



Secret Worlds: The Extraordinary Senses of Animals

Martin Stevens

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Martin Stevens's *Secret Worlds* is a brilliant book on animal perception—the astonishing sensory adaptations that birds, insects, and other creatures evolved for their survival.

Humans share five senses with animals; animals have two senses that humans do not. And our human senses, it is revealed, are of middling quality anyway—“good but not spectacular”—so that most other creatures perceive things that we do not. Stevens describes the physiology of each sense with clarity, citing creatures with extraordinary versions of those senses chapter by chapter. For instance: barn owls envisage detailed spatial maps of food sources based on hearing alone; birds, including robins, have four color receptors (as opposed to our three) and perceive a fourth dimension of color that's invisible to us; and star-nosed moles navigate tunnels with a tiny appendage that has five times more sensory nerve fibers than an entire human hand. Ants, too, have a staggering diversity of receptors to detect the chemical odors they use to communicate.

The book is also fascinating in addressing those senses that humans do not have. The electric sense, for instance, is the ability to detect changes in positive and negative charges. With that sense, a bumblebee can determine a flower's shape and whether it has been visited recently based on the geometry of the electrical field around it. And the platypus has 40,000 electroreceptors in its bill that enable it to detect the swish of a shrimp's tail. And the magnetic sense is used by birds and herding animals to gauge Earth's geomagnetic field for orientation, navigation, and migration—there's an engrossing discussion exploring multiple theories on how this sense works.

Riveting, enlightening, and humbling, *Secret Worlds* profiles an array of creatures who have evolved extraordinary abilities to perceive realities that are invisible to human beings.

KRISTEN RABE (September / October 2023)

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