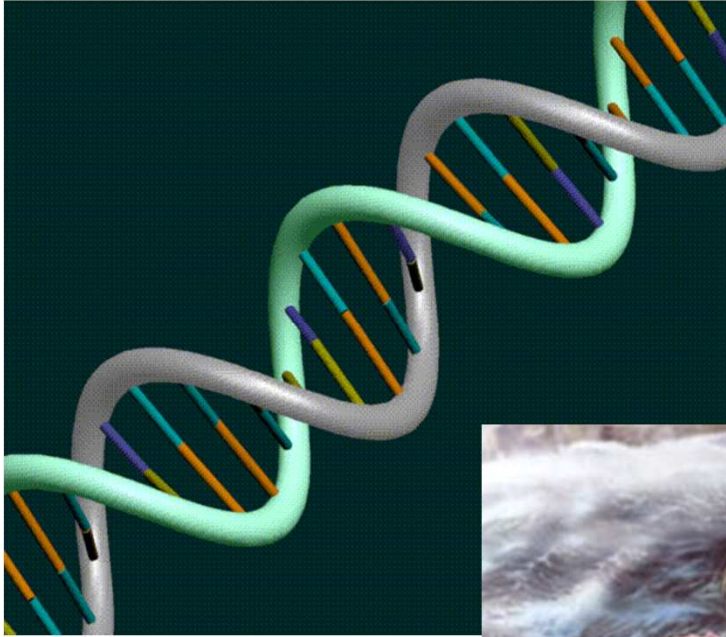


DNA & the Vikings



Steve Harding



Mark Jobling
Turi King



08/06/2010 21:59



Haugesund, Norway

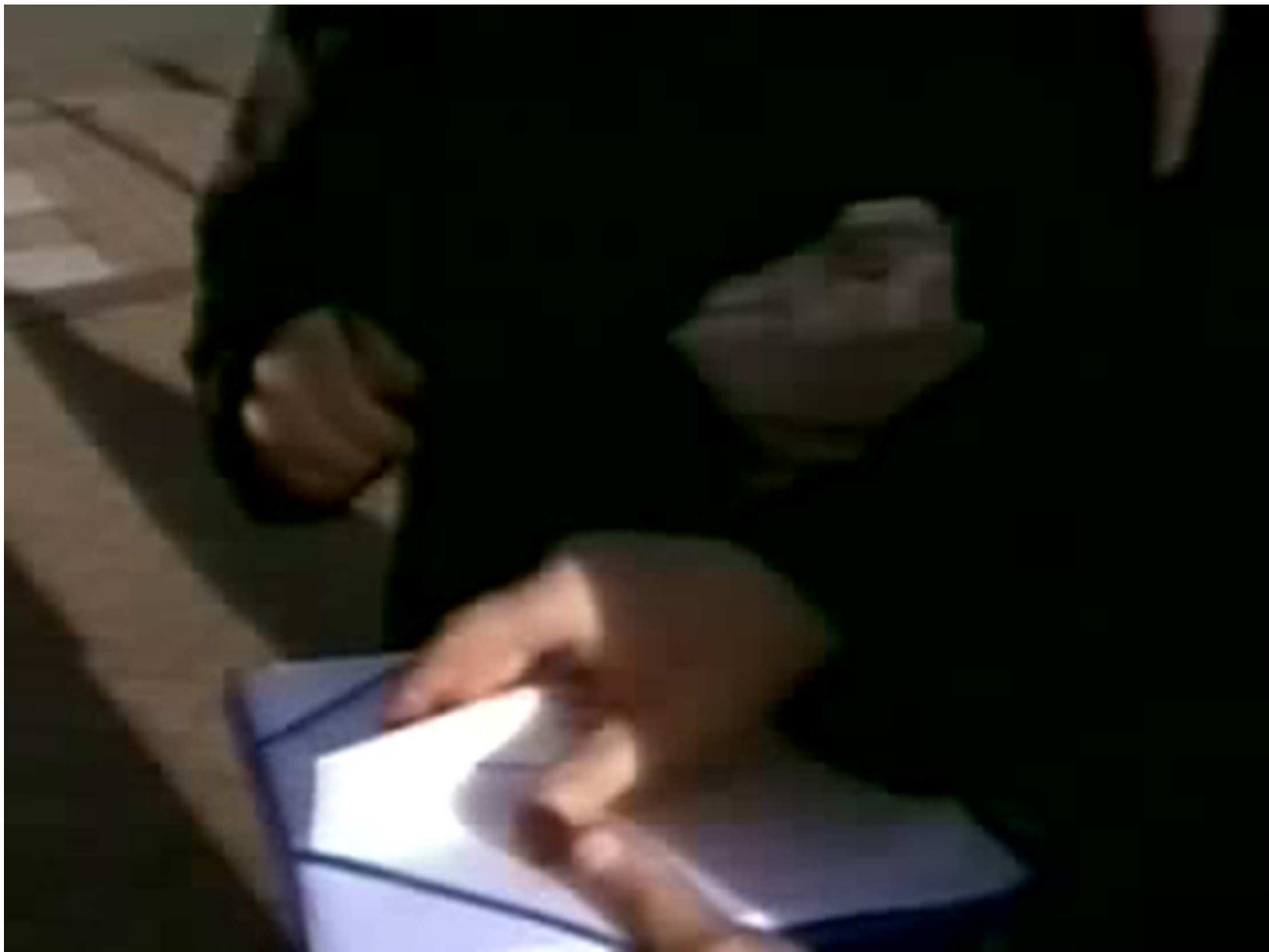
Mark Jobling

Turi King



08/06/2010 21:59





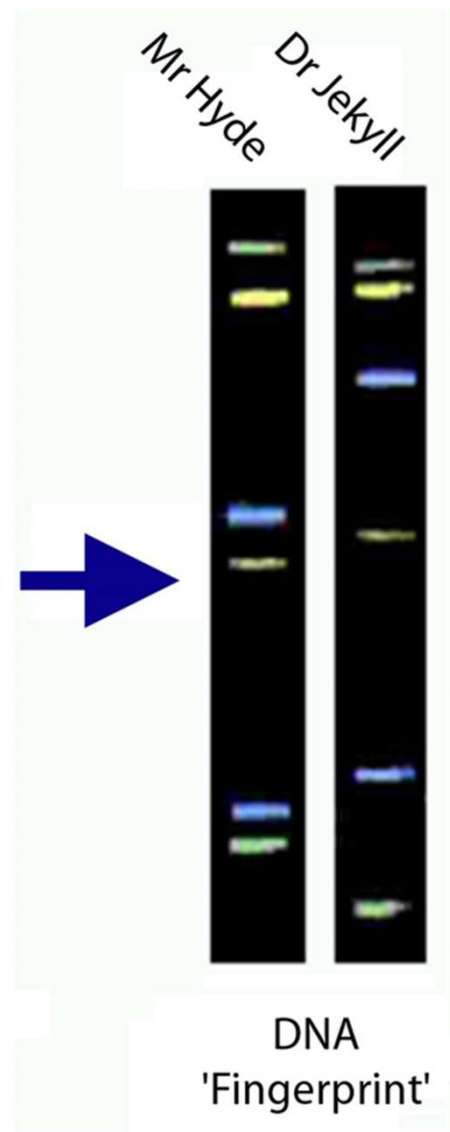
What happens to your sample?



What happens to your sample?



What happens to your sample?



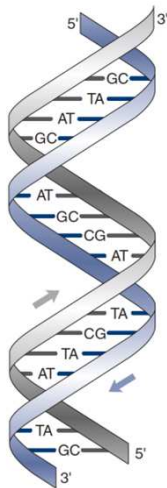
Scandinavian settlements in England & Wales

Grey shading means a high density of Scandinavian place-names



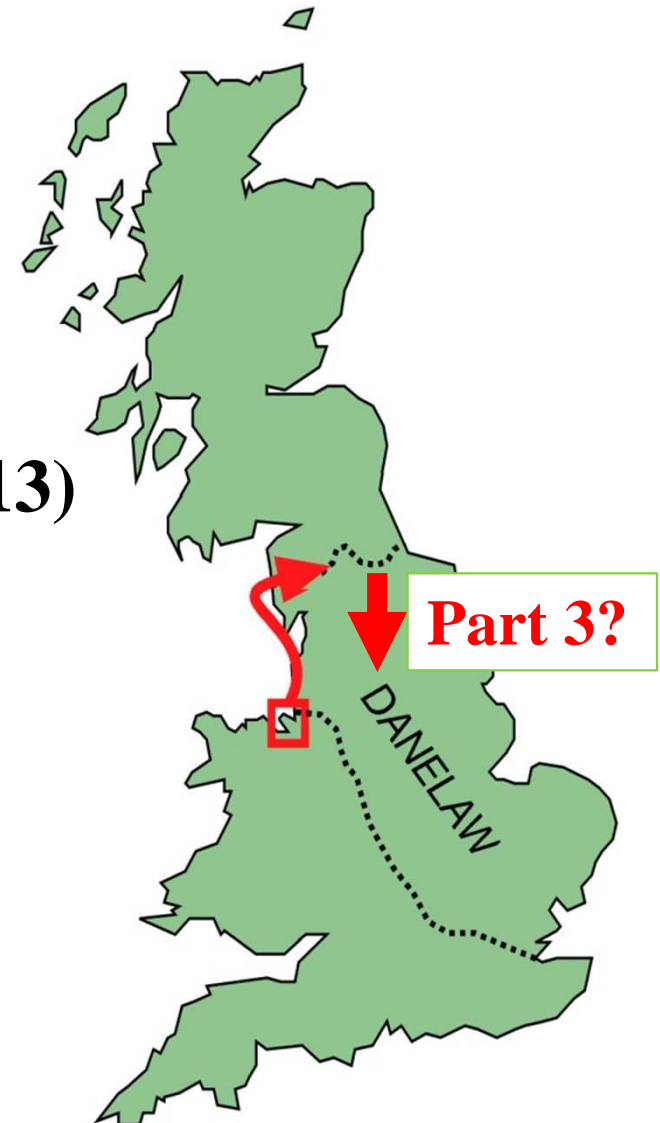
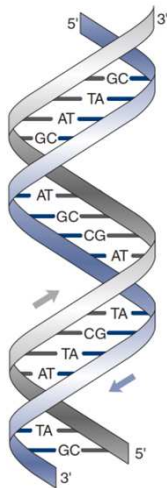
Viking genes in Northern England project

- ◆ **Part 1 - Wirral and West Lancashire (2002-2008)**
- ◆ **Part 2 - North Lancashire, Cumbria and N. Yorks (2009-2013)**

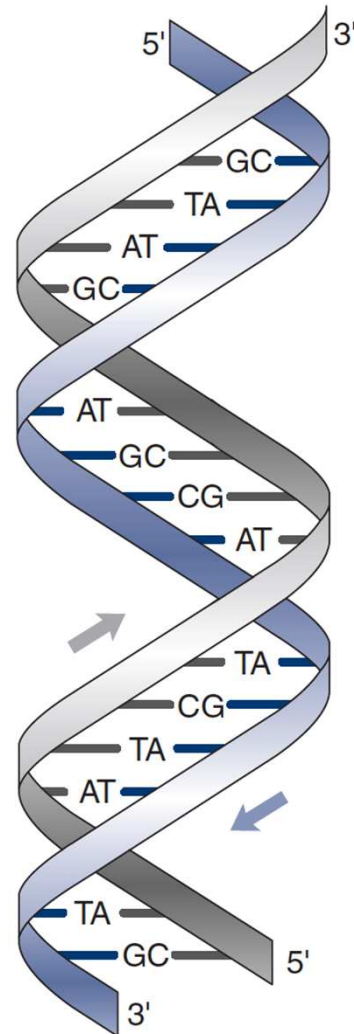


Viking genes in Northern England project

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DNA – Message from our Ancestors



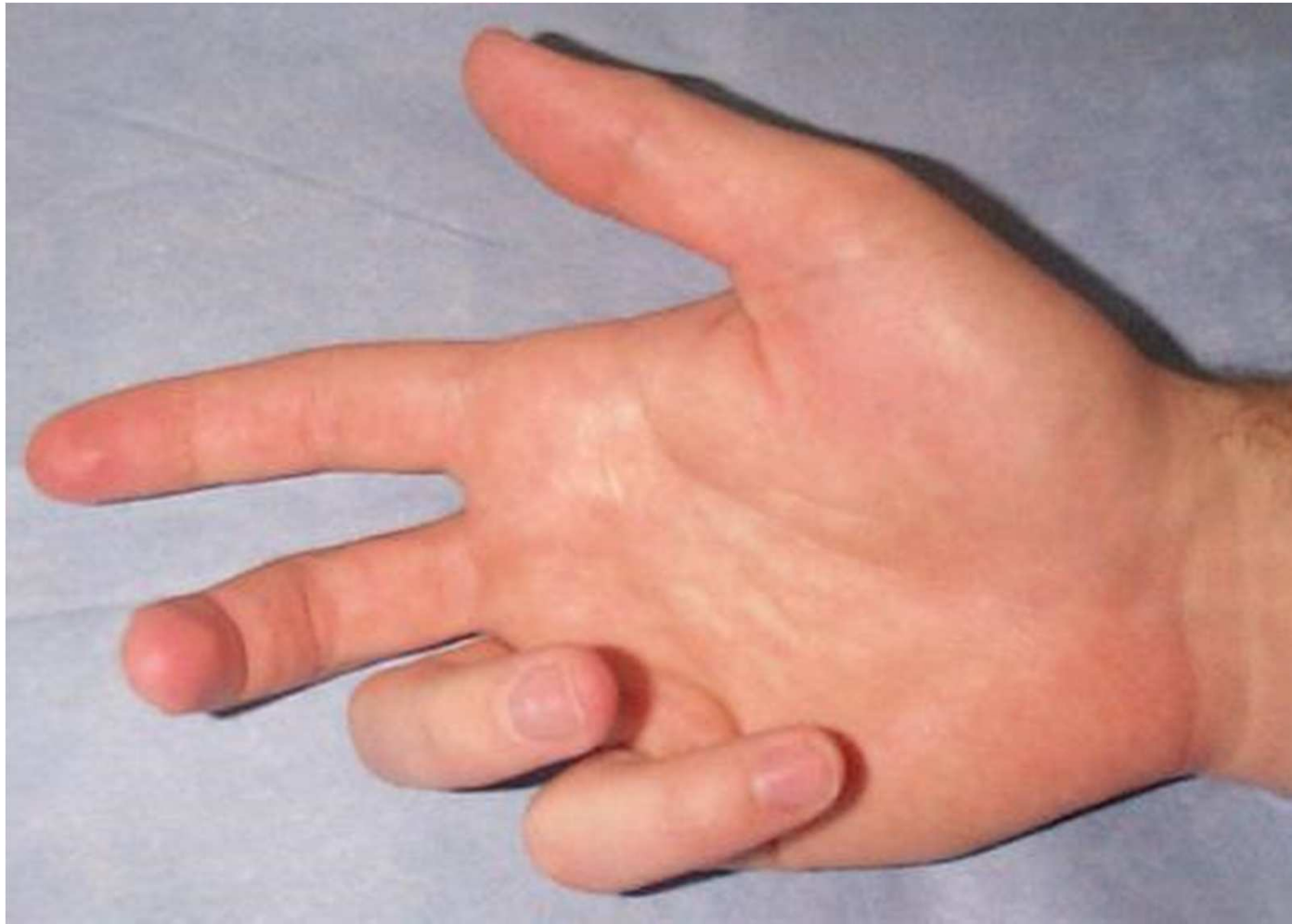
Genetics of Physical Characteristics



Genetics of Physical Characteristics



Dupuytren's contracture



**Or can we examine the DNA directly
on our chromosomes?**

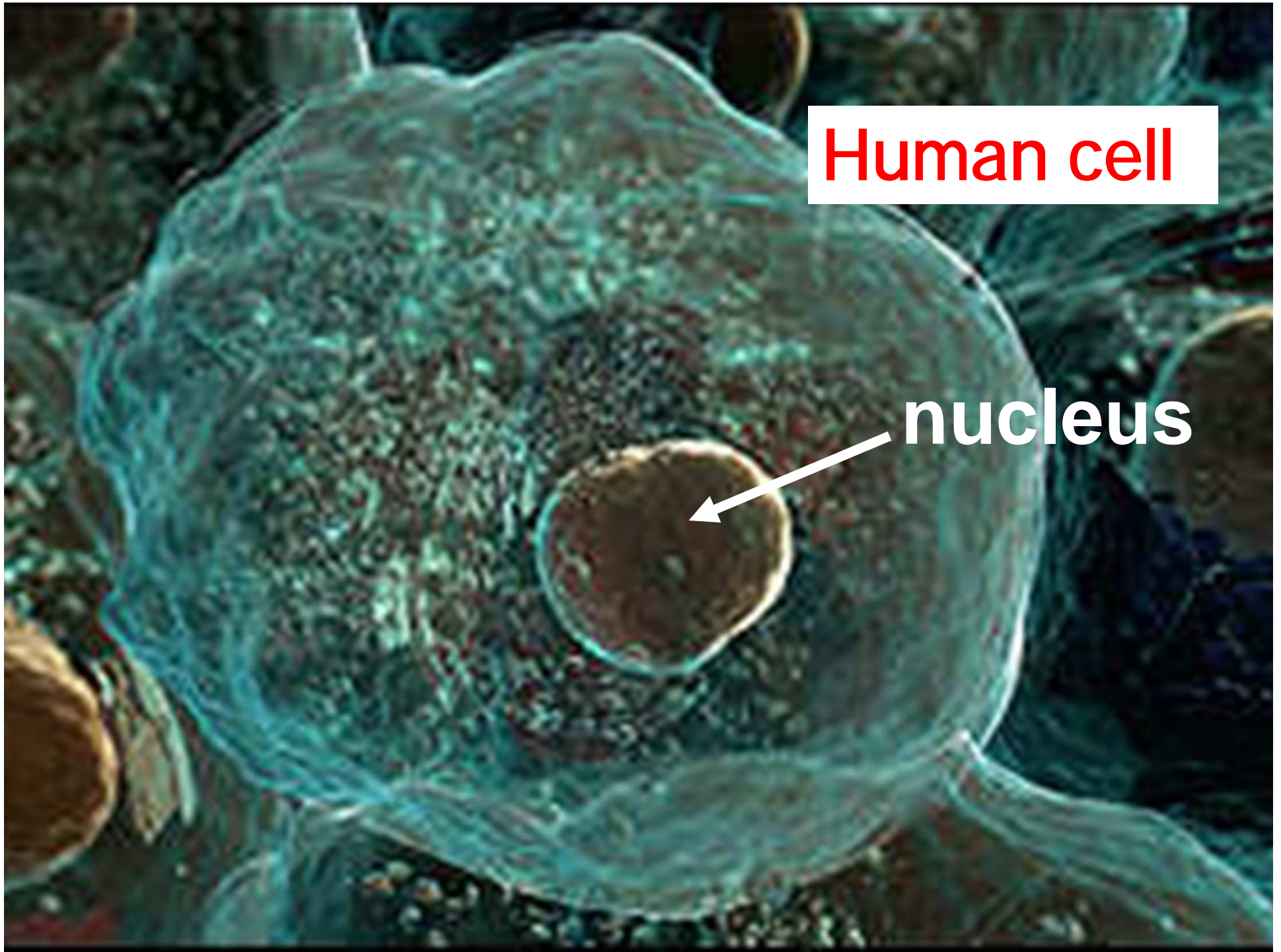


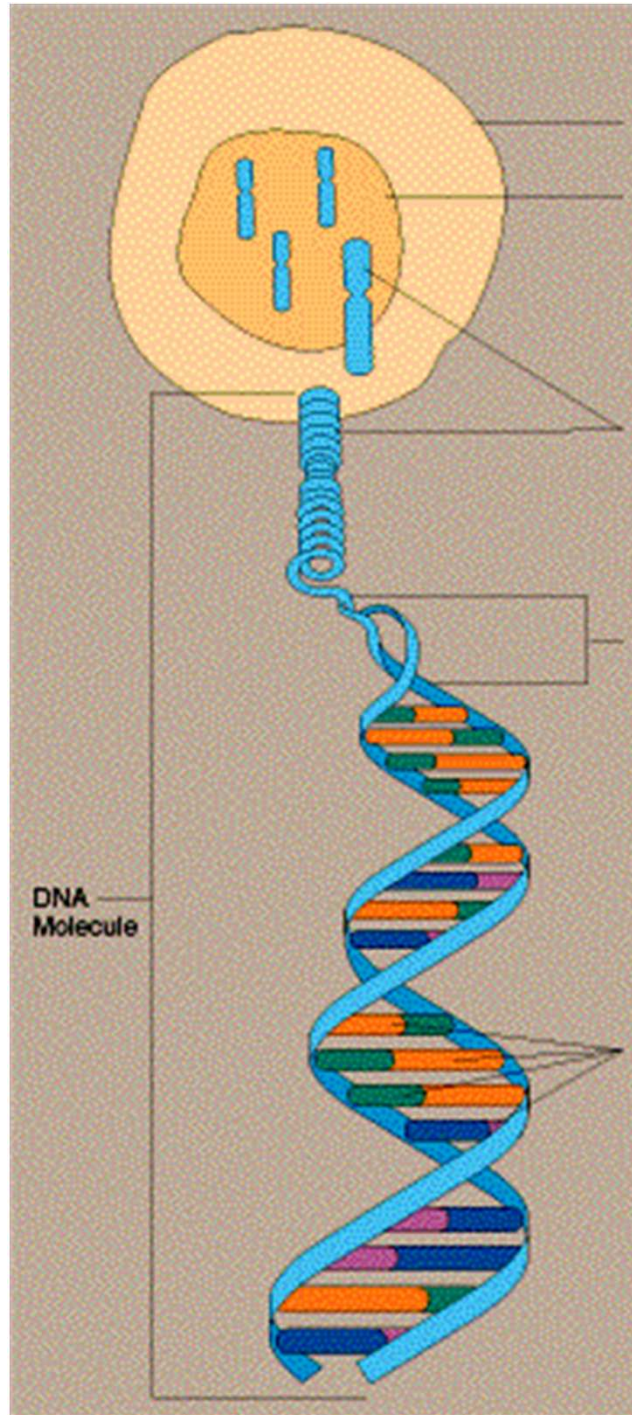
Or can we examine the DNA directly on our chromosomes?



Human cell

nucleus

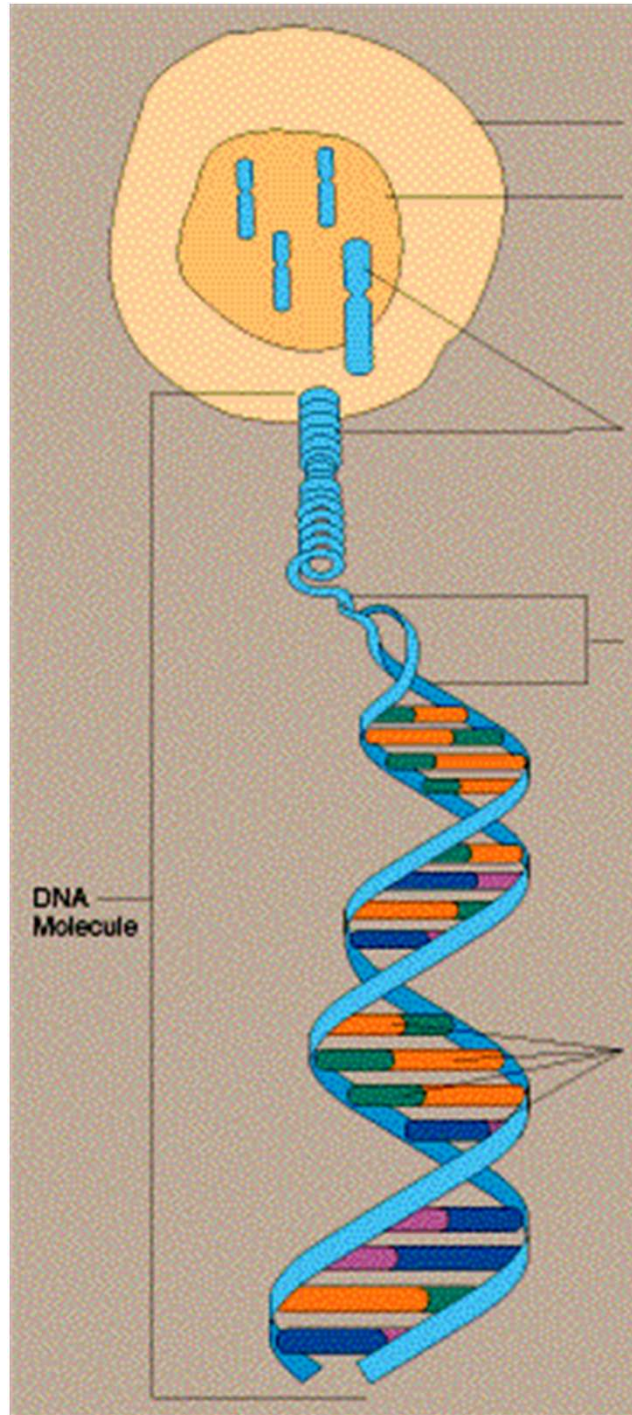




Cell
Nucleus

Chromosomes

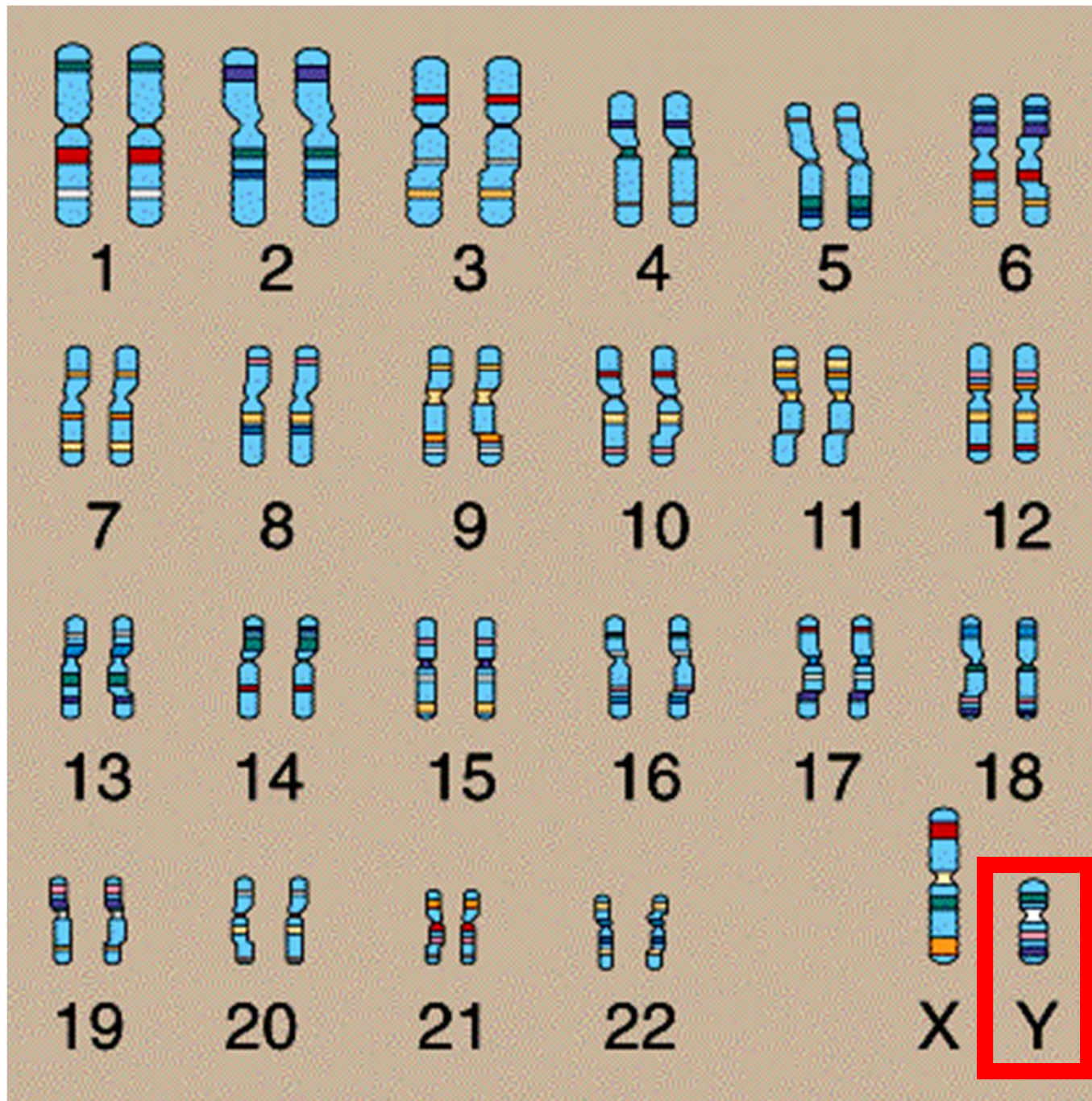
DNA



Cell
Nucleus

Chromosomes
(23 pairs in humans)

DNA

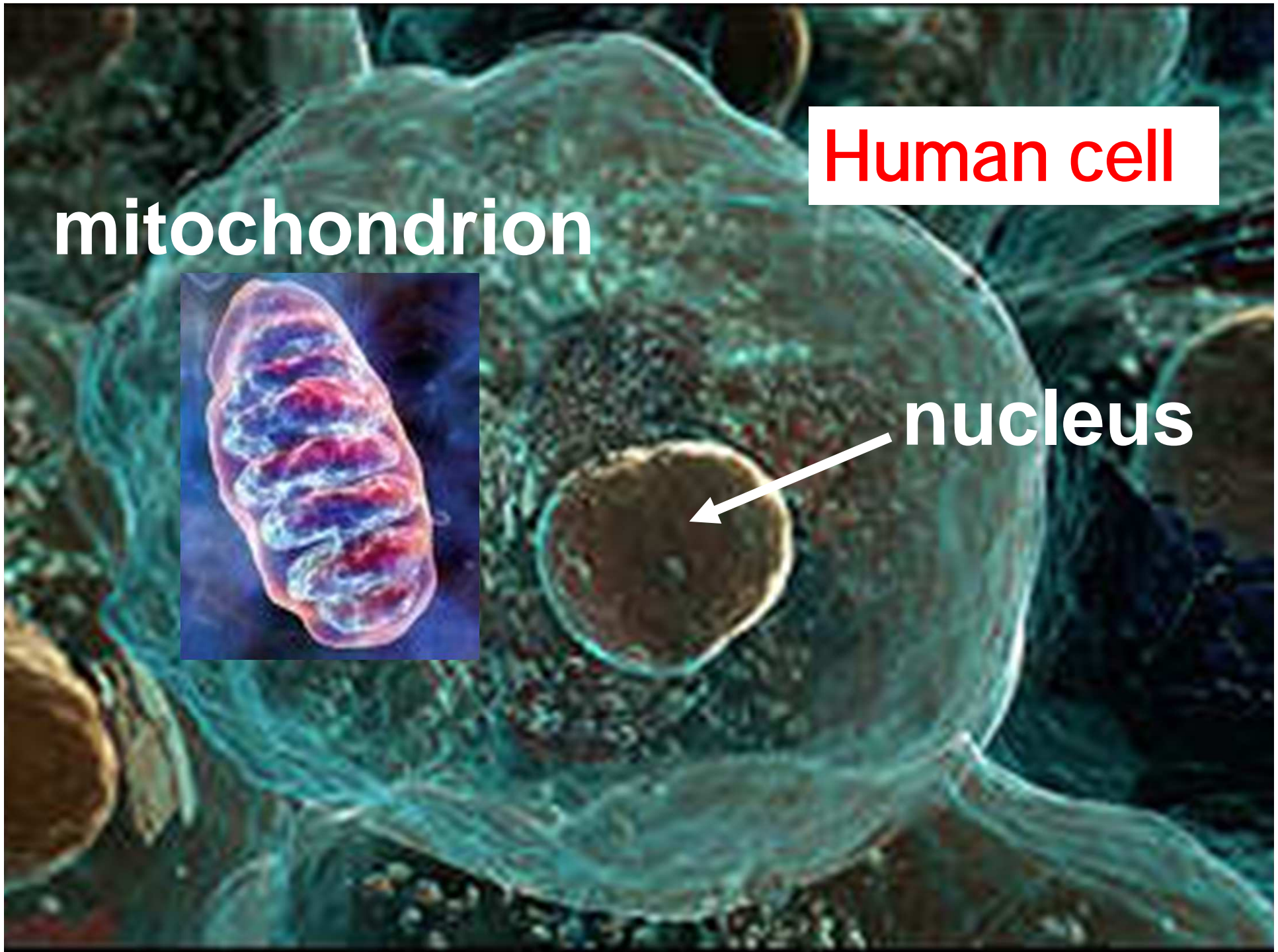


**Male Y-
chromosome**

Human cell

mitochondrion

nucleus



Human cell

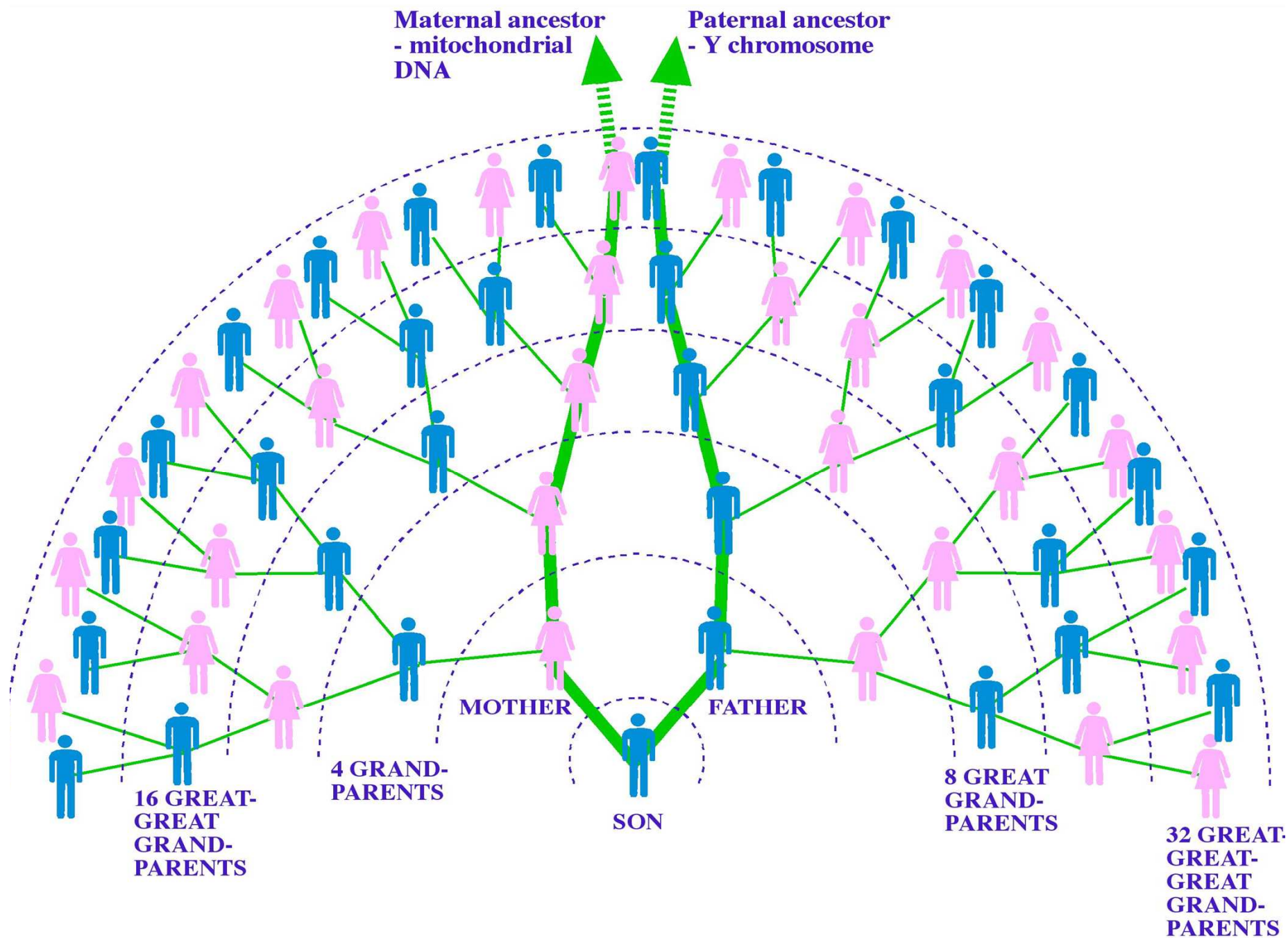
mitochondrion



nucleus



**Maternally
inherited DNA**



The Hardings







for men we look for 2 types of variations in Y-DNA



Male 1 GTAC**T**AGACTACTACTACTACTACTG...
5 repeats

Male 2 GTAC**A**AGACTACTACTACTACTACTACTG...
6 repeats

Male 3 GTAC**A**AGACTACTACTACTACTACTACTACTG...
7 repeats

for men we look for 2 types of variations in Y-DNA

HAPLOGROUP



HAPLOTYPE

Male 1 GTAC**T**AGACTACTACTACTACTACTGGTG...
5 repeats

Male 2 GTAC**A**AGACTACTACTACTACTACTACTGGTG...
6 repeats

Male 3 GTAC**A**AGACTACTACTACTACTACTACTACTGGTG...
7 repeats

Results from a man's Y-chromosome test

HAPLOGROUP

☐ A ☐ BC ☐ DE ☐ F* ☐ G ☐ H ☒ I ☐ J ☐ K* ☐ R1* ☐ R1a ☐ R1b

HAPLOTYPE

DYS436 12
DYS437 14
DYS438 10
DYS434 12
DYS435 11
DYS439 12

DYS391 10
DYS390 23
DYS393 13
DYS392 11
DYS388 15
DYS19 15

DYS389I 14
DYS389II 30
461 12
462 12
460 10

Haplotype (& haplogroup) database

YHRD.ORG 3.0

R43: 112005 haplotypes

Search Analyse Research Contribute Meet

WELCOME TO THE Y CHROMOSOME HAPLOTYPE REFERENCE DATABASE (YHRD)

The ability to identify male-specific DNA renders polymorphic Y-chromosomal sequences an invaluable addition to the standard panel of autosomal loci used in forensic genetics (REF Roewer 2009). Y-STR haplotyping is particularly important for sensitive typing of male DNA in mixed stains as well as for rapid assortment of biological crime scene evidence. Moreover, Y chromosomal profiling can trace back paternal lineages into the past and has thus been proven a useful tool in genealogical and kinship testing. The individuality of the male-specific part of the Y chromosome can be optimally explored by the Y-STR haplotype analysis using a set of highly variable short tandem repeat markers approved by the forensic and scientific community. An extremely informative Y-STR core set or minimal haplotype (minHt) amplifiable in a multiplex reaction has been recommended for court use : [DYS19](#), [DYS389I](#), [DYS389II](#), [DYS390](#), [DYS391](#), [DYS392](#), [DYS393](#), [DYS385ab](#) (REF Kayser et al. 1997 and REF Pascali et al. 1999). This core haplotype can be extended by other hypervariable Y-STR loci ([DYS438](#), [DYS439](#), [DYS437](#), [DYS448](#), [DYS456](#), [DYS458](#), [DYS635](#), [YGATAH4](#), [DYS481](#), [DYS533](#), [DYS549](#), [DYS570](#), [DYS576](#), [DYS643](#)) to further increase the power of discrimination (REF Ayub et al. 2000, REF Redd et al. 2002, REF Mulero et al. 2006 and REF Vermeulen et al. 2009). With the establishment of the Y chromosome haplotype reference database (YHRD) in the year 2000 two important objectives are pursued:

- I. the generation of reliable Y-STR haplotype frequency estimates for Y-STR haplotypes to be used in the quantitative assessment of matches in forensic and kinship casework ([Search Haplotypes](#))
- II. the assessment of male population stratification among world-wide populations as far as reflected by Y-STR haplotype frequency distributions ([Population Analysis](#))

To this end, a large and steadily growing number of diagnostic and research laboratories ([Search Contributors](#)) have joined in a collaborative effort to collect population data ([Search Contributions](#) by accession number) and to create a sufficiently large reference database. All institutions contributing in this project, participated in an obligate quality control exercise. This database is interactive and allows the user the search for Y-STR and Y-SNP typed haplotypes and haplogroups in various

advertisement

applied biosystems
investigating sexual assault cases
why use Y?

SEARCH YHRD

Enter terms Search

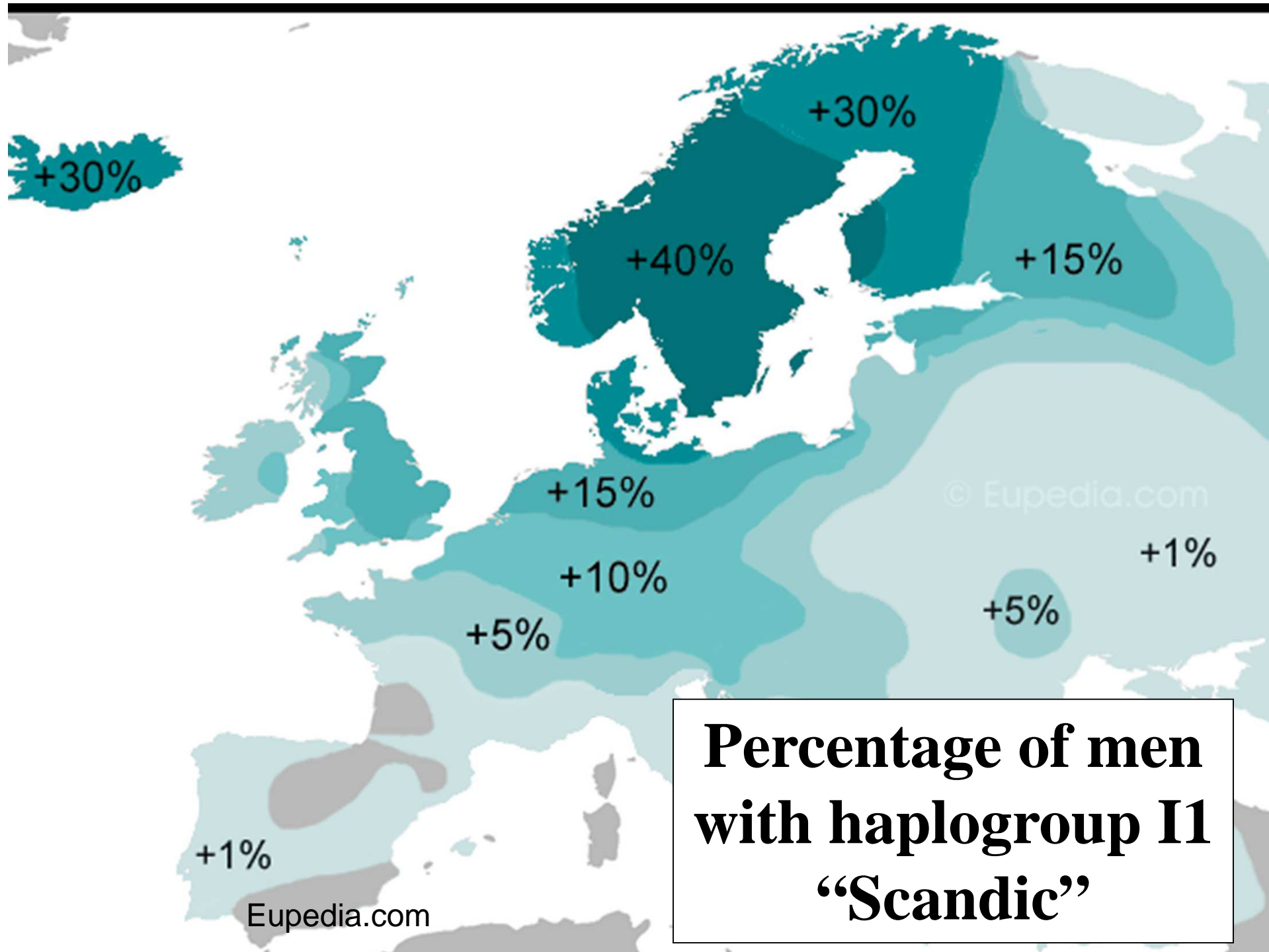
LATEST NEWS

Mutation rates updated
The mutation rates for all STR loci were updated, including fresh values for [DYS576](#), [DYS481](#), [DYS549](#), [DYS533](#), [DYS570](#) [...]
Posted 8 hours ago by Lutz Roewer

Release 43
We have updated the YHRD with 3,055 new haplotypes from 40 populations. The YHRD has now 112,005 haplotypes typed in 834 different [...]
Posted 2 months ago by Lutz Roewer

Release 42
We have updated the YHRD with 3,452 new haplotypes from 14 populations submitted by 16 research groups. The YHRD has now 108,949 [...]
Posted 4 months ago by Lutz Roewer

Release 41
We have updated the YHRD with 1,324 new haplotypes from 13 populations submitted by 7 research groups. The YHRD has now 105,498 haplotypes [...]
Posted 7 months ago by Lutz Roewer

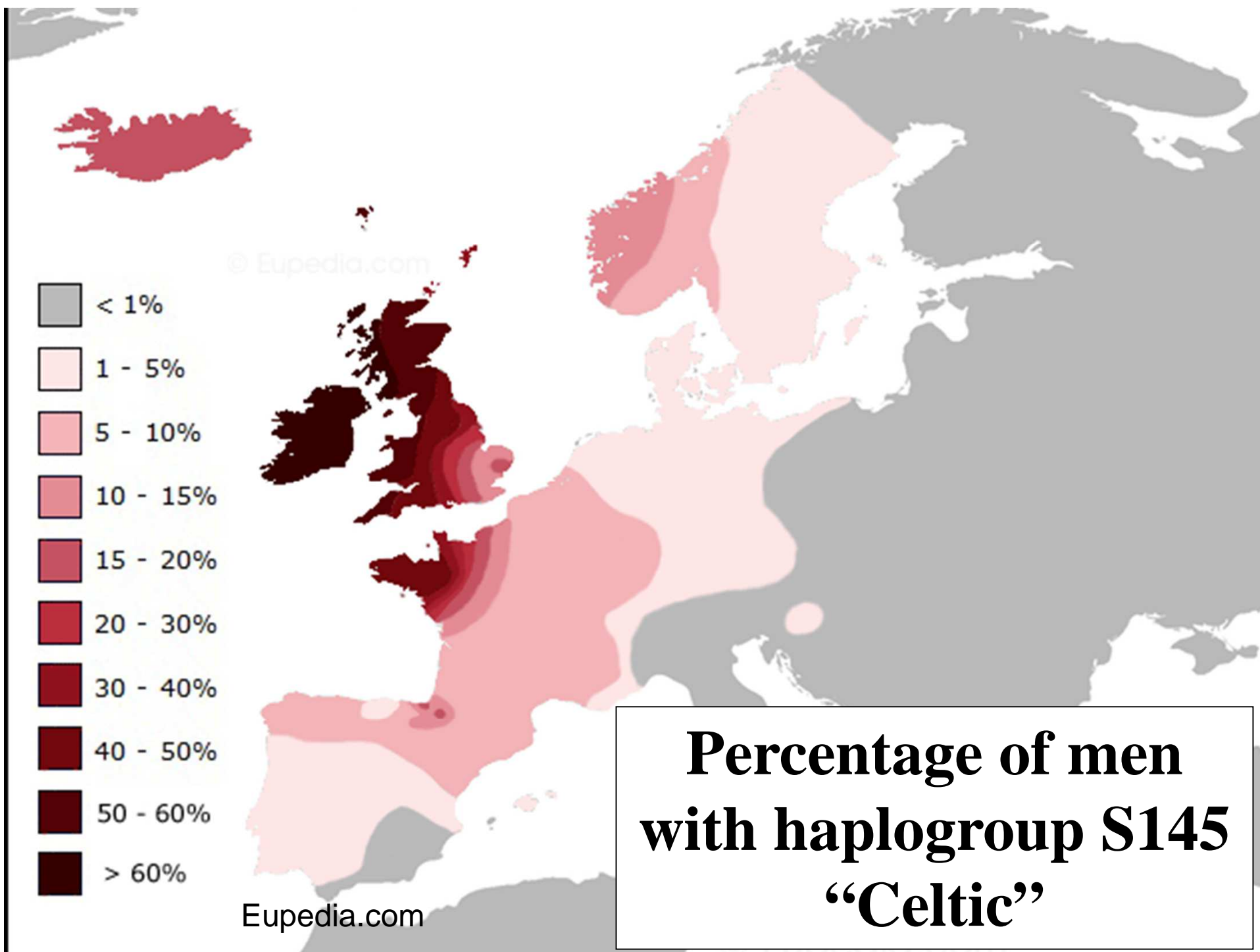


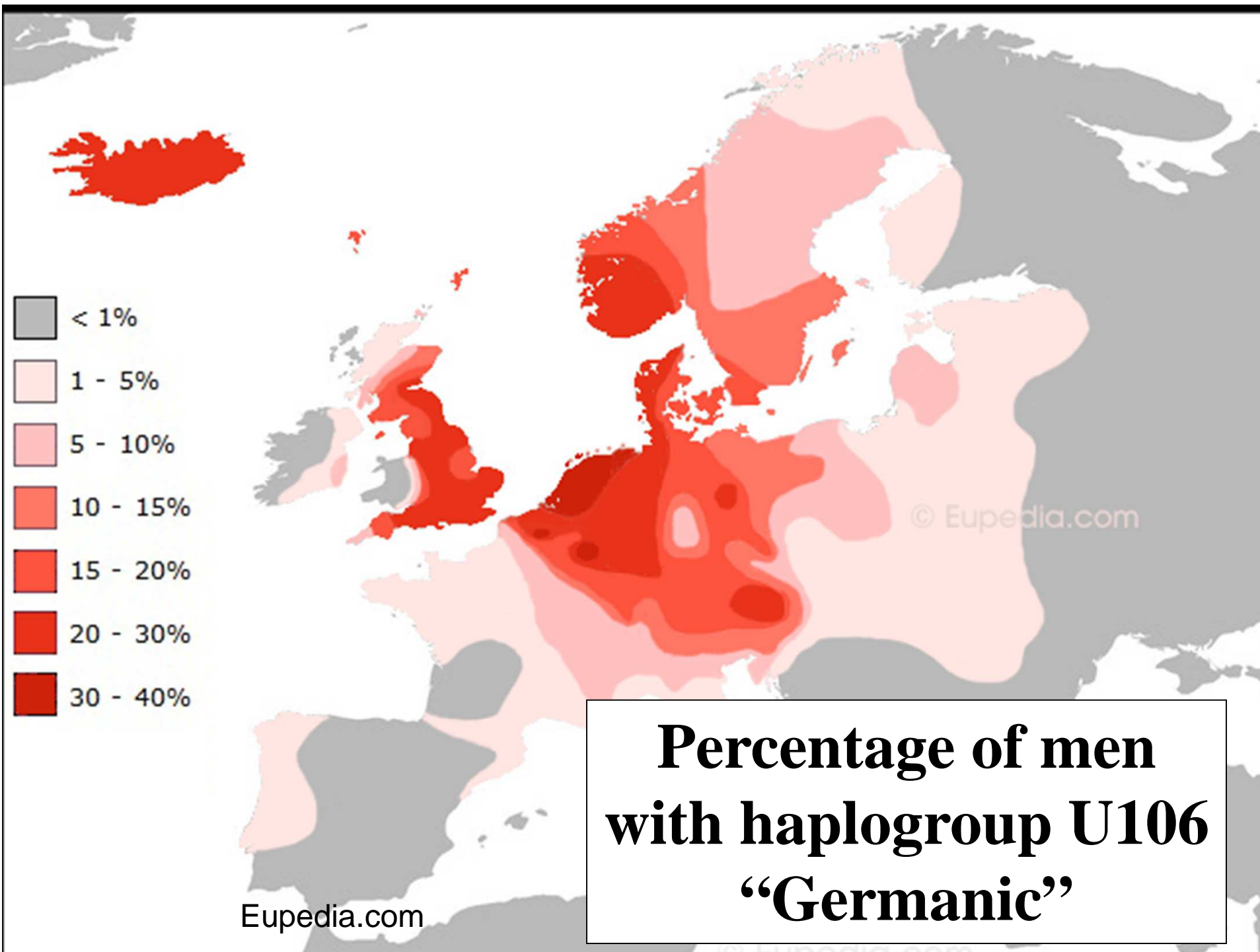
Percentage of men with haplogroup L11*



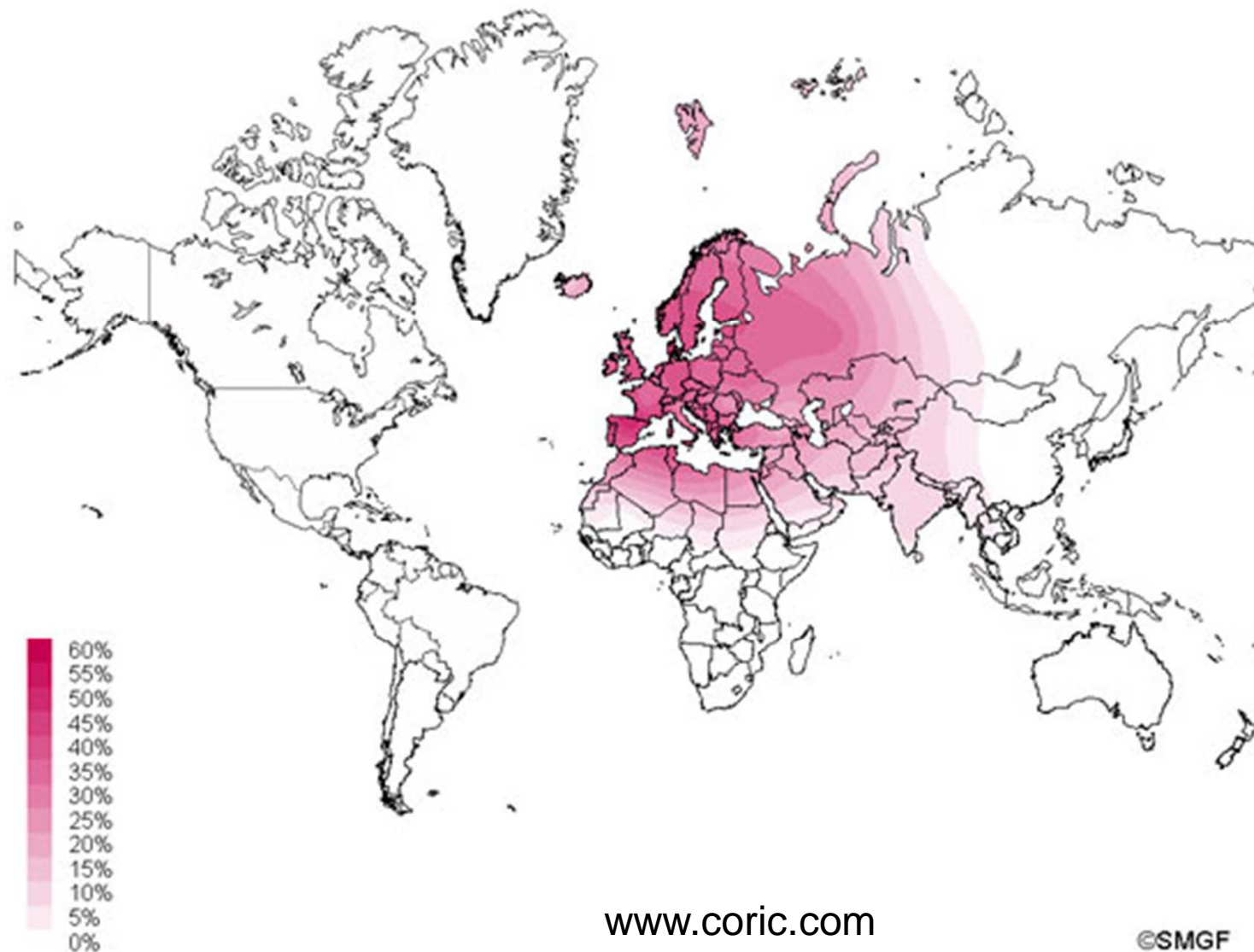
Myres et al, 2011

“Baltic”

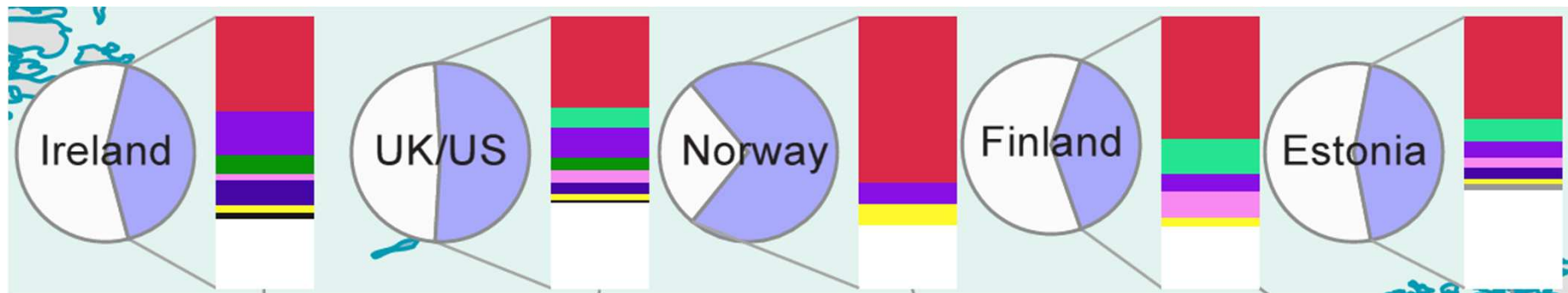




Percentage of people with Mitochondrial haplogroup H

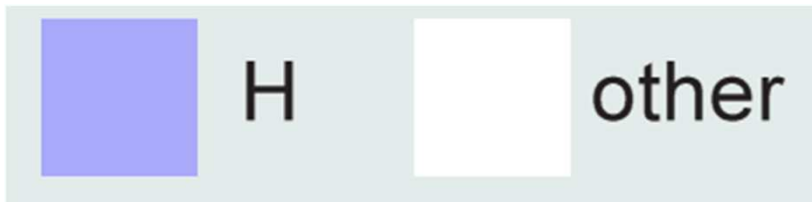
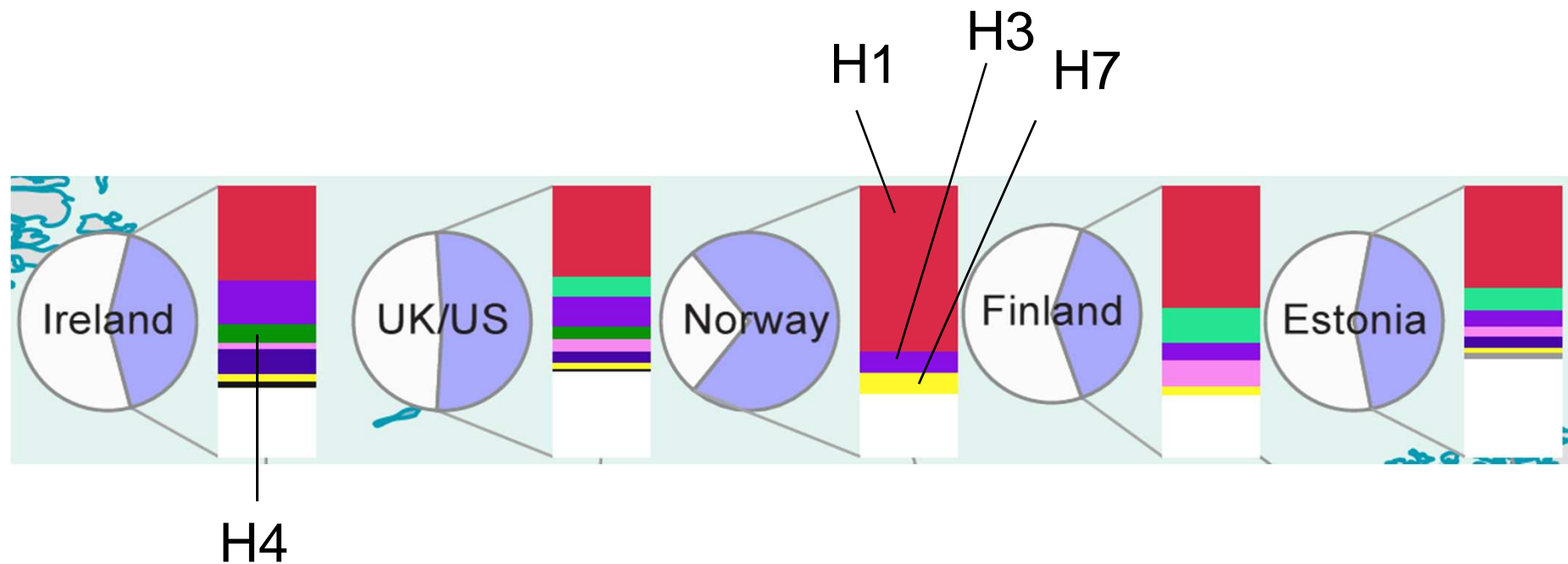


Percentage of people with maternal haplogroup H



www.genebase.com

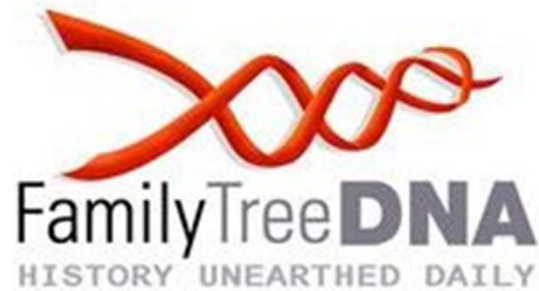
Percentage of people with maternal haplogroup H

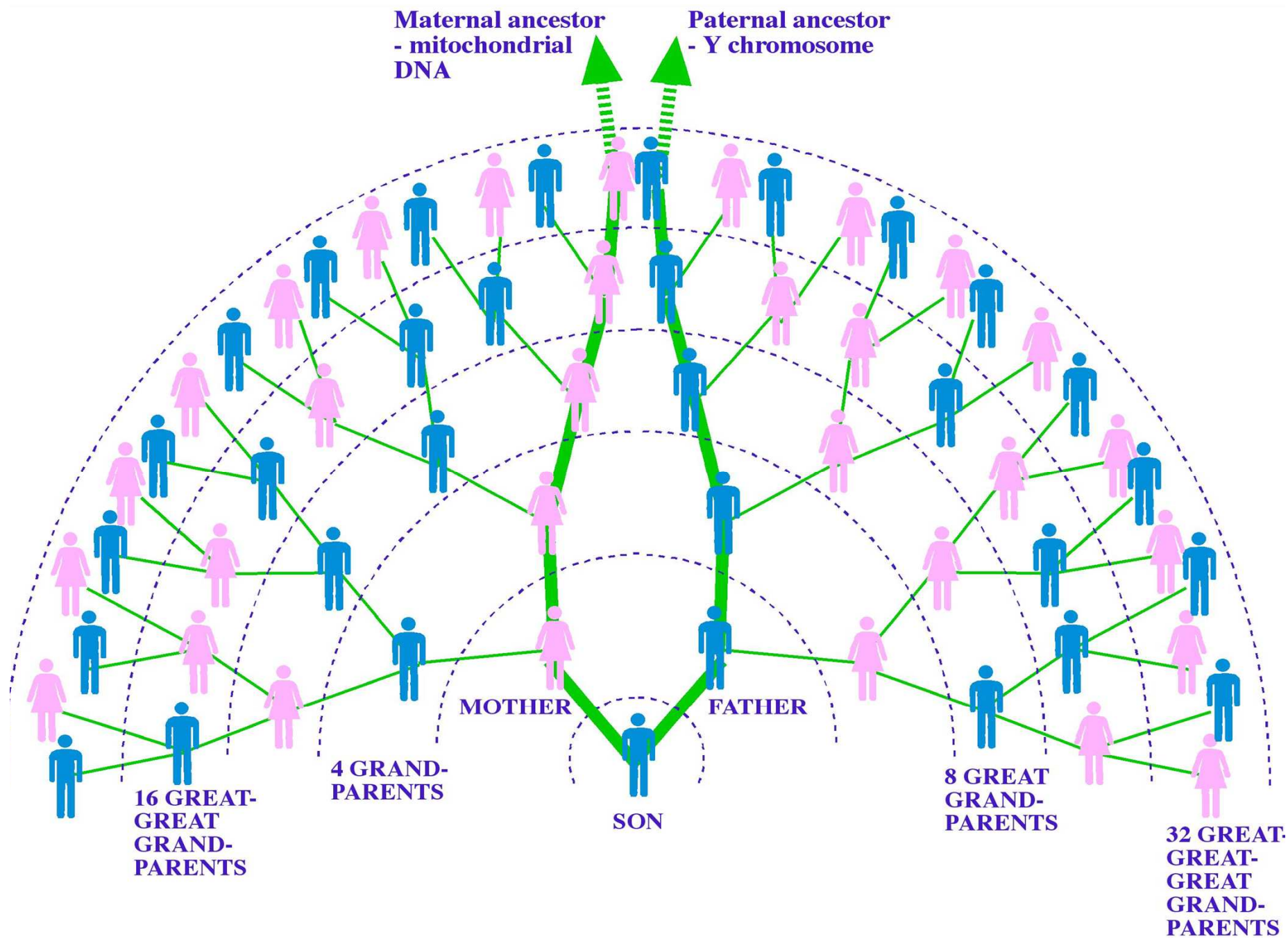


Viking ancestry?



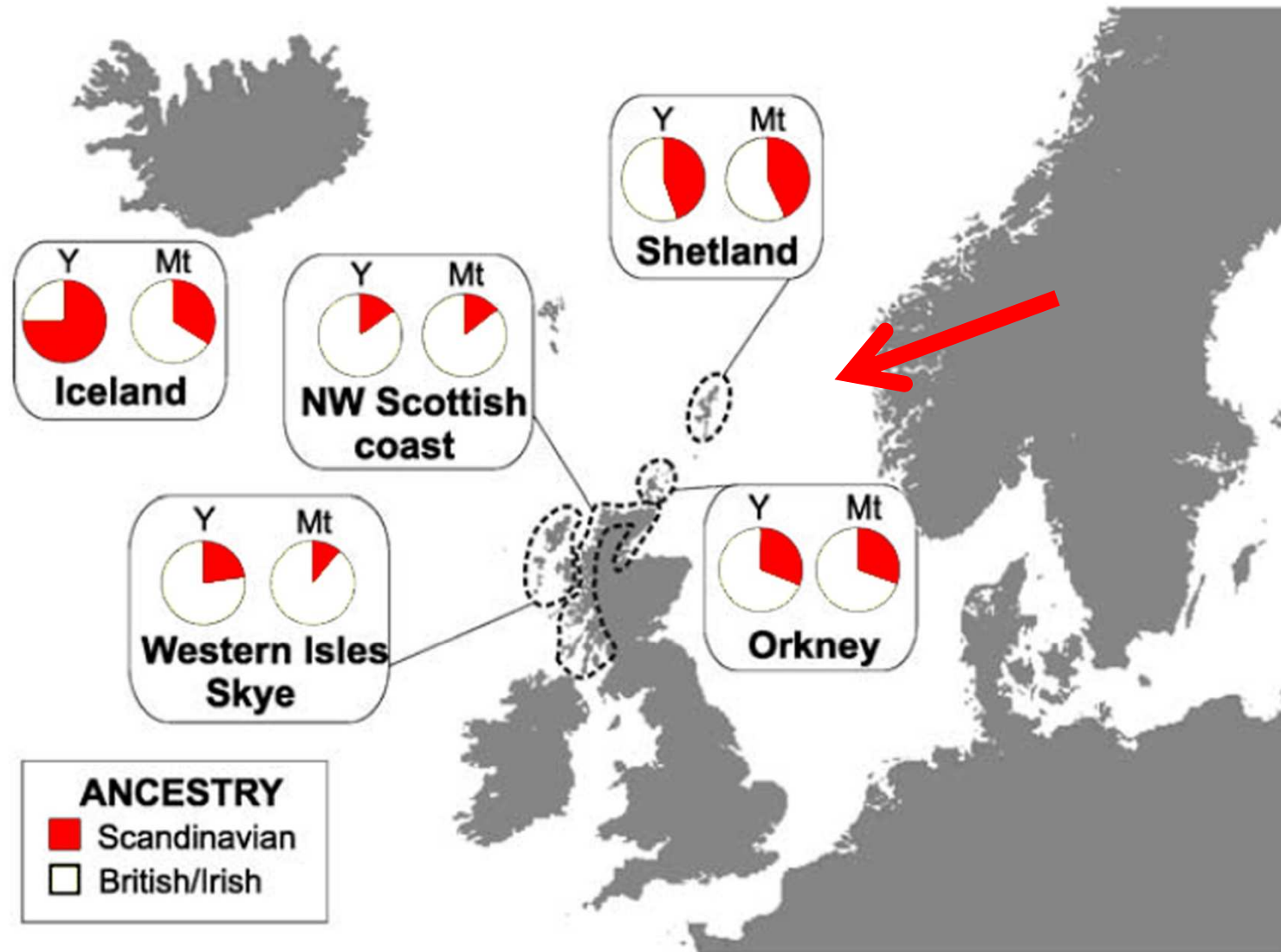
Commercial DNA testers



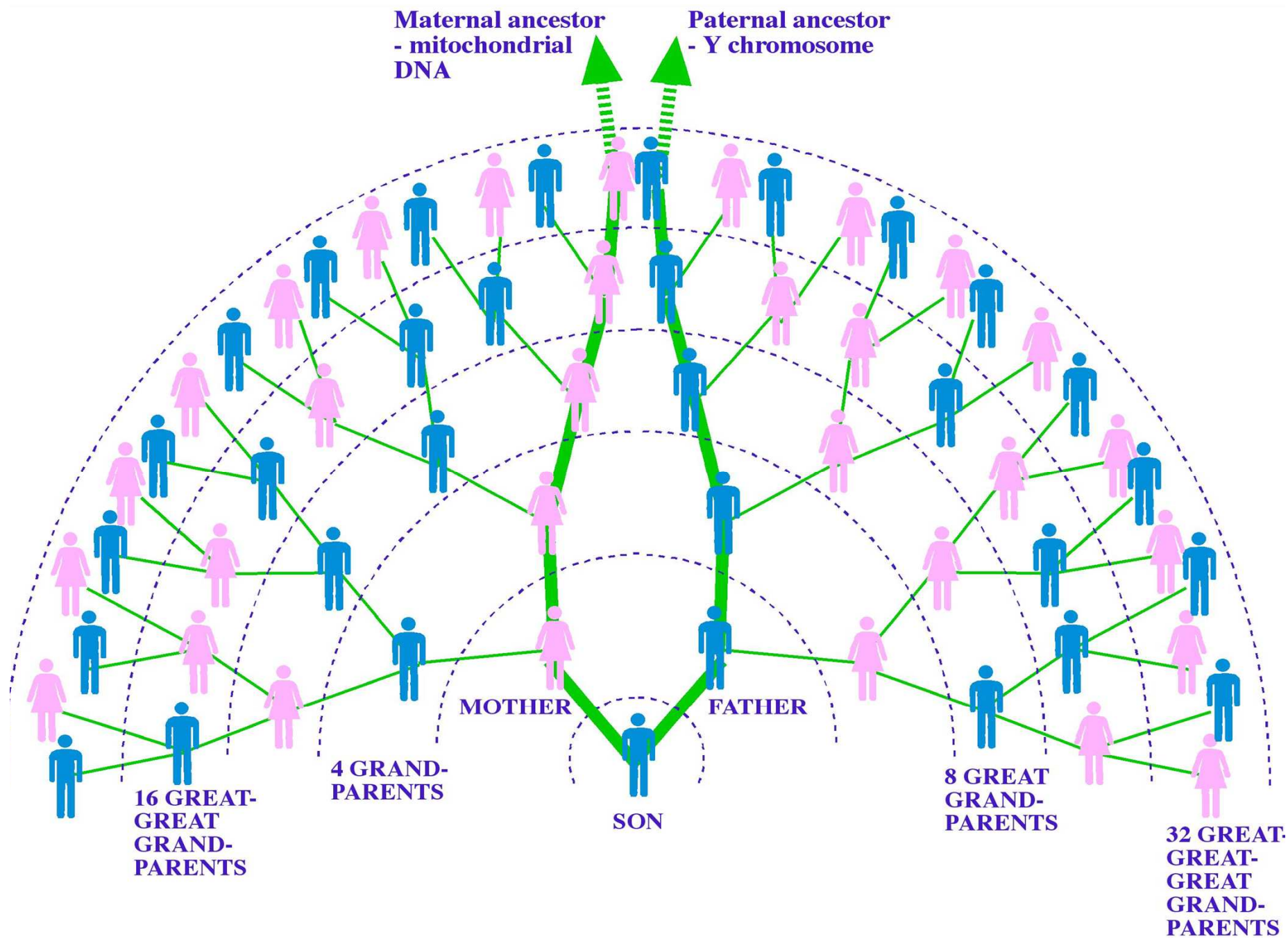


-
- **As an individual test – gives an idea of one (or two) lines of ancestry**
 - **Much more powerful for telling us about population ancestry**

Did the Vikings take their families with them?



Goodacre,
Helgason
et al, 2005



Scandinavian settlements in England & Wales

Grey shading means a high density of Scandinavian place-names



J.D. Richards, 2005

Scandinavian settlements in England & Wales

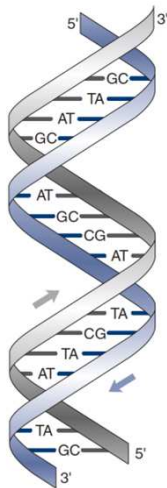
Grey shading means a high density of Scandinavian place-names





Viking genes in Northern England project

- ◆ **Part 1 - Wirral and West Lancashire (2002-2008)**
- ◆ **Part 2 - North Lancashire, Cumbria and N. Yorks (2009-2013)**



Old Wirral surnames present in area before 1600

Adam, Allin, Alleyne, Andrew, Ball, Barber, Barker, Barrell, Barrow, Bailiff, Beck, Bennett, Bergs, Billing, Bird, Blackburne, Boland, Brant, Bratherton, Browne, Brunt, Burscough, Bryde, Burrows, Bushell, Caley, Carr, Carlile, Carlisle, Challoner, Charnock, Chantrell, Coley, Colley, Colton, Coke, Corf, Corfe, Corness, Cotton, Cowper, Cross, Dalby, Dane, Danold, Davey, Davy, Denham, Denson, Dobb, Doe, Done, Duke, Dunn, Edmonds, Edmunds, Ellcock, Fazackerley, Fiddler, Fidler, Foreshaw, Forshaw, Fox, Francis, Gallie, Gardener, Gardiner, Gardner, Garratt, Garrett, Gibson, Gill, Gleave, Glegg, Goodacre, Grace, Gray, Gregory, Grey, Grice, Hale, Hancock, Hand, Harding, Hare, Harper, Harrison, Harvey, Heath, Helsby, Hesketh, Hey, Heyward, Hide, Hill, Hogg, Hole, Holme, Holmes, Home, Hough, Hulme, Hulmes, Humphrey, Huntington, Hynes, Jennion, Jensen, Jeunds, Johnson/Joynson, Jump, Kemp, Kirk, Kirkby, Leck, Lancelyn, Ledsham, Leighton, Lennard, Leonard, Ley, Lightfoot, Linacre, Little, Lunt, Macklin, Massie, Massey, Matthew, Mayle, Mayles, Middleton, Milner, Molyneuz, Moss, Moulding, Mutton, Nelson, Newbold, Newton, Otter, Otty, Oxton, Page, Parr, Pearson, Pemberton, Pendleton, Pennington, Penketh, Penney, Philip, Phylip, Pigot, Pinnington, Plumbe, Poole, Potter, Prenton, Pye, Pyke, Raby, Radcliffe, Rathbone, Richardson, Rider, Ridley, Rimmer, Robinson, Rogerson, Russell, Rutter, Saddler, Sadler, Sampson, Scarff, Scarffe, Scarisbrick, Sclater, Scriven, Sefton, Sharpe, Shephard, Shepherd, Sherlock, Skinner, Smalley, Smythe, Spenser, Stones, Swain, Swaine, Swarbrick, Swindley, Tarleton, Taskar, Tellett, Thomason, Thomasson, Thomson, Threadgill, Threadgold, Tottey/Totty, Tumath, Tyldesley, Upton, Wade, Wainwright, Walley, Walton, Warburton, Waring, Warrington, Watmough, Watt, Whalley, Wharton, Wilkinson, Williamson, Whitby, Whitehead, Whitelaw, Whitfield, Whitmore, Whittle, Whyte, Williamson, Willoughby, Worrall, Woods, Woodward, Wilcock, Wise, Wyse, Young, Yoxon.



Research Paper in *Molecular Biology & Evolution*, 2008

Excavating Past Population Structures by Surname-Based Sampling: The Genetic Legacy of the Vikings in Northwest England

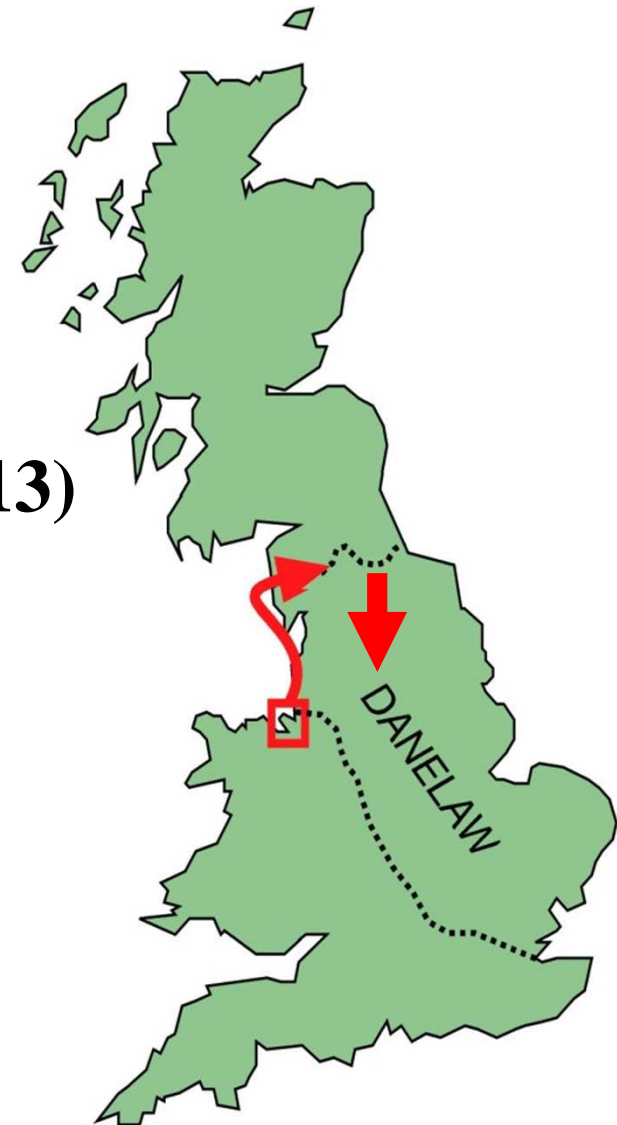
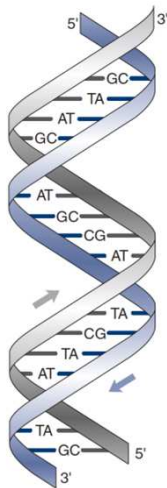
Georgina R. Bowden, Patricia Balaesque,* Turi E. King,* Ziff Hansen,† Andrew C. Lee,*¹ Giles Pergl-Wilson,† Emma Hurley,† Stephen J. Roberts,‡ Patrick Waite,§ Judith Jesch,|| Abigail L. Jones,¶ Mark G. Thomas,# Stephen E. Harding,† and Mark A. Jobling**

*Department of Genetics, University of Leicester, Leicester, United Kingdom; †National Centre for Macromolecular Hydrodynamics, University of Nottingham, Sutton Bonington Campus, Loughborough, United Kingdom; ‡The Queen Katherine School, Kendal, Cumbria, United Kingdom; §West Lancashire Heritage Association, Ormskirk, United Kingdom; ||School of English Studies, University of Nottingham, University Park, Nottingham, United Kingdom; ¶The Centre for Genetic Anthropology, Department of Biology, University College London, London, United Kingdom; and #Department of Biology, University College London, London, United Kingdom

→ Up to 50% of the DNA in old Wirral & West Lancashire families is Norse

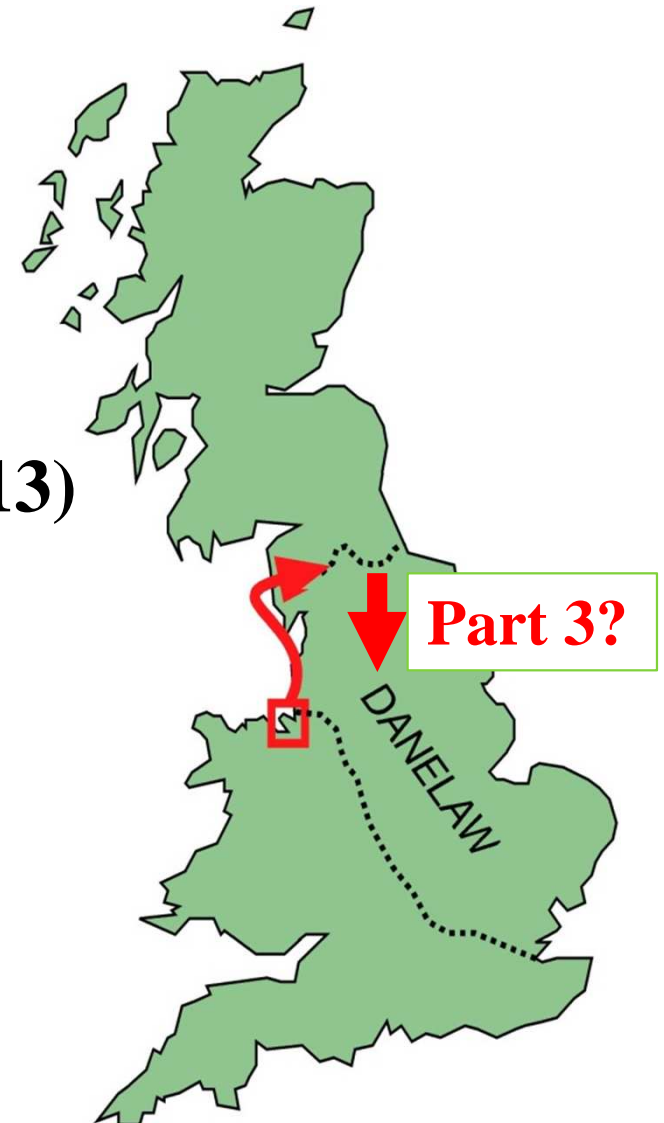
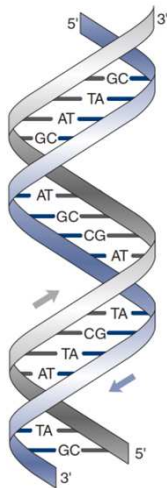
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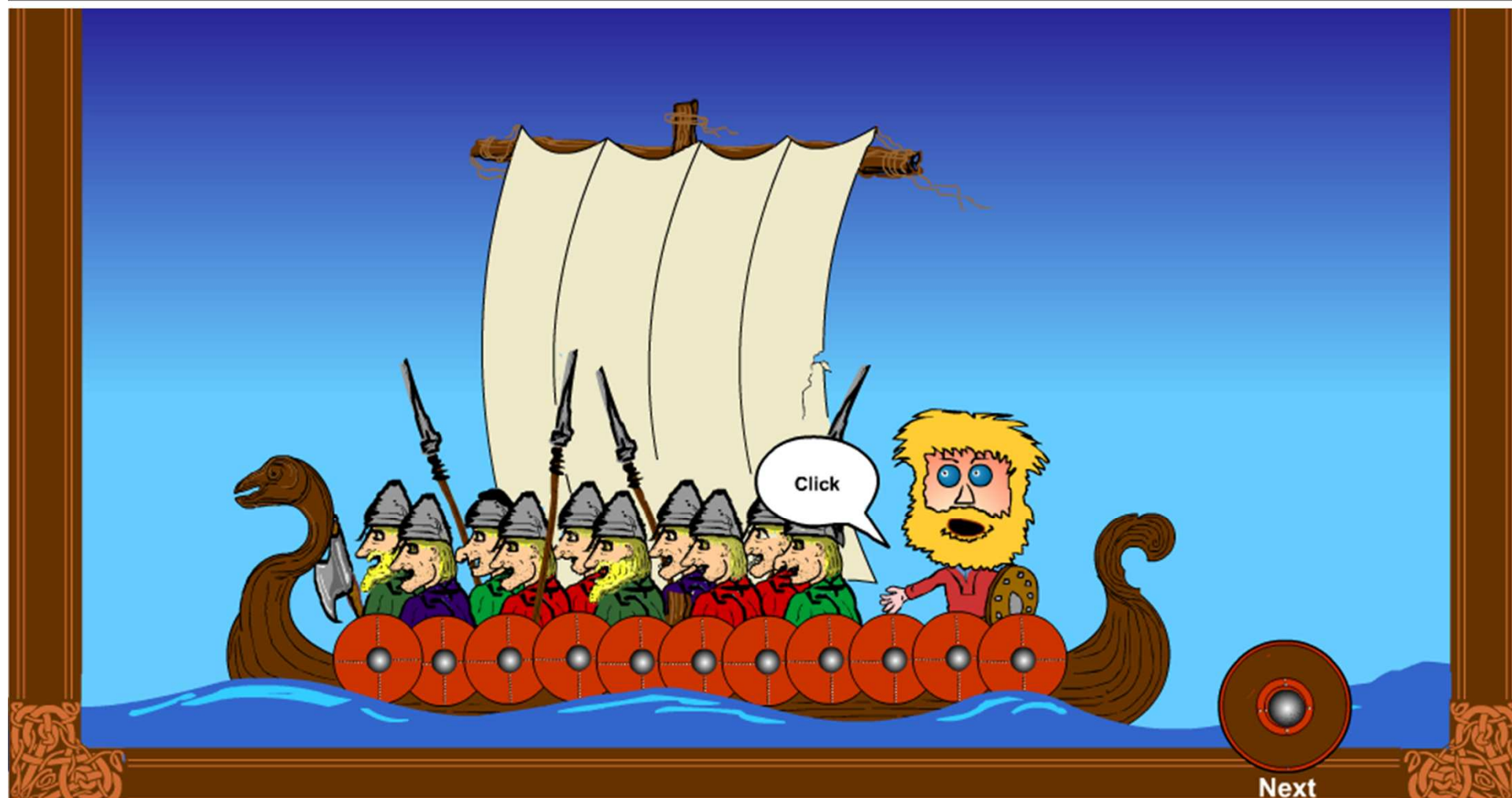


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The Vikings in Wirral



-
- **Is it worth £150?**

Sources

Slides 9 & 46: J.D. Richards (2005) A Very Short Introduction to Vikings, Oxford: Oxford University Press; Slide 31: yhrd.org; Slide 32, 34, 35: www.eupedia.com; Slide 33: N.M. Myres et al (2011), European Journal of Human Genetics 19, 95–101; Slide 36: www.coric.com; Slide 37,38: www.genebase.com; Slide 45: S. Goodacre, A. Helgason et al (2005) Heredity 95, 1-7; Slide 54: www.wirral-mbc.gov.uk/vikings/

