Genealogy and DNA

DNA has two major areas of interest from a family history point of view:
1. The first is Anthropological - that is the study of the earliest history of man and woman through the mutations of male and female DNA.
2. The second is Genealogical - Here we study recent male DNA changes to help people find more modern relations.

Although these are independent studies yet they are linked; they are both of interest to us. We all like to know where our ancient ancestors came from as well as finding some close cousins.

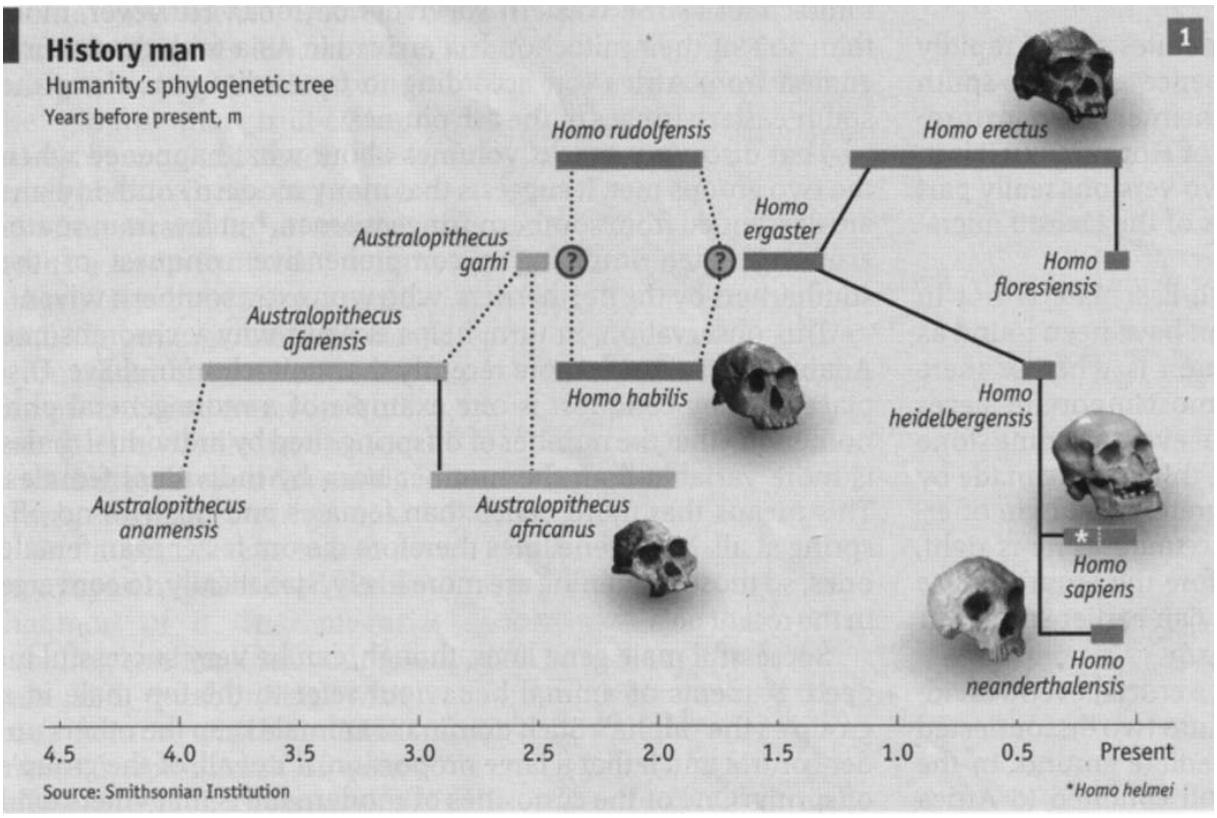
The difference between these two study groups of DNA derive from the two kinds of mutation that occur in a person's DNA that take place over the short and long term:

The two types of mutation are:

1. "Snips" or SNPs - Single Nucleotide Polymorphisms.
2. STRs - Short Tandem Repeats - these are lengths of DNA with repetitious sequences of chemical bases.

Type 1 - "Snips" are relatively rare occurrences of mutations in the chemical bases. These happen very infrequently in a family - every thousand years, or even much longer. These mutations are non-recombinant - which means that once this mutation has passed from father to son or mother to daughter that same mutation is passed on to future generations. Now, this is very useful. This is because it means that DNA can show which branch of a family has a particular snip or mutation and that distinguishes it from other families who do not. From this data one becomes able to trace the movements of populations over several tens of thousands of years through the analyses of the sequences of changing mutations.

The well-known DNA double helix contains all the genetic information which is passed from parents to children. The two helixes are joined by sugar-phosphates - just four and always in the same combinations - Adenine always joins with Thymine and Guanine always joins with Cytosine. A snip occurs rarely when a pair, say: Adenine and Thymine, switch sides.



Let's go back in time and look at how man has evolved.

We are homosapiens. But we were by no means the first of the human family. We can trace the earliest beginnings of man to a group 4.5 million years ago in Africa. These were descendants of the great ape and within 300,000 years they had evolved an upright stance. Much later we find a couple of groups with very human like appearance - homo erectus and homo heidelbergensis for example. Other hominds evolved and these included the Neanderthals and the homo sapiens. Both Neanderthals and early Humans used tools and had large brains. They lived side by side and it is believed that the reason that Neanderthals did not survive may have to do with the shape of their pallets - they did not have the ability to develop speech.

The earliest "modern" man lived in Africa 200,000 years ago. Between 85,000 and 60,000 years ago one of these went beyond the bounds of Africa and this "African Adam" commenced the peopling of the rest of the world.

The first man - as we would know him - existed in Africa around 200,000 years ago. From the study of snips scientists have put together a chart showing the gradual evolvement of families of DNA. This basic family tree of major family

DNAs are known as Haplogroups. This tree shows the major family branches of man from the start of human life in Africa. Each snip or mutation creates another branch of the human family. It is their genetic markers that have enabled scientists to trace the movements of populations over the past 60,000 years.

The National Geographic Society and IBM have teamed up under Dr Spencer Wells to set about getting 100,000 DNAs from people around the world - particularly from remote territories to try and identify the movements of populations based on their slowly evolving (snip) mutations. The last I heard was that they had collected 80,000 and we can see early results.

Were it not for these “snip” mutations we men would all share the same yDNA as African Adam.

One major haplogroup known as R1b started with a man in the Basque region of northern Spain around 35,000 years ago. His descendants populated most of Europe. 90% of Irishmen and 80% of Scots are in the R1b haplogroup. Since most of Europe was at one time covered in ice and the ice age did not end until around 10 to 12,000 years ago we can generalize that our early Scottish ancestors started to move north into Britain and northern Europe at some point after 12,000 years ago.

What about finding cousins ?

While these snip mutations help us to get major family groupings in the world they do not satisfy genealogists who are looking for modern cousins. For this we need the faster mutating Short Tandem Repeats, which occur in man's DNA y-chromosome. STRs are a bit like hiccups or a stutter. If we say "I like living in Canada" but because of the hiccup it comes out as "I like living in in in in in Canada" we have a repetition of "in" 5 times. It is the same with DNA these repeats pass from father to son and we count the number of repeats. If suddenly the word "in" appears six times then we have a genetic change and this change, or marker as we call it, is also non-recombitant - it will pass from father to son with six "repeats".

Other than the very rare snips, generally the y-chromsome DNA passes from father to son unchanged, except for these "hiccup" mutations, which occur with a single marker in 0.4% of each generation. Or, about once every 25 generations, or every 700 years or so. But when we compare our own DNA results against anoth-

er person's DNA we compare, not just against one marker, but against 12, 25, 37 even as many as 59 markers.

Most of us go for 12 markers at first because it costs less. We can expand to more markers later if we need to. We calculate how many of the markers are identical. If we match say 25 out of 25 markers then we have prima facie evidence of a close family relationship, which we can explore by exchanging family trees. If on the other hand we show that we share only 14 out of 25 markers then we know that there is only a very distant relationship through the direct male line.

However, if two men with the same surname share DNA with 37 out of 37 markers then the chances are very high (over 50%) that they descend from a common male ancestor within just FIVE generations. And that is a close relationship - a common great great great grandparent.

Here is an example: I have a three marker difference with my 4th cousin Colin McKenzie who lives in New Zealand. We share 34 out of 37 markers. Our respective paper trails state we are 4th cousins once removed and we descend from a common McKenzie ancestor born in 1730. The DNA now confirms that statistically we are true cousins. We have a relatively uncommon DNA and in fact out of 100 participants in the DNA study of Mackenzies we are each other's closest match. In fact we are also each others closest match out of over 60,000 DNA tests so far for all surnames. So DNA can help prove a relationship as well as disprove it.

We had two brothers take a DNA test and they did not match. They certainly came from the same mother but the father (now deceased) was not the father of both of them. So DNA can also disprove a relationship.

Now let me talk about the x and y chromosomes

Every man receives one y chromosome from his father and one x chromosome from his mother. All women receive two x chromosomes, one each from the mother and the father. It is the y-chromosome which is important genealogically as it passes - generally unchanged from father to son. And so too does the surname! Hence the great interest nowadays in single surname DNA programs for males in a family trying to connect to others with the same surnames and the same yDNA.

Dr Bryan Sykes of Oxford who has written a number of best selling books on the subject of DNA tested the situation by writing to all men in England called Sykes and asking them to undertake a DNA test. The result showed that around 60 to 70% shared a common DNA indicating that they descended from a common male ancestor and Dr Sykes calculated that this ancestor lived in Yorkshire around 1200 A.D. A remarkable result.

Unfortunately because women do not pass on their surname their DNA - mitochondrial DNA - is not very useful for genealogical purposes except in the case of the anthropological search for population movements in the distant past. However women can have a mitochondrial DNA test and that will trace her ancestry back to probably one of seven women who lived between 40,000 and 15,000 years ago. Dr Sykes refers to these in his book of the same name "The Seven Daughters of Eve." Mitochondrial DNA has also been used to prove the identities of the bodies of the Tsar Nicholas II and his family. Among those tested with matching mitochondrial DNAs was Prince Philip whose mother was a direct descendant in the female line from the Tsarina's female antecedents. Similarly the Tsar's remains matched a mitochondrial DNA with that of a Count Drubetskoy who had the same female ancestry as the Tsar.

Single Surname Projects

I mentioned earlier that there has been an explosion of single surname projects around the world. And it is obvious of course. People sharing the same surname and finding someone with the same DNA have a very good chance of having found a cousin.

I run the Mackenzie Surname DNA Project. In the Mackenzie Clan we have 109 men who have registered for DNA tests. According to form over 80% are R1bs. The rest are mostly in the "I" haplogroup which has an ancestry from Northern Europe and we believe that these would likely be the descendants of the Vikings who raided and settled in the Highland and Islands of Scotland.

Most of our Mackenzie clan members have joined the DNA Project to try and find more about their ancestry. Many descendants of immigrant Scots have lost the trail back to Scotland and DNA provides a last chance to try and connect with someone with a similar DNA and learn more about where the family came from.

There are currently over 2700 single surname DNA Projects run by Family Tree DNA and that company has analysed over 60,000 DNAs to date and is adding them at the rate of up to 1,000 per week. It is an extraordinary growth of interest in this fascinating subject.

Let me just show you what happens when you join a DNA Project connected to a single surname. There is nothing to stop you having your DNA analyzed even if there is no surname project as you may be able to connect with others with a different surname. After all we are dealing with Haplogroups that have been around for thousands of years while surnames have only been around for hundreds of years.

The front page of each person who registers with Family Tree DNA (see www.familytreedna.com) shows a DNA "kit" from Family Tree DNA in Houston Texas - the biggest such group in the world. Each kit has a couple of small plastic brushes which we scrape against the inside of each cheek. It is quite painless - no blood is drawn. The head of the brush is then put into one of the two small container included and these are mailed to the laboratory. The DNA on each brush is then analyzed and the result is passed back to you. The two results for each cheek must match - and this is the quality control. If they do not match then something in the mouth has spoiled the test and it has to be redone. Cost is about US$99 for a 12 marker test.

I have been tested and I am in the haplogroup R1b. There are some pages on my file with Family Tree DNA which I can access on the computer. There are also explanatory pages on the results. These show my closest matches and where there are matches I can get the email address of the person with whom I match.

All communication between Family Tree DNA and between members is by e-mail. It is very difficult to be effective unless you have access to e-mail. Some members without e-mail provide the e-mail address of a close relative. If you find a person who matches with you then you want to be able to get in touch immediately and check your respective family trees.

The Clan Mackenzie DNA results are shown on the Clan Mackenzie website for Canada which is at www.electricscotland.com/mackenzie. They show the DNA results for about 100 Mackenzies. We colour strings of markers that match. It

makes them easier to read. While most members are R1b the relationships are in many cases very distant and this was a puzzle and I should talk about it: A final word on Highland surnames:

The Recent Use of Surnames in the Highlands

Although we find large groups of Mackenzies with similar Haplogroups we find just as many with distant connections only. It is my belief that the reason for this is that while most of us certainly share a distant common ancestor, we find the surname connection does not work as well as that of Sykes. The reason for this has to do with our Highland Gaelic ancestry. Highland surnames were Gaelic miniature family trees - with lots of macs (meaning "son of"). The general adoption of modern Highland clan names was as late as the early 18th century. Only the landed proprietors who had to register their land interests had the generic Mackenzie surname and these can be found from the early 1400s.

Consider for instance the following extract from The Account of the Parish of Tain included in the *Statistical Account of Scotland, 1845*.

Most of the landowners and in truth most of the people bore the name of Ross or to speak more correctly almost everybody possessed two surnames, by one of which (in general, a patronymic beginning with Mac) he was universally known in conversation, though he deemed himself called upon to change it to Ross, or sometimes to Munro whenever he acquired any station in society or became able to write his name. (Easter Ross, it may be observed, was of old divided by these two clans . . .)

This is well demonstrated in the rental rolls of the late Earl of Seaforth's Estate in Lewis in 1728 when the lists of tenants drawn up by the Commissioners who now controlled these lands following Seaforth's involvement in the failed Jacobite uprisings of 1715 and 1719. The first list, which follows, shows what we would see as modern clan surnames and in each case the rentals are high suggsting that these were "important" tenants, or people of a higher social standing. The second list shows tenants with low rents, or people with tiny land holdings such as crofters or cotters. In these cases the surnames are Gaelic names and by the time of the census of 1841 these names had disappeared. We can conclude therefore that within the last 300 years a large proprtion of the Highlands and Islands did not have modern surnames and these came a little when the people adopted a clan surname. This explains the reason for the wide range of DNA results. There are,

however large groups of Mackenzies who are closely related through their DNA results and these could well be the descendants of the early Mackenzies of the 15th century who owned land and had a "proper" surname which passed from father to son.

The listings of Seaforth's tenants have been taken from the Scottish History Society's 1916 volume *Highland Papers Volume II - 1240-1716.*
Alan McKenzie FSA Scot (Clan MacKenzie Society Canada)

RENTALL OF THE FORFEITED ESTATE BELONGING TO THE LATE EARL OF SEAFORTH [1726]

Tenants' Names.	Habitations.	Parishes.	Muttons.	Butter.	Meal.	Scots Mony.
Isle of Lewes.				st. lb. oz.	B. F. P. L.	£ s. d.
1. Mr. Colin Mackenzie .	Arinish	Loches	..	..	..	100
2. John Mackenzie .	Rarnish	Ditto	..	..	..	200
3. William Mackenzie .	Leurbost	Ditto	6	6	..	116 18 8
4. Kennith McEiver .	Kioss	Ditto	7	6	..	132 1 4
5. Widdow Mackenzie .	Laxay	Ditto	3	2	..	68 9 4
6. Rory Mackenzie .	Waltos	Ditto	3	2	..	54 16 8
7. John McEiver . .	Bellallan	Ditto	10	5	..	103
8. Donald Mackenzie .	Seaforth	Ditto	..	..	..	40
9. Kennith Mackenzie .	Shant	Ditto	..	..	..	53 6 8
10. Alexander Mackenzie	Saint Columbs	Ditto	..	..	..	222 4 6
11. Alexander Mackenzie	Habost	Ditto	..	..	..	111 2 4
12. Donald McAulay .	Melista	Uig	3½	2 10	2 1	104 5 8
13. John McAulay . .	Ditto	Ditto	3½	2 10	2 1	104 5 8
14. Malcolm McAulay .	Carnish	Ditto	..	..	..	66 13 4
15. Donald McAulay .	Adderaivill	Ditto	3	3	3	106 13 4
16. Malcolm Smith . .	Craulista	Ditto	3	2	2	96 3 4
17. Alexander Mackenzie	Belnakiel	Ditto	1½	1	2	60 12
18. George Mackenzie .	Ditto	Ditto	1½	1	2	60 12
19. Donald McAulay .	Vattos	Ditto	3	2	3	91 3 4
20. Ditto . . . for .	Pabbay	Ditto	3	2	3	79 12
21. Rory McLennan .	Kneep	Ditto	3	2	1	84 5 4
22. Widdow McAulay .	Berva	Ditto	3	2	3	85 2
23. John McLeod . .	Haclet	Ditto	3½	2 5	1 2	80 18
24. Donald McLeod 25. Widdow McLeod	Airshadder	Ditto	1½	15	1 2	26 19 8
26. Widdow Mackenzie .	Hopsin or Bosta	Ditto	..	..	..	83 9 4
27. Murdo McLennan .	Ditto	Ditto	..	..	..	83 9 4
28. Alexander McLennan	Berneraveg	Ditto	2	1	1 1 2	34 6 8
29. Farquhar McLennan	Ditto	Ditto	2	1	1 1 1	34 6 8
30. Angus McNicholl .	Ditto	Ditto	2	1	1 1 1	34 6 8
31. John McAulay .	Kirkabost	Ditto	3	2	1	178 3 4
32. Angus McAulay .	Linsader	Ditto	2	2	2	104 15 4
33. John Mackenzie .	Callarnish	Ditto	2	2	1	48
34. Aulay McAulay .	Breskell	Ditto	3	2	2	61 16
35. Widdow McEiver .	Tolisk	Carlava	3	..	1	85
36. Donald McEiver .	Kerevig	Ditto	1	1	1	41 4
37. Mr. Kennith McEiver	Upper Carlava	Ditto	3	1	..	242 13 4
38. Kennith Mackenzie .	Delinore	Ditto	2	1	1	54 10 8
39. William Mackenzie .	Delbeg	Ditto	1	10	2	27 5 4

Listing of the small tenants (1726)- note the use of Gaelic surnames in each case.

Tenants' Names.	Habitations.	Parishes.	Muttons.	Butter.	Meal.	Scots Mony.
				st. lb. oz.	B. F. P. L.	£ s. d
40. Peter McCoile .	Shabost	Cladach	½	10	1 2 1 2¼	9 7 4
41. John McHepharick .	Ditto	Ditto	½	10	1 2 1 2¼	9 7 4
42. John McInish Ean Vane . . .	Ditto	Ditto	¼	5	3 3	4 13 8
43. Murdo McHormoid .	Ditto	Ditto	⅜	7 8	1 3 ½	7 6
44. Peter McCoil VicInis .	Ditto	Ditto	5/16	6 4	1	5 17 6
45. Murdo McVurchie Vic-Neil . . .	Ditto	Ditto	5/16	6 4	1	5 17 6
46. John McVurchie Vic-Ean . . .	Ditto	Ditto	⅜	7 8	1 3 ½	7 6
47. Duncan McInis Vic-Ean VicUrchy .	Ditto	Ditto	⅛	2 8	1 2 1½	2 6 10
48. Christian Inis Doil VicHormoid . .	Ditto	Ditto	¼	5	3 3	4 13 8
49. Norman Baine .	Ditto	Ditto	⅜	7 8	1 3 ½	7 6
50. Rosie McGillichallum	Ditto	Ditto	¼	5	3 3	4 13 8
51. John McUrchie Ken Roy . . .	Ditto	Ditto	¼	5	3 3	4 13 8
52. Normand MacEan Vane . . .	Ditto	Ditto	¼	5	3 3	4 13 8
53. John McOil Vane .	Ditto	Ditto	¼	5	3 3	4 13 8
54. Malcolm McCoil Ken Roy . . .	Ditto	Ditto	¼	5	3 3	4 13 8
55. Duncan McIliphadrick	Ditto	Ditto	⅜	7 8	1 0 3 ½	7 6
56. Kennith Gow . .	Ditto	Ditto	⅛	2 8	1 2 1½	2 6 10
57. Murdo McFinlay .	Ditto	Ditto	⅜	7 8	1 3 ½	7 6
58. John McFinlay Roy .	Ditto	Ditto	¼	5	3 0 3	4 13 8
59. Malcolm McFinlay Roy	Ditto	Ditto	¼	5	3 3	4 13 8
60. Katherine Inis Vic-Ean . . .	Ditto	Ditto	⅛	2 8	1 2 1½	2 6 10
61. John McOil VicIlle Challum . .	Ditto	Ditto	⅛	2 8	1 2 1½	2 6 10
62. Malcolm McEan Kinley	Ditto	Ditto	3/16	3 12	2 1 2	3 10 4
63. Donald McHuiston .	Ditto	Ditto	3/16	3 12	2 1 2	3 10 4
64. Murdo McCoil . .	Ditto	Ditto	¼	5	3 3	4 13 8
65. John McWilliam .	Ditto	Ditto	⅜	7 8	1 3 ½	7 6
66. Murdo McGilchrist .	Ditto	Ditto	5/16	6 4	1	5 17 6
67. Malcolm McAulay .	Ditto	Ditto	⅜	7 8	1 3 ½	7 0 6
68. Donald McOil VicIlle-challum a Inis .	Ditto	Ditto	3/16	3 12	2 1 2	3 10 4
69. Patrick McFinlay .	Ditto	Ditto	5/16	6 4	1	5 17 6
70. DuncanMcFinlayVane	Ditto	Ditto	⅜	7 8	1 3 ½	7 6
71. Neal McEan . .	Ditto	Ditto	⅜	7 8	1 3 ½	7 6
72. Murdo McIllephadrick	Ditto	Ditto	..	6 4	1	5 17 6
73. John Bane McCoil .	Ditto	Ditto	¼	5 0	3 3	4 13 8
74. Murdo McInis Cunchie	Ditto	Ditto	¼	5	3 3	4 13 8
75. Finlay McUrchy Neal	Ditto	Ditto	5/16	3 12	2 1 2	3 10 4
76. Donald McGillichal-lum Ken Inis .	Ditto	Ditto	¼	5	3 3	4 13 8
77. Gill Mitchell . .	Ditto	Ditto	¼	5	3 3	4 13 8
78. John McIllichallum Cunchy . .	Ditto	Ditto	¼	5	3 3	4 13 8
79. Hustoin McEan .	Ditto	Ditto	¼	5	3 3	4 13 8
80. Donald McIllichallum Cunchy . .	Ditto	Ditto	¼	5	3 3	4 13 8
81. Murdo McIllichallum						