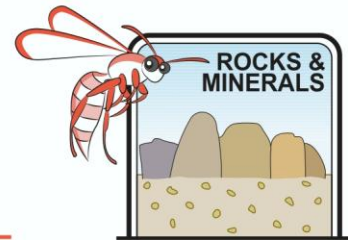


## Sedimentary Sandwiches – Teacher Notes



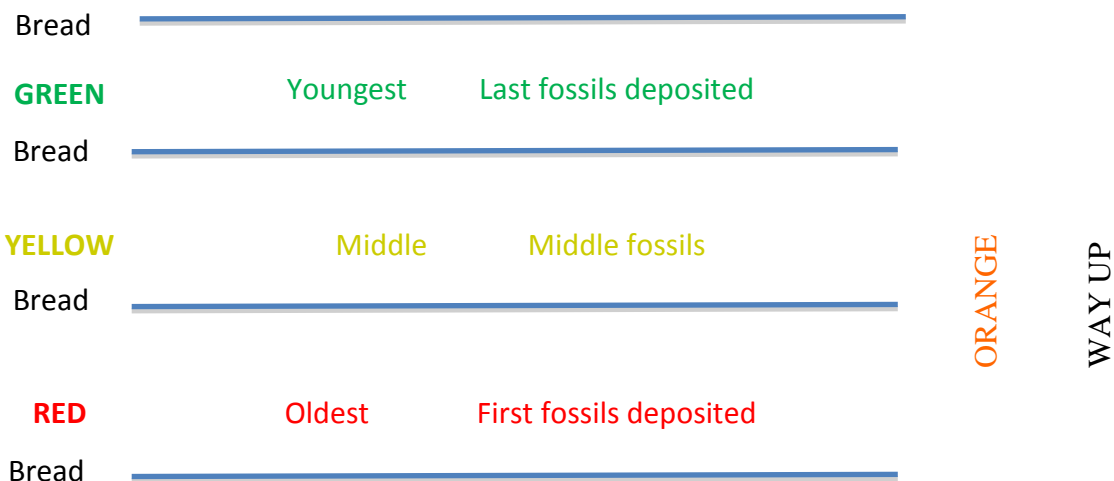
It can be critical to know which way up your rocks lie. We assume that they were originally deposited as flat lying beds (The Principle of Original Horizontality). Later they may have been faulted, folded or even overturned. Under pressure at depth, rocks fold like plasticine. If you wish to drill down to a gold bearing bed or an oil bearing bed you need to know which **“WAY UP”** your sediments lie or you could be drilling (very expensively) in the wrong direction.

How would graded bedding tell you **“WAY UP”**? **The larger grains lie below the finer grains. Beds decrease in grain size towards the top.**

Some fossils can also indicate age. These are known as ***index fossils***. Index fossils are useful if:

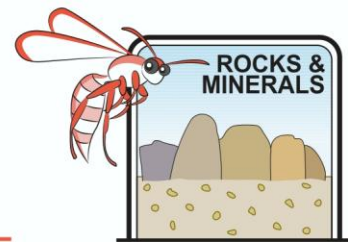
- They existed for a short period of time.
- They existed over a wide geographic range.

By matching up these index fossils across the country you can find rocks of similar ages and work out quickly if your rock sequence is the right **“WAY UP”**. In this activity slices of bread will be used as layers or beds of sediment and thin cross slices of red snake indicate the oldest index fossil, yellow slices the middle fossils and green the youngest. The orange fossils can be found at any level as they are not index fossils.



Materials per student or group

- Four slices of bread with the crusts removed (ask the school canteen or local supermarket for old sliced loaves). One loaf is usually enough for five sedimentary piles. Crusts impair compaction.
- Scissors
- Three thin slices of green, red and yellow snake and 9 orange (1 packet should do for 1 class). Excitable classes may need the cut snake sections prepared earlier. Scissors work better than knives. These colourful slices represent fossils.
- 1 plastic sandwich bag

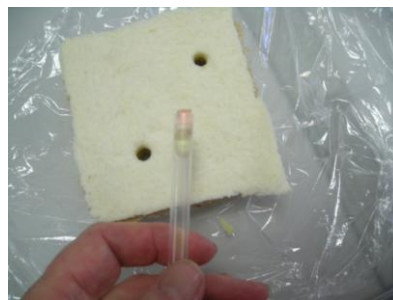


## Sedimentary Sandwiches – Teacher Notes

- 1 drinking straw. These will drill through the sedimentary sandwiches/beds to see if they hit target and tell which way is up. Some fast food venues have great transparent drinking straws.
- Old newspaper to cover bench or table

***I have found it easier to direct students step by step through this exercise.***

1. Lay a sheet of newspaper onto the bench
2. Direct the students to slice the snakes so that you have 3 slices of 3 different colours (index fossils) and 9 orange slices (fossils which do not indicate any specific age).
3. Place the first layer of sediment (slice of bread) onto the newspaper
4. Place three red “fossils” on the bread and add three orange ones. This is the oldest bed.
5. Cover with another slice of bread/layer of sediment
6. Place three yellow “fossils” on this slice and add 3 orange ones. This is the middle bed.
7. Cover with a slice of bread/layer of sediment
8. Place 3 red “fossils” on this slice along with any orange ones that remain
9. Cover with a slice of bread/layer of sediment
10. Since sediment needs to be cemented and compacted before it becomes rock, students should slip the pile into the sandwich bag, without sealing it and then sit on it for a count of twenty.
11. Then pick up the bag and turn it in your hands several times until they cannot remember which is the correct way up
12. Pass this bag on to another group without speaking
13. Students collect their new bag and gently slip the pile of bread/sediment onto their newspaper. The sedimentary pile cannot be moved after this.
14. They will be using the straw to drill down into the pile to see if you can find any fossils and work out way up



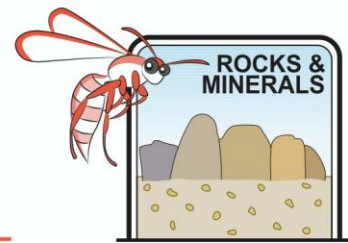
Each drill hole will cost you half a million dollars. You only have a budget of three million dollars.

You should consider these ideas before you start:

What does finding an orange fossil tell you? Nothing. They are not index fossils

What does finding a yellow fossil tell you? Nothing. They are in the middle of the pile

## Sedimentary Sandwiches – Teacher Notes



If gold is found in the beds with the green fossils will you have a short way to drill or a long way? That depends on which way up the sedimentary pile lies

Before we think of drilling, which is expensive, we use geophysics or remote sensing to guess what might lie below the surface. Without moving your sedimentary pile, run your fingers gently over the surface. Are there any clues which might help you to site your drill holes? Some students might feel bumps which indicate fossils below the top layer.

Have a good look at your sedimentary pile. Can you see any indications of which way up it lies? Some students might see fossils pushed to the edge during compaction. If the chairs students compressed the sandwiches on have a pattern, then the bread with an impression of that pattern might indicate the base of the pile.

Decide whether to concentrate drilling over any indications in a square grid or radiate outwards. These are questions that exploration geologists, geochemists and geophysicists have to consider.

Drill core in the straw can be removed by squeezing or gentle blowing

15. Drill your first three holes. How many holes did you have to drill until you knew “Way Up”.