Geological structures exposed.
A history of movement

Nigel:
Well these rocks below us, they look like quartzites.

John:
Yes, the whole of this hillside is a dip slope of quartzite but it's sloping down towards us, towards the road. And then the remainder of the Cambrian and Ordovician succession is exposed in these crags that we're walking along. And at the top we have the light coloured, creamy coloured material which is the Durness Limestone.

Nigel:
Okay, so that means we're walking up the Cambro-Ordovician succession?

John:
Yes.

Nigel:
And we wait and see what happens next. And this looks like something completely different from what we've seen so far.

John:
Well we've certainly got two very obviously different coloured rocks; below we have the creamy white material of the Durness Limestone, and then above it a much darker grey coloured rock, and the contact between the two is an extremely sharp, almost knife-edge line that we can trace along through the crags there. So what do you reckon to this material above?

Nigel:
Well it's certainly grey, it looks rather like the Moines that we've seen before.

John:
It is the Moines, these are Moines above and Durness Limestone below, so we've got the classic older over younger relationship of a thrust fault, and what we're looking at is the Moine Thrust, the Moine Thrust being the thrust that brings Moine rocks over the top of younger. And the line that we've got here, this very sharp contact line, that suggests that the movement on that plane was frictional sliding, we had a brittle phase of movement.

Nigel:
Well with such a brittle movement you might expect there to be some sort of deformation going on in rocks immediately underneath it.

John:
You certainly would, you'd expect those rocks below to be brecciated and these certainly are. It's perhaps not very obvious in that out rock, but all of this fracturing, the slight changes in colours that we see, all that's indicative of brecciation of the limestone material below the thrust plane. Let's walk along and follow this contact for a little way and see what other features we can find as we go along it. And what we can see here a bit more clearly because this water has conveniently washed it a bit for us is some of the structure within the Moine Rocks and we can see, in fact, that there is a lot of structure there to be seen. And we can see that there is a strong planar fabric to these rocks. If we look carefully we can see that the grains, the individual quartz grains within these Moine rocks, have been stretched out dramatically, and we have these really long, elongated ribbon grains, and I think even at the outcrop scale we'd be justified in calling these Myelenites. So we've got good evidence here

that these rocks during their passage along the thrust plane have not only been affected by brittle frictional sliding, there must also have been a period of time when their deformation was much more ductile, when the grains were able to streak out and produce these Myelenites.

Nigel:
Well presumably the ductile features were imposed earlier when the rocks were deeper and hotter in the Earth's crust, and then the brittle features that we've seen here and at the last outcrop they were superimposed on these early ductile features.

John:
Yes, we're seeing some elements of the history of the movement on this major thrust plane, because these rocks had to have been at a higher temperature in order to deform in this way to give rise to the Myelenites. But later in the evolution of that Moine Thrust, when the rocks were the nearest the surface towards the end of their carriage on the thrust, they were deforming by brittle fracturing processes and they were finally emplaced here on top of the limestones by friction sliding. But that is just one last element in a much longer story in getting them displaced tens of kilometres from over in the east.