

Copying nature could save us energy, study shows

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New technologies that mimic the way insects, plants and animals overcome engineering problems could help reduce our dependence on energy, according to new research published in the Royal Society journal *Interface*.

When faced with engineering difficulties, such as lifting a load or coping with extremes of heat, up to 70 per cent of man-made technologies manipulate energy, often increasing the amount used, in order to resolve the problem.

However, new research which has compared how nature and man-made technologies overcome similar problems has shown that only 5 per cent of natural ‘machines’ rely on energy in the same way.

Instead, insects, plants, birds and mammals rely on the structure and organisation of their body parts and behaviour; the solutions to problems are already built in.

“An example might be a hammer,” said Professor Julian Vincent from the University of Bath who led the research .

“A man-made hammer has a very heavy head, so that it is heavy to carry around and lift but can do a lot of work with one hit. It relies on inertia.

“But the woodpecker’s hammer, its head, relies on speed. It is very light to carry around, and functions rather like a whip, with the heavier body

moving a small amount, and the lighter head, on its long neck, moving much faster.

“They can each deliver the same amount of impact energy, but they do it in a very different way.”

Although mankind has looked to nature for inspiration for generations, ‘biomimetic’ devices are a relatively recent phenomenon. The stable wing in aeroplanes, Velcro and self-cleaning paint are all simple devices based on natural inspiration.

The Centre for Biomimetic and Natural Technologies at the University of Bath is helping extend this principle to more advanced engineering challenges.

Researchers are currently looking at the desert cockroach (to develop a new kind of dehumidifier technology), insect sense organs (for structural health monitoring) and the egg-laying organ of a wood-wasp (for a new type of steerable endoscope).

“Evolution has sculpted animals, insects and plants to produce incredibly efficient machines that carry out a range of impressive engineering feats,” said Professor Vincent, Director of the Centre.

“From the way desert cockroaches gather water to the way wasps bore a hole into a tree, nature has developed a myriad of ways of solving difficult problems.

“By better understanding the way in which biology defines and solves technical problems, we can develop new approaches that could significantly reduce our dependence on energy.

“It is likely that we have similar technologies to nature – it’s just that we

use them in a particularly unintelligent way.

“Exactly how much energy we could save is not yet clear, but our research suggests that the potential is certainly there to be exploited.”

The researchers used a form of the Russian analytical system TRIZ to compare how man-made technologies and natural ‘machines’ overcome similar engineering problems.

The analysis showed that there is only a 12 per cent similarity in the way biology and technology solves the problems they are faced with.

“Whilst we have been quick to see the potential for developing new kinds of products from nature, it is only now that we can see the potential for making energy savings too,” said Professor Vincent.

“Given the growing demands for improving our energy-efficiency and reducing the amount of pollution we produce, biomimetics offers a new area of study which could reap strong rewards for the future.”

Source: University of Bath

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