# Our Plastic Environment

*Exploring the environment in all its meanings with Jeanie Clark*

What do your children know about plastic? Do you 'reduce, re-use, recycle' … and refuse it? June 5 is World Environment Day (WED). This article will explore plastic as a science background for this theme in 2018's WED.

## A plastic hunt

Let's start with a "Plastic Hunt"! How long will it take to find five different products made with plastic? Are they all bottles? They could well be, as so many of our bottles come in plastic of many shapes and sizes (e.g. photo below). Even milk bottles from different companies differ!

So go for another five items, all designed for a different purpose. Or collect more if you would like a longer challenge! Next do this in different locations e.g. rooms, inside compared with outside. Does the number of plastic products found keep increasing? How different are these plastics?

## Describing plastics

A key aspect of science is describing the world. Talk to your children about the five senses and how they are the simplest scientific tools. Other tools extend these senses in some way e.g. a telescope for distant vision, a microscope for magnifying vision.

Which senses can be used to describe the plastics found? Do NOT use taste. Experiment with sound – can plastics make a noise? Do they have a detectable smell? Touch – what adjectives describe how they feel? Sight – colours, patterns, shape and size are good starting points.

This data could be recorded in a table to 'look' like science. Can a summary be made from that 'data set'? Going back to plastic bottles, a summary might be that plastic can come in white or clear colour, can feel smooth or rough, is hard and holds shapes as containers.

## Plastic means ...

'Plastic' is one word, but it does not seem to be one thing looking at the range of products. (Well 'wood' is like that too, isn't it?) Time to look at a dictionary to see what it is! That may lead to a group of words that need definitions like: synthetic, organic, polymers, moulded, malleable and rigid.

One of the definitions may hint that there is a range of materials that are 'plastics'. One way to get a handle on this and understand the scope of plastics, including those hidden ones that we may not have been aware of, is to follow the history of the development of plastics. How old might they be? Have a guess - then research.

## The history of plastic

A web search for the 'history of plastic' will result in several webpages (see box next page), of differing readability and definitions of plastic. Some include natural plastics, like horn, ivory, wool and rubber, because chemically, these are polymers and have the 'plastic' ability to take and hold a shape. Under this definition, the history of plastic products becomes older. But when we say 'plastic', we usually mean man-made and that term was first used in 1925, and became common in the 1930s.

In 1862, Alexander Parkes showed the first man-made plastic material. He called it "Parkesine" and said it could do what rubber did at a lower cost. There have been so many developments of other materials since then. Choosing some of these, a puzzle can be made to match inventions to dates. For example, here is a selection of twelve plastics from 1850 to 1950 to match:

Dates: 1865, 1869, 1899/1909, 1908/1912/1927, 1926, 1930, 1933, 1935/1939, 1941/1943, 1942, 1943, and 1945.

Plastics: Bakelite, celluloid, cellophane, LDPE, nylon, PET, polyethylene, PVC, rayon, transparent sticky tape, Superglue, and Teflon.

The British Plastic Federation has a video about the history of plastic as a timeline, at
< https://www.youtube.com/watch?v=IBFMLMxGANc >

Why would people create so many plastics? Slightly different properties? Different uses? Can you find some examples?

## Plastics' properties

Consider products found in your plastic hunt. Which plastics could have other uses and which could not?

Why? Using the photo of plastic products: why not use the soft rayon of the shirt for a container? Or thin clear sticky tape to bind a book? Or the flexible spiral for a texta?

Plastics can be grouped by their properties. The first property is response to heating ('thermo'). There are two main groups. If a plastic softens, it is a 'thermoplastic'; if it stays hard, it's a 'thermoset'. The Plastics Institute and the Composites Training Centre has a clear chart of these two groups and their properties at <https://www.partec.qld.edu.au/files/Plastics_Identification_Flow_Chart.pdf >. What other properties of plastics can be found on this chart? Look for responses to water and fire. Why might these properties also matter for the disposal of plastics, e.g. PE's sink, PVC's don't burn easily?

The names of the plastics are on the 'material observations' row of this chart. Find plastics you have heard of and look at their properties for what they mean, e.g. PET, PVC, PE (includes HDPE and LDPE) are thermoplastics. They can be softened, making them useful to be made into films, fibres and packaging shapes.

## Labelled plastics

With such a range of plastics, how can we know what product uses what plastic? Fortunately, there is some labelling. Look for labels on your plastic hunt products and create a table of what is labelled. Why might some have labels (often bottles), but not others (often stationary)?

The labelled plastics are most likely to have a number in a rounded triangle. This system has been used since 1988. It identifies seven groups of plastics for recycling (e.g. see the chart at <https://ksenvironmental.com.au/plastic-recycling-codes/ >. A comparison of this and the earlier chart can be used to see how different properties of plastics leads to different recycling groups.

## Plastics - a rubbish problem

Disposing of rubbish is not a new problem, but the plastic's durability has been. Recycling into groups and bins has been one response. Another came, in 1990, with the development of biopol (bio-degradeable plastic). But the problem of 'plastics' continued to grow – especially as not all can be, or are, recycled.

Have you noticed if there is plastic rubbish in your local environment? If so, what do you do about it? Have you heard of concerns in other places? Perhaps a river or beach polluted with plastic, a surfer in a plastic wave, or a plastic garbage patch in the ocean? (Images below.)

The above plastic rubbish is easy to see, but there are hidden and unforeseen plastic problems, e.g. coming from clothing and cosmetics. Some plastic rubbish is smaller than a 5c piece: microplastics, nurdles and micro-beads. These affect the tiniest sea creatures all the way up the food chain to us, on a global scale. With the aid of ocean gyres, plastics have collected into ocean 'garbage patches'. There is more - tiny plastics have been found in water and soil. Plastic pollution is a global problem.

A search for the terms above will find many 'adult' articles on the web. The UN WED website's video targets plastics to refuse. 'The Standard' 23/11/2017 reports a nurdle problem at Port Fairy. ABC News 28/2/2017 has a broad report 'Plastic and how it affects our oceans'.

For our future, the focus of this World Environment Day on plastic is worth considering and its continuing messages from "Reduce, reuse, recycle" to "Beat Plastic Pollution" - "If you can't reuse it, refuse it".

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A veteran home educator, Jeanie runs environment education sessions for schools and home ed groups.

Logos Source:<http://worldenvironmentday.global/>

# Resources

### Plastic timelines (in a rough order of least to most amount of detail).

Professor Plastics, American Chemistry Council (2011)
Bellis, Mary. Thought Company (2017)
History of plastic (2018)

### Plastic rubbish in the environment = Pollution

2012 Romanian river bank by E.R. Vicol.
2013 Kamilo Beach,Hawaii.
2014 Palau Bunaken, Indonesia, Photo P. Kennedy
2017, Monterey Bay, California, Aquarium Foundation
British Plastics Federation (2018)