Climate science

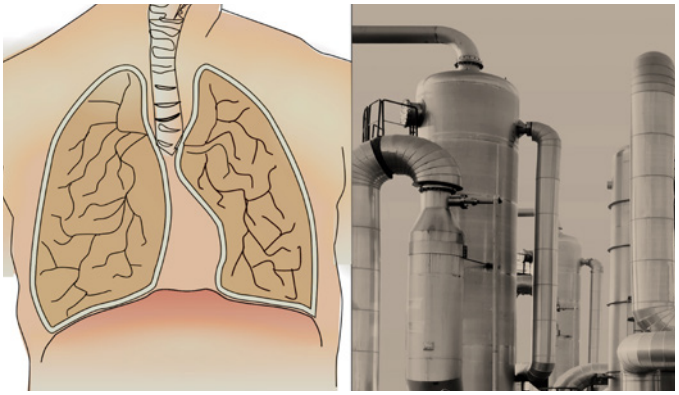
Turning to nature as our teacher

PSTT Trustee and civil engineer, Jyoti Sehdev, describes how biomimicry – using ideas from nature as models for the design of new structures and systems – can be part of the solution to some of the global challenges we are facing.

Engineers are problem solvers. We evolve our designs over and over to meet the changing needs of society. The last issue of the Why & How magazine focused on society's greatest challenge of the moment: human-induced climate change which is leading to a mass extinction of species.

Consequently, engineers are looking for ways to reduce our use of fossil fuels whilst evolving infrastructure to be resilient to the impacts of changing weather events. Perhaps we need to turn to the very species we are trying to protect, the beings that have been evolving for 3.8 billion years, to develop truly sustainable answers to these challenges.

Biomimicry is the conscious emulation of life's genius to create sustainable designs. Biomimetic design in engineering has led to the development of more efficient and lower carbon solutions. The following examples illustrate some of the recent biomimetic approaches that have been used by engineers.



Biological processes in chemical engineering

Recent climate change regulations require industrial factories to capture CO_2 as a resource instead of allowing it to enter the atmosphere. The company Saipem has taken learning from an enzyme found in red blood cells, carbonic anhydrase, which converts carbon dioxide to carbonic acid to be transported in and out of the lungs. They have developed an 'Industrial Lung', which is a carbon capture solution that uses a synthetic carbonic anhydrase enzyme to dramatically accelerate CO_2 capture.

Find out more **here**.

Structural and materials engineering

Honeybees build hexagonal honeycombs as the tessellating shape provides the most area with the least perimeter for honey storage. The honeycomb pattern also provides a high strength-to-weight ratio, enabling scientists and engineers to incorporate hexagonal designs into building applications, such as flexible panels for bridge construction, sound absorption and even building better surfboards.

Find out more **here**.

Mathematical form in automotive engineering

Japanese engineers turned to the kingfisher when tasked to reduce the noise from drag on the Shinkansen (Japanese bullet train). The new trains are designed on the beak of the kingfishers, which has evolved to aerodynamic perfection to avoid disturbing the water's surface, increasing the bird's chances of catching fish.

Find out more **here**.

Physics in mechanical engineering

Buildings in hot countries need to keep their inhabitants cool all day long. So do termite mounds, often found in desert conditions. Engineers have built the Eastgate Centre in Zimbabwe to cool itself like a termite mound, with porous walls with opening and closing vents, without needing to use expensive and energy-intensive air conditioning.

Find out more **here**.

Inspiring children to look to nature for solutions

Biomimicry and nature-based learning is a great way to engage children with different engineering challenges whilst encouraging interest in the natural world around them. "Why?" and "How?" are exactly the questions we should be encouraging children to ask about their local ecosystems. Why does that look like that? How does it grow like that? By incorporating bio-inspired learning into the classroom, we have an opportunity to inspire children to have a reverence for the life around them and a personal sense of environmental stewardship as part of their education, preparing our next generation of engineers to find truly sustainable solutions.