WHAT'S THE DEAL WITH HEXAGONAL HONEYCOMBS?

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You see them in the secret chambers of the Pantheon; you see them form when you blow soap bubbles across a water surface; you see them coddling green goods in transport truck freight. Hexagons. This six-sided polygon appears in myriad nooks, crannies and infrastructures throughout nature, and there's a reason why humans have been incorporating them into designs grand and humble over history. Where the hexagon features in its most marveled-at architecture, however, is the beehive.

It's a home that has been remarked upon for centuries. The builders must "possess a divine sense of symmetry" wondered the mathematician Pappus of Alexandria around 320 BC, who would devote his life to a theorem around the shape. Darwin – who found bees to be rather pesky in the way they messed about with a few of his key evolution principles – also considered the hive a triumph of first-rate engineering. Made of a uniform, six-sided cylindrical lattice built from waxy secretions, it is an all-purpose storage feature, used for packing honey, pollen and brood. The cells are worked upon collectively and non-stop by all of the hive's bees save the queen, who is too busy pumping out eggs at terrific rates to concern herself with anything else. With the kind of extraordinary social coordination that has led some to view the colony as a 'superorganism', the bees are able to make each cell almost identical in size, and each cell wall almost identical in width.

Why hexagons though? Well, the polygon happens to be the most efficient of all those capable of tessellation when it comes to packing goods. "It is a mathematical truth," wrote the American physicist Alan Lightman, "that there are only three geometrical figures with equal sides that can fit together on a flat surface without leaving gaps: equilateral triangles, squares and hexagons." Of these three, it's the last which is able to fill the maximum volume with minimal perimeter material. It is, to put it another way, geometrically cost-saving, and is the reason we see the shape in structures as diverse as the multi-lens optics of flies and aerospace applications. This idea that "the hexagon tiles the plane with minimal boundary" has been around a long time actually – dating all the way back to a Polish polymath called Jan Brożek at the turn of the 16th century. It took over four hundred years however for final verification to come in, when the University of Michigan's Thomas Hale was able to slam dunk on uncertainty and turn conjecture into mathematical proof.

BEES DO NOT, IN FACT, MAKE HEXAGONS. THEY MAKE CIRCLES.

For bees, the efficient distribution of resources is of premium value. As with all animals, these insects are adaptively orientated to develop a greater sense of thrift to maximize their chance of survival. Manufacturing the building material behind hives comes at a steep cost if we're talking calorific currency – with one ounce in wax equivalent to about eight ounces in honey (which in itself is hugely energy-expensive to make, necessitating bees to forage vast distances relative to their size). The hexagon is the best answer to this economic need.

Before we start parroting the kudos of insect-curious ancients for bee ingenuity however, hold just a few. It turns out that the hexagonal structure isn't a 'life hack' divined by bees at all. It's more just the laws of physics doing their thing. Several years have passed since scientists brought in the news that bees do not, in fact, make hexagons. They make circles – the shape which is able contain the most volume within the least surface area, but which sure has a lot of space wastage when they're packed together on a plane. Under a natural formula of surface tension, these circles get 'pulled together' into hexagons whilst the comb is still being built: the waxy walls (still malleable from the heat given off by the hard-at-work bees) hardening to converge at each of their six corners, forming a triple juncture of approximately 120 degrees.

Do the bees assist in this process? Is there at least a bit of deliberate molding going on? Scientists are still hashing it out. The best answer we can give here currently is: maybe.

So, sure – credit for honeycomb's unique hexagonal aesthetic cannot technically be awarded in full to bee architects. It wouldn't be fair to throw shade though – the hive remains a remarkable structural feat, which serves to protect the colony from pests and predators, keep them fed on well-preserved supplies during winter, and give the young a safe place to grow. For beekeepers, it is also incredibly handy when it comes to the procurement of delicious honey. Hardly a thing to dismiss lightly.

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