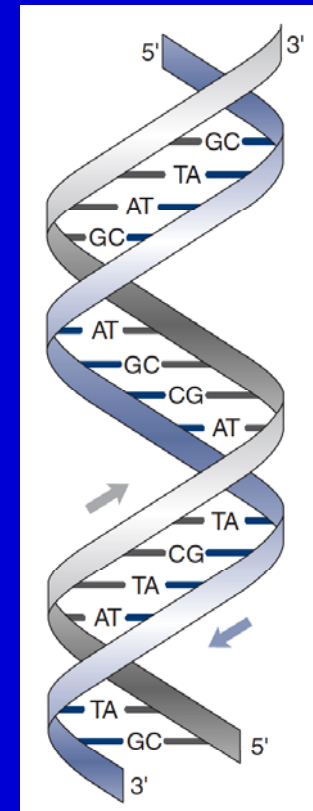


# Viking DNA



**Steve Harding, \*Turi King and \*Mark Jobling**  
**Universities of Nottingham & \*Leicester, UK**



*But you just never know...*

## HOW TO AVOID A VIKING ATTACK ON YOUR WAY TO THE LIBRARY

- 1** Keep your head – don't try to reason with them (they hate softies).
- 2** Show them you don't wear a vest – you're obviously a man to be reckoned with!
- 3** If they persist head directly to the public library.
- 4** Vikings are notoriously noisy, and will be expelled forthwith!
- 5** Once the coast is clear, head down to your nearest Cains' pub and reward your ingenuity with a refreshing pint of Cains – you deserve it.



*Show them  
you don't  
wear a vest*



*Vikings are  
notoriously  
noisy*

**Tell us about your narrow escapes and  
win an 'I KEPT MY HEAD' T-shirt!**

Send your true stories to:

I Kept My Head,  
Robert Cain Brewery, Stanhope Street,  
Liverpool L8 5XJ or  
e-mail: [ikeptmyhead@cainsbeers.com](mailto:ikeptmyhead@cainsbeers.com)

*All respondents qualify to join the "Cains  
Survivors' Club" and receive certificates  
for themselves and their local pub.*

# Viking DNA in Northern England Project

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- ◆ Part 1 - Wirral and West Lancashire (2002-2007)
- ◆ Part 2 - North Lancashire, Cumbria and N. Yorkshire (2008-2012)

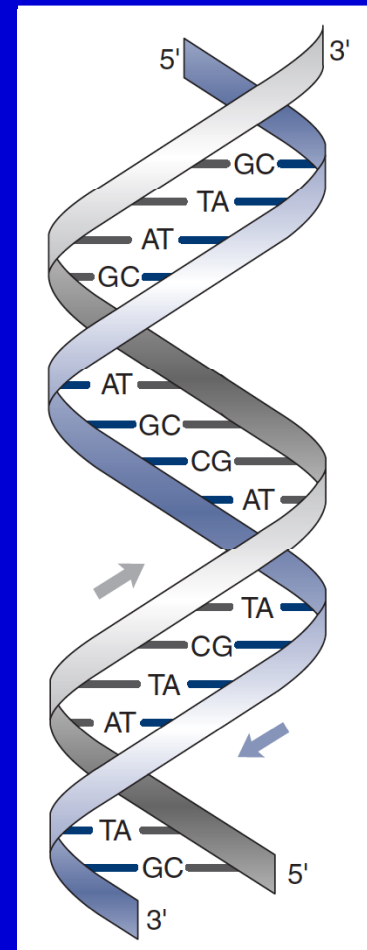






# DNA – Messages from our ancestors

- ◆ DNA is a ‘text’ that changes slowly through time, and varies between individuals
- ◆ **Analyse DNA from skeletons**
  - ◆ ‘Real’ information about the past
  - ◆ Difficult, small sample sizes, prone to modern DNA contamination; maybe no descendants
- ◆ **Analyse modern people**
  - ◆ Easy to get samples
  - ◆ Can be unrepresentative of past populations, need methods of inference



# Genetics of physical characteristics 1

- ◆ Blood groups
- ◆ Poorly discriminating and widespread
- ◆ Pigmentation, stature, facial shape
- ◆ Complex, poorly understood, wide distribution in N.Europe

Geipel J (1969) *The Europeans: an Ethnohistorical Survey*. Longmans, London



9 A Dane from Jutland, whose facial features remind one irresistibly of his forerunner, Tollund man (1)



10 An Icelandic from Reykjavik

## LIVING EUROPEAN TYPES

11 A Norwegian woman



12 Max von Sydow, Swedish film actor



17 An English schoolgirl



18 Ivor Emmanuel, Welsh singer



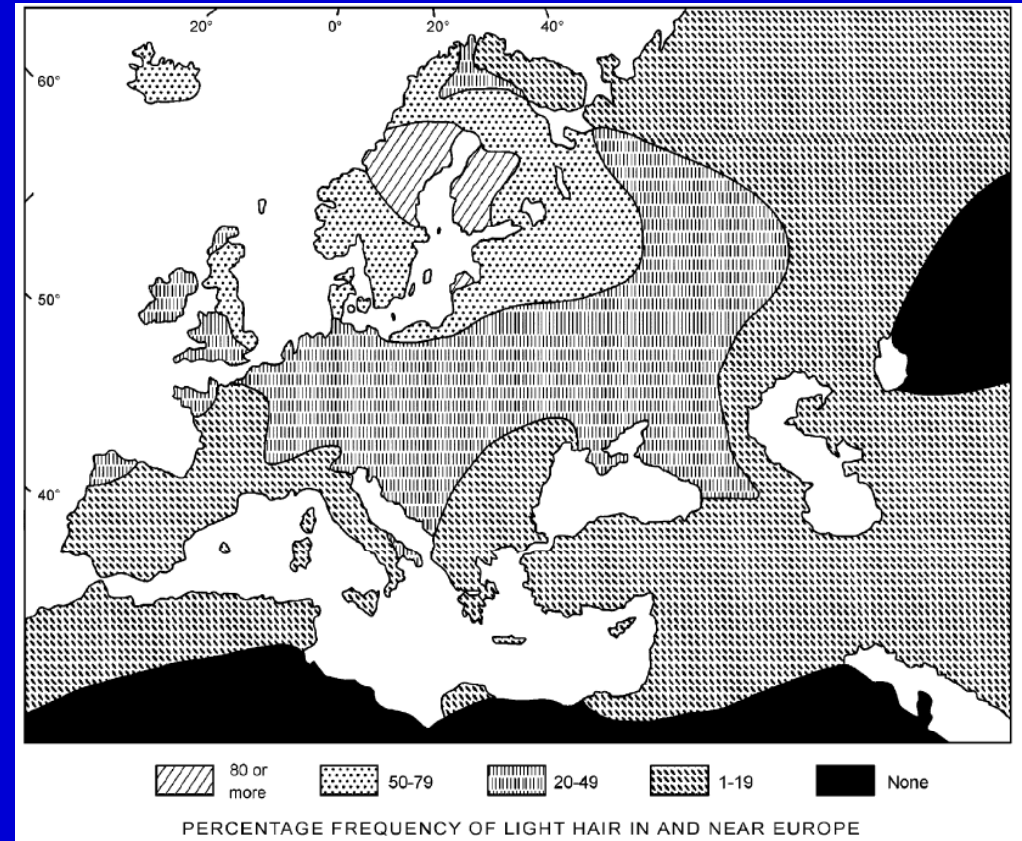
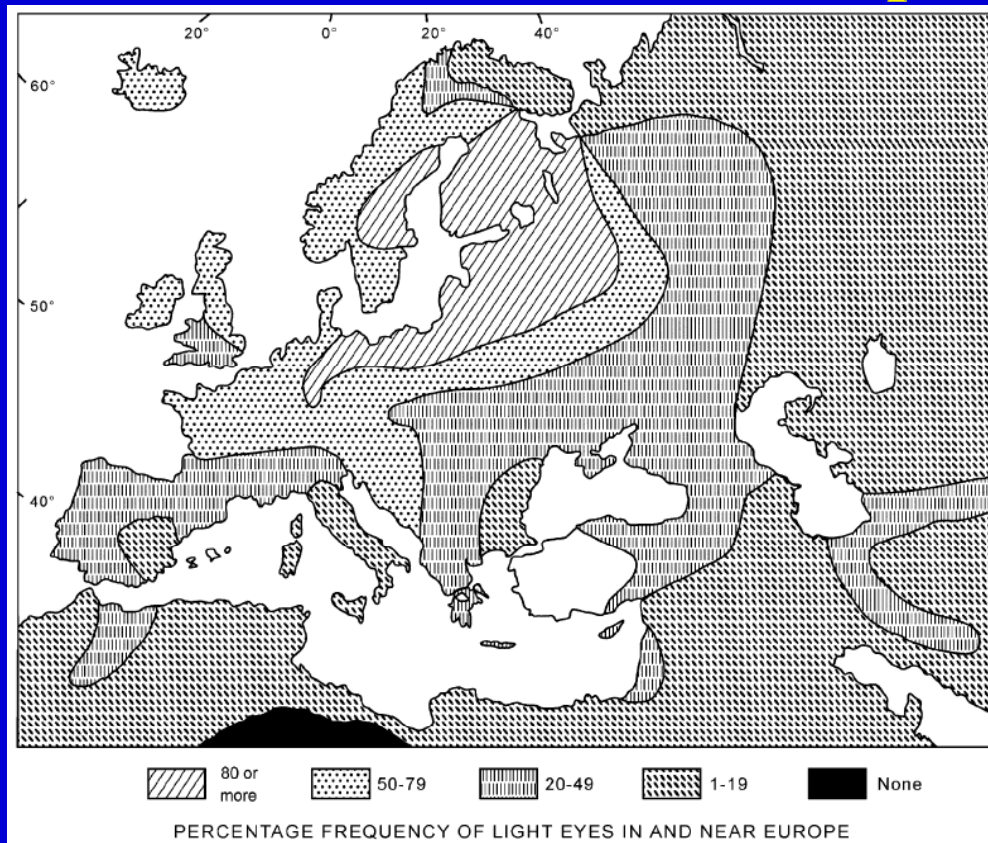
# Genetics of physical characteristics 2

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# Genetics of physical characteristics 2

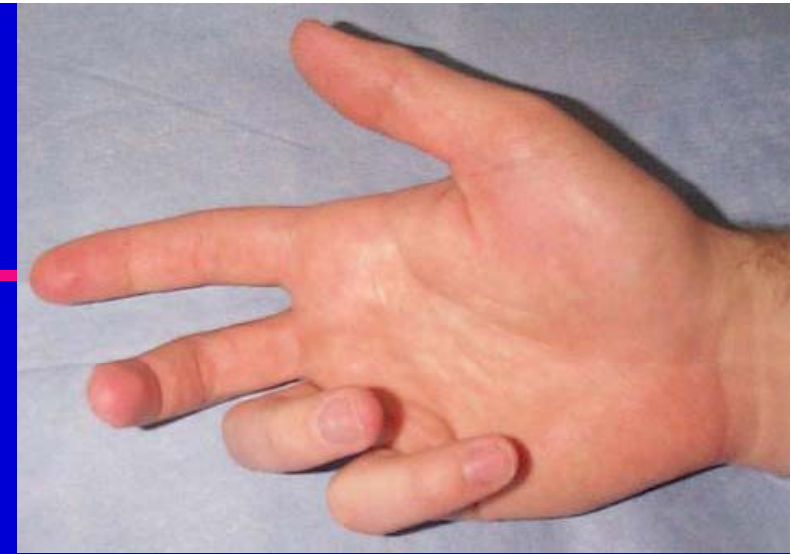
- ◆ Eye colour, hair colour, give an indicator and the genetics are now becoming better understood, but still not yet the basis for a scientific comparison





# Genetics of physical characteristics 3

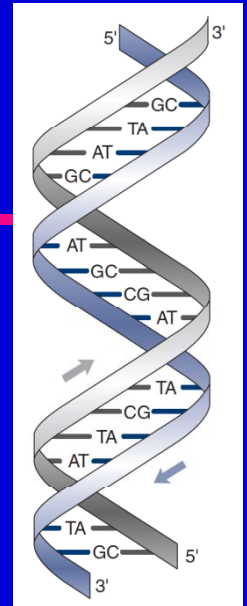
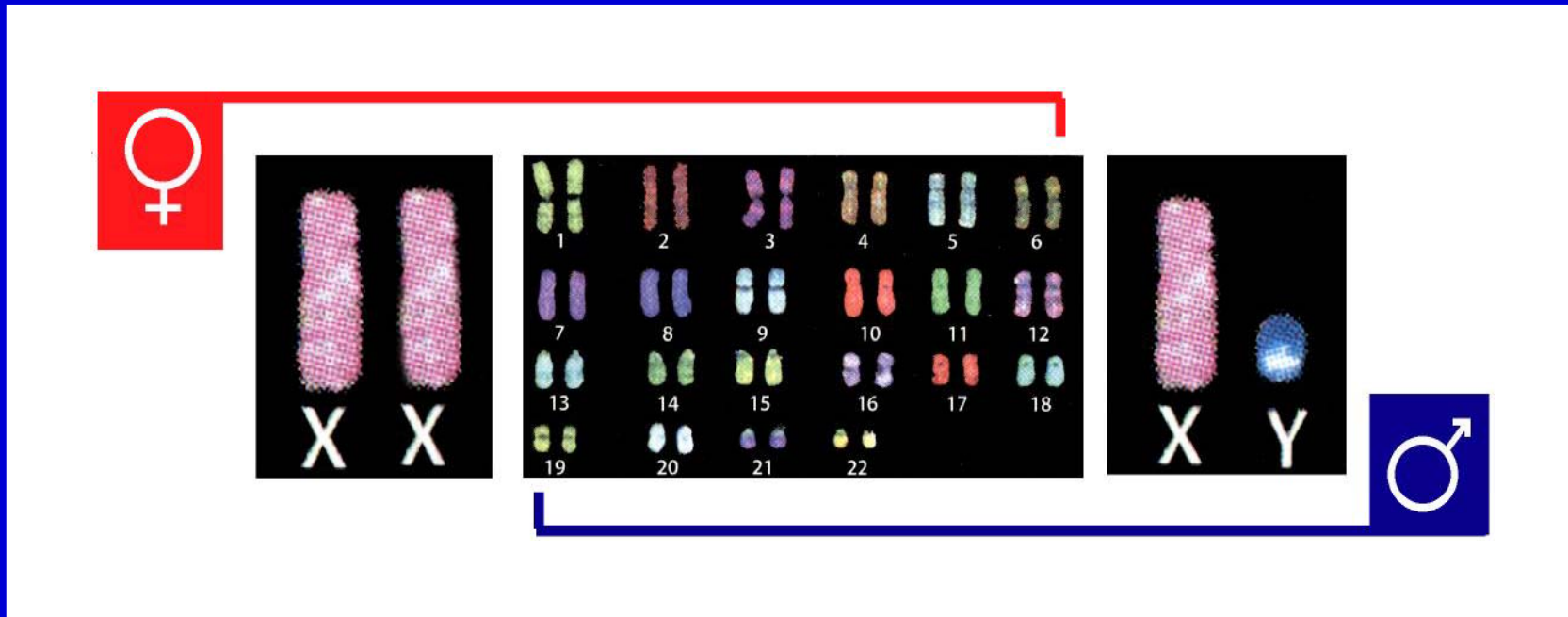
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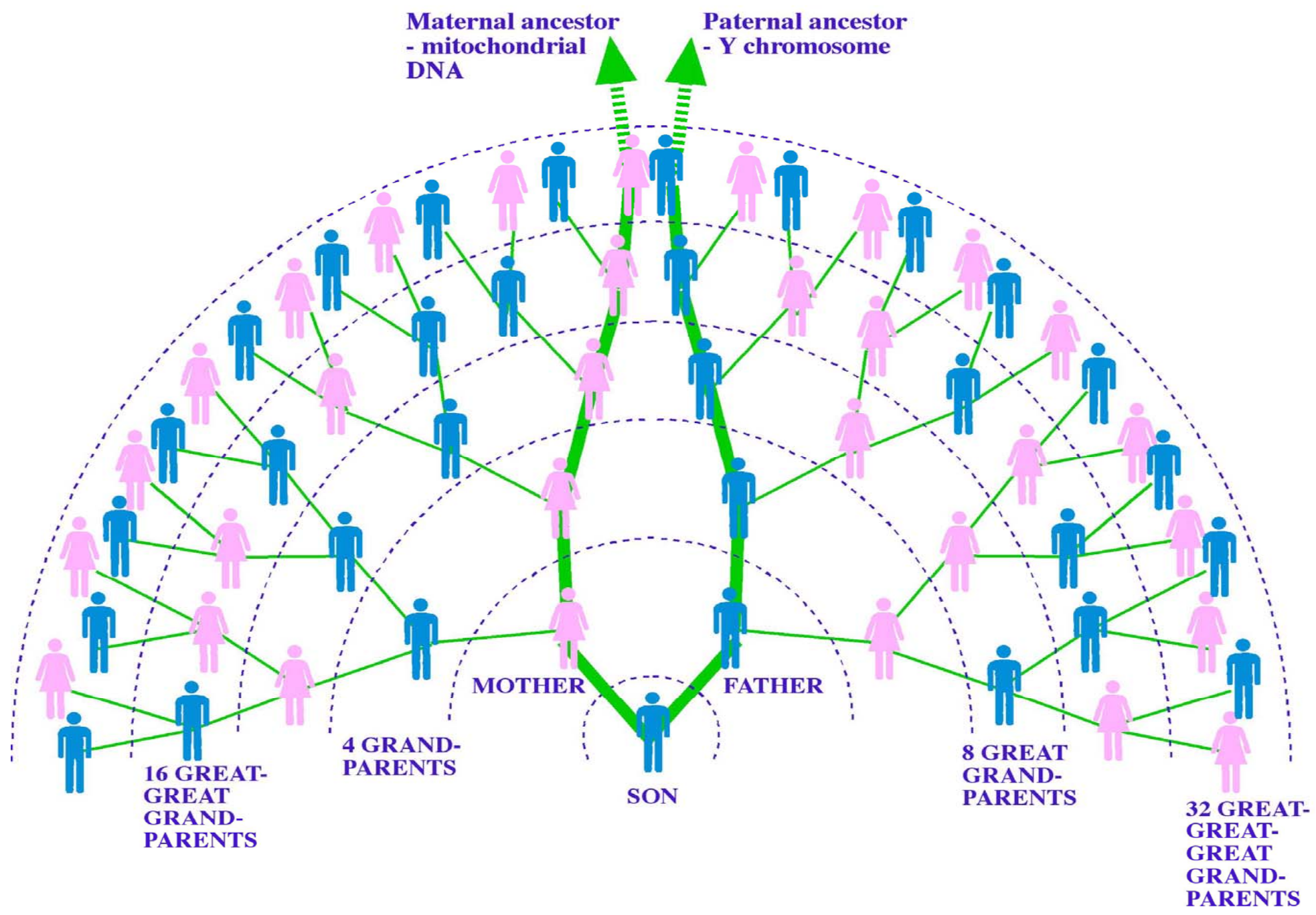
- ◆ **Dupuytren's / digitopalmar contracture**
- ◆ **Distribution suggests possible Viking origin**
- ◆ **Evidence from Icelandic sagas: *Longer Saga of Magnus of Orkney***
- ◆ **More frequent in regions of Britain influenced by Vikings**
- ◆ **But, crops up in other populations**
- ◆ **Fortunately there is a more powerful method of genetic enquiry as we will now see**

# Genetic markers of inheritance

## Chromosomes:



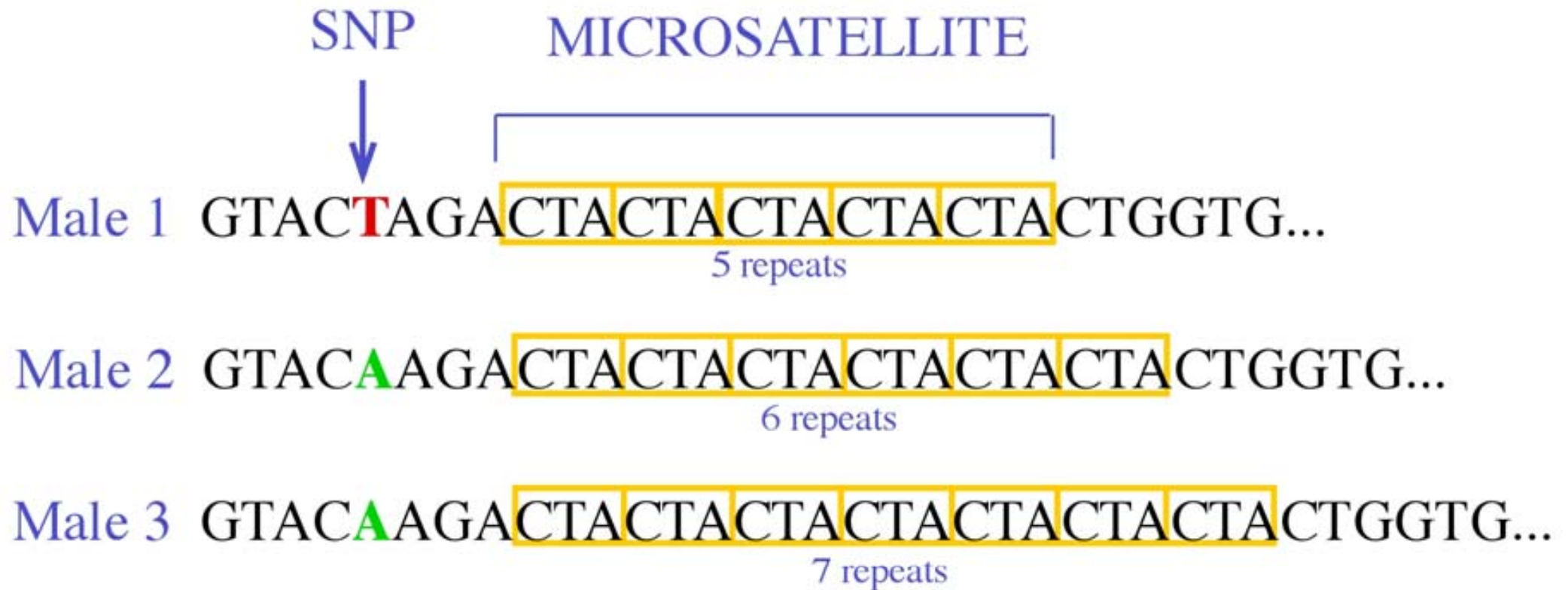
- ◆ Men have a Y chromosome - sex-determining
- ◆ Both sexes also have what's called mitochondrial DNA, but inherited only from mothers to offspring
- ◆ So can probe one line of ancestry for a woman (maternal line) or two for a man (maternal and paternal lines)





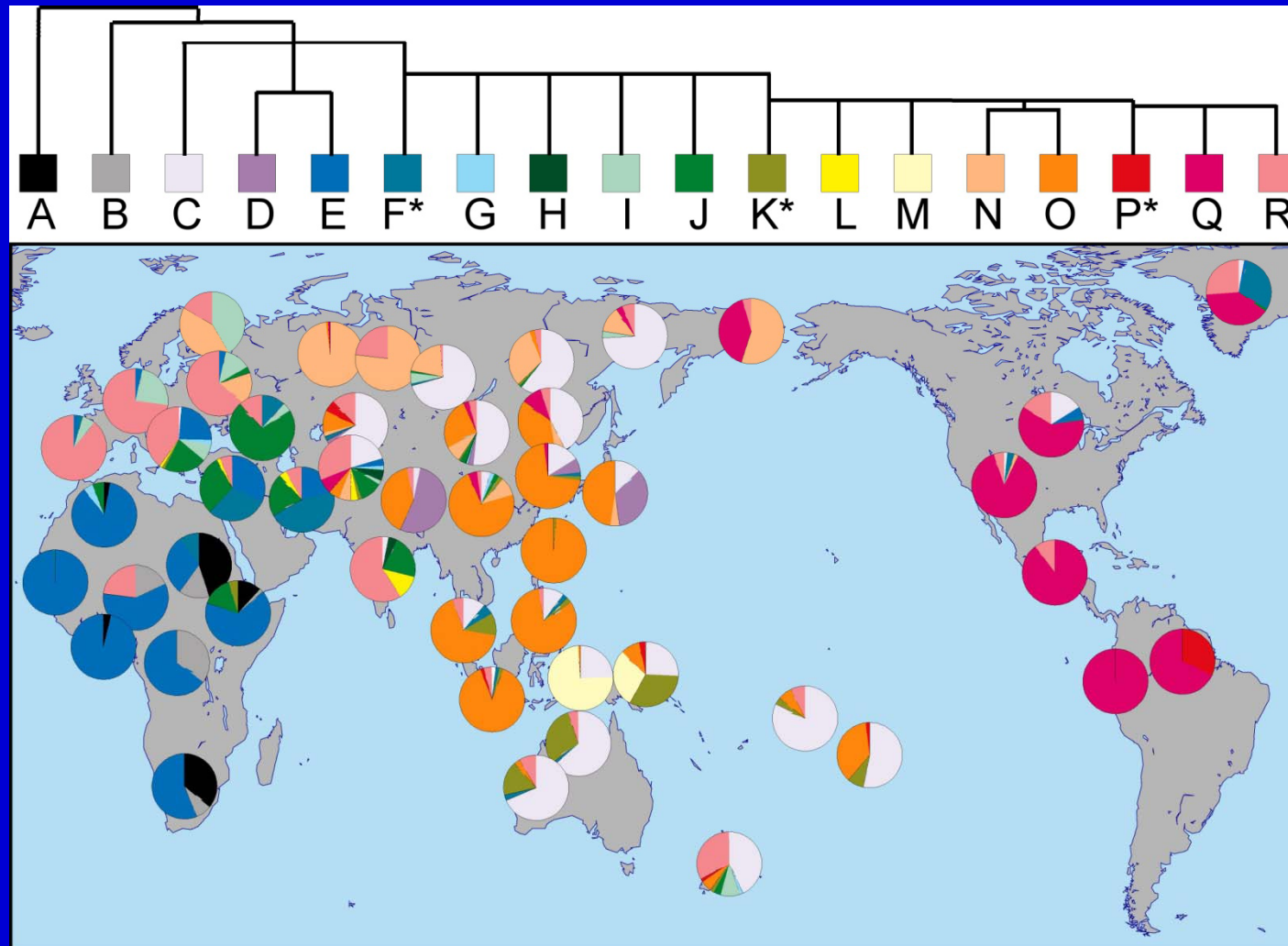


## for men we look for 2 types of variations in Y-DNA

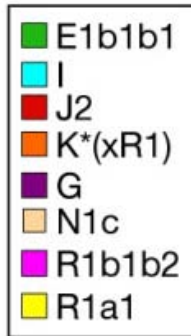


- The SNP's define a man's HAPLOGROUP
- The STR's define a man's HAPLOTYPE

# The major haplogroups – continents show major differences







## 2 recent papers resolving R1b

European Journal of Human Genetics (2011) 19, 95–101  
© 2011 Macmillan Publishers Limited All rights reserved 1018-4813/11  
www.nature.com/ejhg



### ARTICLE

## A major Y-chromosome haplogroup R1b Holocene era founder effect in Central and Western Europe

Natalie M Myres<sup>1</sup>, Siiri Rootsi<sup>2</sup>, Alice A Lin<sup>3</sup>, Mari Järve<sup>2</sup>, Roy J King<sup>3</sup>, Ildus Kutuev<sup>2,4</sup>, Vicente M Cabrera<sup>5</sup>, Elza K Khusnutdinova<sup>4</sup>, Andrey Pshenichnov<sup>2,6</sup>, Bayazit Yunusbayev<sup>2,4</sup>, Oleg Balanovsky<sup>2,6</sup>, Elena Balanovska<sup>6</sup>, Pavao Rudan<sup>7</sup>, Marian Baldovic<sup>2,8</sup>, Rene J Herrera<sup>9</sup>, Jacques Chikarioni<sup>10</sup>, Julie Di Cristofaro<sup>10</sup>, Richard Villems<sup>2</sup>, Toomas Kivisild<sup>11</sup> and Peter A Underhill<sup>\*,3</sup>

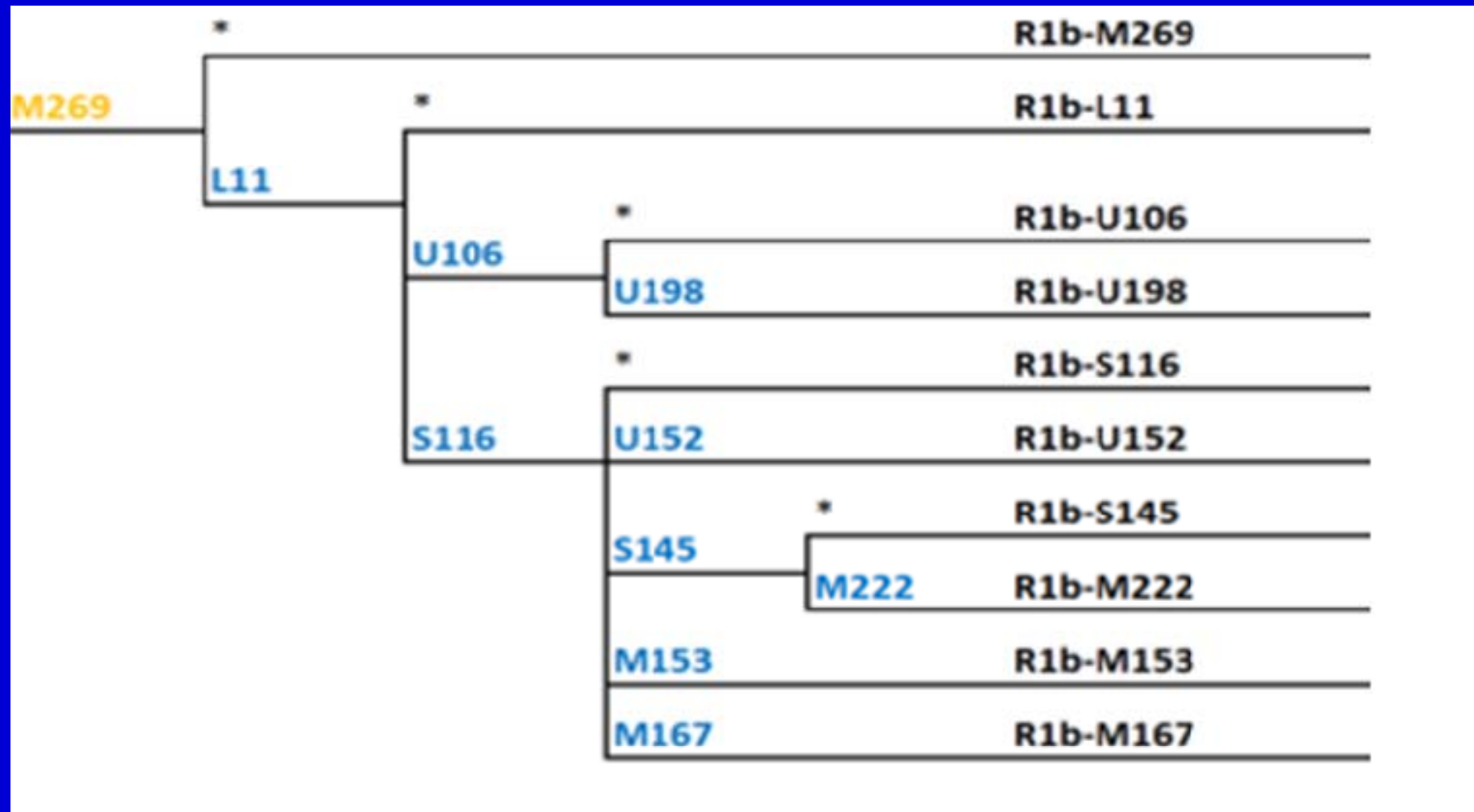
**PROCEEDINGS** OF **THE ROYAL SOCIETY** **B** **BIOLOGICAL SCIENCES**

## The peopling of Europe and the cautionary tale of Y chromosome lineage R-M269

George B. J. Busby, Francesca Brisighelli, Paula Sánchez-Diz, Eva Ramos-Luis, Conrado Martínez-Cadenas, Mark G. Thomas, Daniel G. Bradley, Leonor Gusmão, Bruce Winney, Walter Bodmer, Marielle Vennemann, Valentina Coia, Francesca Scarnicci, Sergio Tofanelli, Giuseppe Vona, Rafal Ploski, Carla Vecchiotti, Tatijana Zemunik, Igor Rudan, Sena Karachanak, Draga Toncheva, Paolo Anagnostou, Gianmarco Ferri, Cesare Rapone, Tor Hervig, Torolf Moen, James F. Wilson and Cristian Capelli

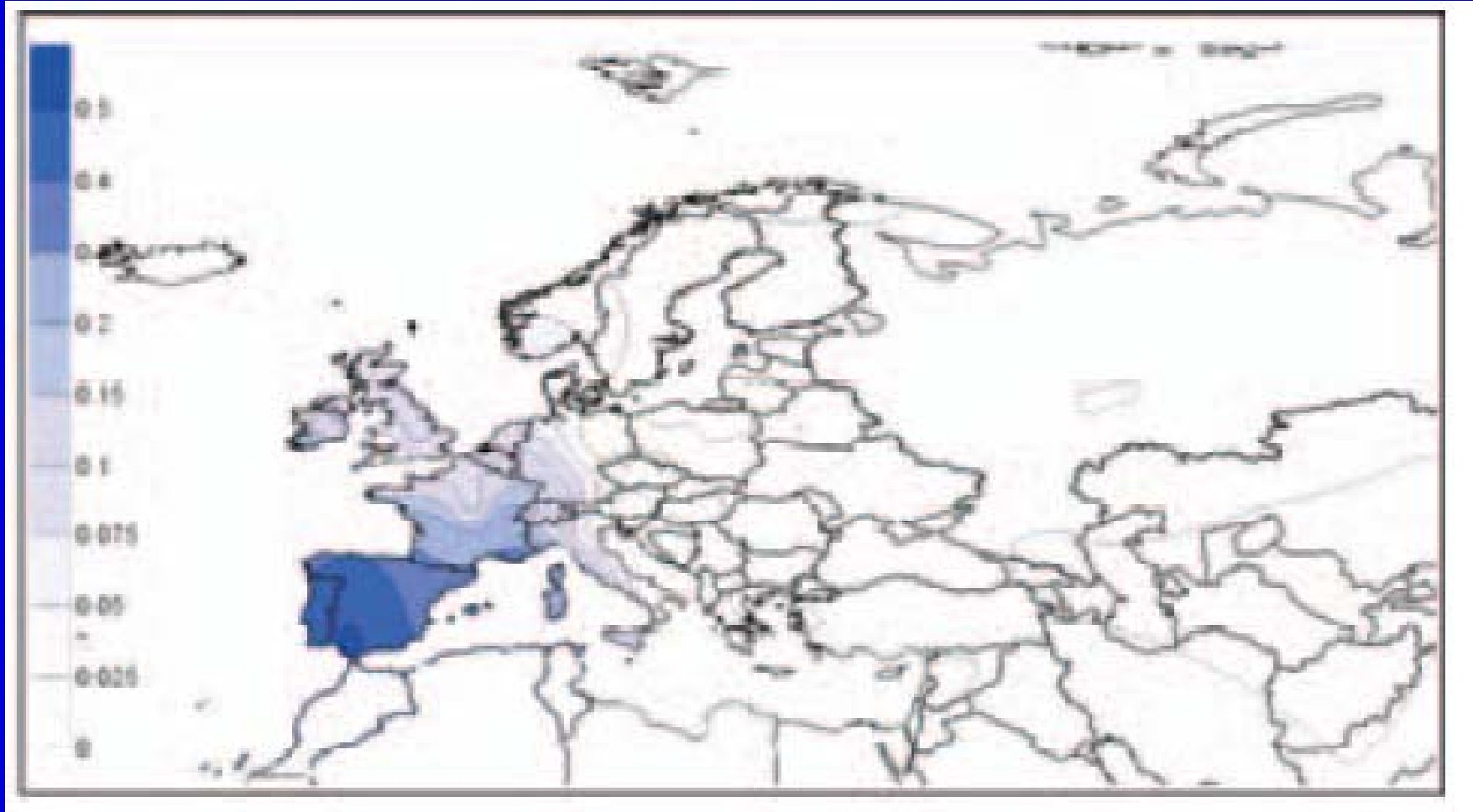
*Proc. R. Soc. B* published online 24 August 2011

# R1b- sub-haplogroups in Europe



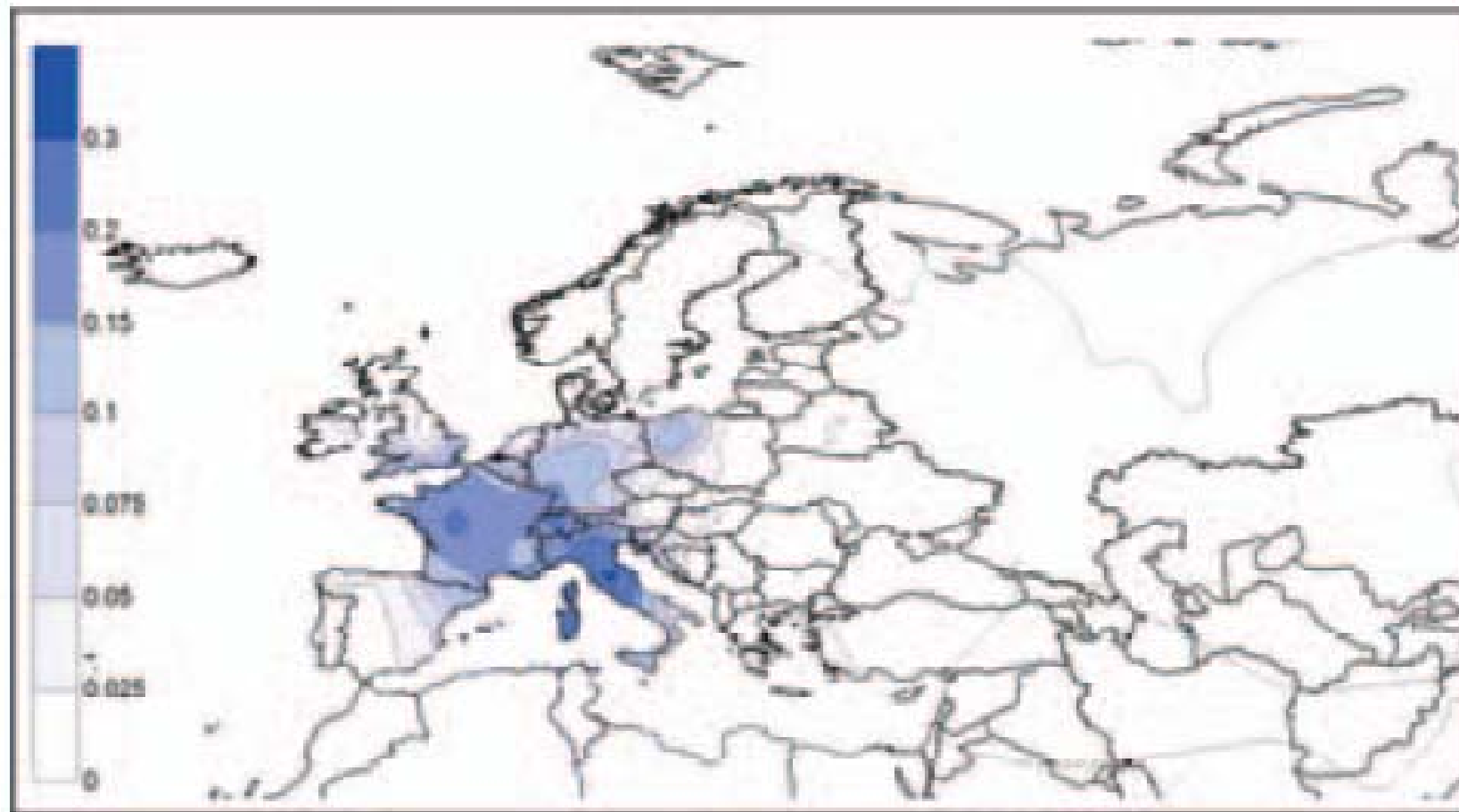


# R1b-S116\*



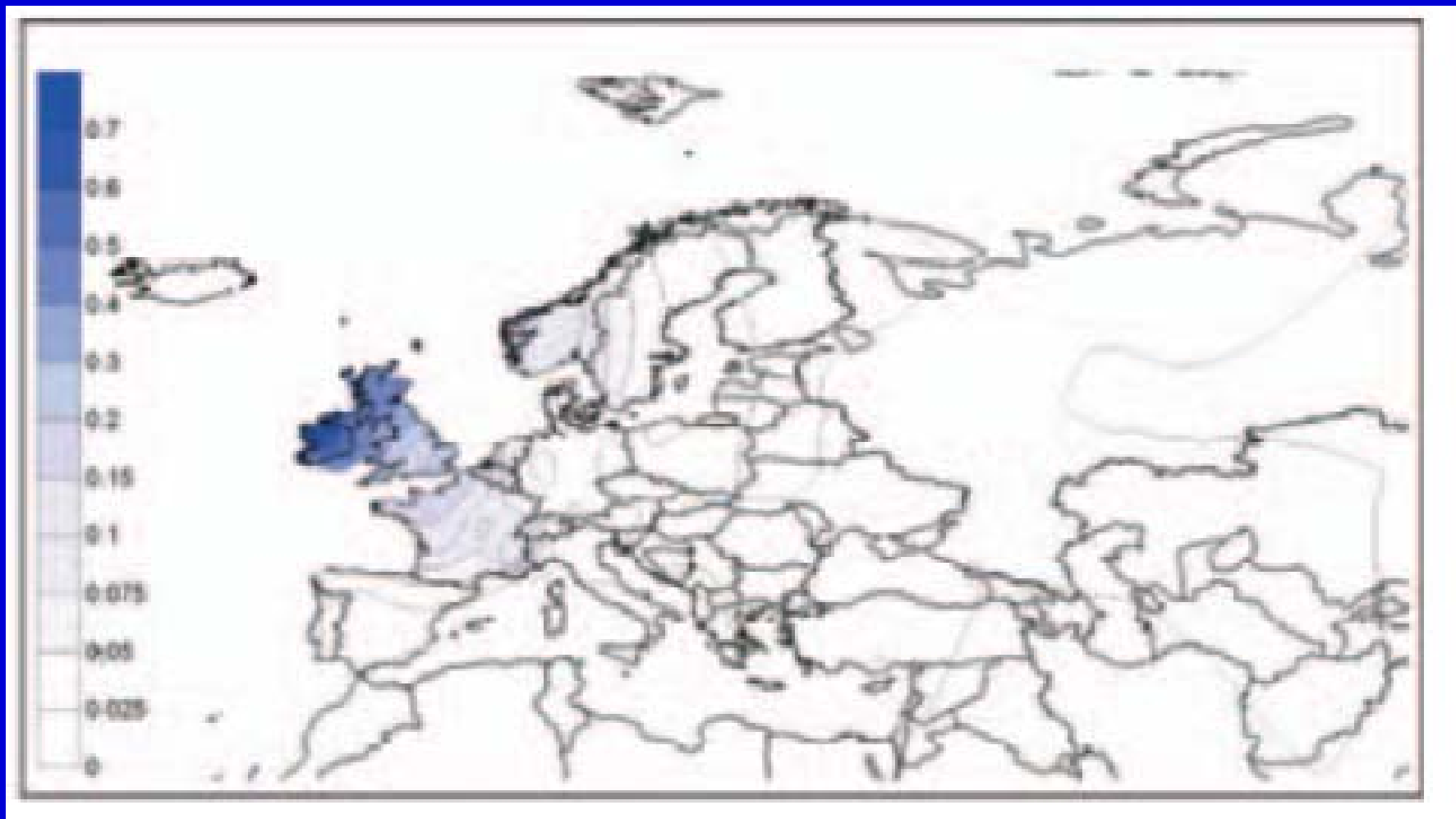
**Spain (50%), Basque, SW Europe**

# R1b-U152



**France, Italy (30%)**

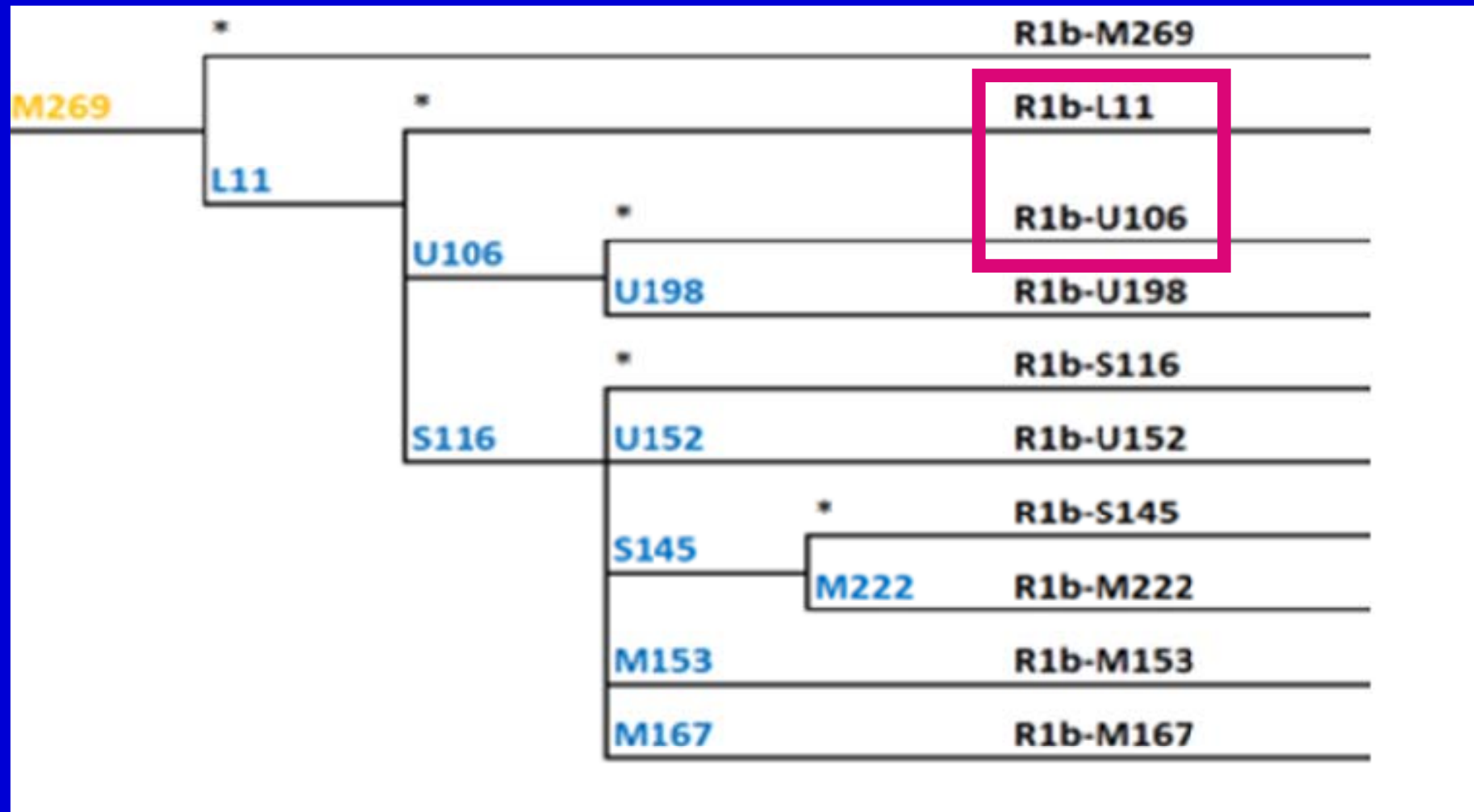
# R1b-S145 & M222



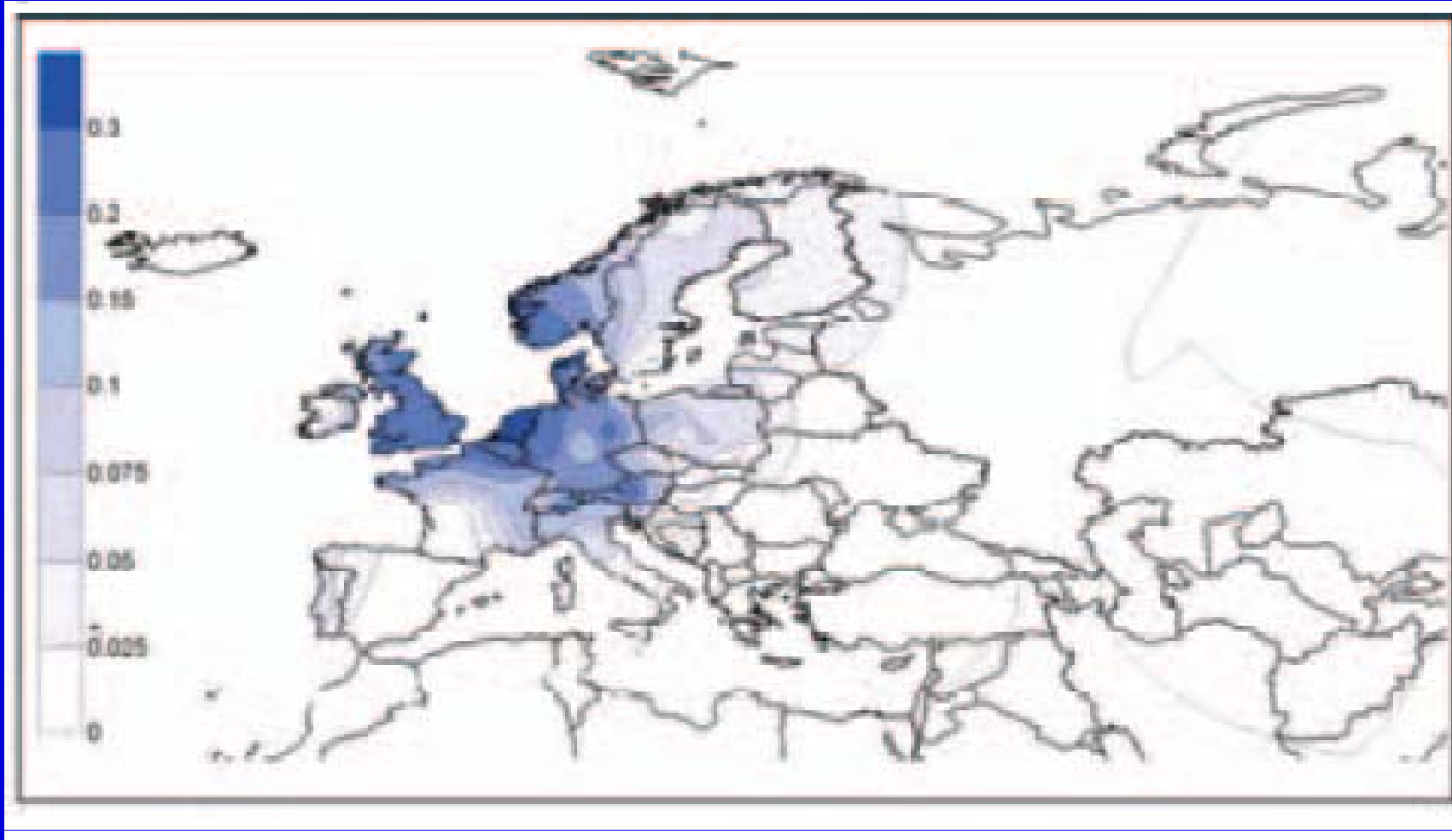
**‘Celtic’ – Ireland (70%), Scotland**



# R1b-M269 sub-haplogroups

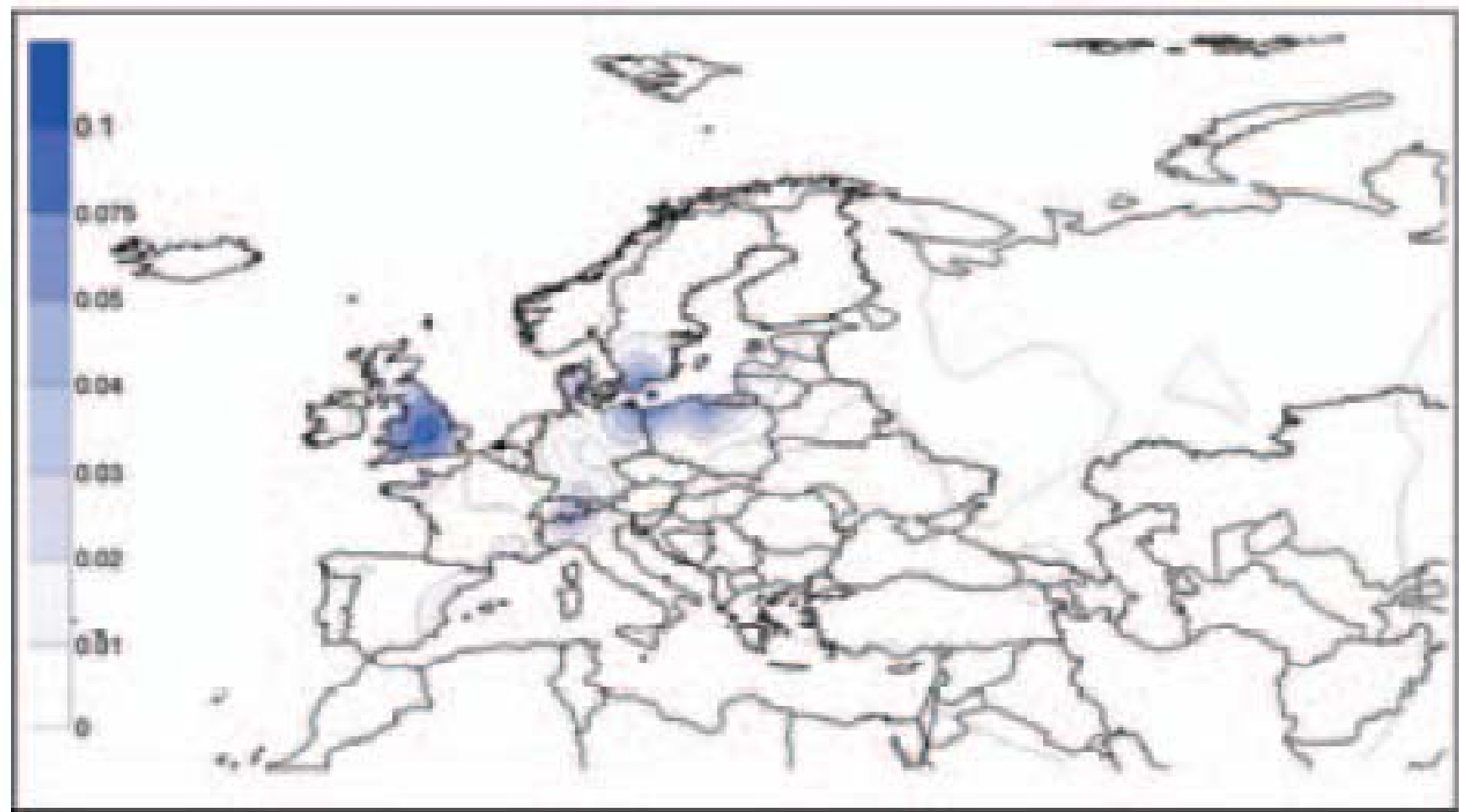


# R1b-U106



**Friesland (>30%), Holland,  
Germany, Britain, Scandinavia**

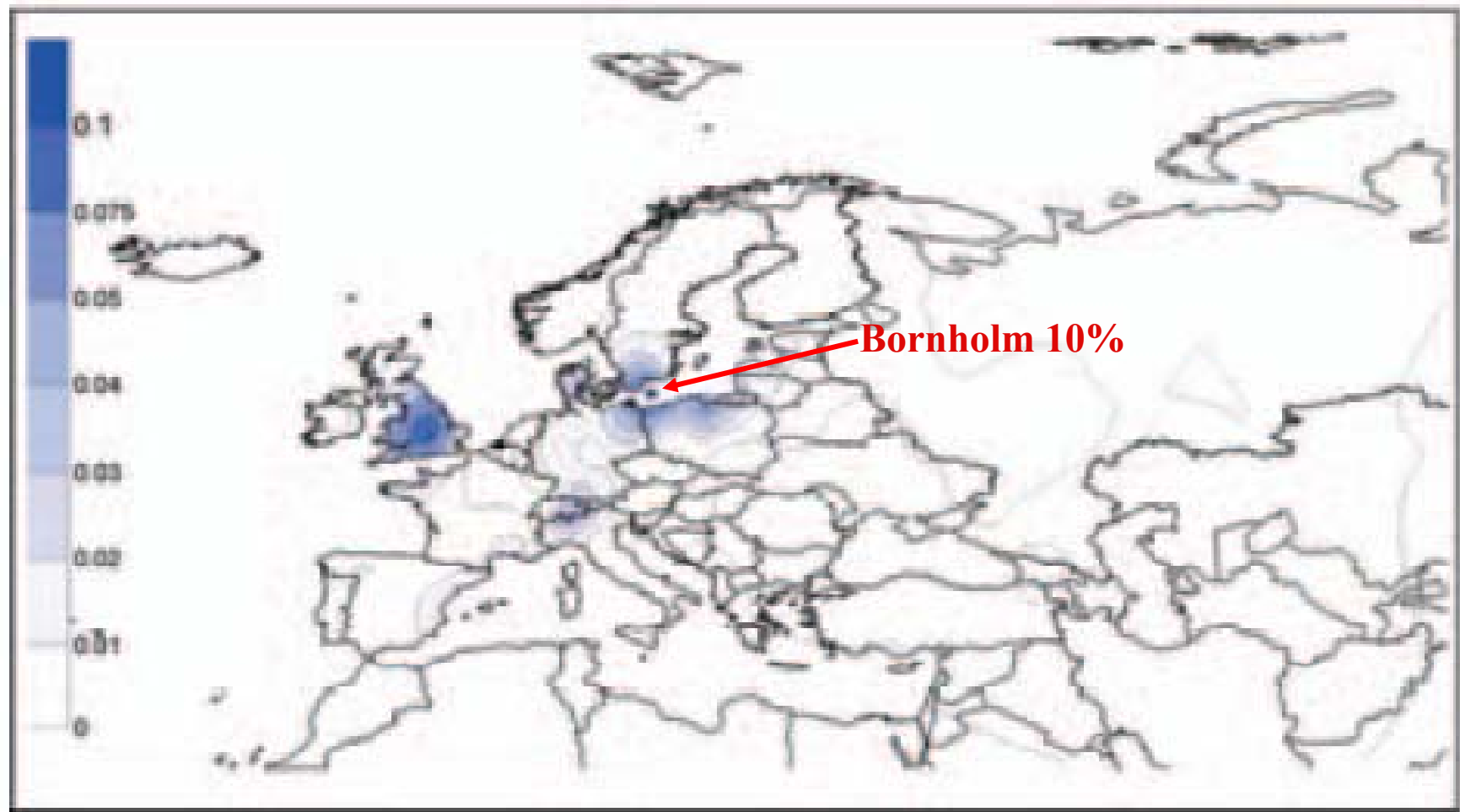
**R1b-L11\***



**England, Southern Baltic**



# R1b-L11\*



**Strong in E. Denmark & Bornholm but weak in Friesland  
- more unique signature than U106 or I1 for Danes in England?**

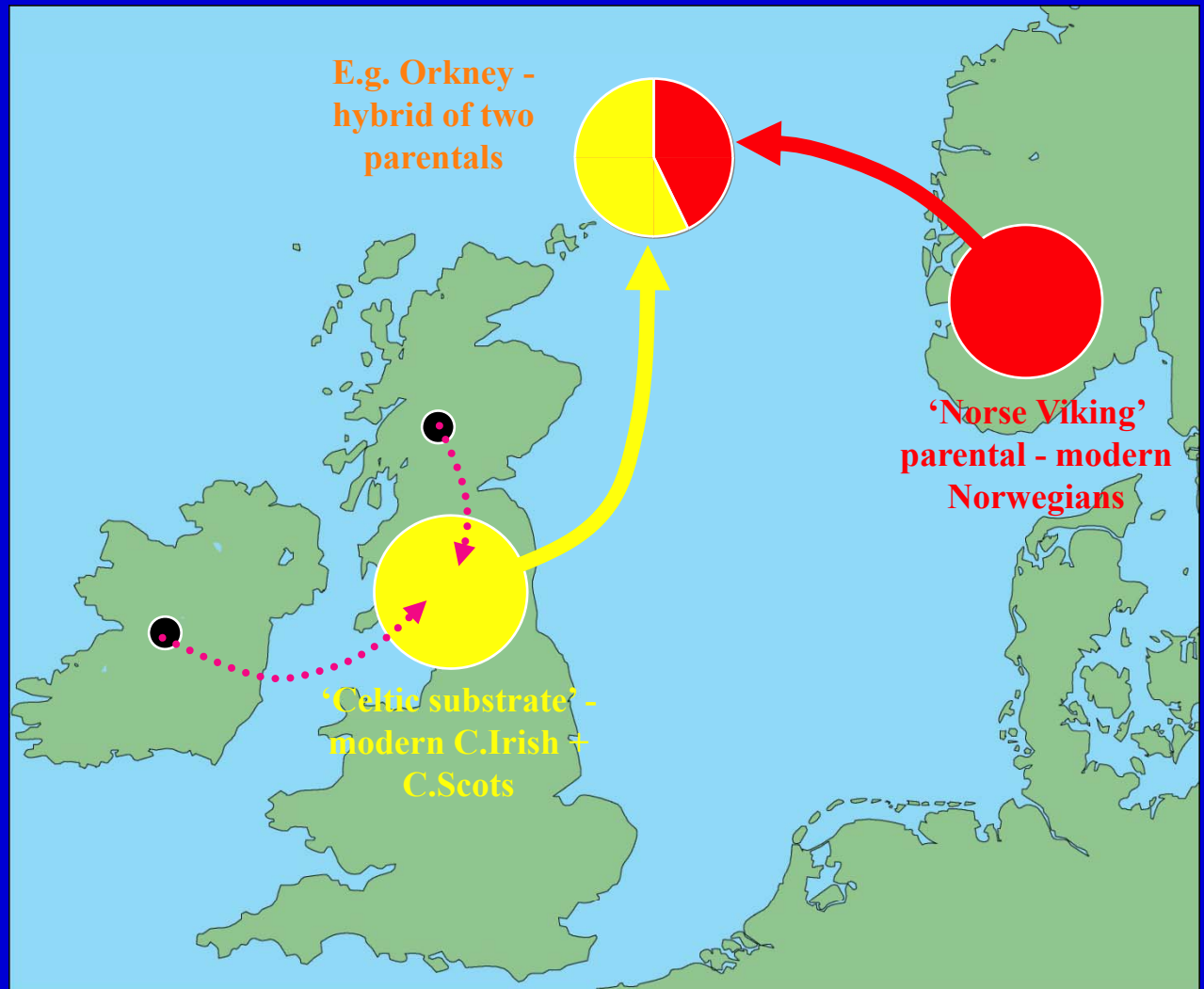
# Population Viking ancestry: admixture approaches

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- ◆ Testing at an individual level gives “only an idea”
- ◆ More secure at *population* level ( $\geq 20$  people)
- ◆ Volunteer selection and the problem of modern population movements
- ◆ 2 generation and old surname based selection criteria
- ◆ Compare distributions of Y-chromosome types – “Admixture analysis”
- ◆ Resolution of the method is improving all the time

# Norse Viking ancestry in the British Isles: admixture approaches

- ◆ **Admixture:**  
parental and  
hybrid populations
- ◆ **Algorithms**  
available to  
estimate  
proportions

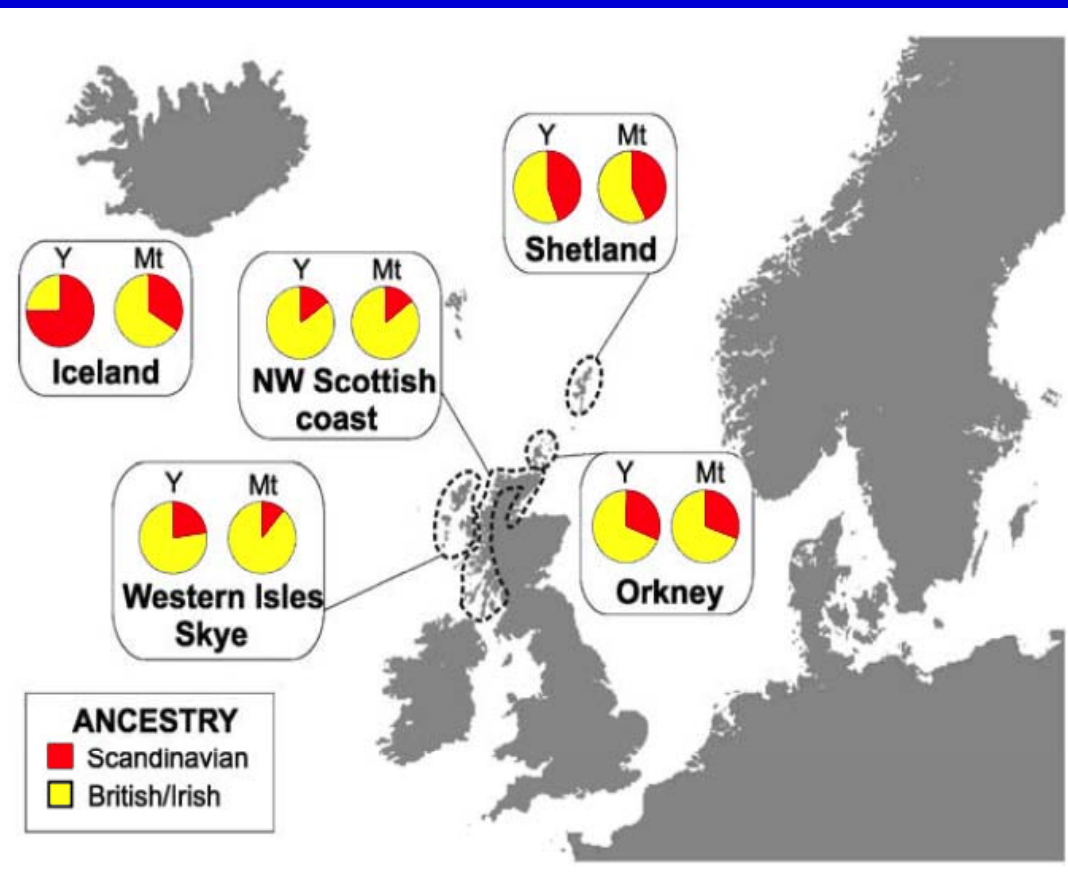




## Genetic evidence for a family-based Scandinavian settlement of Shetland and Orkney during the Viking periods

S Goodacre<sup>1,4</sup>, A Helgason<sup>2,4</sup>, J Nicholson<sup>1</sup>, L Southam<sup>1</sup>, L Ferguson<sup>1</sup>, E Hickey<sup>1</sup>, E Vega<sup>1</sup>, K Stefánsson<sup>2</sup>, R Ward<sup>3,\*</sup> and B Sykes<sup>1</sup>

<sup>1</sup>Weatherall Institute of Molecular Medicine, University of Oxford, Oxford OX3 9DS, UK; <sup>2</sup>deCODE Genetics, Sturlugata 8, 101 Reykjavik, Iceland; <sup>3</sup>Institute of Biological Anthropology, University of Oxford, Oxford OX2 6QS, UK



## Goodacre, Helgason et al. 2005

- ◆ Analysed mtDNA and Y markers, and used admixture approach
- ◆ Close to home, male and female proportions similar, so family-based settlement
- ◆ Further afield, male-biased settlement
- ◆ Most biased in Iceland

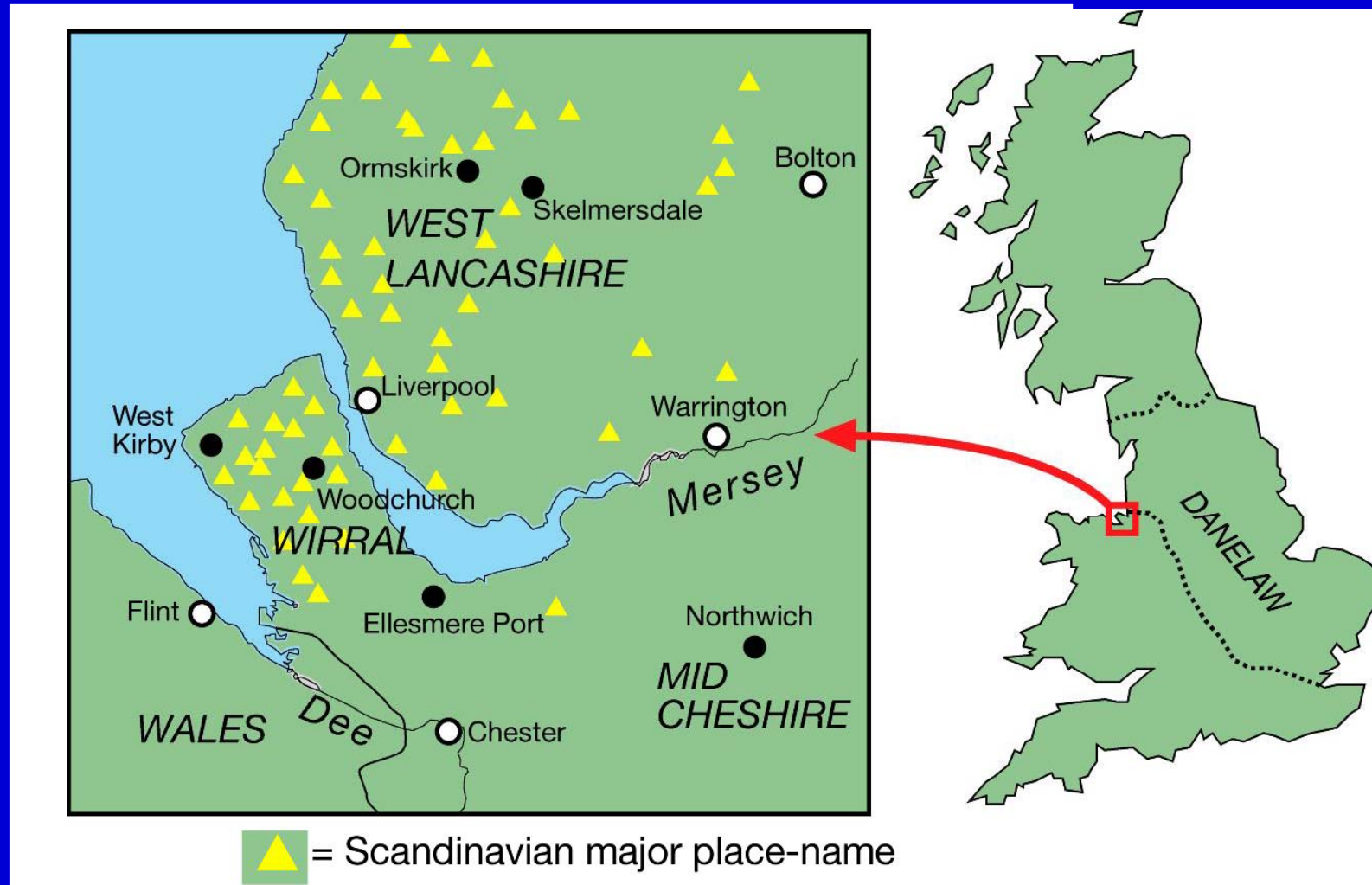
# Viking DNA in Northern England Project

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- ◆ Part 1 - Wirral and West Lancashire (2002-2007)
- ◆ Part 2 - North Lancashire, Cumbria and N. Yorkshire (2008-2012)

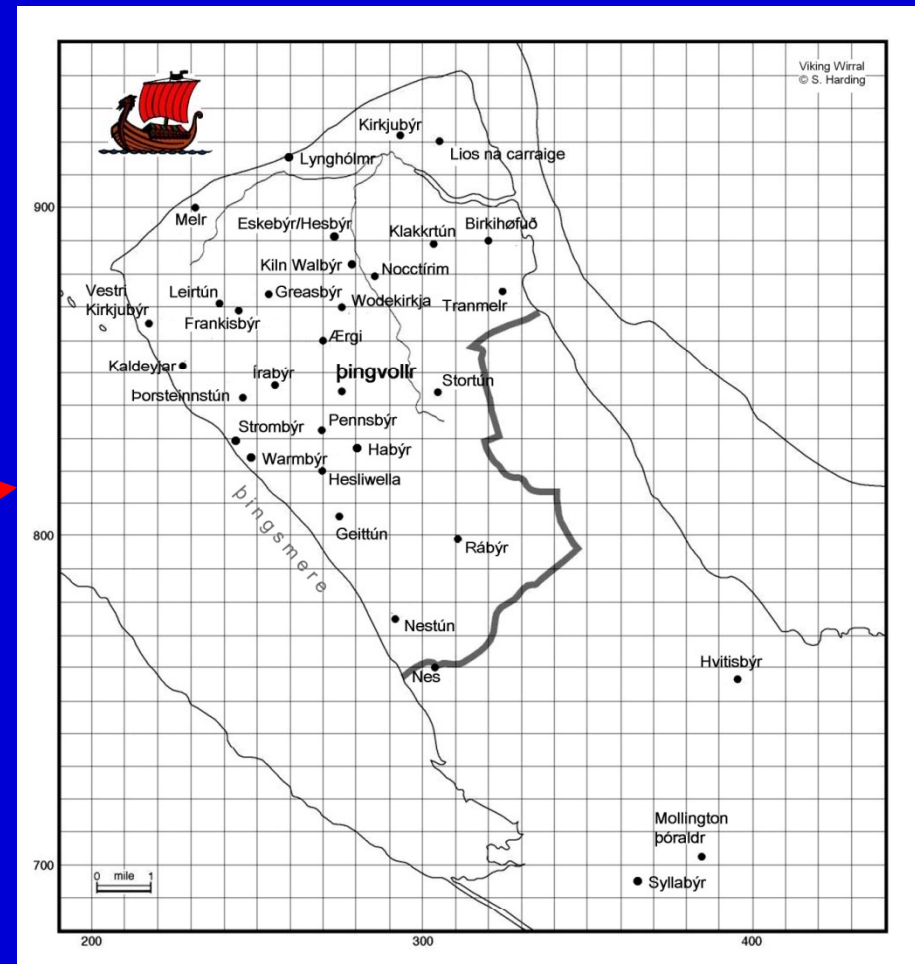
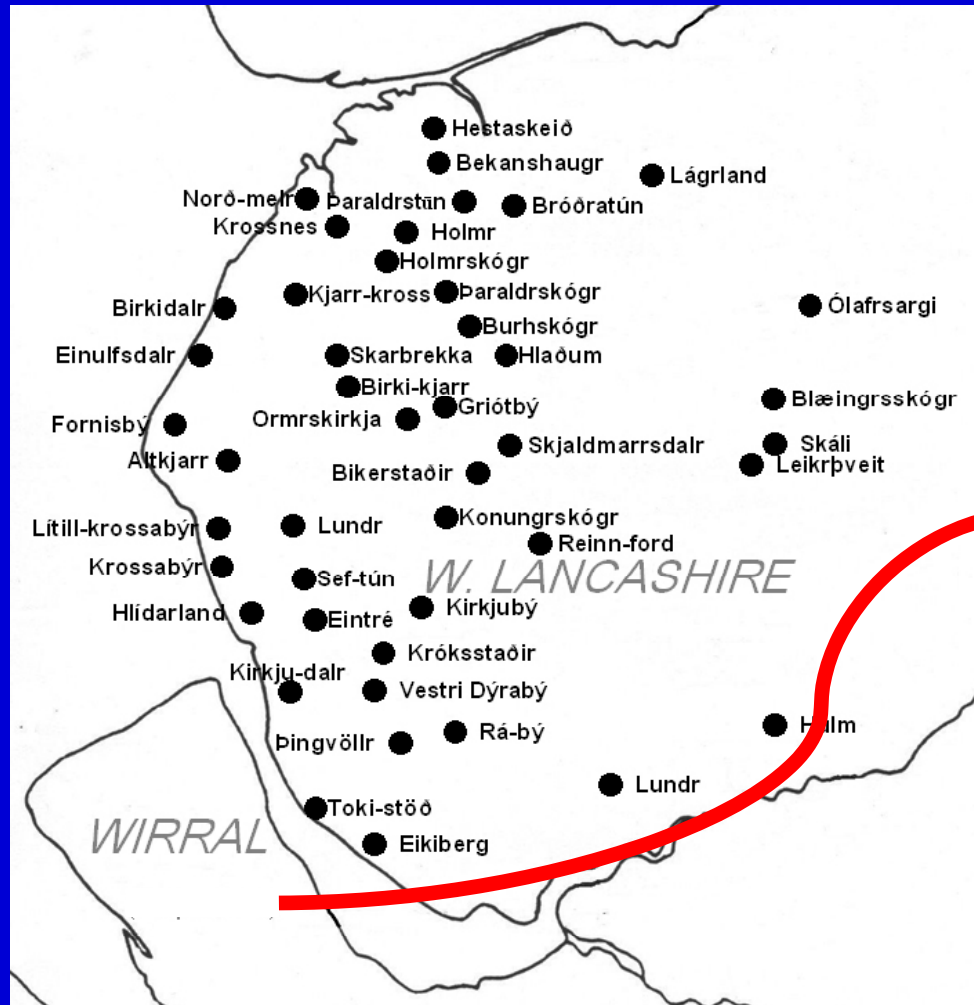


# Viking DNA in Northern England Project: Part 1. Wirral & West Lancashire



Bowden *et al.* (2008) Excavating past population structures by surname-based sampling: the genetic legacy of the Vikings in northwest England. *Molecular Biology and Evolution*, 25, 301-309

# Viking DNA in Northern England Project: Part 1. Wirral & West Lancashire





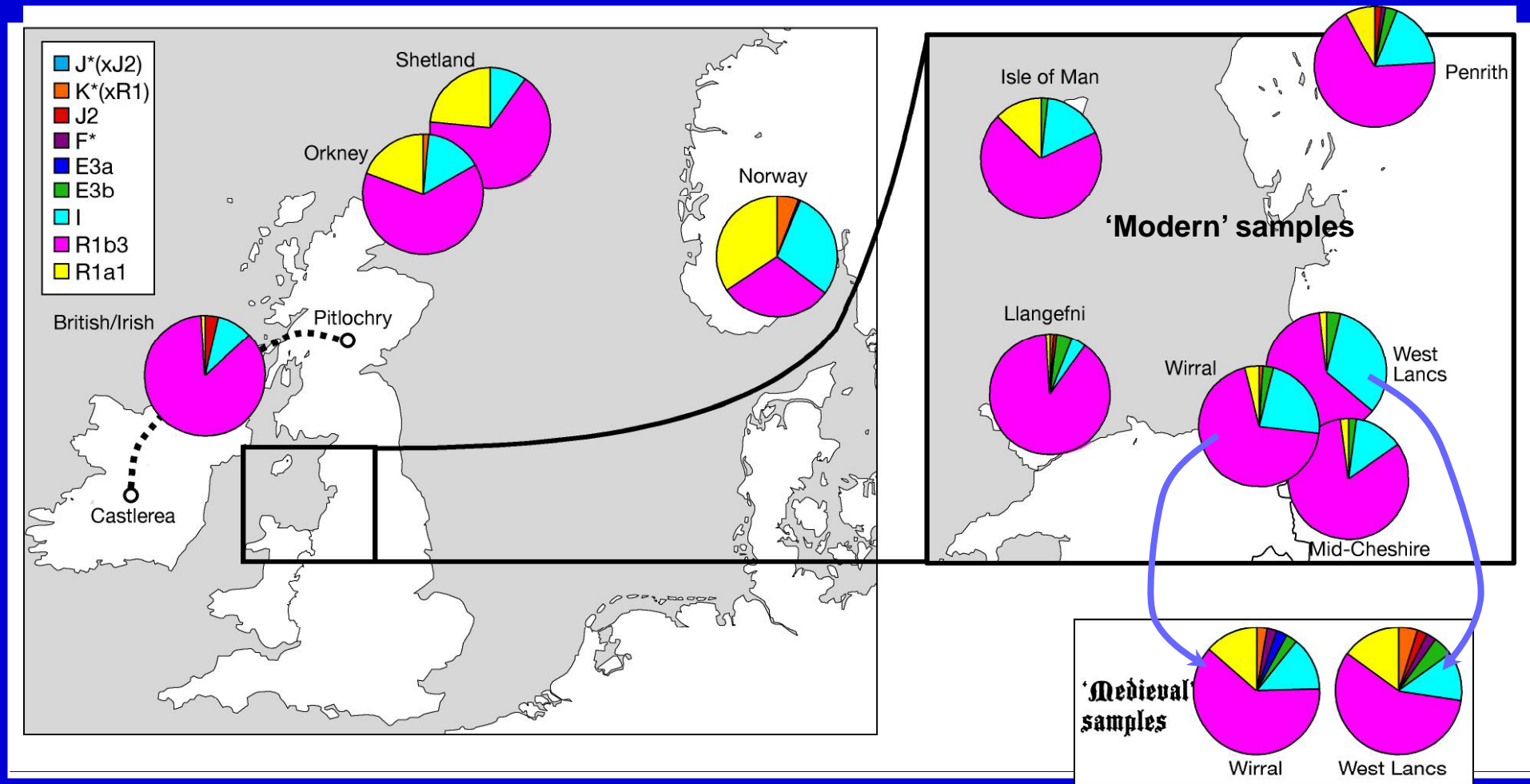
# Problem of large population movement following the “Industrial Revolution”

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So, we tested 2 population sets tested for Wirral and West Lancashire

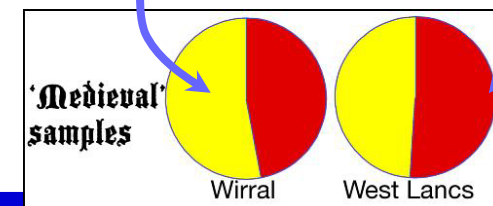
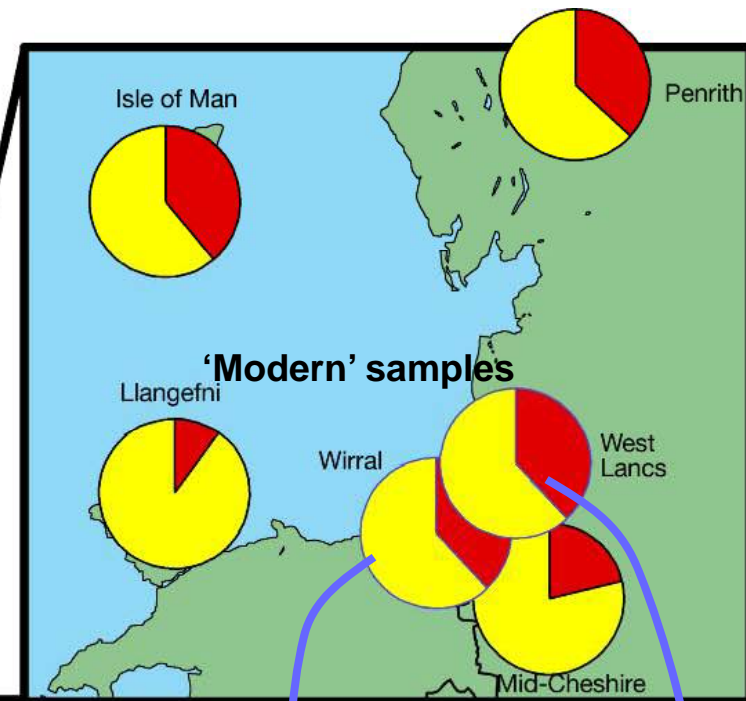
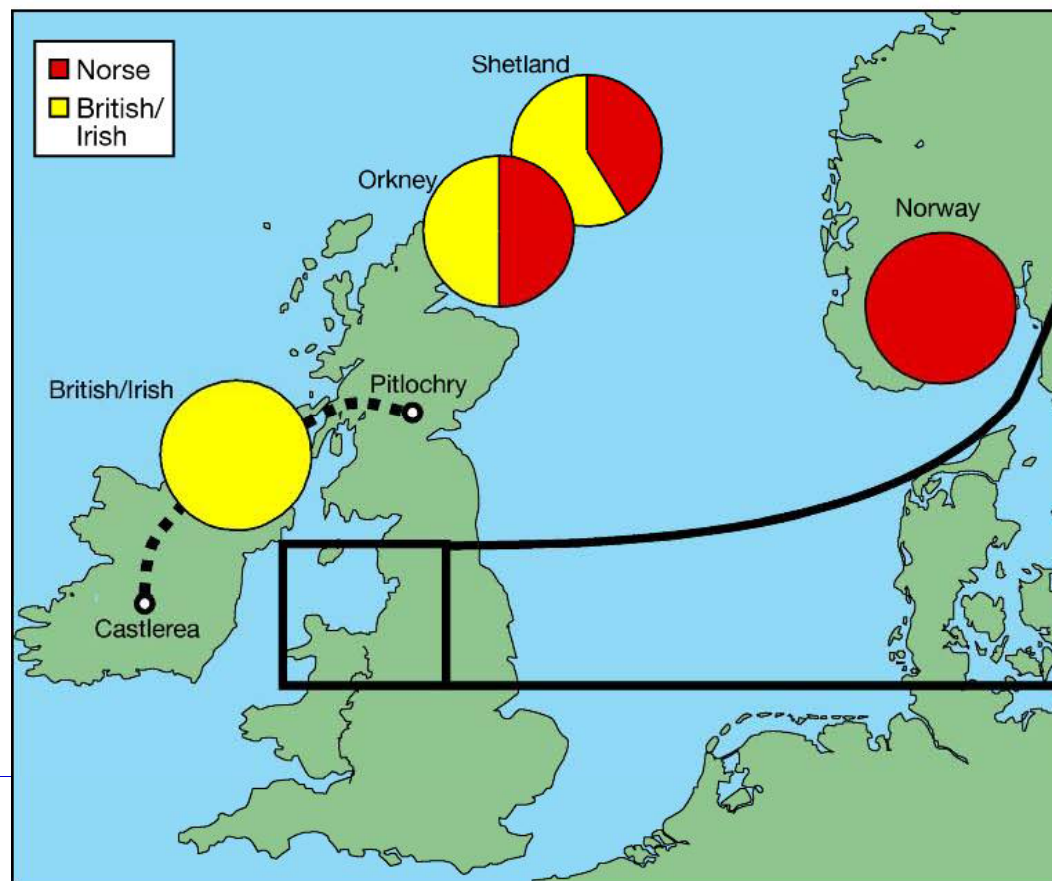
- “Modern” – men whose parental grandparents from that area
- “Medieval” – men whose parental grandparents from that area AND possessing a surname present in the area prior to 1600 (Medieval tax records, criminal proceedings, lists of people paying towards salaries of priests etc.)

# Y-chromosome distributions for NW England



**Note increase in R1a1!**

# Viking admixture results



◆ Increases in 'medieval' samples

~50% Norse ancestry

# Viking DNA in Northern England Project: Part 1. Wirral & West Lancashire

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*Mol. Biol. Evol.* 25(2):301–309. 2008  
doi:10.1093/molbev/msm255

## 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,\*<sup>1</sup> 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



# Viking DNA in Northern England Project: Part 1. Wirral & West Lancashire

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## Part 2: N. Lancashire, Cumbria and N. Yorks

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... nearly complete,  
results 2012  
> 1000 men tested



## ... includes “Old Norway” project

Norges største kystkulturfestival

# Skudefestivalen

SKUDENESHAVN 1. - 4. juli 2010 [www.skudefestivalen.no](http://www.skudefestivalen.no)

Karmøy Lokal      Avaldsnes

## Jakter på viking-gen



Forskertrioen Stephen Harding (t.v.), Turi King og Mark Jobling trenger hjelp av norske menn til DNA-undersøkelsen. Den kan fint gjen nomføres hjemme. En prøve av munnepiteceller fra innsiden av kinnet med denne pinnen er det som skal til. (Foto: Terje Størksen)

## ... includes “Old Norway” project

- DNA taken from 400 men with ancestry from one of 10 regions:

**4 Fjord: Møre (Tingvoll) , Sognefjord, Hardangerfjord, Ryfylkefjord**

**3 Inland: Namdalen, Gudbrandsdalen, Hedemark**

**3 Coastal: Trondheim, Bergen, Stavanger**

- Results will tell us about regional differences in “old Norway” – expected to be significant before the railways etc. were built

- And also provide improved Norwegian Viking control data for the North of England Project

- Results out in 2012





# Perspectives

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- Individual tests are interesting but you have to be careful.
- **More powerful on a population basis: The results confirm the belief that the coastal regions of North-West England were once heavily settled by Norse Vikings**
- Sampling strategy important in linking old genes with modern geography; surname method is very useful in Great Britain but only for male history

# Acknowledgements

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**Wellcome Trust**

**Mark Jobling, Turi King (Leicester)**

**Gurdeep Lall, Tina Baker**

**Berit Dupuy (Oslo), Judith Jesch (Nottingham)**

**Sigurd Aase & Harald Løvikk**

**All volunteers!**



# We can recommend....

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