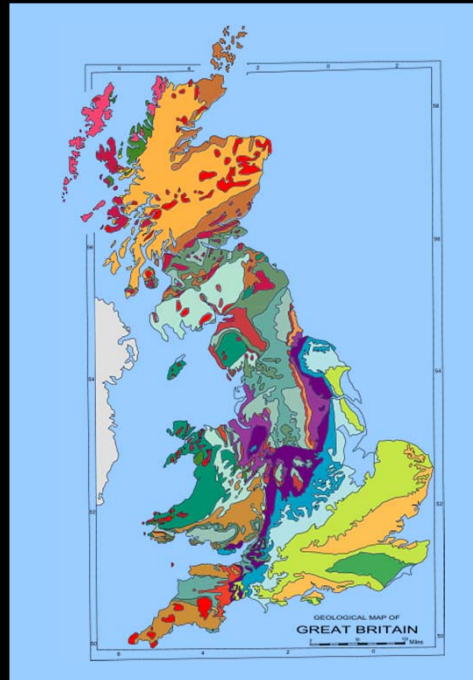


# A Geological History of Britain

Dr Liam Herringshaw  
[lgh865@hotmail.com](mailto:lgh865@hotmail.com)



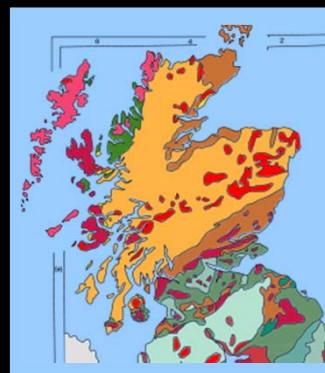
## Week 2

### 1. The Precambrian-Cambrian of Scotland

- Units & Distribution
- Environments
- Researchers & history

### 2. Case study - Assynt

### 3. Geo-nealogy

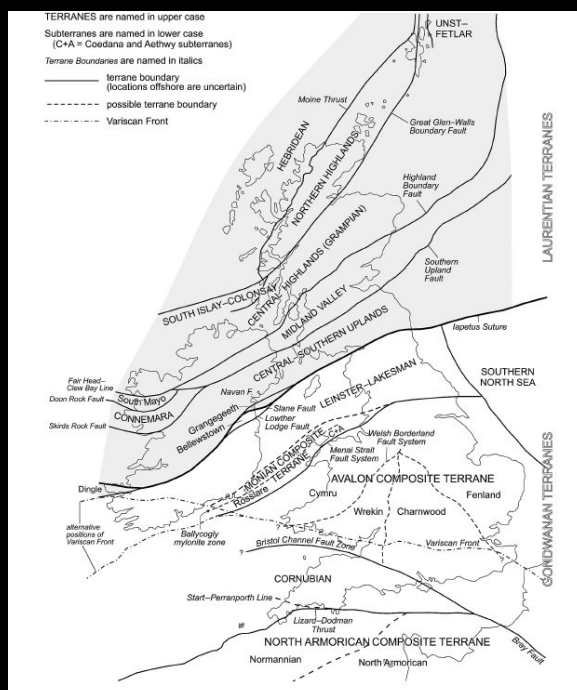


# North-South divide

A Pre-Devonian of two halves:

Scotland-northern Ireland = Laurentian

England, Wales, southern Ireland = Avalonian

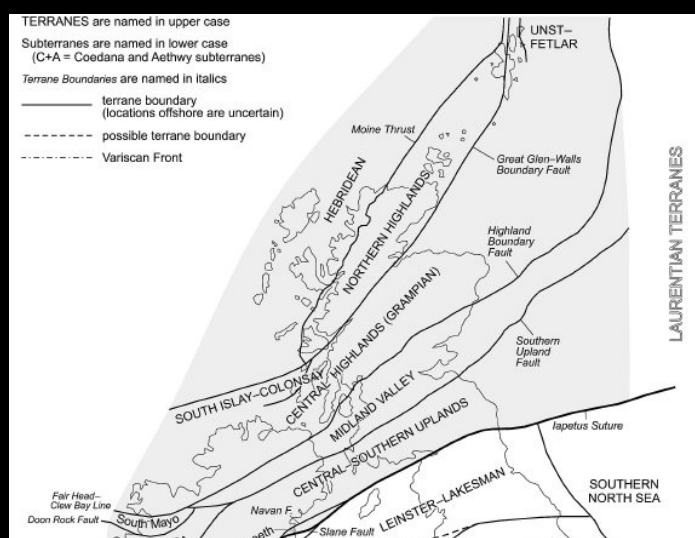


## Ancient Laurentian terranes

1. Hebridean terrane

2. Northern Highlands

3. Central Highlands (Grampian)



# The Oldest Rocks in the UK

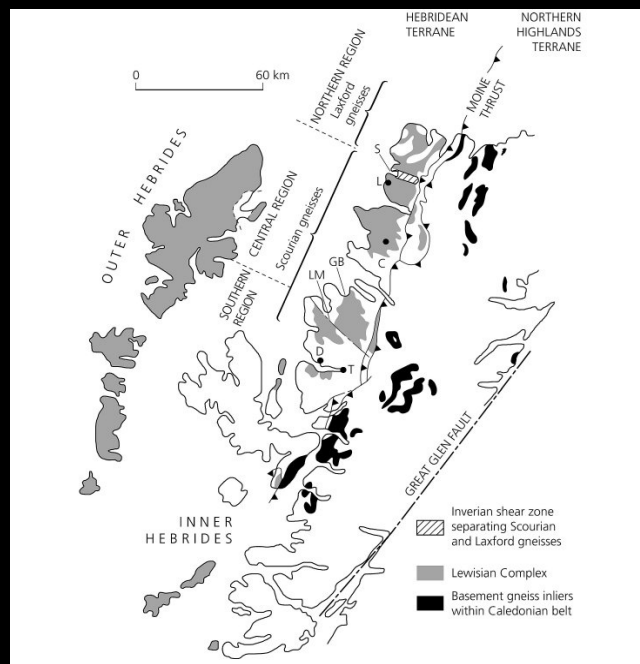


## 1a. The Lewisian Complex

Gneiss and complex!

3 regions:  
N, Central, S

2 main units:  
Scourian  
Laxfordian



## Scourian



## Scourie Dykes



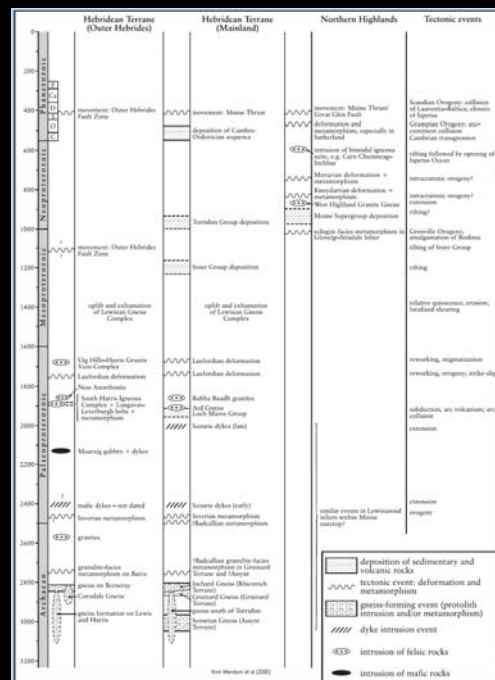
# Laxfordian



## The Lewisian Complex

Intensely metamorphosed  
Archaean-Proterozoic  
continental rocks

Oldest rocks ~3.0 Ga



## Above the Lewisian



Slioch, Loch Maree

## 1b. Torridonian



Stoer Group snowstorm, Clachtoll

What type of rocks were deposited  
in the Torridonian?

## The Torridonian

'Red beds' =  
River, lake and  
alluvial fan deposits

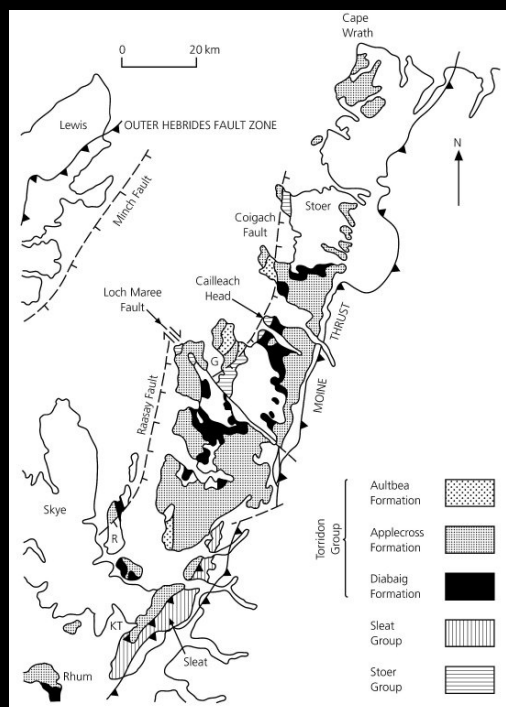
Stoer Group, Stoer, Sutherland



# The Torridonian

Oldest sedimentary rocks in the UK (~1100-900 Ma)

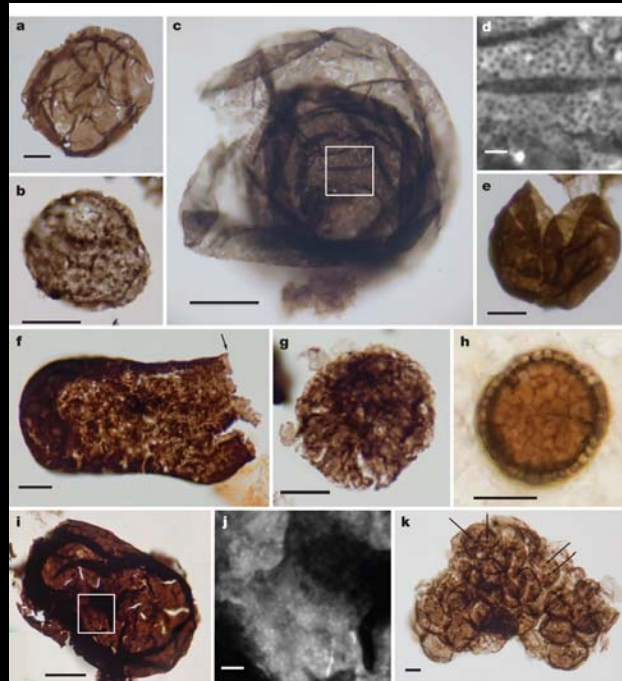
Weathering of North American continent



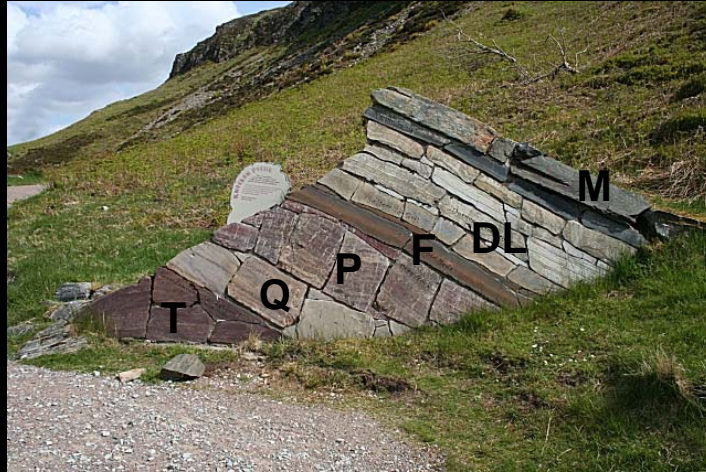
## Earth's earliest non-marine eukaryotes

Multicellular plankton living in lakes ~1 Ga

(Strother *et al.* 2011)



# Above the Torridonian



Stratigraphic sculpture, Knockan Crag

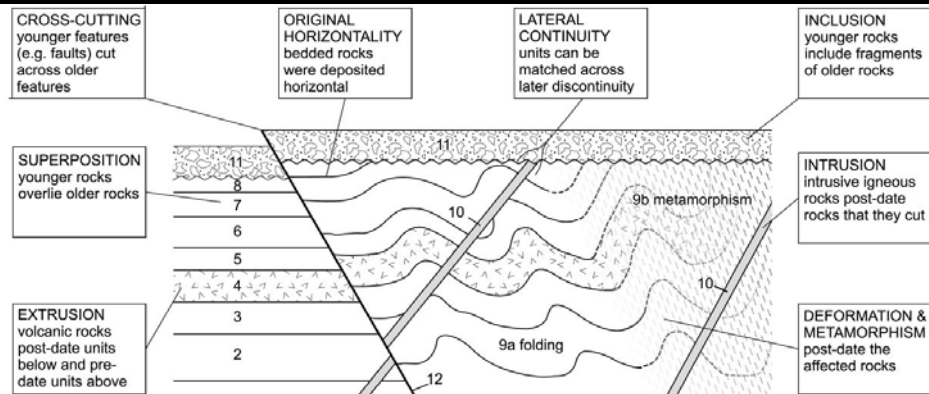
## The Highlands Controversy

*Constructing Geological Knowledge through  
Fieldwork in Nineteenth-Century Britain*



DAVID R. OLDROYD

# Stratigraphic principles



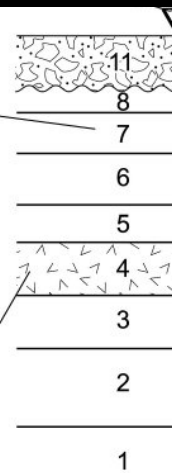
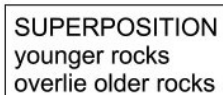
*Geological History of Britain and Ireland*, Second Edition. Edited by Nigel Woodcock and Rob Strachan.  
© 2012 Blackwell Publishing Ltd. Published 2012 by Blackwell Publishing Ltd.

**Fig. 1.1** Cross-section illustrating the rules of stratigraphy, which allow rock geometry to be translated into a sequence of events (numbered 1–12).

# Stratigraphic Controversy



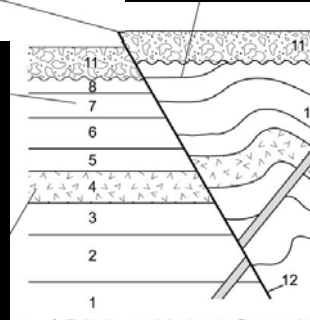
# Sir Roderick Impey Murchison



# Stratigraphic Controversy



CROSS-CUTTING  
younger features  
(e.g. faults) cut  
across older  
features

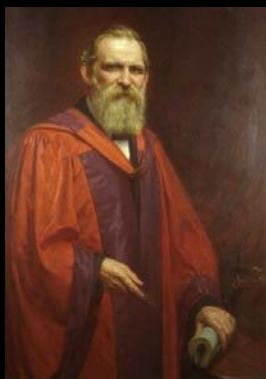


Prof. James Nicol:

Upper layers are schist

Beneath are sedimentary rocks

## Resolution



Prof. Charles Lapworth

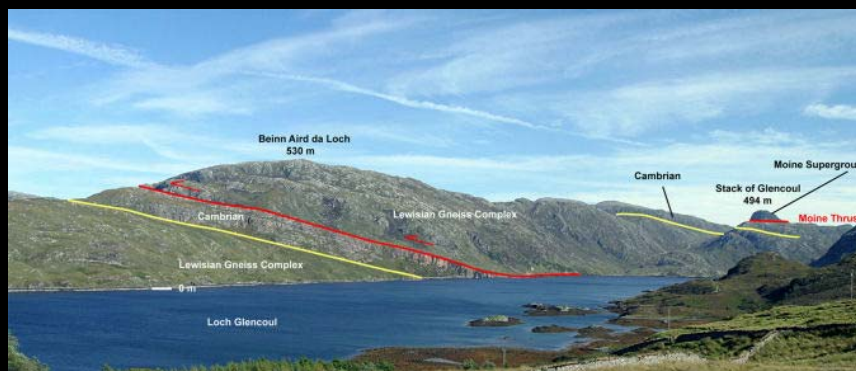
Mylonite + Alps + Southern Uplands

= The Moine Thrust

Q. How fast does a thrust fault move?

A. About a mylonite

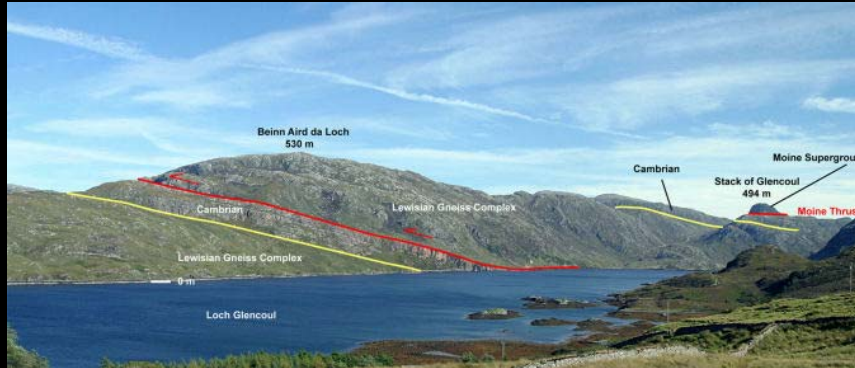
## The Secret of the Highlands



Thrusts = low angle 'reverse' faults

Older rocks shunted onto younger rocks  
under high pressure

# The Secret of the Highlands

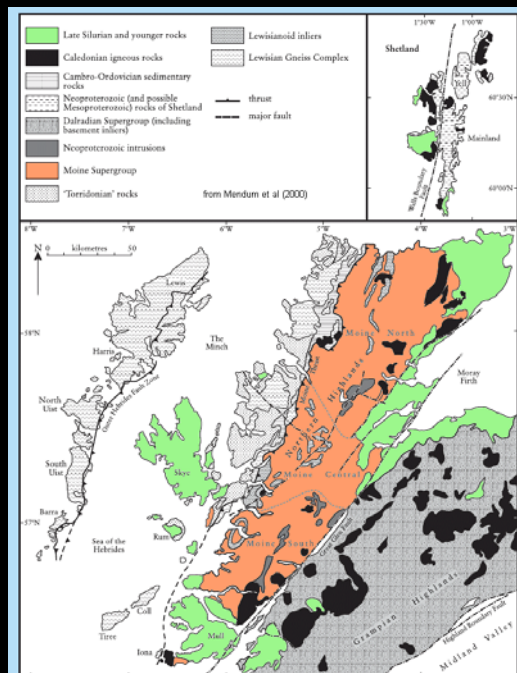


“Conceive a vast rolling and crushing mill of irresistible power... Shale, limestone, quartzite, granite and the most intractable gneisses crumple up like putty in the terrible grip of this Earth-engine”

## 1c. Moine Series

Northern Highlands Terrane

Marine meta-sedimentary rocks of ~Torridonian age



Moine Metasediments  
(Ross of Mull, NW Scotland)  
Photo Mark W Hounslow



## Moine Series

Well-cooked,  
well-  
compressed  
marine  
sands and  
muds

## Moine schists

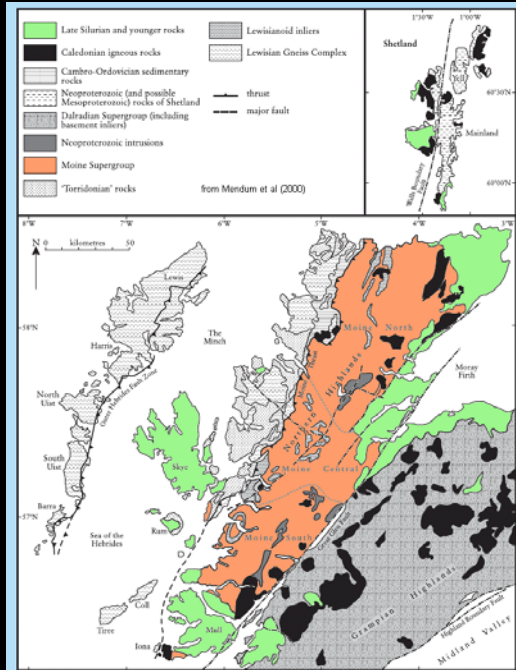


Loch Eilt, Glenfinnan

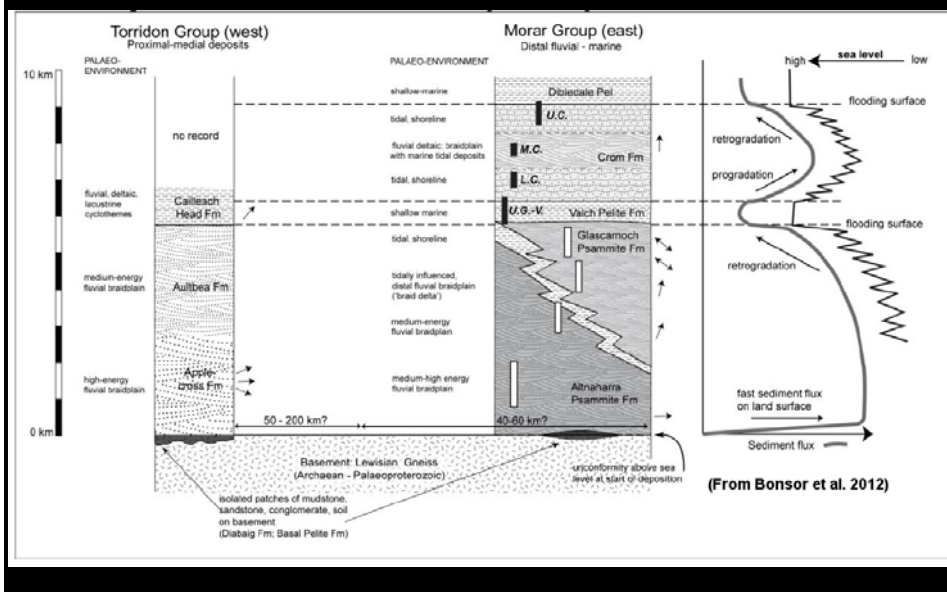
# Moine Series

Deposited 100s of km to east

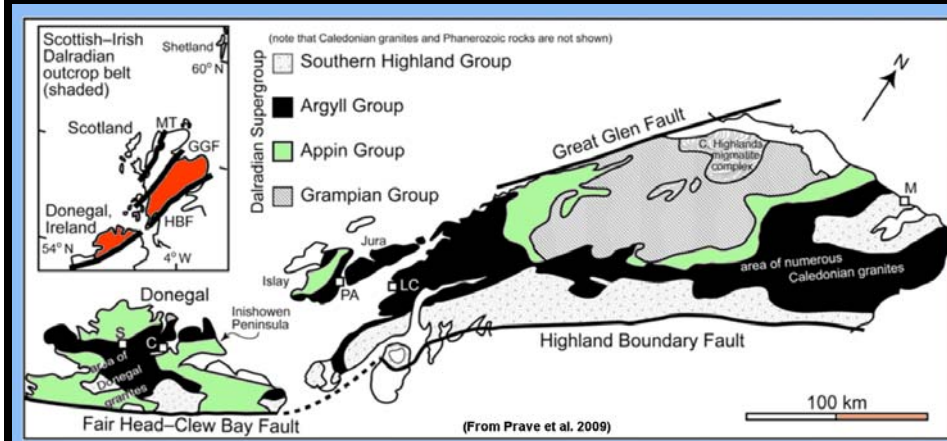
## Shunted west and metamorphosed during closure of Iapetus Ocean



# Torridon-Moine correlation



## 1d. The Dalradian

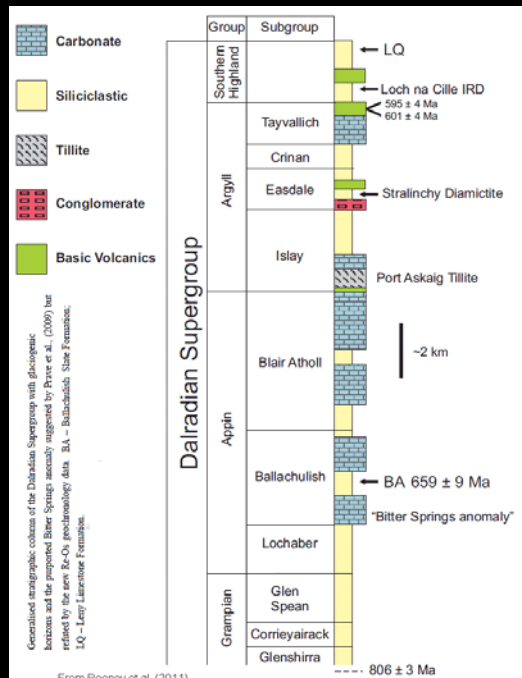


Central Highlands (Grampian)  
Terrane

## The Dalradian

Sedimentary +  
igneous; Late  
Precambrian-early  
Cambrian age

4 groups:  
Grampian  
Appin  
Argyll  
Southern Highland



## Dalradian – Argyll Gp

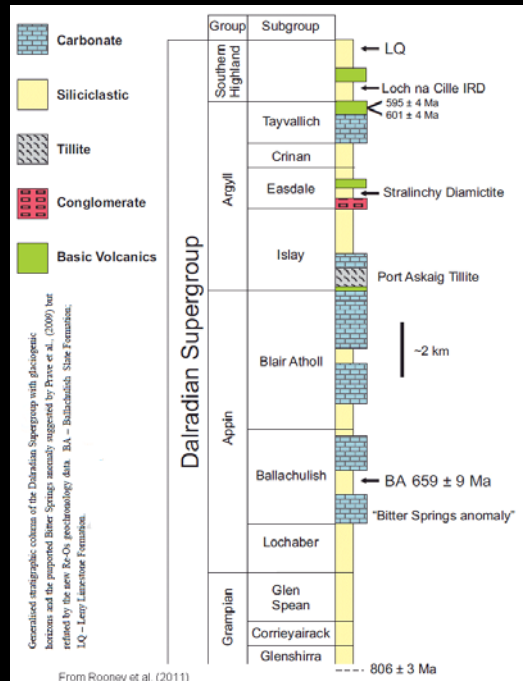
Metamorphosed sandstones, Jura

## Snowball Scotland?

Port Askaig tillite

# The Dalradian

Also shunted west /  
metamorphosed  
during closure of  
Iapetus Ocean

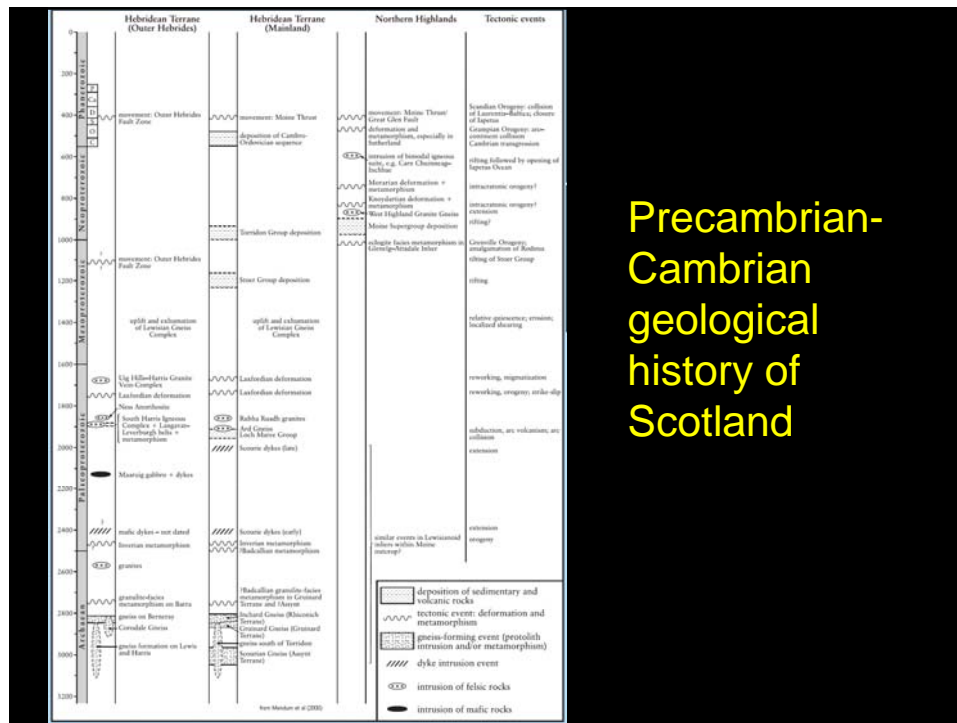


## 2. Case study: Assynt

Lewisian  
Torridonian  
(Moine)  
Cambrian

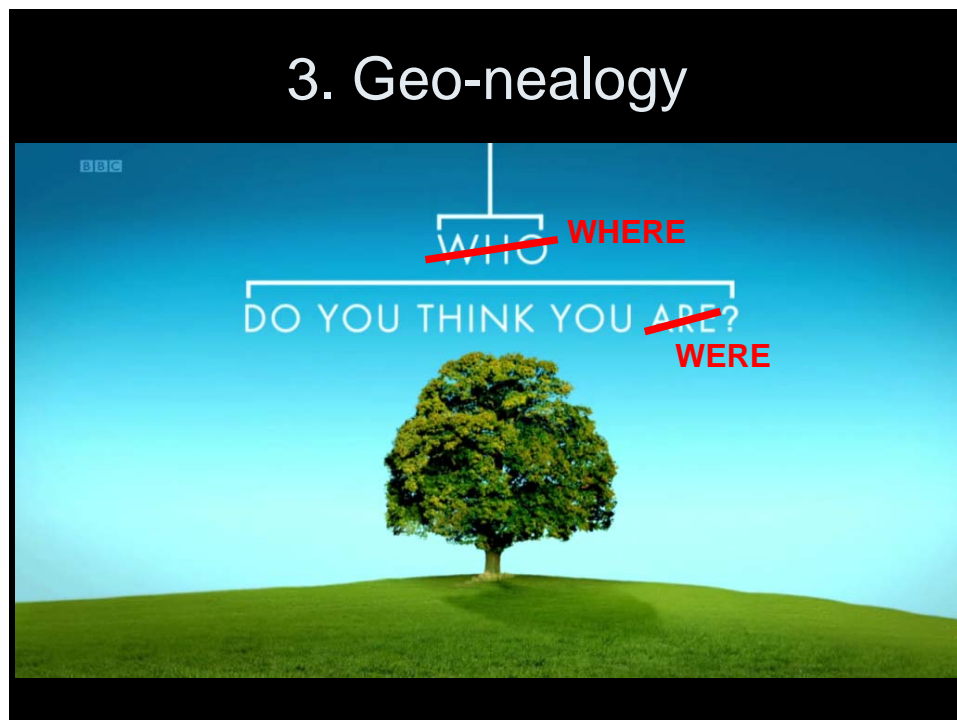
Cambrian 'Pipe Rock', Skiag Bridge





## Precambrian-Cambrian geological history of Scotland

## 3. Geo-nealogy



## Next week

South of Iapetus: The Precambrian-Cambrian of England & Wales

Q. Where and what is the Gwna Melange?

## Links

Geological Society: Lewisian, Torridonian and Moine:

<http://www.geolsoc.org.uk/page10473.html>

Geological Society: Dalradian

<http://www.geolsoc.org.uk/page10472.html>

Assynt geology (Leeds University):

<http://www.see.leeds.ac.uk/structure/assyntgeology/index.htm>