Rocks in the field

Rock successions

GLYNDA:
Lets wander over a succession of rocks as we might find them in the field and make some general observations about the different types we come across.

TONY:
Looking at this structure here I've got two very pronounced sets of joints that I can see. The dominant set running down the centre produces almost a channel in the middle of this structure and perpendicular to those on the edge of the structure I've got a number of these joints that are running across the body. If I look at this rock in hand specimen, it's crystalline, it's non-foliated which suggests to me I'm dealing with an igneous rock, it's quite dark in colour, it's got a high mafic content and that would suggest it's basaltic in type. But I'd need a thin section to be absolutely sure. It does give me a clue though to the origin of these joints, they are almost certainly cooling joints developed within the magma.

To imagine what we're seeing here lets think of a wall that extending a couple of kilometres out into the sea and a couple of kilometres into the land. It's a dyke, an igneous intrusion has been injected into the crust as a linear feature discordant with the bedding on either side of it. In addition to being able to identify it as an igneous rock we can also tell something of the age relationship. For the igneous rock to inject into the crust the sediments must be there and therefore this dyke has to be younger than the rocks into which it's intruded.¬

GLYNDA:
Now lets look at the rocks into which the dyke was intruded. They're eroded by the sea but you can still get a sense of bedding. The top most unit is a very coarse sandstone with angular grains of quartz, some of which are up to a centimetre in diameter. Beneath that a coarse sandstone and beneath that a finer sandstone. At the very base is a fine grained siltstone. We often find sandstones of varying grain size and siltstones interbedded indicating changes in depositional environments.

TONY:
Look at the junction at the base of the coarse sandstone. The erosive nature of this junction is shown by the way that the base of the sandstone cuts down though the underlying layers. Whereas in the conglomerate we inferred a channel deposit, here we can actually see the channel it'self.

GLYNDA:
Nearby we find a few more rock types. Notice the bedding a clue that we're still dealing with sedimentary rocks. Lets look for some other clues.

TONY:
These rocks are clearly very well bedded. But the problem I'm having here is that they are extremely weathered on the surface and I'm finding it difficult to identify exactly what these rocks are. The only thing I can do is to try and get a fresh surface and there's only one way I can do that. Well this is now a beautiful grey fresh surface, it's glinting
with skeletal material showing. I think there is a very obvious test I can do here. I'm going to use acid to see if there's a reaction and .. .oh yeah, it's fizzing like fury, oh this is a limestone without any doubt.

GLYDNA:

Sometimes the relationship between two lithologies is very instructive. Here for example is a sandstone overlain by a black rock which I'm sure you'll easily recognise -it's a coal -ironically preserved because of the sea wall which has been built over the top of it. Coals typically form as an accumulation of plant material. In the underlying sandstone we have evidence of plant rootlets. And the sandstone is rich in organic matter which ends
up as black carbonaceous material. Within the space of two hundred metres we've seen a sandstone, a siltstone, a limestone bed and a coal. A fascinating succession of different depositional environments.

TONY:
Clearly for the most part these sediments were deposited on land, the coals, the sandstones with their channel structures and rootlet beds all support this idea. But the limestone contains fossils that indicate it was marine.To put these two ideas together one plausible hypothesis is that we're dealing with a delta
which was occasionally inundated by the sea.

GLYNDA:
Then 200 million years later, igneous activity and the vertical intrusion of a dike and if we glance behind at the huge cliffs of Fair Head, we can see the horizontal intrusion of a rather large sill.

TONY:
So clearly working in the field is very good, we can get a lot of experience from actually examining rocks, not just in terms of describing them, but more importantly in terms being able to identify field relationships between one rock and other rocks in the sequence. It's all part of what we geologists refer to as "getting your eye in".