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HUMANS *and* DOGS

have been best friends for thousands of years, but how much do we actually have in common? How do dogs see, hear, taste, touch, and smell the world?



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MAKING SENSE OF DOG SENSES

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HOW OUR FURRY FRIENDS EXPERIENCE THE WORLD



WRITTEN BY **Stephanie Gibeault** | ILLUSTRATED BY **Raz Latif**

Sniffing butts,
eating garbage,
rolling in
stinky stuff ...

Dogs definitely have habits that don't seem to make a lot of sense. Except these behaviors *DO* make sense—in a dog-sense way.

Even though dogs and humans have been best friends almost *fur-ever*, the way we each experience the world is very different. *Making Sense of Dog Senses* explains the unique ways dogs see, hear, taste, touch, and smell from both evolutionary and scientific perspectives.

Entertaining anecdotes, fascinating facts, and hands-on activities will help readers make sense of dog senses and, along the way, discover how to have even better dog-human friendships.



— Smell —

Follow My Nose

Remi is part Labrador retriever and part magician. No matter where her human hides a five-dollar bill, Remi can find it. Even if there are other distracting smells around, like a hidden piece of hot dog—abracadabra!—she locates the money. What makes Remi's nose so powerful?

Let's take a close look at how a dog's nose knows.

When dogs breathe in air through their nostrils, scent particles come along for the ride. Inside the nose, the air separates into two streams. Most of the air travels to the lungs, but some travels to an area at the back of the dog's nose used only for smelling. Once in this area, the air lingers and stays undisturbed when the dog exhales. This gives the dog longer to absorb all the scent particles in that air.

This scent-detecting tissue at the back of a dog's nose is called the olfactory epithelium (ole-FAK-tor-ee eh-puh-THEE-lee-uhm). It contains special cells called olfactory receptors that sense smells. Certain receptors react to certain smells. And each receptor is connected

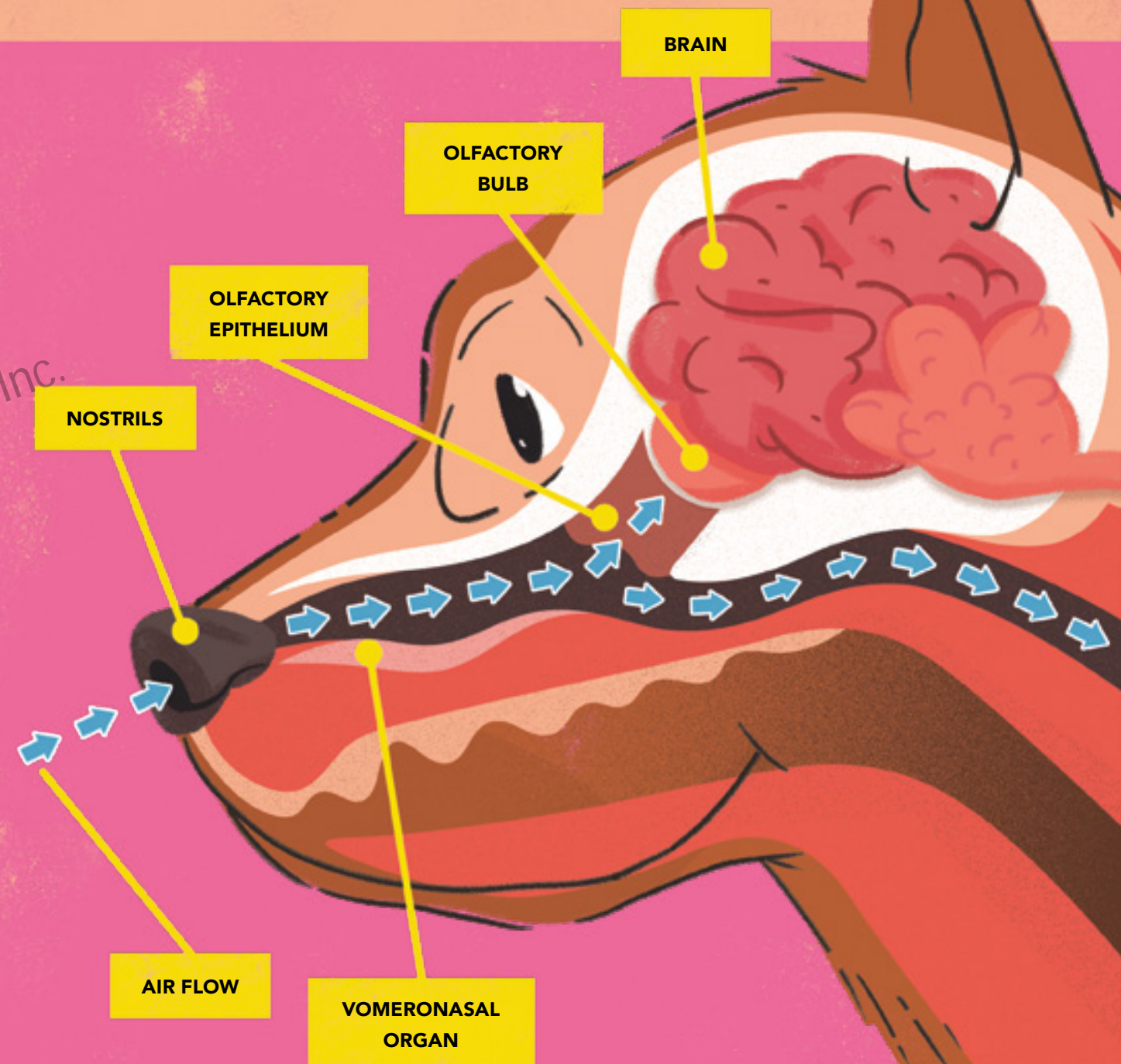
to nerves in the olfactory bulb of the brain.

The olfactory bulb is the part of a dog's brain responsible for filtering and distinguishing between all the different smells. Once the olfactory bulb has sorted the scents, it signals the rest of the brain to react. The brain might decide where the smell is coming from, recall a memory associated with that smell, or respond with an emotion.

A vomeronasal (VOM-ero-NAY-sal) organ sits above the roof of a dog's mouth. Also called the Jacobson's organ, it's a separate scent-detection system that recognizes special chemicals called pheromones (FEHR-uh-mowns). These help dogs communicate with each other. For example, the

much larger. Finally, a dog's olfactory bulb takes up a far larger portion of their brain than a human's does. All this means that dogs can detect smells too faint for our noses *and* distinguish between them. Now you know the secret to Remi's magic trick!

smell of a mother dog's pheromones will comfort her nursing pups, or a female dog's can indicate her interest in a mate. Dog pee is full of pheromones. So are the anal glands on a dog's rear end, which explains all that butt sniffing.



DO YOU SMELL THAT?

While a human's sense of smell is nothing to be sniffed at, dogs experience the world through their noses in a way we can only imagine. Not only do they have millions and millions more olfactory receptors than we do, but they also have more kinds of them. Plus, their olfactory epithelium is much,

One Big Nose

All dogs are designed for smelling, but bloodhounds are maybe the most famous for their ability to track a scent.

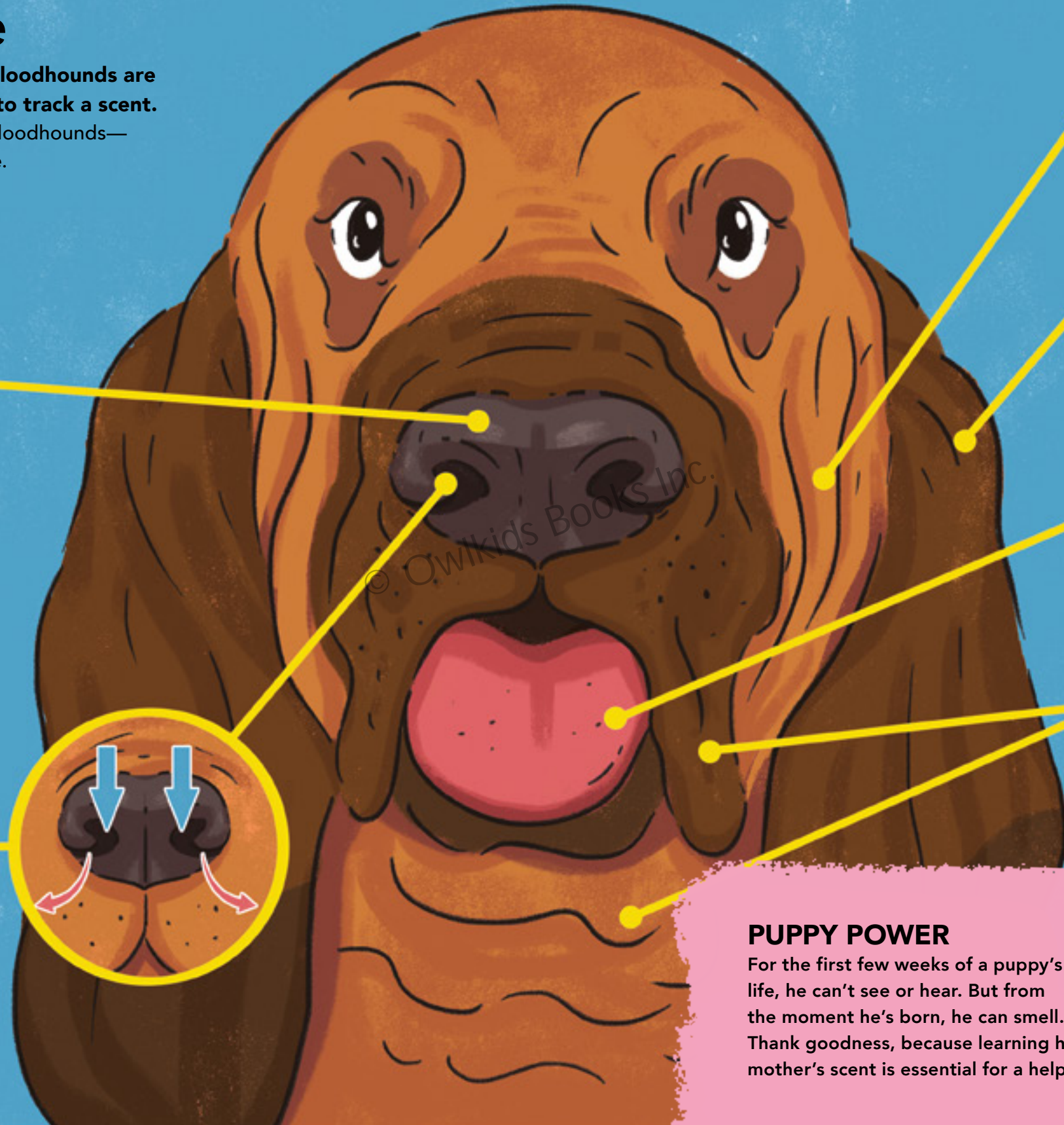
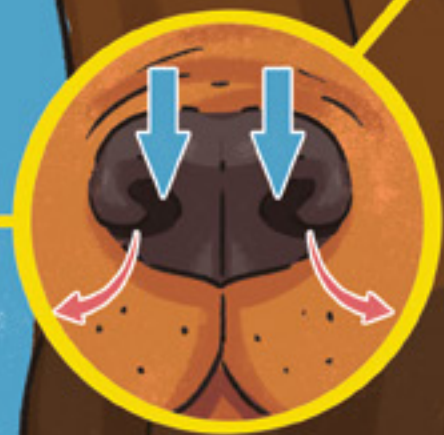
Here's a closer look at the parts that make bloodhounds—and other dog breeds—act like one big nose.

NOSE

Why is a dog's nose usually wet? It's to help her smell. The nose is kept moist by a layer of mucus that traps odor particles. This allows the dog to breathe them in on the next inhale.

NOSTRILS

When a dog breathes, air goes in through her nostril holes and out through the slits at the sides. This protects odor molecules already in the dog's nose from being disturbed when air is exhaled. That way, odor molecules are inside the nose for longer and have a better chance of being detected. Breathing out of the nostril slits also helps the dog collect more smells, especially from the ground. How? Air exhaled out of the slits swirls around and kicks up new odor particles. Then on the next inhale, there are more scents for her nostrils to capture. Dogs can even use their nostrils independently: for familiar smells they enjoy, they rely on their right nostril, and for smells they find upsetting, they use their left.



WRINKLES

Breeds such as bloodhounds have so much loose skin, they have deep wrinkles all over their faces. It's thought that these wrinkles also help trap scent particles.

EARS

Long, droopy ear flaps help funnel smells up from the ground toward the dog's nose.

TONGUE

Dogs lick their noses to keep them damp since a dry nose doesn't work as well for collecting scents. Nose licking can also carry odor particles into the mouth and closer to the vomeronasal organ.

FLEWS AND DEWLAPS

Some dog breeds have what look like extra folds of skin on their heads and necks. Long, droopy lips are called flews or jowls. And a flap of sagging skin dangling from a dog's neck is called a dewlap. All this loose skin is not just adorable; it collects and traps smells.

PUPPY POWER

For the first few weeks of a puppy's life, he can't see or hear. But from the moment he's born, he can smell. Thank goodness, because learning his mother's scent is essential for a helpless

newborn's survival. He depends on his mother for safety, companionship, and her nutritious milk. Whenever he needs her, he finds her by her scent. In fact, a puppy's sense of smell might even start working in the womb!

You Can Run but You Can't Hide

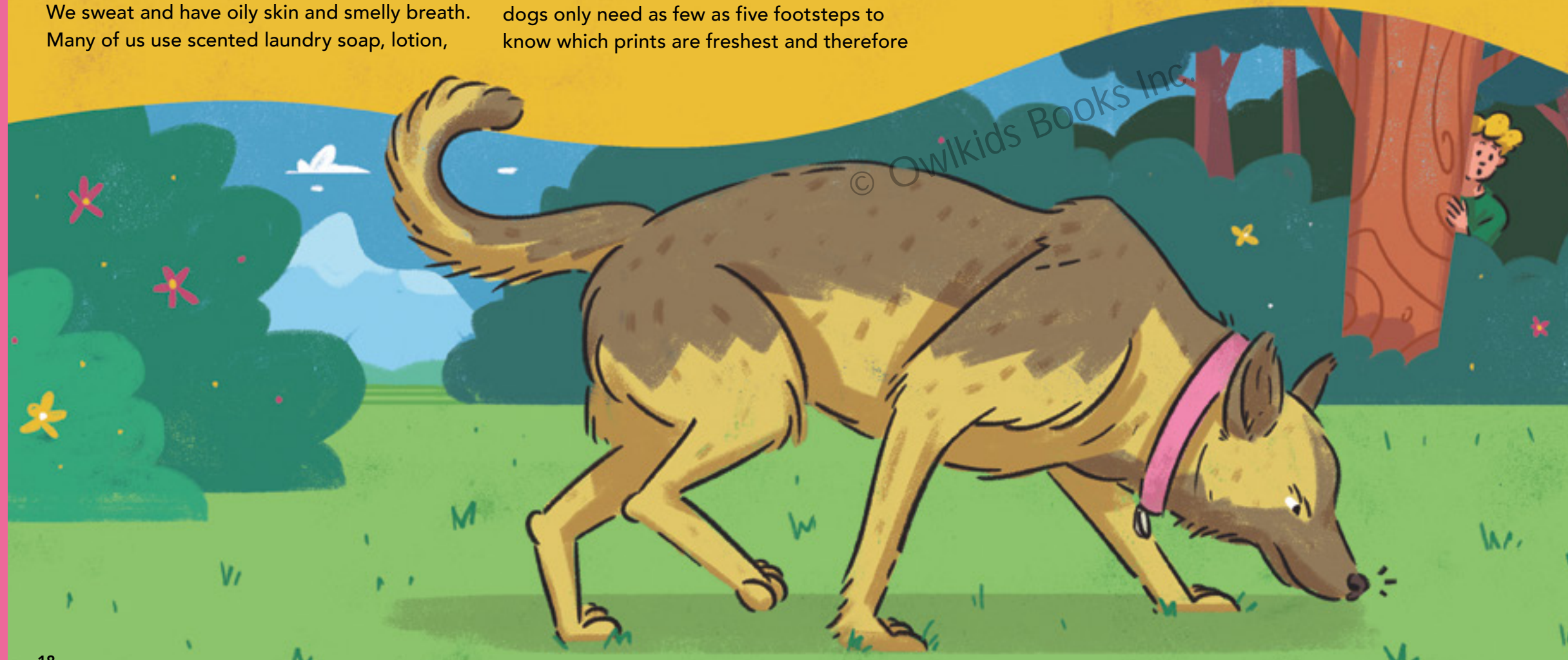
It makes sense that dogs are born following scents. It's one of the ways their wolf ancestors found prey. And this nosey nature is what allows us to use dogs for tracking. Whether it's a lost child or a criminal on the run, we can give dogs a smell to follow, and off they go. But you might be surprised by all the things a dog can reek-ognize when they are on the trail of a scent.

From a dog's perspective, humans stink. We sweat and have oily skin and smelly breath. Many of us use scented laundry soap, lotion,

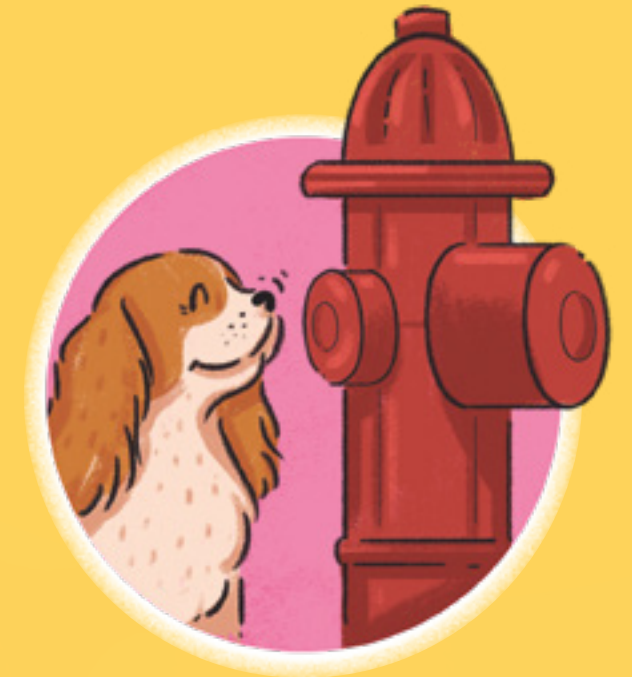
and perfume. And everybody has their own unique odor, even identical twins. On top of that, we shed smelly skin cells wherever we go. Finally, when you walk across the ground, you squish plants, soil, insects, and so on, leaving behind a smell known as a disturbance odor.

But a scent trail could go anywhere—across a field, through woods, or even through a stream. So how do dogs stay on track? They might pay attention to the strength of the smell, since the longer a footprint has been on the ground, the more its scent fades. A dog on a trail will move toward the fresher prints and away from the older ones. In fact, some dogs only need as few as five footsteps to know which prints are freshest and therefore

which direction the person was headed. And this is where dogs' nostrils may be extra useful. When close enough to the smell, dogs get different information in each nostril. By comparing the strength of the smell that goes in the right versus the left nostril, a dog can tell which direction to take.



READING THE DAILY PEE-MAIL



Dogs love fire hydrants. They're perfect for bathroom breaks ... and for smelling the pee of the dogs who have been there before. Yuck! But don't turn up your nose just yet. Similar to the way dogs' wolf ancestors peed on trees and rocks to communicate with other wolves, dogs can tell a whole lot from these "pee-mail" messages, including another dog's age, health, sex, mood, confidence, and interest in romance. So the local hydrant lets a dog catch up on all the neighborhood gossip with just a sniff.

Sniffing Superpowers

Although there are other animals with impressive sniffers, such as elephants and mice, they won't walk on a leash or work for kibble. However, dogs are so trainable, we can teach them—in just a few steps—which smells to find. First, they learn to associate a certain smell with a reward, such as a treat or game of tug. Then they must find that smell from a range of samples or out in the real world. When they find it, they get their reward.

There are many jobs in which working dogs are trained to use their superpowered noses.

Some dogs search for explosives. Others are taught to find the poop of endangered species, such as whales. And some even sniff out diseases, such as cancer.

Cancer-detection dogs often make their diagnosis by smelling a person's blood, pee, or breath. Those samples contain thousands of different chemicals, yet a dog can find the smallest trace of unhealthy odor. But dogs don't go to medical school, so how do their noses know?

Dogs can smell just a particle or two of smell in one trillion particles of air. That's like finding a single mint jellybean in a sports stadium filled to the roof with jellybeans! Superpowered noses is right!

TIME-TRAVELING NOSES

A dog's superior sniffer is something of a superpower. For instance, in a way, they can smell the past! How? Because smells fade over time, dogs can sense how long a stink has been lingering around. Dogs can kind of smell the future, too. That's

because someone's smell reaches a dog's nose before the person comes through a door or around a corner. Finally, a dog's home and yard smell different in the morning than in the afternoon or evening, and that rhythm of daily scents helps a dog smell the time with her nose.



THE DISAPPEARING SMELL

Believe it or not, humans can detect certain smells, like bananas, even better than dogs. But for many other smells, dogs have the upper paw. Here's a way to test the power of your nose:

1. Put 15 ml (1 tbsp.) of water in a large mixing bowl. Add a drop or two of scent like vanilla or peppermint extract.
2. Stir them together and then smell the mixture.
3. Add 120 ml (½ cup) of water to the mixture and smell it again.
4. Keep adding water 120 ml (½ cup) at a time, smelling your mixture each time. When you can't smell the scent anymore, you've reached your nose's limit.

How much water did you add before the scent disappeared? Could a dog beat you? Probably. Remember that dogs can smell just a few drops of a scent in a swimming pool of water! But try a different scent and see if you can do better.

