

Surveying Methodology

Each field trip that you undertake will be different, and work activities should be expected to change according to need and objectives. However the same basic processes ought to be considered to ensure that you are working through the steps needed to produce useful and long lasting data on a field slip. This method of working should ensure that you are efficient in the use of your time and energy, and provide you with the confidence to know that you are working scientifically and thoughtfully, and not just reproducing somebody else's thoughts.

All geology is about the art of collecting meagre data from a variety of sources, and producing a range of theories as to how they all fit together to make a plausible conclusion [s]. The key is to find a 'sampling' sequence which provides enough data, in the time available, to generate a provable picture of the ground which can be used to represent a wider area of the terrain.

There will always be uncertainty, but by making each new observation you are gradually reducing the guesswork element, so long as you are methodical. But you have to be strictly honest with yourself, record what you see, and not what you want [have been told] to see. And actually the key is just to be open to the possibilities of seeing, and have a method of recording it, so that others can interpret your observations. If you do that, surveying is relatively straightforward.

So, it is wise to use a checklist approach to ensure that you are not forgetting important tasks and readings at each opportunity, otherwise you will get back home and will have forgotten to record a key bit of data that you had observed. The following method is based upon carrying out tasks which inform you so that your mind [which is multitasking] can prepare itself for the next activity and interpretation. If your observations don't make sense in the field, don't worry, so long as you record what you actually see then it will be the truth. If you change what you see in the field according to what you know somebody else has written about it then you are in some danger of just losing the plot.

There are various phases to a survey, and we would expect to visit some of the locations several times to get more detail, but in the first phase 'reconnaissance' the objective is to find the exposures and get the 'lie of the land', making preliminary conclusions on the way.

So, to be methodical here are the main steps which you can embroider upon:

For Reconnaissance surveys :

Preparation:

Use all sources of information available to you to prepare for what you might be expected to interpret. Remember you will need to form an idea of the landscape, accessibility, parking, safety, communication with others especially if working in a team.

You also need to prepare yourself , your knowledge and skills, so rehearse ; rock type identification and description , recognising potential facies types and likely fossils, drawing skills , a little rehearsal goes a very long way, using books such as Coe, and Stow.

The use of google earth is very helpful in forming an mental layout of the terrain and assessing the physiography which is resulting from the geology. It is not full-proof, but it helps a lot. If you can achieve some stereoscopic vision then this too will be very helpful.

Prepare topographic [navigation] maps, identify some potential traverses [A,B and C] usually to cut across the likely lithologies; bearing mind the most likely places that you might see some exposures safely and quickly.

Prepare notebook/ traverse sheets and field slips, so that cross referencing is easy, and note taking is as simple as possible. Things can get a bit messy in the field so organisation is important, therefore keep it all as simple as possible. If there will be two people it can be helpful to allocate tasks so keep each individuals work load as simple as possible. It is worth agreeing at the preparation stage because it will simplify equipment needs and clarify roles.

Read previous works, get an idea what others have seen before, quite often the earliest geologists were using their eyes and senses [in the same way that you will] looking for clearly mappable units, and looking for facies based upon sediment patterns and some simple field palaeontology. Later work, including BGS maps are not always right, and they do suffer from 'professional' reworking of ideas which are often more obscure and not quite so obvious in the field*.

Set up on the day: Prepare according to the checklist of equipment, weather forecast, people, communications, car arrangements, food, safety and tools.

As you approach the area, you are now looking at the physiography, potential exposure types, soil colour seen along the roadsides, difficulty of the terrain and weather. You may need to adjust your plans accordingly.

At the starting point: Agree a strategy [even with yourself], appropriate to the day.

In field - your objective is to see as much as possible in a given time period, there is no point in stretching yourself too much either physically or temporally. Sometimes you can run over the ground in the car [some traverses are just done in the car with the occasional stop] to get the feel of the land and the number and quality of exposures that might exist.

Before you get going, stand back and look around, take it in, if you are on high ground use binoculars, assess the valleys, are they flat... you can already mark in the alluvium if they are. Look for exposures and field grain [hummocky or smooth, colour of soil, shapes, shadows etc] You have started to map.

Observations and Records

90% of your geological observations will be geomorphological. That is to say you will rarely see the rocks, this is quite normal. Then when you do see the rocks they will rarely be well exposed, often being just scuff marks on the road side or track, generally at the change of slope or direction; streams, overgrown diggings etc.

You are looking to classify the material, and as a result come to some form of conclusion about the facies seen. This is the only method you can use to observe with your own eyes the type of rock present. The types of names that are given to rock formations are not imprinted on the rock, and actually neither is it a permanent feature, it is merely a convenient re-interpretation later, but what you can see is what you will record. Always use a method to attempt to cover all the pertinent points, and so have a copy of the SPLADLOR checklist in your notebook.

You are looking initially for evidence of the relative hard rocks versus soft rocks, these will be evident as shapes in the ground, often very subtle, but it is all there. It shows up as features, shapes, drainage patterns degree of slope etc, even where you do not see the rocks you can mark these features [called feature mapping based upon mappable units**]. This is all crucial evidence, a non exposure is evidence often concealing smoothed [soft?] rocks, which are much more likely to be seen than the relative hard rocks. Alternatively the smoothing might be the effect of quaternary infill, either way it is useful.

Man made features, imported material and oddities of all sorts are commonplace, you can still note it down, basalt or concrete on a farm track are just as likely as the country rock, but note it down this is evidence which shows that whatever else you find might not be trustworthy either.

Alternatively trust the shapes of the landscape, they do closely reflect what is underneath if you only knew what it is ! The rock head has been formed perhaps over the last 40-20 Million Years , and then modified and buried in the Quaternary era, primarily by water and freeze thaw action. This has 'sandpapered' the rock surface, smoothing it over differentially, picking out areas of weakness and strength. But the evidence is all there, everywhere, it's just a question of looking at it.

All your observations will need corroboration eventually, two points to link up are better than one, you will make plenty of mistakes, and that is absolutely fine, it's a difficult environment to work in, but if you have the data and observations the errors even themselves out.

Take all measurements twice, and check for sense [strike lines and dips etc] once you have walked away you won't remember, take a photo as an aid memoir. If you don't write it all down on either your map or notebook at the time of the observation, then it simply does not exist, you have lost it.

As you move along, it is worth reviewing your original objectives and opening hypothesis, it may force a change of direction.

Uncertainty and a lack of confidence are the main barriers to field work, both are real responses to the reality which is that there is very little to go on, but as you survey your confidence will certainly grow, and the more observations you make the less uncertain the picture becomes.

At the end of your survey day, don't just drive off, summarise what you saw, what went well, and what did not, what remains uncertain or mistakes, list the questions and problems remaining. Suggest possible places that need to be visited in a follow up, check potential access and parking. .in other words start to prepare for a future visit.

Post survey assessment and write up

The survey is not the end of the process, that is just the data gathering stage, if you stop there then the data will be of little value. Very quickly after the survey you will need to ink up your notes on the field slip. Remember that a field slip is not a fair copy, but a record of the raw data, it might be coloured in a bit to show established facts.

Write up your field notes clearly so that somebody else could follow them. Check locations, GR's show locality numbers , print off a contact print of any photo's and cross reference all of that to the Field Slip reference number.

Having done all of that, you will have found some errors, some questions and probably been able to see some form of pattern emerging. You could place your ideas on a cross section or just as part of the field notes.

Problems and snags, places to return to and other notes all need to be compiled together ready for next time, or another surveyor, the whole package forms part of the survey documentation.

You might at this stage be in a position to start to interpret the field slip to generate the fair copy, which is your first attempt a drawing something that looks like a geological map. You do not do this on the field slip. This may involve drawing up cross sections, a possible geological column or sedimentological log [see Sedlog] coloured index of facies used and calculate some thicknesses.

For each day that you delay undertaking the write up , which is so very easy to do, then you will lose 25% of the impetus and detail. Within 4 days of the survey it is certain that you will not finish off this stage, and your work will be much less valuable as a result. If you have brought back samples, without marking them clearly and cross referencing them then probably they are just worth incorporating into your rock garden after 5 days.

The scientific method of surveying is thus a simple process of methodically sampling and seeing without bias , adjusting to what you find, and writing all of it down so that you or others can check it and interpret later. Uncertainty is part of the process, you can't survey all of it, but there is no need to so long as you follow a method.

References

Coe. A [Ed.] 2010 Geological Field Techniques, Wiley-Blackwell

Stow D V 2012 Sedimentary Rocks in the Field , Manson Publishing

Sedlog – Freely available software to generate lithological logs. [seems not to work on W8]

Notes

*'Professional reworking' refers to the later review process which seeks to identify the sequence of stratigraphy, the environmental interpretation and the need to comply with international rules of stratigraphic nomenclature. All of that is a secondary or tertiary result built upon primary [your] observations.

** Mappable units , are those features that you can readily see, and provide reliable indicators of rock type across a wide enough area. These may include hard rock bands, soft rock, seepages, etc all of which might produce a geomorphological signature such as landslip tendencies, colour in soil, ridges, hollows and a lot more.