



How Animals Sense Earth's
Amazing Secrets

AN
**IMMENSE
WORLD**

**READ-TOGETHER FAMILY
DISCUSSION GUIDE**

PULITZER PRIZE-WINNING AUTHOR

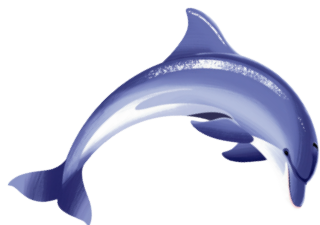
ED YONG

ADAPTED BY **ANNMARIE ANDERSON**

ILLUSTRATED BY **REBECCA MILLS**

BEFORE YOU START

Before you begin, use the empty lines below to make some predictions. How do you think animals sense the world? How do you think animals' senses might be different than ours?



Dolphin:



Birds:



Mouse:

WHILE YOU READ

Use the questions below to discuss each chapter after you finish reading. Think about your answers, and don't forget to refer back to the book!

1. How many senses do humans have? (Intro)
2. Why is it worth trying to imagine how animals perceive the world? What are the dangers of not trying to imagine how animals perceive the world? (Intro)
3. Think critically: Why might so many "smell words" be borrowed from "flavor words"? (Ch. 1)
4. Why is taste important? Why would a baby be born with an ability to taste bitterness? (Ch. 1)
5. The author writes that both a starfish and humans "see what we need to see." What does he mean by this? (Ch. 2)
6. Compare and contrast the vision of a scallop, a cow, a bird, and a human. (Ch. 2)
7. Yong writes, "Color, then, is something our minds create" (p. 57). Can two people ever really see the same color? Reflect on this. (Ch. 3)
8. The author writes, "Guided by evolution, eyes are living paintbrushes," and "Beauty is not only in the eye of the beholder. It arises because of that eye" (p. 74). What does he mean by this? (Ch. 3)
9. Why is the chapter on pain titled the "Unwanted Sense"? As you read, consider if pain is truly unwanted. (Ch. 4)
10. Why can't scientists treat all animals the same way? (Ch. 4)

11. How is hibernation different from sleep? (Ch. 5)
12. What are some examples of animals having “senses that match the places they live”? (Ch. 5)
13. Why do you think touch is one of the least studied senses? (Ch. 6)
14. For which animals does the sense of touch not necessarily rely on direct contact? Which animals do rely on direct contact? (Ch. 6)
15. What do treehoppers and elephants have in common, despite their difference in size? (Ch. 7)
16. How and when does a Japanese orb weaver change its web? Why is this useful? (Ch. 7)
17. How has hearing guided the evolution of some animals? (Ch. 8)
18. Which animals can communicate at ultrasonic frequencies? Does this surprise or not surprise you? Why? (Ch. 8)
19. How do tiger moths and luna moths avoid being eaten by bats? (Ch. 9)
20. Why is echolocation referred to as “touching with sound”? (Ch. 9)
21. Why is magnetoreception so hard to study? (Ch. 10)
22. Why is the rush to find the magnetoreceptor making matters worse for scientific study? (Ch. 10)
23. Why must we think of the senses as a unified whole? (Ch. 11)
24. How does learning about an animal’s experience of their world expand our understanding of ours? (Ch. 11)
25. What affects are man-made noises having on animals? Why does it more dramatically affect sea creatures? (Ch. 12)
26. What is the human sense—the “gift”—that we are blessed with, according to the author? (Ch. 12)

ONCE YOU’RE FINISHED

1. How do our senses and human biases get in the way of our understanding animals and their perception?
2. Why is trying to imagine animals’ experience of the world important, though it may be difficult—even impossible?
3. Using knowledge about dichromacy, what are some changes you would recommend to design our world for dichromats?
4. Should animals be used for testing given what you’ve learned about pain, nociception, and animals’ experiences of the world around them?
5. Write a personal reflection on this statement: “We tend to think of nature as something separate from us, rather than something we exist within.” (p. 247)

Do you remember these words?

Take turns pointing to a word and defining it.

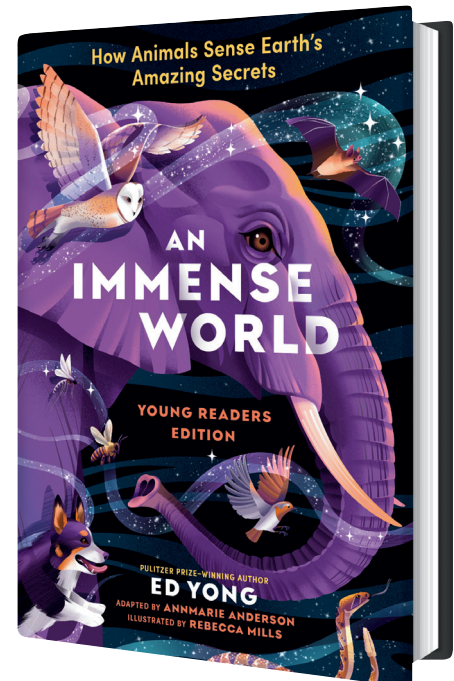
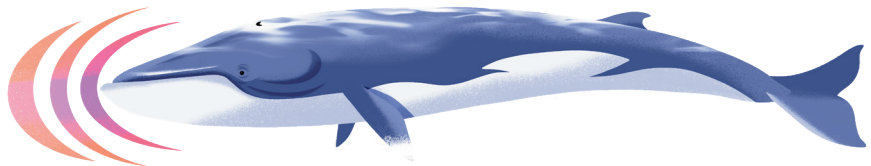
synesthesia, **electrolytes**, ions, **conductor**, **insulator**,
electroreceptors, magnetoreception, **ornithologist**, magnetoreceptors, **echolocation**,
odontocetes, **infrasounds**, **embryos**, **vibrometer**, **mechanoreceptors**,
vibrissae, **oripulation**, **hydrodynamic**, **hypothermia**, thermosensor, **capsaicin**,
infrared, **parasites**, **membrane**, nociceptors, **neurons**, dichromats, **trichromats**,
ultraviolet, **tetrachromats**, panoramic vision, **lens**, **retina**, **photons**, **monochromatic**, **cones**,
rods, odorants, **molecules**, pheromones, **umami**, umwelt, **stimuli**,
receptors, **sense organs**, **proprioception**

PHOTO BY URSZULA SOLTYS



ABOUT THE AUTHOR

ED YONG is an award-winning science writer who until recently was a staff writer at *The Atlantic*. His writing has also appeared in *National Geographic*, *The New Yorker*, *Wired*, *The New York Times*, *Nature*, *New Scientist*, *Scientific American*, and more. He talked about mind-controlling parasites at the TED2014 conference, and his talk has been viewed more than 1.4 million times. He is the winner of the Byron H. Waksman Award for Excellence in the Public Communication of Life Sciences, the Michael E. DeBakey Journalism Award, the National Academies Keck Science Communication Award, and awards from the Association of British Science Writers for Best Science Blog and Best Communication of Science in a Non-Science Context.



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BRIGHT
MATTER
BOOKS