# Listening 2

**Script:**

- Architecture, chemical processes, material sciences – all these faculties are beginning to be touched by ideas which are inspired by nature. Where in, the past, man's inventions have been considered all-powerful, engineers are now turning to nature, over the last 3.8 billion years, has developed a wealth of successful innovations. So, over the last decade there has been a new wave of scientific interest in Biomimicry, measures which emulate nature's genius. And we are not restricted to copying the structures found in nature. We can also imitate its processes and its systems.

- One of the most famous products inspired by nature is the sticky fastening, Velcro, invented in 1941 by the Swiss engineer George de Mestral, who noticed how the seed heads of burdock got tangled in his clothes and his dog's coat. Meanwhile, engineers at the Centre of Biomimetics at Reading University, have developed a material based on the properties of wood. One of the reasons why wood is so useful to us is that its ability hold nails when they are driven into it. This property is down to the structure of hollow cells, and fibres which hold the nail in place. The new material uses equivalent fibres made of glass fibres, and resin to hold everything in place. The result is a material with the same geometric arrangement as wood, but which has none of the disadvantages of wood – that it changes shape according to moisture levels and temperature. The substitute wood has been developed for the post office. They wanted a container which could contain threatening packages, directing the blast safely and holding any explosive fragments.

- But the second realm of Biomimetic is imitating not the just physical form of natural substances, but also the processes that take place in nature. A perfect example of this is the Sahara Forest Project, which has utilised a processed used by the Namibian Fog Basking Beetle. This beetle is able to live in very harsh, desert conditions using its ability to harvest moisture from the air. The beetle comes out into the desert only at night and, due to its black shell, is able to maintain a temperature cooler than that of its surroundings. The moist breeze blows in from the sea, and droplets of water condense on the beetles shell. At sunrise, the beetle lifts its shell, drinks and returns to its hole. What is even more interesting is that the beetle has hydrophilic bumps on its shell which attract water, separated by a waxy finish which repels water. Consequently, the water gathers in tight, spherical droplets, so that hardly any water is wasted. The Sahara Forest Project uses a process which is, in effect, identical to that of the beetle. Seawater evaporates from the front wall of the greenhouse to create ideal cool growing conditions, and condenses to form fresh water on the downwind side of the greenhouse.

- However, just mimicking the structure and processes in nature is not enough, if, in doing so, we create tonnes of waste. Human designs are linear. We take resources from the earth, use what we need, and the rest goes to waste. But in the natural world, systems are cyclical. Waste from one organism goes on to become nutrients for

another. One scheme which has taken advantage of nature's cyclical design is 'the Able Project' based in Wakefield, Yorkshire. Here, everything is recycled and reintegrated into the system. Consequently the project is able to turn cardboard into caviar. The cardboard is used as animal bedding, and is then composted using vermiculture. The worms are then used to feed fish. Excrement from the fish is collected and recycled into the system.

- The age of Biometry is still in its infancy. The novel and yet proven ideas which are inspired by nature are attractive to industries. But we need to be careful. As we lose more animal habitats to development, extinction rates are increasing. And with this we lose the wisdom and ideas embodied in these species. Already, we've seen the loss of the Gastric Brooding Frog, an animal able to turn off its production of stomach acid. Had we been able to study this animal before its demise, we could have found a way to alleviate the problems experienced by many sufferers of excess stomach acid.

1. **Type:** fill-in-the-blank
   **Question:** Architecture, chemical processes, and material sciences are being increasingly influenced by ideas inspired by nature. Where in the past, man's inventions have been considered all-powerful, engineers are now turning to the _____, which over the last 3.8 billion years, has developed a wealth of successful innovations.
   **Answer:** natural world
   **Explanation:** The script states, "...engineers are now turning to nature, over the last 3.8 billion years, has developed a wealth of successful innovations." Here "nature" is referring to the natural world.

2. **Type:** fill-in-the-blank
   **Question:** Velcro, one of the most famous biomimetic products, was invented in 1941 by Swiss engineer George de Mestral, who noticed how the _____ of burdock became entangled in his clothes and his dog's coat.
   **Answer:** seed heads
   **Explanation:** The script says, "...George de Mestral, who noticed how the seed heads of burdock got tangled in his clothes..."

3. **Type:** fill-in-the-blank
   **Question:** Researchers at the Centre of Biomimetics at Reading University have developed a material based on the properties of wood. Unlike traditional wood, which is affected by _____ levels and temperature, this new material utilizes glass fibres and resin to replicate the geometric arrangement of wood while eliminating these disadvantages.
   **Answer:** moisture
   **Explanation:** The script explains that the new material has "...none of the disadvantages of wood – that it changes shape according to moisture levels and temperature."

4. **Type:** fill-in-the-blank
   **Question:** The Sahara Forest Project mimics the moisture-harvesting ability of the Namibian Fog Basking Beetle. This beetle, which lives in harsh desert conditions, uses

hydrophilic _____ on its shell to attract water, separated by a waxy finish that repels water. Consequently, the water gathers in tight, spherical droplets, ensuring minimal wastage.
**Answer:** bumps
**Explanation:** The script states that the beetle has "hydrophilic bumps on its shell which attract water..."

5. **Type:** fill-in-the-blank
**Question:** Human designs are described as linear, where resources are taken from the Earth, used, and the rest is discarded as _____. In contrast, natural systems are cyclical, where waste from one organism becomes nutrients for another.
**Answer:** waste
**Explanation:** According to the script, "We take resources from the earth, use what we need, and the rest goes to waste."

6. **Type:** fill-in-the-blank
**Question:** The Able Project in Wakefield, Yorkshire, exemplifies cyclical design principles. Cardboard is first used as animal bedding, then composted using _____. The worms produced are used to feed fish, and the fish excrement is recycled back into the system.
**Answer:** vermiculture
**Explanation:** The script explains that "The cardboard is used as animal bedding, and is then composted using vermiculture."

7. **Type:** fill-in-the-blank
**Question:** As industrial development accelerates, increasing extinction rates result in the loss of habitats and species. The demise of the Gastric Brooding Frog, for example, has cost us the chance to study its ability to _____ its production of stomach acid, potentially offering solutions for individuals suffering from excessive stomach acid.
**Answer:** turn off
**Explanation:** The script mentions, "...the Gastric Brooding Frog, an animal able to turn off its production of stomach acid."