



Highly Commended

Science Writing Year 9-10

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Oliphant Science Awards: First Nations Science

By Vinayika Chopra

Thousands of years ago, the First Nations people used science in their Indigenous objects, for several uses including creating hunting equipment and labour-saving devices.¹ Their knowledge of chemistry was demonstrated by making medicines and identifying poisonous species and showed a deep biological understanding through observing and using all their senses to formulate a hypothesis. Their creation of weapons and tools like bows and arrows and slings, demonstrated a deep understanding of physics and how it affects the motion of the tool. Astronomy and reading the stars was a significant part of Aboriginal culture as it passes on knowledge and history onto new generations. Science was used in Traditional Indigenous objects by First Nations people in several ways to help them create basic needs and tools to survive.

The knowledge of bush medicine was used and shown by Indigenous First Nations people through many examples including how acid base techniques are applied and including organic and inorganic chemistry. They used their knowledge of poisonous plants like cycads and nardoo, in making food or medicine or to kill animals, like fish, for food.² They had a deep understanding of chemical reactions like fermentation, the chemical breakdown of a substance by bacteria involving giving off heat, combustion which is the process of burning things, pyrolysis the decomposition which occurs by high temperatures, and calcination which is reducing something by exposing it to strong heat. All these chemical reactions helped transform the resin in Spinifex into a very strong glue they utilised. Confirmed by scientists, that the anti-bacterial properties of several honeys in Australia, were similar to, or better than the well-known manuka honey in New Zealand, which Aboriginal people knew long before it had been researched. This native honey didn't cause Indigenous people any tooth decay as it has a much lower glycaemic index (GI) than regular sugar, and its sweet component is trehalose, which also helps protect mitochondria and promotes autophagy in blood vessels.³ First Nations Indigenous formed, developed and utilised new substances. Some examples include quicklime (calcium oxide), pigments and ochres (iron oxide, charcoal), acid (pyroligneous acid), plaster (calcium sulphate), alkali salts (salts of potassium and

¹ *Science Principles in Traditional Aboriginal Australia* 2012, The Queensland Museum Network Blog, The Queensland Museum Network Blog, viewed 29 June 2023, <https://blog.qm.qld.gov.au/2012/08/01/science-principles-in-traditional-aboriginal-australia/#:~:text=During%20traditional%20times%2C%20Aboriginal%20people,senses%20to%20predict%20and%20hypothesis.>

² Jens 2021, *Aboriginal knowledge for the science curriculum*, Creative Spirits, viewed 29 June 2023, [https://www.creativespirits.info/aboriginalculture/education/aboriginal-knowledge-for-the-science-curriculum/#:~:text=Chemistry,for%20food%20\(e.g.%20fish\)](https://www.creativespirits.info/aboriginalculture/education/aboriginal-knowledge-for-the-science-curriculum/#:~:text=Chemistry,for%20food%20(e.g.%20fish))

³ *4 Ways Trehalose Powder May Benefit Your Health* 2020, Bulksupplements.com, viewed 29 June 2023, <https://community.bulksupplements.com/health-benefits-of-trehalose-powder/#:~:text=Trehalose%20sugar%20naturally%20helps%20protect,reduce%20oxidative%20stress%20and%20inflammation>

sodium), beverages (ethanol), charcoal, and other products such as heat and light. First Nations people used Chemistry in their Traditional objects in several uses like making medicine to catch animals or making glue to help build tools, such as attaching spear points to shafts and attaching knife blades to the handle.

First Nations Indigenous people created and built tools and weapons using their strong knowledge in physics.⁴ Boomerangs, alongside other weapons, were developed by the First Nations Indigenous people for a variety of purposes including hunting and improving stone knives.⁵ The first unmanned controlled flight was first developed with a boomerang by Aboriginal people. The complex arrangement of wings are positioned so the boomerang rotates when it is released rather than fly straight like an aeroplane. When released, the boomerang has an uneven lift on the wings which is caused by a forward spin motion. This happens because whilst one wing is rotating in the same direction as the flight (forwards direction), the other is rotating against the direction of flight (backwards direction). Because the wing on one side of the disk has a higher airspeed than other wing, the airflow generates more lift. The boomerang tips over due to the uneven lift, and twists the tipping force at right angles, giving the boomerang a curving flight. When the centre of lift being forward of the centre of gravity, it causes the boomerang to "lie down" in flight.⁶ Both these twisting motions are called gyroscopic precession, which is the rebound of a spinning object when a force is applied. Indigenous people used this interesting mechanism of the boomerang to use as a weapon and as a tool for hunting and digging. First Nations people used physics in a lot of their Traditional Indigenous objects, especially the well-known boomerang.

First Nations Indigenous people also had a strong understanding and belief in astronomy and how it impacts us here on earth. Aboriginal people have been telling dreamtime stories for hundreds of generations and have a rich astronomical tradition such as the "Emu in the Sky" and other stories about the Sun, Moon and stars, which tells us about the great depth, complexity and detail, ancient Aboriginal cultures carry. Indigenous people were also familiar with modern science like planetary motions which caused tides, eclipses and phases of the moon, while Italian scientist Galileo Galilei was still declaring, that the moon had nothing to do with tides, which turned out to be incorrect.⁷ This knowledge of the sky they had was used to construct calendars, song lyrics, and other navigational tools to help the navigate

⁴ Jens 2021, *Aboriginal knowledge for the science curriculum*, Creative Spirits, viewed 29 June 2023, [https://www.creativespirits.info/aboriginalculture/education/aboriginal-knowledge-for-the-science-curriculum#:~:text=Chemistry,for%20food%20\(e.g.%20fish\)](https://www.creativespirits.info/aboriginalculture/education/aboriginal-knowledge-for-the-science-curriculum#:~:text=Chemistry,for%20food%20(e.g.%20fish))

⁵ Acton, C 2023, 'Boomerang | National Museum of Australia', *Nma.gov.au*, viewed 29 June 2023, <https://www.nma.gov.au/exhibitions/defining-symbols-australia/boomerang#:~:text=Boomerangs%20have%20many%20uses%20for,exchanged%20boomerangs%20across%20the%20continent>

⁶ *Boomerang Info - how it works | Rangs Boomerangs* 2023, *Rangsboomerangs.com*, viewed 29 June 2023, <https://www.rangsboomerangs.com/info-how-it-works#:~:text=The%20distance%20between%20the%20boomerang's,%E2%80%9C%20down%E2%80%9D%20in%20flight>

⁷ Jens 2021, *Aboriginal knowledge for the science curriculum*, Creative Spirits, viewed 29 June 2023, [https://www.creativespirits.info/aboriginalculture/education/aboriginal-knowledge-for-the-science-curriculum#:~:text=Chemistry,for%20food%20\(e.g.%20fish\)](https://www.creativespirits.info/aboriginalculture/education/aboriginal-knowledge-for-the-science-curriculum#:~:text=Chemistry,for%20food%20(e.g.%20fish))

their way across the country.⁸ According to First Nations Indigenous people, emus were more than just birds and were creator spirits that looked down to the land while soaring through the skies above. These birds were very helpful and helped indigenous people predict what was going on in the world around them. The Emu in the Sky changes appearance depending on the time of year. It is usually shown to either appear sitting or running, and depending on what position it is in, Indigenous people knew whether they should be out hunting for emus or collecting their eggs. The Emu in the Sky is composed by the dark areas of the sky in the Milky Way, outlined by light, rather than the stars itself. To find it, look at the dark between the stars that make up the Southern Cross in the emu's head, from where you can start to identify its neck, body and legs, forming between the Milky Way's iconic dust lanes.⁹ First Nations people used astronomy in several ways to tell dreamtime stories, create calendars, and navigate their way through the country.

Over the past hundreds and thousands of generations of First Nation Indigenous people have used science in their traditional objects to help survive basic needs. Their knowledge and passion for chemistry was shown through using different plants to make medicine utilising a range of plants and also creating tools like glue made out of spinifex using their knowledge of chemical reactions like fermentation, combustion, pyrolysis and calcination. They also had a deep understating of physics and created a tool called a 'boomerang' using specific measurements so when thrown, it returns to its initial location which can be used as a tool for hunting and improving stone knives. As Indigenous people read the stars, they navigated their way through the country, passing along their knowledge and stories, to many more generations. Long before modern scientists had made new discoveries, First Nations people had already discovered this with their own magic and knowledge and applied it in their Traditional Indigenous objects like medicines, weapons and tools, cultural astronomy, and much more.

⁸ *The Astronomy and Navigation of Aboriginal Australians* 2019, ANU, viewed 29 June 2023, <https://www.anu.edu.au/events/the-astronomy-and-navigation-of-aboriginal-australians#:~:text=Their%20songs%20and%20stories%20show,trading%20artefacts%20and%20sacred%20stories>

⁹ *Stargazing at Ayers Rock Resort: The Emu in the Sky* 2023, Ayersrockresort.com.au, viewed 29 June 2023, <https://www.ayersrockresort.com.au/stories/emu-in-the-sky#:~:text=According%20to%20Indigenous%20legend%2C%20emus,in%20the%20world%20around%20them>