some amazing DNA-based discoveries



GENETICS IN ACTION

One of the best examples of how DNA tests are providing new breakthroughs in people's recent and ancient ancestry is in PBS America's new genealogy TV series *Finding Your Roots*. As presenter Professor Henry Louis Gates Jr explains, the boom in private genetic testing market using cheap, readily available kits over the internet means the number of people tested is increasing. As more people submit their DNA to the pool of information, the probability of finding a genetic match in the databases increases, whether it's sharing an ancient DNA group or finding you're descended from someone who lived in more recent times.

The show's format is a familiar one, with celebrities discovering their ancestral roots, but with an extra emphasis on how DNA analysis can help find each person's ancient line, particularly pertinent for the American celebrities whose country has only existed for a few centuries, but also for recent family

history that produces the greatest interest.

"What they're interested in is their recent ancestry," says Professor Gates. "Finding that you share a distant relative 10,000 years ago is one form of satisfaction, but a higher form of satisfaction is realising that you're connected to other human beings with whom you share a great-, 2x great-, or 4x great-grandfather from the autosomal DNA results."

Through the latest autosomal DNA testing the programme's creators have shown that DNA in genealogy needn't be about finding out if your ancient ancestors roamed the plains of Africa. As so many people have chosen to submit their DNA samples for testing, the results are becoming more accurate.

As Professor Gates explains: "The latest thing we're doing with autosomal DNA reveals the long stretches of identical DNA that say you and I might share, in which case we have a common ancestor going back 100, 200,

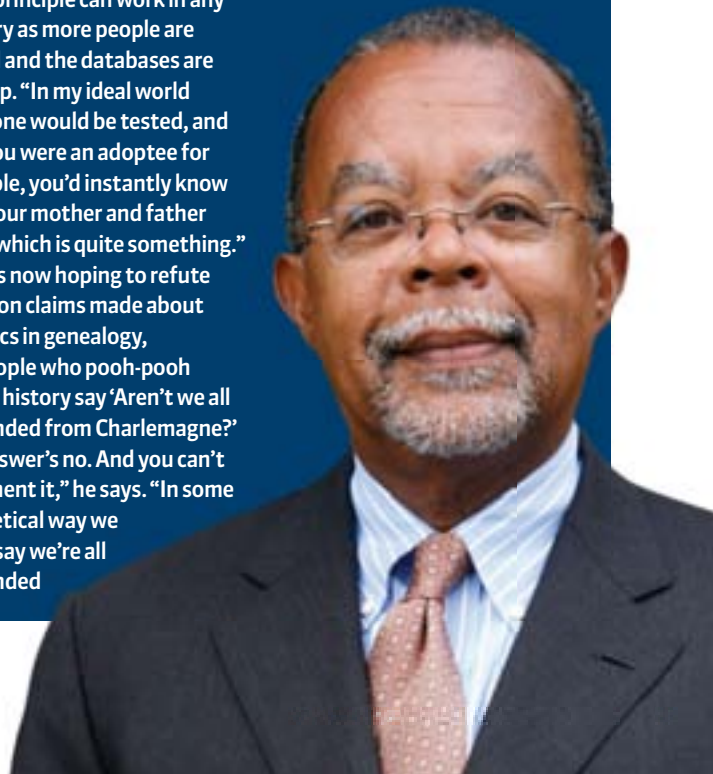
300 years, which is yesterday in terms of human evolution. People are riveted about this as much as they are about their actual paper trail family trees."

Such discoveries suit American family historians, whose history is short, built on immigration and links to prominent families. However, Professor Gates believes the same principle can work in any country as more people are tested and the databases are built up. "In my ideal world everyone would be tested, and so if you were an adoptee for example, you'd instantly know who your mother and father were, which is quite something."

He is now hoping to refute common claims made about genetics in genealogy,

"People who pooh-poo family history say 'Aren't we all descended from Charlemagne?' the answer's no. And you can't document it," he says. "In some theoretical way we could say we're all descended

from Genghis Kahn or Confucius, because we're all descended from two people walking around in East Africa. But that's not the same as being able to document it, either genetically through autosomal DNA or through a paper trail. This is a gift we give to people on the series."



“The most popular tests compare 37 genetic markers, and matching all of them suggests a very close relationship”

► ‘genealogical timeframe’ – ie since the introduction of surnames.

Because the transmission of Y chromosomes happens in parallel with the passing on of surnames from a father to his offspring, Y-DNA testing is most commonly used for genealogical research in surname-building projects. Because only men possess a Y chromosome, women researching their surnames through Y-DNA will have to borrow a male relative.

However, a man can have his Y-chromosomal DNA analysed and then compare it to that of others with the same surname to establish the relationships between them, if any exists – it’s less likely between more common surnames, particularly those derived from trades and occupations.

NAME GAME

There are now around 7,000 surname projects in existence, many of them hosted by Family Tree DNA, so the most commonly occurring surnames are likely to have a pre-existing project to which new testees can add themselves.

For names that are more rare, it may be necessary to start a completely new project. Any good testing company will have a facility to register a surname project, and then it’s a case of

DEEP ANCESTRY

As well as being used to investigate recent family history, you can use DNA to find out about your genetic origins into the distant past by tracing back in time to find out who, from just a handful of people, we’re ultimately descended from.

Oxford University’s Prof Bryan Sykes’ book *The Seven Daughters of Eve* tells the story of how he discovered that most Europeans are descended from just seven women, to whom he gave names below.

✂ **URSULA (HAPLOGROUP U):** Originating 55,000 years ago probably in Western Asia, ancestor of 11 per cent of Europeans.

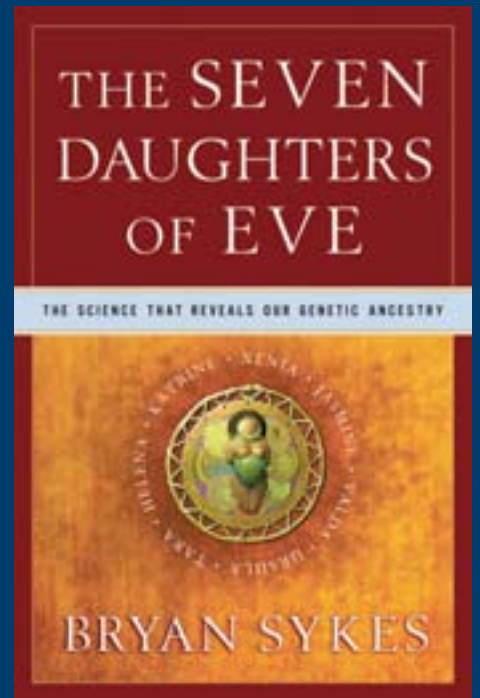
✂ **XENIA (HAPLOGROUP X):** Also from Western Asia but from 30,000 years ago, the ancestor of around seven per cent of Europeans.

✂ **HELENA (HAPLOGROUP H):** Originating around 25,000-30,000 years in South West Asia, H is the most common haplogroup in Europe, present in about 41 per cent of native Europeans.

✂ **VELDA (HAPLOGROUP V):** A relatively rare group found in approximately only four per cent of Europeans, this probably originated on the Iberian peninsula around 13,000-14,000 years ago.

✂ **TARA (HAPLOGROUP T):** Dating from approximately 20,000-30,000 years ago in what is now Syria or Turkey, haplogroup T is found in 10 per cent of Europeans.

✂ **KATRINE (HAPLOGROUP K):** This woman is



Revelations As the name of the book suggests, author Prof Bryan Sykes tells the reader how he found out that most Europeans are descended from seven women

the least well-defined in terms of age, coming from 22,000-44,000 years ago in Western Asia, ancestor to around 10 per cent of Europeans.

✂ **JASMINE (HAPLOGROUP J):** From 45,000 years ago in the Caucasus, this haplogroup is found in around 12 per cent of Europeans. It’s also associated with a degenerative eye disorder called Leber’s hereditary optic neuropathy.

Prof Sykes is now tracing the “clan mothers” of Japan. Similar research reveals the Y chromosome haplogroups, passed down the male line through early male ancestors and showing their probable geographic origins. These are more numerous than mitochondrial haplogroups.

administrative tasks, such as actively recruiting members or waiting for them to find you; making decisions such as to whether to focus on a specific geographical area, and helping to interpret test results. However, the companies should be able to pass on any particularly technical questions to a specialist. You can also use the results to plot the locations of surnames around the world using a name-mapping website.

ROAMING OFF COURSE

A woman known as Anna Anderson maintained – until her death in 1984 – that she was Grand Duchess Anastasia of Russia, the youngest daughter of Tsar Nicholas II, and had survived the massacre of the rest of her family at the hands of communist revolutionaries. After her death, a comparison between her DNA and that taken from bodies believed to be those of the Tsar, his wife and some of the rest of the family (which were themselves identified by comparing their DNA with that of Prince Philip the Duke of Edinburgh and others) proved that she did not belong to the Romanov dynasty and in fact was an impostor.

Online Author and lecturer Chris Pomery has a special interest in the way DNA testing is being developed by historians. You can also read the Genetic Genealogist blog for news on DNA changes



As well as better-established methods of sharing leads and findings such as family history societies, online social networks can also be useful, allowing communication between people researching the same surname or making it easier to track down and contact a person that you'd like to include as part of a study.

This could be one of the commonly used general-purpose sites such as Facebook, on which the 'group' facility is particularly useful for sharing research or for sending the same message to a number of people at once, or a social network specifically intended

THE TIES THAT BIND

DNA has been used to show that the mother of a man, whose body was found in the Italian Alps in 1991 dating from c5,000 years ago, also had a descendant living in Dorset.

for genealogical research, such as Genes Reunited (<http://tinyurl.com/dxtodq>).

Chris Pomery took over the running of the Pomeroy Family Association's project, and a genetic element was added to pre-existing, traditional research in 2000. It's now the most fully developed study of its kind.

"When I took it over it was quite clear that if it was

pursued purely by documentary means to try to reconstruct the family tree for an entire surname, or a group of surnames. There's obviously going to be so many discussions and debates as to which person should be associated with which tree, and had the right decisions been made in that reconstruction," he says. "So it made sense to overlay the genetic data on top of it. So, if you test a couple of people in that family tree and they all have the same Y chromosome result, and it's consistent, then you can link them to another group of people with the same surname, with the same DNA result. You know you're looking at what is – in effect – one tree, that you've not yet been able to document, but you know that if you carry on long enough and look closely enough you should be able to find the documentary evidence that will link them together."

“Online social networks can be useful for sharing leads as well as to communicate with people who have the same surname”

Ancient findings
BritainsDNA conducts
tests designed to get back
thousands of years, way
beyond any documentary data



ADAM REES' TEST RESULTS

This is what we learnt when *Your Family Tree* editor Adam Rees ordered a deep ancestry test from BritainsDNA.

Unlike the other DNA tests we've covered, deep ancestry tests aren't used as a complement to traditional research in reconstructing a family tree. Instead, they're employed to look back further in time to beyond where

documentary records could ever have existed. The Y chromosome tests examine the direct paternal line – the DNA passed from fathers to sons – back to several thousand years ago, and the mitochondrial tests do the same for maternal lines. Though they only cover one branch of one's family tree, they get as near as possible to the root.

The tests found that Adam's Y chromosome haplogroup is R1b-M269. The results report states that this is "one of the most common Y markers in Western Europe but it is also occasionally found as far afield as China, India and Russia." Based on this, the company estimates that Adam's direct paternal line is Pretani, the tribe that gave Britain its name after arriving on these islands from around 11,000 years ago – it probably means "painted", from the ancient practice of dyeing oneself blue.



Discovery Adam had what's known as a deep ancestry test with BritainsDNA company, which shows that his direct paternal line is from the Pretani tribe

Adam's mitochondrial DNA test places him in the H6a1 subgroup, which originated around 40,000 in a group that BritainsDNA calls "The Pioneers" – those who recolonised Europe following the end of the last ice age. The haplogroup is most commonly found in Scandinavia, Britain, Germany and Spain. In fact, it's the dominant maternal line in Europe – Adam will share a great x 1000s grandmother with much of the continent.

The fatherline being that of the original inhabitants of

Britain seems appropriate for a proud Welshman – but it's actually common to most Brits despite repeated invasions of these islands. "Considering I'm always banging on about my pride in being Welsh it's a relief to see my 'native' DNA goes back so far beyond the few hundred years of research I've done into my Welsh and Irish family tree," says Adam. "Given that my mtDNA covers such a broad group, I'd now like to do an autosomal DNA test to find out more on my recent ancestry."



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SEEING RED

DNA tests have a wide range of applications, from those targeted at the US market, which locates the area of Africa one's ancestors came from, to those used to determine whether a test subject carries the gene responsible for ginger hair.

▶ Similarly, Debbie Kennett, the author of two books on genealogy, has used DNA testing to complement her research into her maiden name, Cruwys.

"I was only really researching my own family line to start with, but as I was doing research I kept finding I had to widen the research and look at other branches of the family, sometimes for the purposes of elimination," she says. "So I found I was researching virtually everyone with the Cruwys surname, which became a one-name study, so I then registered that with the Guild of One-Name Studies."

LINE IDENTIFICATION

Kennett's research identified three distinct lines: one going back to the 1100s, one to the 1600s, and one illegitimate line in which there are probably only a few hundred living people worldwide today. Again, combining DNA testing with more traditional methods identifies the different lines.

"You need to identify the lines through the paper-trail research and then you can try and test someone from different parts of the tree and separate lines and see which ones match and which ones don't match," Kennett explains. "Sometimes you might have identified two different lines

and you can get them back to the 1700s and can't get them any further back, and if the DNA results match then you know those lines are related even further back in time, despite the fact that you haven't got the paper trail."

She also found that variations in spelling were sometimes

"Whereas only men can take Y-tests, both men and women can take mitochondrial tests to trace their maternal line"



DNA JARGON BUSTING

✦ **AUTOSOME** An autosome is one of the 22 pairs of chromosomes that are inherited from both parents (as opposed to sex chromosomes). An autosomal test works on the section of DNA, looking at one's whole genetic makeup.

✦ **DNA** Short for deoxyribonucleic acid, it's the molecule that encodes the genetic instructions on how to build an organism.

✦ **GENE** A sequence of DNA that encodes instructions for a specific trait, such as eye or hair colour.

✦ **HAPLOTYPE, HAPLOGROUP** A haplotype is a particular combination of genes that are inherited together. A haplogroup, as the name

suggests, is a set of haplotypes who share a common ancestor.

✦ **MITOCHONDRIA** The "powerhouses" of living cells, generating most of the chemical used to generate energy. The DNA in mitochondria is independent of that in a cell's nucleus, and is inherited only from an individual's mother.

✦ **Y CHROMOSOME** Chromosomes are structures of DNA and protein that contain genes. Humans have 23 pairs of chromosomes that are inherited from both parents, except for those that determine sex – the X and Y chromosomes. The Y chromosome contains a gene that triggers development of male sex organs, and is only inherited from one's father.

localised, with 'Crewes' cropping up in Cornwall and 'Cruise' mostly from Ireland. Her own variant was thought to be that of a local landowner, later aped by others in an attempt to appear posh.

Along with Y chromosome tests, there are mitochondrial DNA tests, which you can use to trace maternal lines, but in cultures where surnames are inherited only from fathers, there isn't often a strong paper trail to help.

Whereas men can only take Y-tests, both men and women can take mitochondrial tests to trace their maternal line. ▶



Breakthrough
Thanks to genetic testing experts were able to confirm that the skeleton found in a car park in Leicester was that of King Richard III

TREK THROUGH TIME

Genetic testing was used to support the claim, confirmed in February, that a body found buried beneath a Leicester car park was that of England's King Richard III. Along with the spinal curvature pointing to it being the skeleton of the notoriously malformed monarch, and injuries consistent with a death in battle, DNA taken from the

corpse matched that of a descendent of Richard's sister, a Canadian furniture-maker named Michael Ibsen. Because mitochondrial DNA is only passed through the female line, and Ibsen's mother is no longer alive and his own sister has no children, then if the king's body had remained beneath the car park for very much longer it may not have been possible to use DNA to confirm its identity.

DNA has recently made the news for helping identify a king as well as go back into a comedian's deep ancestry.

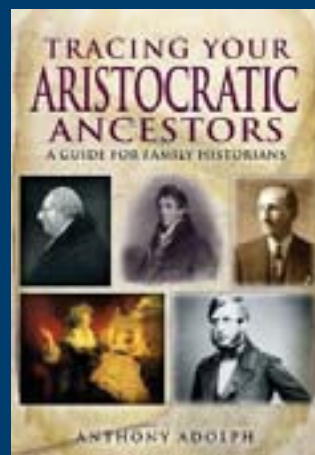
But genealogist Anthony Adolph claims that there may be thousands of more distant relatives worldwide. In his book *Tracing Your Aristocratic Ancestors* he suggests that the family trees of the younger children of aristocratic families – not considered as important as the eldest male – are more easily lost, and relationships to nobility are only recently

beginning to be revealed with the advent of DNA testing. He claims that both the first US President George Washington and World War II General George Patton belonged to King Richard's Plantagenet dynasty, being descended from his cousin John Neville.

With so many minor aristocratic lines lost despite their higher than average reproductive success, perhaps DNA testing will reveal a little bit of blue in your own blood.

February also saw DNA testing feature on television, with comedian Eddie Izzard's (pictured) attempts to trace his ancestry across the world and back in time through his genes.

With the help of Edinburgh University's Jim Wilson, also the chief scientist at testing firm BritainsDNA, the two-part programme traced 200,000 years of Izzard's maternal line in the first episode, taking him from Namibia to Denmark via Turkey, and covered his paternal heritage in the second show.



Nobility Author and YFT writer Anthony Adolph says due to DNA people may find they have blue blood

However, you'll find that such deep ancestry tests are not without their critics. Mark Thomas, a professor of evolutionary genetics at University College London, wrote on the *Guardian's* science blogs that, because DNA from a huge number of ancestors gets mixed together, claiming that someone has, for example, Viking ancestors is "genetic astrology".

That doesn't detract from the usefulness of DNA in finding relatives, however.



“Autosomal DNA testing looks at your entire genetic makeup, this may result in finding kin you never knew you had”



▶ A third type of test can help to find completely unknown relatives. Autosomal DNA testing looks at your entire genetic makeup. As with the other tests, when you order this type, many companies will allow you to opt in to their database, which they'll then search for matches with your DNA, for relatives that you may never have otherwise known that you had.

You can use autosomal tests speculatively, for example, to confirm a hunch about a link suggested by paperwork.

“Often, what will happen is an individual will be researching his paternal line, and he comes to a brick wall – he can't figure out who is the father of John Smith,” explains Bettinger. “So if he takes a Y-DNA test, and the result comes back that he matches a particular segment of names in the database, that's a clue that he should be looking at the family of those lines he matches. And it can help answer, or support or refute, specific hypotheses that you

Simple Self-testing at home using DNA kits is becoming increasingly popular among family historian researchers

may form: if I believe my paternal ancestor was this individual, I can use DNA testing to try to support that or refute that.”

PRICELESS DATA

Autosomal testing is also invaluable where there is little or no paper evidence at all. For example, people who were adopted as children can use these tests to find out about their biological heritage, or they can be used by the descendants of adoptees.

Bettinger is trying to trace relatives of his adopted great-grandmother, born c1890. He's been unable to identify any paper records, so is using the living records of genes.

He says: “By testing me and also another relative who's

also descended from my great-grandmother, I've identified portions of my DNA that I inherited from her. Now I'm looking for people in these databases who also match me in those same locations. And by potentially finding a genetic relative who's related through my adopted great-grandmother, I may be able to reconstruct her family tree and identify her biological parents.”

Adoption is an example of unknown or ambiguous parentage that is at least overt. Other cases aren't so straightforward, and Bettinger warns that people considering having their DNA tested as part of a family history project should expect surprises. Some genetic lines may differ from what is suggested by paperwork or oral history due to, what is euphemistically referred to as, a ‘non-paternity event’.

“I always say that DNA doesn't lie – but families do,” says Bettinger. “Be prepared for a secret that may be revealed by DNA, which people thought would be safe forever.” ■

CONTACTS

DNA and Social Networking: A guide to genealogy in the twenty-first century

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The Seven Daughters of Eve: The astonishing story that reveals how each of us can trace our genetic ancestors

Bryan Sykes, Corgi Books, 2004, ISBN: 9780552152181

The Surnames Handbook: A guide to family name research in the 21st century

Debbie Kennett, TheHistoryPress, 2012, ISBN: 9780752468624

WEBSITES

DNA & Family History

w. www.dnaandfamilyhistory.com

The website of historian and consultant Chris Pomery.

The Genetic Genealogist

w. www.thegeneticgenealogist.com

Ablog that “examines the intersection of traditional genealogical techniques and modern genetic research. The blog also explores the latest news and developments in the related field of personal genomics”.

The Guild of One-Name Studies

w. www.one-name.org

Map Your Name

w. www.mapyourname.com

Name-mapping website.

Ysearch

w. www.ysearch.org

The largest database of Y-DNA results.

HOLIER THAN THOU

According to Jewish tradition, the priestly caste, or “Kohanim”, are all descended from Aaron, the brother of Moses. Genetic studies of those with the surname Cohen have shown very close relationships, supporting the idea of common descent.