

## What's wrong scientifically with "meet the Izzards"?

These are some notes by David Balding on the scientific inaccuracies and misleading aspects of the "Meet the Izzards" programs on BBC TV February 20 and 21, 2013

(<http://www.bbc.co.uk/programmes/b01qxqgn>). Eddie Izzard is entertaining, which is essentially the programmes' only saving grace.

It starts with "Eddie Izzard ... is about to embark on a remarkable journey using his own DNA as the road map. Locked within each of us is a genetic history book that reveals not only our deep ancestry, but also the migration of mankind across the globe." This isn't true, it is the sales patter of some parts of the genetic ancestry industry. The programme only deals with paternal or maternal lineage markers, just a tiny fraction of the genome, and it was misleading about the limited information about an individual's ancestors that can be inferred from these markers. In reality, we can estimate (roughly) the time since two individuals had a common ancestor on the male-only or female-only lineages, but we can make at best only an informed guess at where that ancestor might have lived and what migrations might have occurred before or since. The programme was misleading about the precision and detail possible, and gave little hint that these are just two out of a huge number of an individual's ancestral lineages.

We weren't told anything about what data this was all based on - presumably it is the BritainsDNA database, which I guess is small and not very representative (only those interested in paying to get their genomes tested by the company). We cannot verify the claims in the programme because the data are not public and the claims made have not been through the key scientific process of peer review – BritainsDNA seems to publish only via press releases and with limited details. The program also didn't mention that the world's Y chromosome tree has been completely redrawn in a paper Mendez et al The American Journal of Human Genetics 92, 1–6, March 7, 2013 (it was formally published after the program went out but was well known about before that).

Almost everything in the two programs can be criticised, either for being generic (common to us all, not just Eddie Izzard) or exaggerated/misleading, or wrong.

Nothing that was described in Africa could be specific to Eddie's lineage: it either holds or is wrong for all of us. There's no agreement that South West Africa is where our common ancestors came from, although it is a candidate, nor that the San/Bushmen are their closest modern counterparts. The Bushmen are likely to be about as far genetically from our ancient ancestors as we are. They are likely a remnant of what was a much more extensive population, so the most recent mother of us all could have been almost anywhere in Africa.

The "out of Africa" route to the South of the Red Sea over to Yemen, is one possibility, but to the North of the Red Sea is also highly plausible - we don't know. The southern route was just stated as fact in the program.

Everything said about the Middle East and Turkey also holds or fails for almost all of us. The movement of genes from the South-East to the rest of Europe because of the development of agriculture in Anatolia is part of the common heritage of all Europeans. Talking about Eddie Izzard being a Viking or an Anglo-Saxon is wrong on many levels: it undermines understanding about our past and it encourages crude ethnic stereotypes. The reality of our DNA is that we are all mixed up: pretty much all white British people have some common ancestry with Vikings, Saxons, Romans, Celts, Jews, Arabs and any other group you care to mention in or around Europe.

In fact, the argument that Eddie had any Viking maternal-line ancestors was weak: apparently he has some letters in his mtDNA<sup>1</sup> sequence that are now common in Scandinavia. But they will also be common in other places - and we don't know what their geographic distribution was 1,200 or so years ago; there has been plenty of movement of people around Europe since then.

When Eddie hugged two sisters from Northampton who were said to share his mtDNA from a common ancestor about 50 generations ago, he was disappointed to find no resemblance. Well, no Eddy, you wouldn't: of the 22 chromosomes that code for almost all your genetic characteristics, the amount you can expect to share with those two ladies from that common ancestor around 50 generations ago, is --- nothing at all. Each of us had so many different ancestors 50 generations ago (see below) that the amount of DNA we each inherited from any one of them is expected to be very small and is actually zero for most of them. What Eddie shares with the two sisters is a minuscule fragment of DNA involved in energy generation in their cells. No information was given in the program, but there are probably thousands and perhaps tens of thousands of other UK doors Eddie could have knocked on and hugged the resident with just as much justification (because an ancestor 50 generations ago who has any descendants alive today is expected to have many thousands of them). And since Eddie shares over 99.9% of his DNA with any other resident of Northampton – or anywhere else - sharing one extra letter in the mtDNA sequence doesn't amount to much.

Telling Eddie "you are 2.8% Neanderthal" is misleading - Eddie is not any Neanderthal. We don't know what test was done as BritainsDNA doesn't seem to offer Neanderthal tests. In any case, whether 2.8% genetic similarity with Neanderthal DNA is statistically different

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<sup>1</sup> mtDNA is a small fraction of your DNA that is inherited only from your mother. Unlike other DNA, it doesn't reside in the nucleus of the cell, and it exists in many copies: it is essential for energy generation in the cells.

from the average 2.6% - whether that difference means anything more than measurement error remains unclear; in practice the difference is meaningless – Eddie sensibly tried to ask what it meant and was ignored. It may as well be said that Neanderthals were 2.8% Eddie Izzard. If we compared all our DNA with Japanese or with Australian aborigines we'd all have some level of similarity and it would be a bit more for some and a bit less for others. It doesn't "mean" anything, we are not x% Japanese or y% Aboriginal, all humans are genetically very similar to each other. Also what x and y are depends on what comparisons are made.

Eddie was introduced to so many "genetic cousins" around the world that it devalues the term: he could sit down at a campfire with people in any part of the world with just about as much justification. The main reason is the (near) doubling of ancestors with every generation (two parents, four grandparents, eight great-grandparents etc). Eventually some of those have to be the same people so it doesn't keep doubling forever. But it means that just 200-300 years ago you probably had close to 1,000 ancestors, and around 500 years ago your number of ancestors is likely to be in the tens or hundreds of thousands. By the time we get back to William the Conqueror a white British person potentially has such a huge number of ancestors that they probably correspond to a large fraction if not all of the population of Europe at that time, and - given the prevalence of migration throughout human history – much of the rest of the world as well. So at the time of the Vikings, to talk of any one lineage as saying anything meaningful about a person's individual history or identity is absurd - any one lineage represents such a small fraction of their ancestry.

The program implicitly promoted the product of a DNA testing company and used many of its sales promotion phrases. It had little scientific validity and even though it dealt with controversial issues about human genetic history, the story we were told came from the chief scientist of BritainsDNA, who was therefore able to promote his company's interests without fear of challenge from an independent scientist. I don't know if the program makers sought any alternative expert advice other than from BritainsDNA, or if the BBC's own Science Unit was involved. Jim Wilson's affiliation was given as "University of Edinburgh", but what was presented does not correspond to University-level research but much more reflects his private business, which was not mentioned.