# To bee or not to bee

Does a bee have a mind of its own, awareness of the world, basic emotions and intelligence? **Alun Anderson** explores a brave new book that makes the case

Book
**The Mind of a Bee**
**Lars Chittka**
**Princeton University Press**

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**Bees visit about 1000 of the "right" flowers to make a drop of honey**

ARE we ready for the radical message that an insect may have a form of consciousness? I am not sure.

Most of *The Mind of a Bee* by Lars Chittka, professor of sensory and behavioural ecology at Queen Mary University of London, will upset no one: it is an entrancing journey through the senses and life struggles of bees. The shock comes in the final chapter, when he argues that a bee may have a "mind" that both thinks and feels.

Consciousness used to be seen as uniquely human, but then other mammals, starting with primates, were admitted to the club. Now many consider that an invertebrate, the octopus, may be aware. To include an insect in this consciousness club would be another prodigious leap: from being almost alone, we would find ourselves in a vast sea of sentience.

That is radical and risks inviting ridicule. But the evidence is there, and might force us to rethink our duty towards animals, as Chittka's afterword explains.

The bulk of the book takes an approach that I loved. A subheading in the introduction reads: "Why imagining other minds is important for understanding them." Chittka continues that some philosophers see "no point in trying to imagine such strange alternative worlds. I disagree..."

Me too. Scientists rightly fear anthropomorphism, but used skilfully, the imagination yields understanding. So let's accept Chittka's invitation to "picture what it is like to be a bee".

First, put on your exoskeleton and enjoy your wings – you can fly all day, faster than a human can run. Your eyes are less sharp now, but respond faster: electric lights flicker rather than glow. You are able to sense Earth's magnetic field, and can see ultraviolet light and a range of new colours.

Antennae stick out from your head and can be moved around to smell, taste, hear and analyse shapes. The subtlest flower scents are detected so quickly that you can run your antennae over a surface and trace a pattern of perfumes into what Chittka calls an "odour movie".

But to discover what is on a bee's "mind", you must go further, and imagine yourself living a bee's life, experiencing its challenges.

On day one as a forager, you start by making looping flights near the hive, so that you can recognise home. Fail and you die.

**"Scientists rightly fear anthropomorphism, but used skilfully, the imagination yields understanding"**

Then it is off to work. You must find food sources quickly, remember their location, the best routes to them and the way home. You have to learn when particular flowers make nectar and master new manipulative skills to reach food in different flower shapes.

You will also need to work fast, since you must visit some 1000 flowers, rejecting 5000 others as not worthwhile, and fly 10 kilometres or so to generate a drop of honey. Not easy. Humans struggle to shop thriftily when a few supermarkets offer different bargains at different times – a bee must do far better while putting in 12 to 16-hour shifts.

This "experiment" shows that throughout your foraging life you have to learn fast, solve problems, plan and tap into memories. You need to be smart. A bee isn't the kit of hard-wired, pre-fabricated "instincts" you might think.

Exploring more of the bee's cognitive skills, we discover from Chittka that bees can count. Not as humans do, by identifying small numbers at a glance, but by ticking off items sequentially. They can focus their attention and learn rules to classify flower types, and more abstract rules, like "same" or "different". By watching other bees, they also learn not only which flower types to visit, but the tricks needed to get at the nectar.

A bumblebee can even learn to pull a string to access a sugar source, and another bee can pick up that skill by watching her. This new skill may spread throughout a whole colony, which astonished me. But from the bee's perspective, such cognitive tricks are just what are needed to survive.

If we accept that bees are smart, can we also consider they might be conscious? This is quite a stretch. It is one thing to imagine a bee's mind in order to build a picture of

its daily life, but quite another to claim that it really has a "mind" that both thinks and feels, that is aware and can potentially suffer.

Chittka knows that he is in speculative territory. No one can prove that a creature is conscious. But the bee has some attributes considered critical for "mind". For example, "mind" surely requires integrating information from the senses and body into a bigger picture. Bumblebees that have learned to distinguish between two objects by handling them in the dark can recognise them visually, suggesting they make representations of objects that don't depend on the sense used.

They also appear aware of their own bodies. After carefully examining a narrow gap, a bumblebee can angle its body, or fly sideways, to pass through it. Additionally, bees seem to display metacognition (meaning that they know what they know), have emotional states, feel pain and have different sleep phases.

The list grows, although a bee's mind may be hard for us to grasp. With their fast senses, bees might differ profoundly from us in their perception of time, for example.

There is much more to Chittka's argument that must be left for interested readers to discover. *The Mind of a Bee* is a serious book that requires deep thought. My bet is that a few readers will end up convinced, a few will be indignant and most, like me, will be intrigued and hoping for the birth of a new field of comparative consciousness, in which many such "alien" minds are explored. That would be a fine outcome for a brave book at the frontiers of science. ▮

Alun Anderson is emeritus editor of *New Scientist* and a writer based in London.

For more on bees, turn to page 42

# Lost in meta-space

Grappling with the elusive metaverse makes for a mixed read, finds **Chris Stokel-Walker**

Book

**The Metaverse**

**Matthew Ball**

Liveright

**BILLIONS of dollars and millions of hours have been committed to the metaverse, the buzzy vision of a digital world that promises to transform human life. Yet for all the hype, we have yet to pin down exactly what it will be and why it will matter.**

**One of the first to take a stab at explaining it is Matthew Ball, CEO of US venture capital fund, Epyllion. *The Metaverse: And how it will revolutionize everything* builds on Ball's punchy essays about this virtual future, which are much loved by the tech community. However, in leaping from long essays to a 352-page book, his writing loses some of the lustre for which he has been praised.**

**Ball also struggles to define his readership and their level of expertise. Many general readers won't make it through the tonally confusing first section. Here, information washes over you with little explanation of the thinking behind the way it is presented. Ball veers from a generalised picture of the metaverse and how to access it to manual-like details about how to render environments in real-time. Readers are expected to be know-nothings and know-it-alls simultaneously.**

**The basics are often not that basic. Ball says, seemingly without irony, that "in a simplified sense, the metaverse era can be thought of as involving the use of bits to produce 3D alarm clocks made of virtual atoms". This is part of a metaphor that clearly got lost in translation. I also got lost – and I write about the metaverse a lot.**

**For some, that would be enough reason to put the book down. But persevere and see the fog clear – slowly. Chapters on bringing the various iterations of the developing metaverse together, making them interact, and the hardware required, are lucid and logical.**

**The third section is even better. Ball prophesies about when, where and how the metaverse might arrive, and what it could do to our lives. Its strength is testament to years of thinking deeply about the area.**

**However, much of the book belies that expertise. It may be the format: *The Metaverse* feels like extended thematic essays looped together, rather than building a cohesive narrative.**

**Throughout, intellectual nuggets await those willing to plough on: for example, there are great insights on the risks of tech monopolisation. But it takes willpower to find the gold among the grit.** ▮

We hear a lot about the potential of the metaverse, but what is it and when will it arrive?

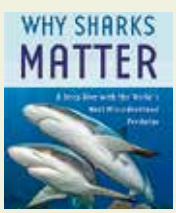
ROCKLIGHTS/ALAMY

Chris Stokel-Walker is a writer based in Newcastle, UK

## *Don't* miss

**Visit**

**The Handshake** is over 7 million years old, says palaeoanthropologist, explorer and comic Ella Al-Shamahi. She will explain the secrets of this most ancient and universal greeting at the Royal Institution, London, at 7pm BST on 21 July.




**Read**

**Why Sharks Matter** to us, the oceans and the marine economy is a subject of concern for David Shiffman, at the University of Arizona. Saving the imperilled predator will require a serious rethink of its image. Available to buy in the UK from 19 July.

**Visit**

**The Future of Ageing** makes the case that now is the best time to be old, with robots, smart rooms and more. Timely, since 25 per cent of the UK will be over 60 by 2040. At the Design Museum, London, from 20 July.

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