



Part A. Simulating Regional Metamorphism in Orogeny

Materials:

- Different colors of playdough or modeling clay
- Waxed paper
- 3 books

Activity:

1. Roll pea sized pieces of modeling clay and place them adjacent to each other on a strip of wax paper.
2. Place a second sheet of wax paper on modeling clay balls.
3. Place books onto wax paper.
4. Record observations of the clay after removing the books.

Materials:

- plasticine or modeling clay
- large brick

Activity:

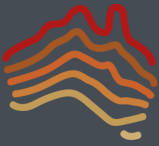
1. Place frozen balls of plasticine on a table (between sheets of waxed paper)
2. Set a large brick on top of them.
3. Record what happens as they warm to room temperature.

Discuss how these activities relate to metamorphic rock. This may be a good time to observe the foliation of gneiss.

Part B. Simulating Contact Metamorphism

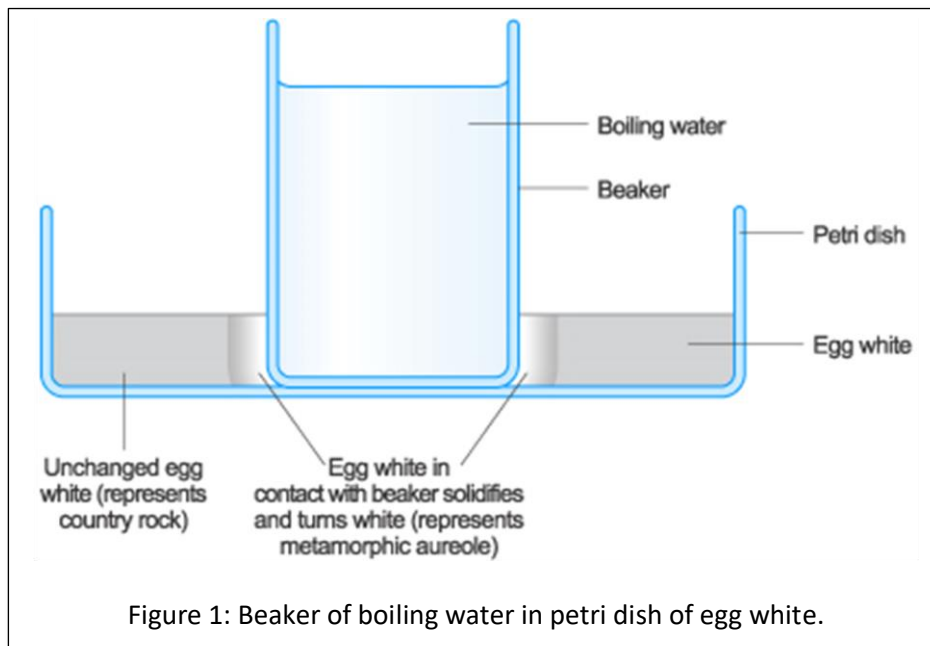
Materials:

- Shallow transparent dish (a plastic Petri dish is ideal)
- 100 mL beaker
- Hot plate OR Bunsen burner, tripod, gauze and heatproof mat
- Spatula or paddle-pop stick
- Cloth for handling the hot beaker
- 1 raw egg white
- Salt (sodium chloride)



Activity:

1. Place the white of an egg in a Petri dish.
2. Add approximately 50 mL of water to the beaker and 2 spatulas of salt to the water (to increase boiling point) and bring the water to a boil on the hot plate.
3. Turn off the heat and carefully remove the beaker from the heat, placing it in the centre of the egg white in the Petri dish as shown in Figure 1.



4. Leave for 10 minutes and record observations.

You should be able to see that a thin layer of egg white in contact with the beaker has ‘cooked’ and changed texture, i.e. it has become white and rubbery.

The beaker of water represents an **igneous intrusion**, the cooked egg white represents the **metamorphic aureole** and the unchanged egg white models unchanged **country rock**. The igneous intrusion is, of course, always hotter than the country rock.

This simulation can then lead into a discussion about how contact with extreme heat can alter the texture of existing rocks.

At this point some examples of **contact metamorphic rocks**, such as marble or quartzite, are useful to show to students.



Part C. Making Slate

Materials:

- Box of used matchsticks OR some short lengths of spaghetti
- Two rulers (appx. 30 cm)

Activity:

1. Pour used matchsticks or short pieces of spaghetti onto the bench, so that they lie in all directions.
2. Take two rulers and place one on either side of the matchsticks and push them together, trapping the matchsticks and forcing them to line up parallel to the moving rulers.

The matchsticks represent the microscopic, flaky clay minerals in mudstone or shale.

Step 2 simulates the formation of slate, where the tiny, flaky clay minerals in a mudstone or shale are realigned at right angles to the lateral forces. Such forces could be found near destructive plate margins, in between two approaching continents.

In practice, the temperature also rises at the same time. This makes the clay minerals recrystallise to form new minerals although there is no analogy to this in the simulation.

The slate will split along the planes made by the new minerals more easily than along the original bedding. This property is called rock cleavage. You can use the matchsticks / spaghetti to show how such rocks can split along the cleavage by using a ruler to separate the aligned 'minerals'. Simply slide a ruler between the aligned pieces of spaghetti and move them apart.

References:

ESWA acknowledges the compilation of this material by Western Australian teachers