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**Perceptual Worlds:
Insights from Animals About the Hidden Realities Around Us**

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October 2, 2022

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One of the many ways of practicing mindfulness meditation is “Six Sense Noting.” This practice takes the “five senses” many of us were taught here in the West (sight, sound, smell, taste, and touch) and adds a **sixth sense of “thinking or mind” recognized in many Eastern worldviews.**

To practice Six Sense Noting, the instruction is to notice—in the arising of each present moment—whatever is most prominent in your experience, and “note” it with one of six different labels:

1. Seeing
2. Hearing
3. Smelling
4. Tasting
5. Touching
6. Thinking

In Buddhism, this list is sometimes described as the “six sense gates.” The theory is that **anything we humans are capable of experiencing must enter through one or more of these sense gates.** If we perceive something, it is because we either see it, hear it, smell it, taste it, touch it, or think it. How else would anything come into our awareness?

If we were to update the traditional practice of “Six Sense Noting” in light of modern science, we would need to expand it to “Eight Sense Noting.” Science has designated at least two additional human sense gates:

1. Our "sense of **balance**.”
2. “Proprioception, which refers to **awareness of our own bodies**, a sensation which is distinct from touch. You sometimes hear this sense referred to as proprioception or “bodyfulness” (10).

It is also important to know that the senses of other animals have often evolved in ways that do not fit neatly into the categories of our eight human senses (10). And this insight begins to point us in the direction that I would like to invite us to explore further.

On the one hand, our human senses give us access to sights, sounds, smells, tastes, touches, thoughts, balance and body awareness—senses whose powers range from spectacular to mundane to devastating. There is so much more available for us to experience directly through our senses than any single human life can begin to take in. On the other hand, we are increasingly aware that **there are many more aspects of reality that are unavailable to our direct perception.**

As a guide to the fascinating world beyond our human sense gates, I recently had the pleasure of reading a book published a few months ago titled *An Immense World: How Animal Senses Reveal the Hidden Realms Around Us* by Ed Yong, a Pulitzer Prize-winning science writer. I found this book riveting. And it makes me want to go back and read his award-winning first book from a few years ago titled *I Contain Multitudes: The Microbes Within Us and a Grander View of Life*.

I love a clear, lucid, accessible science writer. I actually bought two books as background research for this sermon, read the introductions to both, and was immediately clear that this was the better book. I read a bit more of the other one, but didn’t end up finishing it. Life’s too short, and there are too many great books to read.

To begin exploring beyond the boundaries of our human senses, consider this thought experiment from Yong. Imagine that you are the only human being in this sanctuary, and for some odd confluence of reasons you have found yourself sharing this room with a menagerie of other creatures.

- There's an **elephant** over the choir loft,
- a **mouse** scurrying under the chairs,
- a **robin** perched here on the pulpit,
- an **owl** sitting on one of the overhead beams,
- a **bat** on another beam hanging upside down,
- a **rattlesnake** slithering around on the floor,
- a **spider** lurking on its web in a high corner,
- a **mosquito** buzzing around, and also a **bee**.

I know this is an improbable scenario, but stick with me. The point is to consider the different ways these various creatures would perceive the same room.

Let's start with the **mosquito**, whose sense of smell would draw it toward the carbon dioxide of your human exhalations, as well as to the aroma of your skin. When it lands on your arm, the sound of you slapping it away would be most likely to disturb the mouse (3).

The **mouse's** squeak of alarm would be at a pitch too high for the elephant to hear, but it would be audible to the bat. If the **elephant** did let out a rumble, it would be too low-pitched for the mouse or the bat to hear, but the snake would feel the vibrations. We humans would be unable to sense either the ultrasonic level of the mouse squeak or the infrasonic rumble of the elephant, but we would notice the **robin's** bird song, although we would be unable to perceive that song's full complexities (3-4).

Speaking of the robin, the bird's chest would look red to us, but not to the elephant, who can see only blue and yellow. Similarly, the **bee** would be drawn to ultraviolet hues of flowers outside the window imperceptible to our human vision (4).

The **spider** wouldn't care about any of this sensory commotion—unless the mosquito happened to vibrate the spider's web, triggering it to strike. In turn, the spider would be oblivious to the **bat's** sonar, allowing the bat to swoop in and eat the spider with precise accuracy (4-5).

And since the days are getting colder, only the **robin** among all these animals would sense the shifts of the Earth's magnetic field, sending it south for the winter (5).

These examples are only a small sample of the ways that diverse beings perceive different aspects of the same larger reality. The scientific term for this phenomenon comes from the German word *Umwelt*, which in German, literally means “environment.” But in regard to contemporary scientific explorations of the senses, the word *umwelt* has come to have the technical definition of a being’s “perceptual world.”

As illustrated by our thought experiment, each animal—including us humans—exists in its own “**sensory bubble.**” These senses allow creatures to perceive certain aspects of what is happening, while remaining oblivious to other aspects (5). Yong writes that for every sentient being, **our *umwelt* (our “perceptual world”) “feels all encompassing. It is all that we know. So we easily mistake it for all there is to know”** (6).

Even if we limit our sample size to our own species of *homo sapiens*, no two of us experience the world in exactly the same way. To name only a few prominent examples:

- Up to 8% of men and 0.5% of women have “color vision deficiency” (what used to be called “color blindness”), meaning that they **perceive red and green as the same color.**
- Or, I think cilantro is delicious, but approximately 4 to 14 percent of the humans experience **cilantro as tasting like soap.**
- I will also say that body odor is not my favorite scent, but to some people **body odor smells like vanilla** (5).

Reality is wild, ya’ll!

If we break down reality into the language of physics, “**light is just electromagnetic radiation. Sounds is just waves of pressure. Smells are just small molecules.**” And the variations of our sense gates impact the intensity and extent of our experience, interpretation and interaction with all these physical sensations (8).

Yong’s book has chapters exploring how animals experience the world differently than humans—in terms of smells, tastes, light, color, pain, heat, contact, flow, vibrations, sound, echoes, electric fields, magnetic fields, and more. For our purposes, we’ll only explore a few representative examples.

Let's start with a fun one. Does anyone here regularly walk a dog? Have you ever heard the saying that, **“We humans like taking our dogs for walks, but what our dogs really want is to be taken for *smells*?”** For anyone who has spent much time walking a dog, this truth becomes quickly obvious. You barely get started walking before the dog has stopped in its tracks, stuck its nose into some object, and proceeded to sniff intensely and at length.

Here's some of why this happens. Take a deep breath with me. Notice, as you are *inhaling*, that air comes in allowing you to both smell and breathe. Something similar happens when a dog inhales—with one important difference. Dogs have a small tributary in their nose especially for smelling that we don't have, into which a small part of each inhalation branches off. Relatedly, when we humans exhale, we expel most of the molecules related to smell; but because of this different nasal structure in dogs, **odorants linger and are strengthened further with each new sniff** (18-19).

Depending on the breed, **dogs have a sense of smell that is somewhere between 10,000 to 100,000 times better than humans.** And various scientific experiments have demonstrated dogs' abilities to:

tell identical twins apart by smell...and detect a single fingerprint that had been dabbed onto a microscope slide, then left on a rooftop and exposed to the elements for a week.... They've been trained to detect bombs, drugs, landmines, missing people, bodies, smuggled cash, truffles, invasive weeds, agricultural diseases, low blood sugar, bedbugs, oil pipeline leaks, and tumors. (19-20)

Even though we humans share a generalized sense of smell with dogs, their sense gate of smelling is much wider and deeper than ours. And the more I learn about the canine sense of smell, the more patient I am when walking my dogs. I can't always wait, but I try to give them more opportunities to smell to their heart's content (23).

And although dogs tend to be of special interest to the many who enjoy them, many other animals, including rats, pigs, and elephants are each excellent smellers in their own rights (24). Relatedly, if you haven't seen the recent film *Pig* with Nicolas Cage as a truffle-hunter, I recommend it. I should also mention that while we will never

rival dogs, rats, pigs, or elephants in a smelling contest—we're not even in the same league—we humans can get better at smelling with intention and practice (25-26).

Now, since we started with how inferior our sense of smell is compared to many other animals, let's shift our focus to the sense in which we are near the top of the pack: sight. While it is true that eagles and other birds of prey do have substantially sharper vision than we have, in general, compared to most other animals, we humans have formidable visual acuity (62-63).

Ironically, however, there is a shadow side to great eyesight. Our human visual capacity often biases us into falsely assuming that what is eye-catching to us is also eye-catching to other animals—and even other humans. This is another place where our *umwelt*—our “subjective universe,” our “perceptual bubble”— can limit our appreciation for the many alternative ways of experiencing the fullness of reality (63).

So even though we have switched from smell to sight, let's stick with dogs. Has anyone ever heard that dogs can't see color? I definitely heard that growing up. It turns out that's a myth. **“Dogs do see color. They just don't see the same range that people see”** (84-85). “They see mostly in shades of blue, yellow, and gray” (88).

More generally—and this is where things start to get trippy—**“Color is fundamentally subjective. There's nothing inherently ‘green’ about a blade of grass, or the 550-nanometer light that it reflects”** (86). So much depends on the particularities of the sense gate that receives that light. As one vision scientist famously quipped, **“For a blue whale, the ocean is not blue”** (87).

Here's another example: if you've ever been to a horse race, distracting human obstacles are often painted orange. **To us humans, that wavelength of electromagnetic radiation stands out, but to horses, what humans perceive as orange simply blends into the background.** If we wanted to pick a more horse-sensitive color, “we'd paint the marks fluorescent yellow, bright blue, or white” (88).

There is so much more to say about all of this, but I hope that even this brief tour of the senses has made the world both a little less familiar to you and a bit more interesting. The twentieth-century French novelist Marcel Proust said it this way: **“The only true voyage of discovery . . . would be not to visit strange lands, but to**

possess other eyes, to behold the universe through the eyes of another, of a hundred others, to behold the hundred universes that each of them beholds, that each of them is.” (16).

Similarly, the contemporary philosopher Thomas Nagel wrote a famous essay titled, “What Is It Like to Be Bat.” He was interested in the question, not of what it would be like for us humans if we had bat-like abilities (echolocation, the ability to fly, etc.). Instead, his focus was the much more difficult, elusive, and subjective experience of **“What it is like for a *bat* to be a bat.”** Nagel had to ultimately confess that, “If I try to imagine this, I am restricted to the resources of my own mind, and those resources are inadequate to the task” (11).

Nagel is right about our ultimate limitations; nevertheless, I appreciate that scientists continue to push the boundaries on what we can learn about reality beyond our usual human senses. For now, I’ll give the final words to Ed Yong from his book, *An Immense World: How Animal Senses Reveal the Hidden Realms Around Us*:

We may not ever know what it is to be an octopus, but at least we know that octopuses exist, and that their experiences differ from ours. Through patient observation, through the technology at our disposal, through the scientific method, and, above all else, through our curiosity and imagination, we can try to step into their worlds. We must choose to do so, and to have that choice is a gift. It is not a blessing we have earned, but it is one we [may] cherish. (354-355)