

'Bio'-Mimicry Is the Highest Form of Flattery

By Ashley Dear



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Opening a wardrobe to find a moth has indulged in feasting upon your favourite jumper, or opening a cupboard to find an ant raiding party amongst your sweet treats, or even trying to enjoy a traditional British cream tea in a beautiful English garden only to be bombarded with an ariel wasp attack is something we are all familiar with. I'm sure that at some point it has made everyone question the very existence of insects if their only role is to be a nuisance.

But these six legged fiends should actually be considered as our six legged friends. An incredible 480 million years of evolution, driven by changing environmental conditions and inter and intra species competition has created one of the largest taxonomic groups on the planet. Insects used these 480 million years to become specialists in their ecosystems, evolving physical and behavioural traits which we as humans have begun to recognise as potentially being beneficial to us.

The concept of biomimicry is the practice of mimicking strategies seen in nature to solve the problems of humans. These strategies can come from any field in nature but the 'annoying bugs' most people see as an inconvenience of everyday life has been a field which is providing the answer to many of our problems. What they have spent millions of years evolving to do, what makes them so specially adapted at doing what they do best, is now being studied to unlock the answers of our modern day problems.

The sharp sting of a medical needle is one that many of us have come to recognise, especially over the last two years as vaccines have

become more important now than ever before. But what if painful injections could soon be a thing of the past? Sounds too good to be true? Well this is a classic problem to be solved through biomimicry.

We want to inject people in such a way that they don't feel anything. So which species has spent millions of years evolving ways in which to penetrate human skin without being detected.... much to our dismay.... the mosquito.

A team of scientists from Kansai University, Japan, have developed a needle that mimics a mosquito's proboscis and feeding behaviour to deliver a painless injection¹. The needle is currently 1mm long and only 0.1mm wide but a team in the USA are already developing larger versions². The Japanese team developed a silicone needle with 2 serrated shanks which penetrate the skin and allows a drug administering tube to deliver a numbing agent. This along with tiny motors which vibrate the whole device to assist it easing, painlessly, into the skin, mimics the same method and apparatus used by mosquitoes.

Another 'new norm' brought around by the ongoing pandemic is our increased reliance on home delivery. The delivery of goods to our front doors have been the saving grace for most of us over the last few months but the increase of door deliveries comes with more complications. More deliveries means more complicated delivery routes which also means soaring greenhouse gas emissions. So how do delivery services combat these problems?

Well for this conundrum we turn to the beloved buzzing bumblebee. By likening our

delivery stop locations to the bee's favourite flower locations, 'Routific' founder Marc Kuo created the Bee's algorithm³. This algorithm is based on the foraging behaviour of honeybees. Honeybees will visit many different flowers to gather nectar, not only do they learn the most optimal routes to save energy but they then communicate this to their hive sisters through the medium of dance. Although I hoped this story would be the tale of how delivery drivers are now optimising their routes through dance it is actually a tale of how these bee dances influenced the algorithm which is now creating delivery routes which are more efficient saving both time and greenhouse gas emissions.

These biomimicry examples are only two of the ways insects are solving the problems of modern day humans. Nature has spent millions of years evolving solutions to the problems we now face as a modern society and it is becoming increasingly obvious that we should be searching here for further answers.

Even by only focusing on insects to help us become more sustainable, the black butterfly (*Pachliopta aristolochiae*) has micro and nanostructures on their wings which are influencing more advanced and efficient solar panels⁴, the firefly (*Photuris* sp.) has already inspired the creation of a vastly more efficient LED bulb⁵ and termites are reducing energy costs by influencing building designs that mimic the natural air conditioning possessed by their nests⁶.

Anthropogenic causes are increasing global temperatures which threatens much of the Earth's biodiversity yet it is this biodiversity which often holds the key to solving our problems.

References

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