An Introduction

Your DNA

and Your Family Tree

(Technical Basics)

Presentation by:

FredCoffey@aol.com

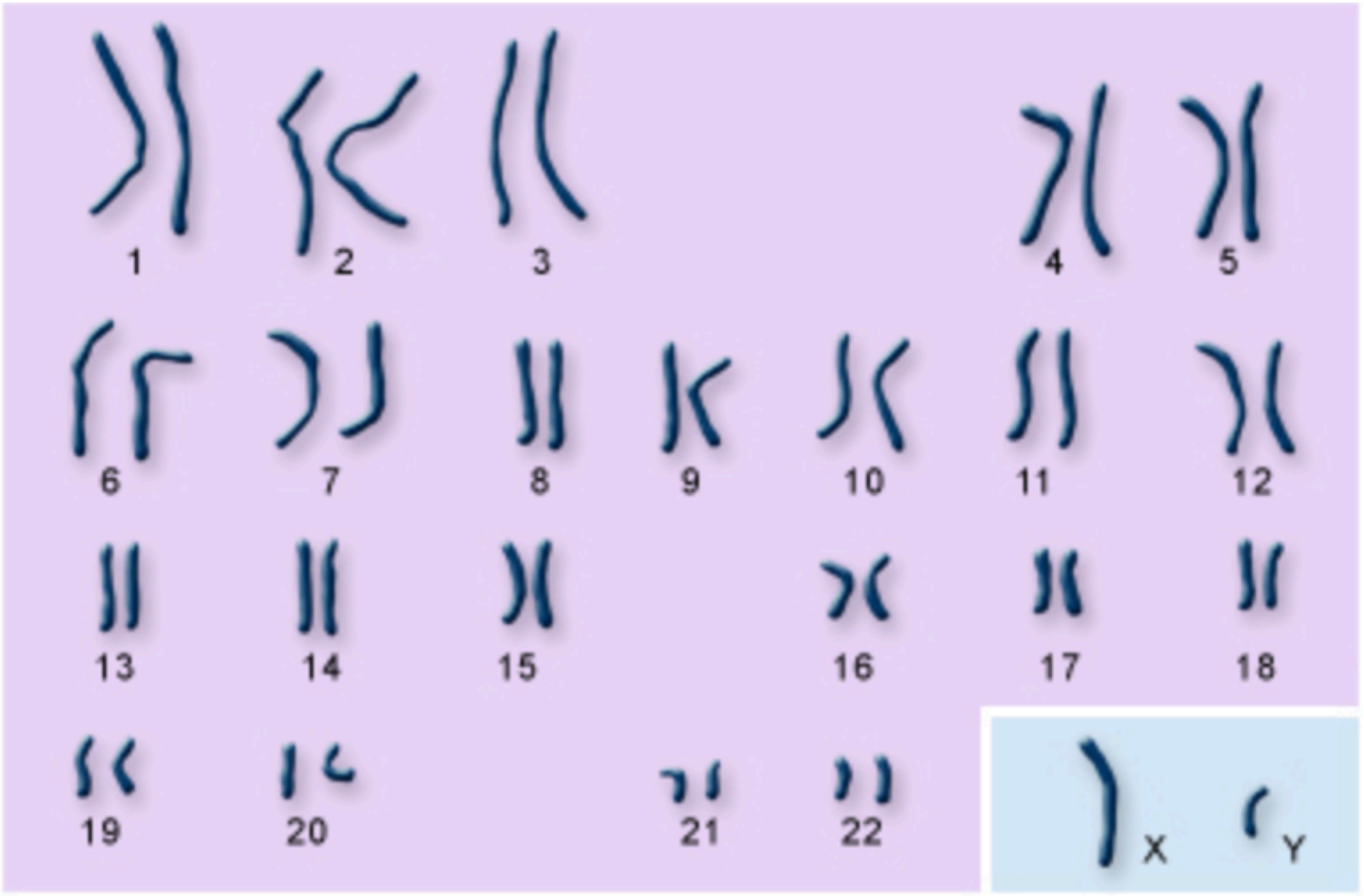
Your DNA - and Your Family Tree

Hello everybody, my name is Fred Coffey. And I'm here to tell you about the family clues and secrets that may be buried in your DNA.

And no, I can't actually claim the family crest shown. I'm not sure it's real, and even if it is, I doubt its connection to my family line. But it's pretty. And since I am mostly going to use EXAMPLES to explain what can be learned from DNA. You can guess whose family tree I'm going to use! You will shortly know more about Coffey family secrets that most people with that name know!

So, whenever you hear me say "Coffey", recognize I'm just offering examples of what might be hidden in YOUR DNA.

A Basic Biology Lesson: Human Chromosomes



A Basic Biology Lesson: Human Chromosomes

Humans have 46 chromosomes, which are organized into 23 pairs. These contain your DNA, which contains all the basic instructions for building and maintaining a human being. And every cell in your body contains a copy of the complete set. And that complete set is called a "genome".

For each pair, you got one chromosome from your father, and the other from your mother. The first 22 pairs are called "autosomes".

For each autosome pair, the one you got from your father was actually a re-combination of the pair he got from HIS parents. Ditto from your mother. So your DNA is MIXTURE of the DNA from your four grandparents. And so on back.

So, each autosome is a complicated mixture of DNA from all your ancestors. The history of your family is there, but it's terribly mixed up! But we can read something of the last few chapters, and we'll talk about that more when we get to the Autosomal testing subject.

But on the bottom right are two chromosomes, called the sex chromosomes. If you have two "X" chromosomes you are female, if you have an "X" and a "Y" you are male.

And that tiny "Y" is found only in males, and is handed down from father to son like the family surname. It never gets mixed with another chromosome, and it only rarely suffers changes. It will be about the same in your father, your grandfather, your GGF, and so on back. It's a very slowly changing story, and we can use it to follow our ancestors back a few hundred years.

A Basic Biology Lesson: The DNA Strand

A Basic Biology Lesson: The DNA Strand

I'll ramble on:

So, what does a strand of chromosome look like, if you look really closely? It's a twisted "double helix". The blue and orange ribbons here represent the backbone of each helix.

And the two sides are connected with pairs of four molecules, with complicated chemical names. But this schematic refers to them by the first letter of their name; A, T, C, or G. And these connectors, or base pairs, are fussy: An "A" will only connect to a "T", and a "C" will only connect to a "G". So if you look at a section, if you know one side is "A", then you automatically know the other is "T".

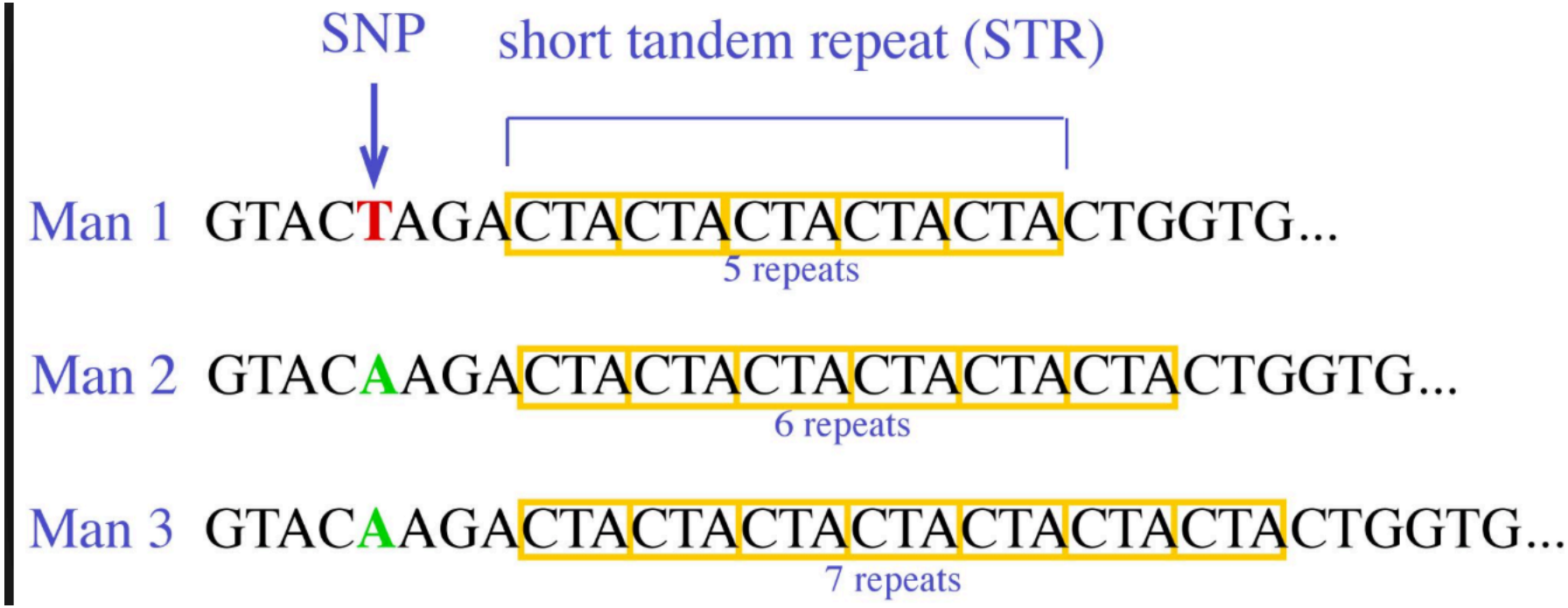
So in the above, if you look at the middle twist, you see the left side is "blue", then "yellow", then "red", and then "Green". Those colors correspond to C and A and G and T. So as shorthand we would say that tiny segment of DNA is coded "CAGT".

You have 46 chromosomes - the complete set is called a "genome". And if you want to describe to someone your genome, then all you have to do is get a "full genome" test, and write it down as a sequence of the letters A, T, C and G.

But you're going to need a LOT of paper. Your full genome has 3 BILLION base pairs. You can actually now get that test. But if you break out your old mechanical typewriter for the reporting task, you will generate a stack of paper approximately 200 feet tall!

But don't get all hyped up about your 3-billion-size genome. The SALAMANDER genome size is 765 billion! Size isn't everything.

A Basic Biology Lesson: Looking at the Y-chromosome



A Basic Biology Lesson: Looking at the Y-chromosome

So, what can this sequence of A, T, C and G tell us about family? Let's think about that little tiny y-chromosome, the one that's handed down from father to son, with rare changes. Here's a tiny segment of the y-DNA code, for three hypothetical men:

All currently living men ultimately descend from a single common y-DNA profile, way back in human history. But over many, many, thousands of years there have been slow changes, and now our three men are different.

Look at the 5th position. The first man has a "T", the other two have an "A". Perhaps the original male had an "A", but at time way back there was a rare mutation that produced a "T". From there on, EVERY descendant of THAT person would also have a "T", and that "T" would identify EVERY descendant of that person. A single location like that is called a "Single-nucleotide polymorphism" or "S N P". It's easier to say "snip". And "snips" can preserve and show differences back many thousands of years.

And also notice that each man also has a stretch where a short segment repeats. Man #1 has CTA-CTA-CTA-CTA-CTA, or "5 repeats". Man #2 has 6 repeats at the same location, and Man 3 has 7 repeats. They're called "Short Tandem Repeats", or STR's. THESE locations change much more frequently, and in a moment we'll see how these can help us look back maybe a dozen generations or so.

EXAMPLE: Y-DNA Test Result

"EDWARD COFFEY" GROUP
(12-MARKER TEST)

Locus	DYS#	# of STR's
1	393	13
2	390	24
3	19/394	14
4	391	11
5	385a	11
6	385b	14
7	426	12
8	388	12
9	439	12
10	389-1	12
11	392	13
12	389-2	28

Haplogroup is "R1b"

- Think of "Locus" and "DYS#" as just labels.
- For each location, the test reports the number of those STR's, or "short tandem repeats".
- There is an estimated "1 in 500" chance the number of repeats at a given location will lengthen or shorten with the next generation.
- "Haplogroup R1b" says these Coffey's are European.

EXAMPLE: Y-DNA Test Result

So, suppose soneone gets a y-DNA test. What will he get back? Let me get technical for another minute:

The most fun will be in **comparing** your data to others, but let's start with what the actual test results look like. This is actually MY OWN profile, for 12 markers:

The first two columns are really just labels, in two different formats. I'll be calling them "Locus" or "Marker". But the "DYS#" is actually the more universal label.

I just told you about these STR's - they repeat, sort of like "stuttering". My first one shows 13 repeats, and the second 24. Those repeats are sometimes considered "junk DNA", because as far as anyone knows they do nothing useful! But us genealogists love them.

These may change very gradually over time, with each new generation being exposed to a small probability that there will be a change (a mutation) in one or two markers. And this is VERY useful for my purposes, because over dozens of generations my Coffey ancestors have evolved a unique pattern of these STR's, different from that of unrelated families. And thus I can easily spot a "Coffey Cousin"!

So far more than half a million men have done y-DNA tests, involving more than 300,000 unique surnames. Computers can compare each tested individual with every other, and can provide a report on all the tested people that match close enough to be my cousins.

The search will also report a "Haplogroup" for the matches. That shows that the result pattern indicates membership in a larger group, whose ancestral connections go back thousands of years. I am in Group R1b. In Part 2 I'll show you the haplogroup migration.

Meaning of Test Differences

Relatedness	12 Marker	25 Marker	37 Marker	67 Marker
Closely Related (Likely very closely related)	-	0-1	0-2	0-3
Possibly Related (need other proof, such as surname)	-	2-3	3-5	4-6
Doubtful Relationship (Unlikely the person is related)	-	4	6	7
Not Related (Precludes Close Relationship)	3 or more	5 or more	7 or more	8 or more

Meaning of Test Differences

Now, before going on, let's talk about how many DIFFERENCES between yourself and another person might be significant, regarding existence or absence of a family relationship:

This table is a rough guide - let me just pick one column for comment - look at the "37-marker" column:

If you have a 37-marker match with another person, and there are not more than two differences, then you are almost certainly related. If there are 3 to 5 differences, you may be related, but we would look for other evidence such as the same surname. If there are 6 differences, then a relationship is doubtful - even if you do have the same surname. And at 7 or more differences, a relationship is quite unlikely.

Actual Data (Part of Edward Group)

COFFEY DNA DATA

DYS # =	DYS393	DYS390	DYS19	DYS391	DYS385	DYS426	DYS388	DYS439	DYS389i	DYS392	DYS389ii	DYS458	DYS459	DYS455	DYS454	DYS447	DYS437	DYS448	DYS449	DYS464	DYS460	Y-GATA-H4	YCAII	DYS456	DYS607	DYS576	DYS570	CDY	DYS442	DYS438
TYPICAL MUTATION RATE (FAST or SLOW) =	1	2	3	4	5-6	7	8	9	10	11	12	13	14-15	16	17	18	19	20	21	22-23-24-25	26	27	28-29	30	31	32	33	34-35	36	37
COLOR = SHOW DIFFERENT VS REFERENCE																														
Kit Number	Name	Haplogroup			FF Test																									
EDWARD GROUP - FROM SON JOHN:		REFERENCE	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	12	12
14986	Luther Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	12	12
14985	Paul Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28																			
283839	Terry Glen Coffia	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	12	12
15366	Richard C Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	13	13	29	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	12	12
143510	Herman Coffey Jr.	R-BY3272	13	24	14	11	11-14	12	12	12	13	13	29	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	12	12
283837	Clarence Gene Coffee	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28																			
133703	David Randall Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	15	18	16	36-40	12	12
136162	Kenneth Cyrus Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	27	14-15-15-17	11	11	19-23	16	16	18	16	36-40	12	12
15194	Edwin Russell Coffee	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	12	12
26238	Lawrence Ronald Coffee	R-BY3272	13	24	14	11	11-14	12	12	13	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	13	12
55864	Max Terry Coffey	R-BY3272	13	24	14	11	11-14	12	12	13	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	12	12
271262	Brent Dustin Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-39	12	12
N118999	Stephen K Coffey-Schmidt	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-39	12	12
EDWARD GROUP - FROM SON EDWARD JR.																														
15020	Leo Frederick Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-39	12	12
229516	Roger Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	15	16	18	16	37-39	12	12
209475	**Billy Coffey***	**R-BY3272***	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11		15	19		14-15-15-17	11	11		15	16	18	16	37-39	11	12
96328	Meldon Robert Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	17	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	12	12
77768	Charles Kevin Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	17	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-40	12	12
182437	Christopher Clarke Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	19	16	37-40	12	12
30581	Ernest Coffey	R-BY3272	13	24	14	11	11-14	12	12	11	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-39	12	12
25548	George Leighton Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	20	29	14-15-15-17	11	11	19-23	16	16	19	16	37-40	12	12
92670	Virgil Glenn Coffee	R-BY3272	13	24	14	12	11-14	12	12	12	12	13	28																			
131764	Raymond Watkins Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-17	11	11	19-23	16	16	18	16	37-41	12	12
541396	Thaddius Elmo Coffey Jr.	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	10	11	25	15	19	29	14-15-15-16	11	11	19-23	16	16	18	16	37-40	12	12
91652	Kenneth Wayne Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28																			
PETER GROUP (EDWARD GROUP SEPT)		(COMPARED TO EDWARD REFERENCE)																												
25480	Carol Coffee	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	11	11	25	15	19	29	14-15-15-17	11	11	19-23	17	16	18	16	37-40	12	12
134201	**Donald Michael Coffee**	**R-BY3272**	13	24	14	11	11-14	12	12	12	12	13	28	18	9-10	11	11	25	15	19	29	14-15-15-17	11	11	19-23	17	16	18	16	37-40	12	12
103723	Dillard Emmitt Coffey	R-BY3272	13	24	14	11	11-14	12	12	12	12	13	28																			

Actual Data (Edward Group)

STOP - don't strain your eyes trying to read this. I just want to talk about the PATTERN:

We have a lot of different Coffey groups in America, but by far the largest group, and my own family, is one that descends from an "Edward Coffey" who was in America before 1699. Edward got here very early, and his descendants were very prolific. There are now thousands of us in America, and a lot have shown up for DNA testing!

The first 37 "STR" markers are listed across the top of this page, and down the left is a list of some of the Edward men. (There are many more, this is all that fit on one page!)

The point I want to make is shown by the PINK marks across the page. These are markers that the various people have that are DIFFERENT from the Coffey norm. It looks like a huge number of differences, but it is absolutely normal. Every one of these people is absolutely solidly related to the original Edward.

The differences can be useful. An example is the bottom 3 rows, who are descendants of "Peter", who arrived in America quite separately. The similarities absolutely prove that Edward and Peter were related. But the two colored marks seem to be unique to ALL of Peter's descendants, and I can now most likely spot a "Peter Descendant" at a glance!

So, we 've talked about how y-DNA can follow you male line, and begin to explore your male origins back several thousand years. In Part 2 we will look at what y-DNA testing has told us about the Coffey families.