

# Look Down, Shape Sleuths on Earth!

Continuing the 2013 biodiversity series in *Otherways* by Jeanie Clark

Flying over Arabia at 39,000 feet, I was struck by how clear the skies were, so clear that I could see so much detail below on planet Earth. The importance of shape and colour as clues for 'sleuths' to identify features was so obvious - as was a lack of green (living things). It made me wonder about biodiversity on the global scale and the UN Decade of Biodiversity (UNBD) vision of 'living in harmony with nature' where life seemed so sparse.

In the last article in this series (*Otherways* 137 p 30), I posed the question about what Felix would have noticed during his 2011 jump from 39 km out in space. As the simulation of his ascent and descent (see <http://www.redbullstratos.com/the-mission/mission-timeline/>) showed clouds, he would not have seen much, even if he had been travelling slow enough to take it in. Arabia had no clouds - nor much sign of life.

This article will use some 'above Earth' images to discover more about life in this region. I hope this article will be used to encourage children (as sleuths) to discuss the images, develop an awareness of living things and human uses of plants, and wonder about how the UNBD vision applies. To do this, one needs to be a sleuth of the images by looking at their shapes and colours for clues of features. Clues can be recorded on sketch maps of key features, with any specific details:

- Water (use blue): sea, lake or river etc.
- Land (use brown): plains, hills, mountains, coast etc.
- Man-made (use red): infrastructure, towns, etc.
- Living things, indicated by plants (use green): forests, farms, sparse or densely vegetated areas.

The sketch map is a bit like the white board of clues used by television detectives! When making sketch maps, standard formatting is a heading, key, source, cartographer (mapmaker - sleuth) and 'not to scale'.

## Satellite views of Earth

Try this out first. Consider a circle shape - dominated by blue, scattered with irregular green and brown patches, all overlaid with white swirls and curved lines. What is it? If you're not sure, check out <http://www.telegraph.co.uk/earth/earthpicturegalleries/5895367/The-Earth-from-space-photographs-taken-by-astronauts-and-satellites.html?image=1> (known as a 'blue marble' image) and [http://poppy-seeds.org/wp-content/uploads/2011/07/earth\\_from\\_space\\_australia\\_oceania\\_satellite\\_map\\_poster\\_p228879530908298369tdcp\\_4001.jpg](http://poppy-seeds.org/wp-content/uploads/2011/07/earth_from_space_australia_oceania_satellite_map_poster_p228879530908298369tdcp_4001.jpg) .

## Global plant patterns

What awareness do children have of the spread of plants across the world, and in particular Australia? It may be worth shading a base map\* in green pencil in varying intensity to show plant densities for what is known/expected. To compare this map hypothesis with the actual pattern of plant life, look at map 2 in the 2012-13 photo-maps at <http://www.space.com/21661-earth-plant-life-space-photos-npp-satellite.html>. It also uses intensity of

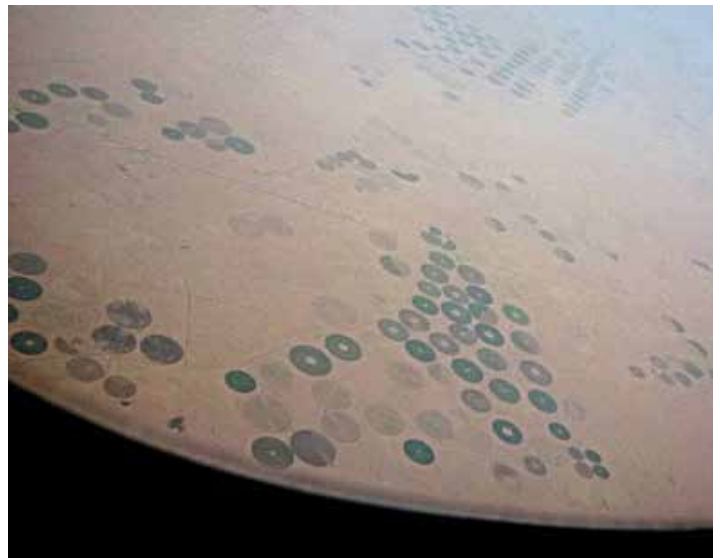
greens to show density of plant life.

How's your children's geography? Was there much green on these 'blue marble' images that could be named? Can they name the darkest green areas of the plant-life set? The rainforests of the Amazon, Congo and Borneo are no surprise, but what about some of the other areas, like France, China and the Nile Delta? How can these intensities be explained? (Farming?) What about the light green across Australia? Compare it with deserts across Sahara and Arabia and Tibet, shown in photo four of the plant-life set.

Another alternative, and a good follow-up, is to look at the world vegetation map in any atlas. This will show the names of the Earth's major types of vegetation zones.

## From a plane up high

Having just seen the lack of green in these satellite images (from about 800+ km above Earth), it may come as a surprise to see some features at a closer distance - about 12 km up where the big planes fly on a trip from Dubai to Casablanca. What can Shape Sleuths detect in the following June 2013 images?



When repeated regular shapes appeared through the plane's window, I was surprised. What clues can explain this?

The Saudi landscape was a yellow base, as expected. But superimposed on it were circles in two tones - brown and green. What sort of living things leave this pattern? If you have ever seen pivot irrigation (for example, in Western Victoria) you will recognise these shapes and colours as crop circles. The development of these irrigated circular farms in the desert can be found at <http://www.earthweek.com/2012/ew120309/ew120309x.html>; and from three photos from 1987 to 2012 at <http://photojournal.jpl.nasa.gov/catalog/PIA15849> and <http://earthengine.google.org/#intro/SaudiArabiaIrrigation> .

\* Base maps on the web: Black and white in pdf at <http://www.teachervision.fen.com/maps/printable/4022.html>. Also compatible with computer 'painting' at <http://www.outline-world-map.com/> . (use map b3c)

Still there were large areas of desert with no green.



The Suez Gulf between Sinai (foreground) and Egypt (background) was brilliant blue and turquoise. But the land was so wrinkled by mountains and dry river beds.

Photo 3 in the satellite plant-set had shown a dramatic contrast of green along the Nile, to cream of the desert.



Here, just north of Cairo, with a bit of the desert in the background, the wriggly Nile has split in two, with major canals (straight lines) running out into the flood plains, dotted with grey splodges of towns. The final clue to irrigated farmlands is

'green' shaped in blocks.

The Nile's farming system is thousands of years old, while Saudi's pivots system is only a couple of decades old. Can changes like this affect the biodiversity of a desert? The technology of this pivot irrigation and the crops grown here are at <http://cropworld.wordpress.com/2010/10/04/thirty-years-of-water-utilisation-improvements-in-saudi-arabia/>. Are both these farming systems sustainable? Consider especially where the water for the plants comes from. Can they, or any intensive irrigation farming system, contribute to the UNDB's Aichi target 7 to have "areas under agriculture ... managed sustainably, ensuring conservation of biodiversity" by 2020? (<http://www.cbd.int/sp/targets/>)

### From a plane low down

More detail is seen during ascents and descents, when planes are at hundreds of metres above ground. Colour and shape still show density and location of plant-life, as indicators of life, nature, living things and biodiversity. But smaller green patches are detectable, especially in urban areas, bringing into focus uses of plants for aesthetics and recreation.

Dubai, in the United Arab Emirates, on the Gulf coast, is

a city only a couple of decades old. (Its amazing structures made me think that we have the technology now to build on Mars!) What does the key feature above look like?



Can you recognise it better from a satellite view?(For example, at <http://www.telegraph.co.uk/earth/earthpicturegalleries/5895367/The-Earth-from-space-photographs-taken-by-astronauts-and-satellites.html?image=2>) The creation of Dubai's landscape over the last couple of decades can be seen in time-lapse (set it on slow) at <http://earthengine.google.org/#intro/CreationOfDubai>. It also shows other changes on land – creating this city from their desert. What clues to land uses, buildings and plants are here? Note especially the waterfronts.

Berrechid is a 'new' satellite suburb of Casablanca, Morocco, developed for the new international airport - like Sunbury was for Tullamarine. What differences are there in land use, buildings and plants to Dubai? It is early summer - the rectangular green in the foreground is irrigated farmland; the dark dots and strips are street trees. Housing is traditional - shorter, white



and in blocks, often around courtyards. What can such relatively new urban areas - Dubai, Berrechid, or other places you know - provide for biodiversity?

Twenty-first century life seems to be offering so many opportunities for travel by plane that were not there in the past. Not only that, but there are now images on television and the web (especially Google Earth) which familiarise us with how earth looks from above at many different scales. In this Maths of Planet Earth year I have focussed on shape and number concepts as tools to discover details of planet earth, including biodiversity. While details are found at ground level, images 'from above' set the broad context of knowledge, potential and priorities for biodiversity conservation, a further step on the way to the 2020 UNDB aim of 'living in harmony with nature'.

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