

Book review

The past, present
and future of the
beasts that may have
made our brainsLars Chittka^{1,2}

Buzz: The Nature and Necessity of Bees
Thor Hanson
(Basic Books, New York, NY; 2018)
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Everyone has heard that bees are dying — except they've typically heard about the wrong bees. The media tend to focus on the domesticated western honeybee, which in many parts of the world is as much a part of native wildlife as is *Rattus norvegicus*. Yes, hive bees have suffered severe losses in some locations — often because they have been subject to the most appalling forms of industrialised husbandry, perhaps only rivalled by poultry factory farming, and this has made them vulnerable to a variety of diseases. But there are more than 20,000 other bee species, most of them wild, with no keepers, no lobby, and thus little or no protection. And they are potentially in much more trouble. In this enjoyable book, written for general audiences, Thor Hanson clarifies at the outset that he wishes to give these lesser-known bees more exposure alongside the domesticated honeybee.

The book's main foci are the evolution of bees, their long entanglement with humans, their current plight and their utility as pollinators of wildflowers and agricultural crops, and the need for more efficient conservation. There are a few pages on the fascinating sensory world of the bee too, and Hanson's enthusiasm is infectious when he writes, "I can't help wondering what its life must be like as it flies through a world of different colors and constant motion, where vision interacts with memory, scent, vibrations, electrical charges and magnetism to form a landscape of vivid sensation." He is less interested in the fascinating behaviour of the bees of the world, but for this topic we can read books by Dave Goulson for bumblebees [1], Jean-Henri Fabre (1823–1915) for solitary bees [2], and Maurice Maeterlinck (1862–1949) for honeybees [3]. Modern science



Bees are more than honeybees: Thor Hanson's new book, *Buzz*, explains the evolution and diversity of the 20,000+ species of bees around the world, including social as well as many solitary species. Many species are threatened by combinations of habitat loss, pesticide use, and disease. Top left: *Tetragonisca angustula* is a small (4–5 mm) Latin American stingless bee that constructs distinct nest entrance tunnels for its colony. Its honey is sold for much higher prices than that of the honeybee in some areas. Here, a worker transports a piece of debris away from the nest, while soldiers guard the nest entrance. Top right: *Bombus impatiens*, a common North American bumblebee that is also bred commercially for agricultural pollination. Like all bumblebees, it constructs wax honey pots and brood containers of irregular shapes. Middle left: Stingless bees of the genus *Trigona* steal nectar from a paradise flower (*Strelitzia* spp.). The flowers are adapted to bird pollination, but the bees simply cut away parts of floral tissue and this allows them to extract nectar without actually pollinating the flowers. Middle right: A social sweat bee (*Halictus ligatus*) harvests pollen from a *Rudbeckia* flower. Sweat bees (Halictidae) are so called because they are attracted to the salt in human sweat. The family contains social as well as solitary species. Bottom left: A sweat bee (*Augochloropsis metallica*) visits a spiderwort (*Tradescantia* spp.) flower to collect pollen for its offspring. Bottom right: Bees evolved from parasitoid wasps, of which a representative is shown here — an Australian *Paralastor* spp. wasp has paralysed a caterpillar, which she will deposit in her nest to be consumed alive by her offspring. (Images © Alex Wild, used by permission.)

writers would also do well to look to Fabre and Maeterlinck for writing style — narrating exceptionally detailed and insightful observations, while also being entertaining, poetic, and intelligible. Does every editor of popular science books now insist on character descriptions befitting an airport novel? I am not certain that portrayals like “she ... projects the sort of trim fitness and boundless energy that you might expect from an expert on nutrition” or “a tall, broad-shouldered

man who ... might easily be mistaken for a professional athlete” bring the reader any closer to the facts. Or, if there must be such descriptions, I insist that, for balance, there are baddies too — how about: “The obese spokesman of the pesticide company greeted me with shifty eyes and sweaty hands, his gold teeth and diamond rings betraying the riches he had amassed”?

Nonetheless, Hanson does keep the reader engaged by describing his

discussions with the key scientists whose findings he recounts, as well as his own encounters with wild and cultivated bees of various species. He also visits some of the man-made disaster scenes, such as California's almond bloom where a monoculture of 250,000 hectares of almond trees are pollinated by over a million beehives trucked in from all over the US specifically for this event [4]. The almond sales are a global, multibillion-dollar business, which perhaps explains the ruthlessness with which the detrimental health effects on honeybees are dismissed by the industry as inevitable collateral damage.

But first, Hanson takes us back to an age when dinosaurs roamed the planet, and there were no bees and only a few early tentative attempts by plants to generate flowers. But there were wasps, and among these wasps, bees' ancestors. These ancestral wasps were solitary (as are many extant bees and wasps), but the females shared with today's wasps and bees the habit of building a home to raise their young and to provide them with food. But these wasps' feeding habits were by all means nastier than those of dinosaurs: they didn't simply kill and consume their prey but instead paralysed it and deposited it in a burrow, to be consumed alive, slowly, over the weeks it took their larvae to develop (many wasp species retain this lifestyle to this day). Hanson explains current theories of how early bees' ancestors made the transition from this gruesome, carnivorous lifestyle to a strictly vegan diet — consuming only nectar and pollen from flowers. This transition arguably changed the planet, and a firework of floral evolution subsequently spread around the world.

I was fascinated to learn about a theory for how bees might have brought about another transformation of the globe: they might be responsible for bringing about *Homo sapiens* and its success. Before humans kept bees in boxes, they had already harvested honey from wild bees, as evidenced, for example, by Neolithic cave paintings on several continents. But the joint history of bees and humans possibly goes back much further. Hanson meets anthropologist Alyssa Crittenden, who points out that all the great apes consume honey and the members of many extant hunter-gatherer tribes extract honey from multiple species

of wild bees [5]. Honey is the most carbohydrate-rich energy drink that nature has to offer. In her discussion with Hanson, Crittenden suggests that the habit of efficient honey collection might have fuelled the evolution of our energy-hungry brains — i.e. the very same brains that ultimately allow us to write books about bees, or book reviews of books about bees. It's an imaginative theory, but one for which hard evidence will perhaps be difficult to acquire.

If bees indeed sign responsibility for the ascent of humans, then humans have been a bit ungrateful in recent decades. Take a look at any arable and flat landscape anywhere on the globe (inspect satellite images or, if you're privileged enough to take a plane occasionally, take a look out the window). The typical picture will show that ~95% of the landscape is dedicated to industrialised agriculture to feed seven billion people, and to the livestock to feed the non-vegetarians among us. The fragments of natural habitat that remain are often so pathetically tiny, so few and far between, that it is practically a miracle that more than a handful of wild animal species still cling on. Take a closer look on the ground, and things are exactly as bad as one might expect them to be. Or worse, because what you don't see from the air are the herbicides and pesticides, and the pathogens spread by careless human transportation of livestock including bees. Across the globe, many species of bees are locally threatened with extinction, or already gone. Hanson takes us to a Chinese region that, as a result of long-lasting malpractice, has been rendered entirely bee free, and where orchard trees are pollinated by human labourers.

Can we afford to wipe out the bees? Hanson knows well that just hoping for benevolence and insight from government bodies and corporations will not be enough. Economic arguments are needed, and they are not hard to come by. He points out that over three-quarters of the top 115 crops grown in the US require (or benefit from) bee pollination. Sure, we could pollinate them all by hand if the bees were to go. But bees don't ask for minimum wages, and I'm not going to climb up any trees for free for weeks on end, vibrator in hand to shake some pollen loose. Nor are you, or you. So your tomatoes, your raspberries, and your plums (and 100+ other crops) will

be a whole lot more expensive, and it's unlikely that you'll be able to afford them year round. But Hanson *really* grabs the American soul by its most sensitive parts when he points out what would be left of McDonald's popular Big Mac in a world without pollinators. You guessed it: not much. That particular prospect doesn't make me too fretful, but I do hope that the burger-chomping masses will be convinced that bee conservation is in their own best interest.

And so, there is some hope. Hanson points to a variety of successful local pollinator-friendly initiatives, but also knows of an example of an "international agribusiness conglomerate based in Singapore" that supports interspersing commercial crops with hedgerows and other features that promote wildlife. Government incentives to farmers to plant wildflower corridors or field margins are helpful, but they might not materialise (or won't survive) in countries where short-sighted anti-environment politics rule the day. In such a setting, voluntary efforts by perceptive citizens (and companies) might be our only hope. Individual members of the public can make a real difference, by letting wildflowers grow in their lawns and planting additional pollinator-friendly flowers. May books such as Hanson's *Buzz* convince as many readers as possible and sway public opinion that we kind of owe it to the bees. After all, they may have made our brains what they are. And if your sense of gratitude (for energising human brain evolution) does not sway you, then turn your attention to your tummy and remember that a world without Big Macs is looming.

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