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I consider myself a perennial student, in that life is a giant university and you can only hope to learn 0.000 something percent of what there is to know, so you better at least keep your eyes and ears open. But I must have become a bit complacent about my knowledge of, and abilities in, the science and art of design because a few weeks ago I had an experience that rocked me on my heels and left me gasping in a state of discovered ignorance and wonder. I had a crash course in *biomimetics*.

I was extremely lucky; for reasons too complex to explain here, the UK government decided to pay for me to join a group of scientists on a mission to the Netherlands and Germany; our task: to find out how they're progressing in engineering and design based on lessons learned from nature. In one frenzied week we visited research institutes, universities and private research groups, where we saw scientists measuring the mechanical properties of the hairs on a fly's foot and the hydrodynamics of frozen penguins, and designing linear motors the size of viruses. We learned that lotus plant leaves, geckos, bamboo stems, ants, lungs, jumbo squid — and of course flies and penguins — can all teach us a great deal (I know, a teaching lung…) about engineering and design.

Those penguins by the way, when stretched out missile-like in their diving pose, travel through the water with less drag and turbulence than any comparable projectile (a torpedo for instance). It turns out that they can do this because their profile shape is a kind of accelerating wave (picture the beak, head, neck, body, tail) that somehow makes more hydrodynamic sense than the classic, obvious teardrop. I have to thank Dr Rudolph Bannasch in Berlin for this insight. When asked where he got his fiberglass test penguins he replied "from frozen penguins of course, readily available". So now you know. Penguins took a few million years to get this right, thanks to the workings of evolution but we can just go hey, nice one penguin! — and steal their blueprints.

That's how biomimetics works, and nature has a pretty much endless supply of well-honed design solutions for us to borrow. The penguin is a macro-scale design but there is probably as much or more to learn from the places only a scanning, tunneling microscope can reach. For example it turns out that a fly's feet can stick to a window because tiny hairs on its footpads conform to the microscopically rough surface of the glass so precisely that air is excluded. Geckos do a similar trick but with tiny, flexibly mounted plates, and Dr Stanislav Gorb at the Max Plank Institute in Stuttgart has produced a patented Gecko Tape that sticks to glass without glue. Which is weird, when you see it.

Biomimetics has nothing to do with biomorphic or ‘organic’ design — it’s not nature’s look that’s important here. A product can be as retentively, clenchingly modernist as a polished white cube and still apply biomimetic principles in the way it works. What attracts the attention of researchers is the subtlety with which design ‘problems’ are ‘solved’ in plants and animals — not that nature goes about it in quite that way of course. And nature is pretty slow at the job; deadlines come and go — what the hell, and the iterative prototyping runs up huge bills; whole projects fail and there’s never an apology. But when it gets it right — phew!

Expect biomimetics to have a big impact on materials design in the coming years for sure. But also think about the way nature does things next time you’re designing stuff. How would biology do a sun visor, I wonder?

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