How Much "Sense" Do You Have About Snakes? How Alike (and Different) Are They From Us?

Perhaps one of the largest attributes, or characteristics going against the positive perceptions of snakes, and even other reptiles and amphibians in general, are that they happen to be so much different than what we know or are familiar with in terms of their overall appearances, lifestyles, behaviors, and other characteristics. We are simply much more familiar and empathetic with our fellow humans, and even other, "less scary and frightening" birds and mammals, for instance. Snakes, and other reptiles have evolved over thousands, if not millions of years in many different ways from our own, and during these times, have also developed unique sensory characteristics and abilities unique among the animal kingdom!

So how can, and do snakes manage to survive and get around when they are so much different than we are? How is their vision and eyesight compared to ours? Are snakes able to hear in the same ways that we can? How good is a snake's sense of smell? Well, as it turns out, snakes and other reptiles share some of the same, or at least similar sensory abilities to us, while at the same time, may also have additional or heightened senses we as humans do not, or have not evolved, and vice versa. Some of our sensory abilities likewise may be more advanced or developed than snakes, or other reptiles, and vice versa, whether for the better or worse.

While entire books and chapters could probably be written on the subject of the sensory perceptions these unique and amazing groups of animals possess, this educational article will examine and compare all five of the major senses that snakes in particular have (namely their senses of sight and vision, smell or olfactory organs, taste, hearing, and their sense of touch and feeling) with the aim of perhaps better empathizing, or relating to in what ways these animals might still be similar to us, while being different at the same time! At that's all not even including if we acknowledge all of the other, additional sensory abilities that many other reptiles and amphibians possess! So without further adieu, here are how the five snake senses compare to those of we, as humans!

Sense of Sight, or Vision:

**Figure 1. Showing the clear Spectacles on a shed snake skin. Photo Credit: Jason Bittel.*

-A snake's sense of sight, or vision, is perhaps one of the more better studied senses. In general, snakes do not possess as good of eyesight or vision as humans, although there are always exceptions. Unlike humans, snakes do not blink, and do not have eye-lids. Instead, they possess a clear scale over each eye known as **Spectacles** which serve as protection to the eyes, while also retaining moisture.

**Figure 2. African Boomslang displaying Excellent Stereoscopic Vision. Photo Credit: African Snakebite Institute.*

-Some species of snakes, particularly those which are either active, diurnal predators or arboreal species, can have relatively good eyesight, or **Stereoscopic Vision** and depth perception to be able to detect and gauge the distance needed to either strike or ambush their prey from these elevated or otherwise enhanced settings.

-A snake's pupils can expand or contract, depending on their lighting and environmental conditions, which filters or regulates the amount of light allowed in. While there are of course always exceptions, most diurnal species of snakes have rounded or relatively large eyes and pupils, while more nocturnal or crepuscular species of snakes generally have narrower, or more slit-like pupils, and/or relatively smaller eyes. However, pupil shapes are not a reliable means of identifying whether a snake is venomous or not when used on its own, as discussed in further detail in our article, "Reptile and Amphibian Myths and Misconceptions".

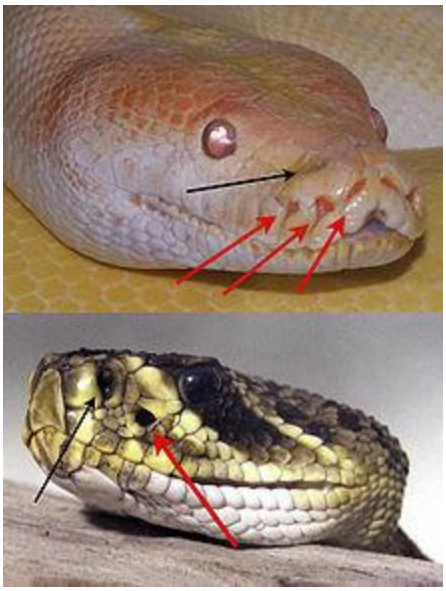

**Figure 3. Displaying Labial Heat Pits (above) in the Albino Burmese Python, and Loreal Heat Pits (below) in the Eastern Diamondback Rattlesnake. *Photo Credit: Serpent Nirvana.*

-Some groups of snakes, namely the pit vipers, pythons, and most boas, also have **Pit Organs** located either within their loreal scales between their eyes and nostrils (in pit vipers), or labial scales along their upper jawlines (in pythons and boas). These pit sensory organs are also quite sensitive, and use electro-receptors to detect warm-blooded, or endothermic prey even in complete darkness.

**Figure 4. A Parietal Eye atop the head of many lizards, but not yet widely known in snakes. Photo Credit: Timothy Hess.*

-Some species of burrowing, or exclusively fossorial snakes have only tiny, remnant, or Vestigial Eyes, which can only sense changes in photo-periods or the amounts of “light” and “dark”. Similarly, many species of lizards also have atop their heads a “third eye” or **Parietal Eye**. This parietal eye does not act as a fully functional eye, but likewise can sense changes in photo-periods or changes in light, in order to select suitable basking locations, and to detect and avoid potential predators from overhead. It is not known, however, whether snakes, or other reptiles and amphibians also have this parietal eye as well.

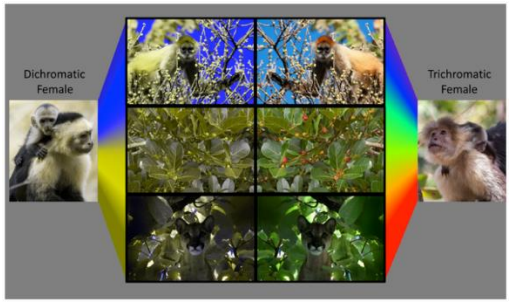

**Figure 5. Example showing the primary colors, and combinations thereof, between dichromatic and trichromatic vision. Photo Credit: Plos One.*

-When it comes to seeing in color, some scientific studies and research has found that at least some snakes can see in **Dichromatic** vision, or the ability to see at least two colors and their combinations thereof, namely blues and greens, and are otherwise only able to see in **Monochromatic** vision at night, just as with humans. Humans, on the other hand, are able to see in **Trichromatic**, or the three colors, and their combinations thereof, namely reds, blues, and greens.

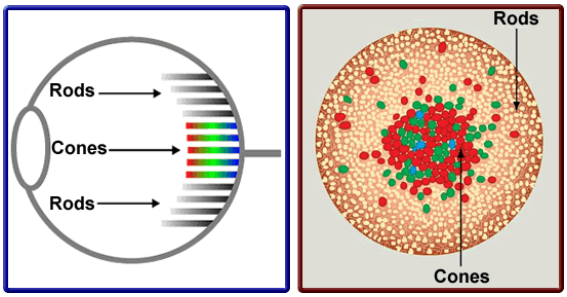

**Figure 6. Showing the rods and cones within the eye. Photo Credit: Blog.daum.net.*

The Verdict: Humans generally have the greater advantage in their overall sight and vision, being able to see a wider range of tri-chromatic colors than do snakes. Snakes, however, have added layers of protection over their eyes, as well as sometimes additional sensory organs which humans do not possess. In these cases, snakes possess the advantage over humans in terms of having spectacles and sometimes labial or loreal heat pits!

<u>Sense of Smell, or Olfactory Organs:</u>

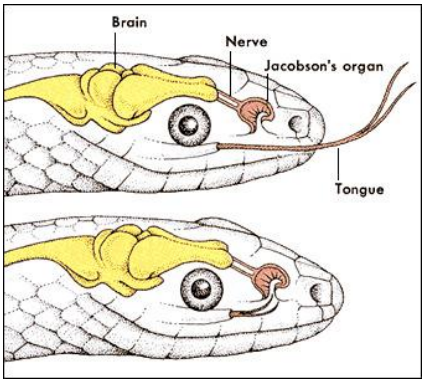

**Figure 7. The Jacobsons, or Vomeronasal Organ in snakes. Photo Credit: Blog.daum.net.*

-Another one of the perhaps better known, developed, and studied senses that snakes, and other reptiles have, are their senses of smell. Snakes, as well as some other animals, have a **Vomeronasal**, or more commonly known as a **Jacobson's Organ** located in the roof of their mouths which act as their primary olfactory organ. A snake's tongue is forked in order to provide it a greater amount of surface area in which to gather and collect scent particles from the air surrounding them, which are then processed and interpreted by their Jacobson's Organ and by their brain! It is highly debatable whether humans also have a Jacobson's organ as well, or not.

-In addition to using their Jacobson's Organ to find and locate prey or food sources, snakes also rely on it heavily as well to identify other scents and pheromones as well, such as in being able to recognize and identify sexes of at least their same species, locating females in order for mating in the case of males, and even in some cases tracing or following certain scents trails or pheromones in order to locate their home ranges and/or hibernaculums or overwintering areas each year.

-While snakes do also have nostrils as well like we do, they are used primarily for breathing and respiration, and less heavily on their sense of smell, although snakes are probably capable as well, at least to a small degree.

The Verdict: With the scientific debate ongoing as to whether humans possess or have evolved a true "Vomeronasal" or "Jacobson's Organ", this sense likely goes towards snakes over humans for having a greater sense of smell, in addition to their ability to detect chemical scents and pheromones that we humans cannot!

Sense of Taste:

-While a snake's sense of taste has not been well, or extensively studied, it is known that they generally do not have taste-buds, or very few taste buds, on their tongues, unlike a human's much more developed sense of taste. However, it is likely that the snake's Jacobson's Organ can also provide at least some level of taste in addition to their sense of smell.

The Verdict: A human's sense of taste is generally more advanced and well developed than that of snakes.

Sense of Hearing:

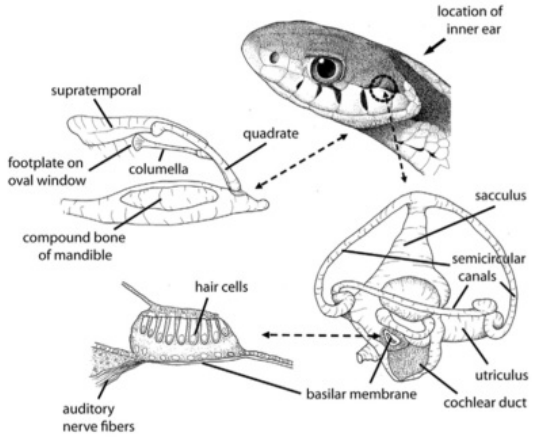

**Figure 8: The Inner ears and quadrate bones in snakes. Photo Credit: Weebly.*

-While snakes lack external ears or ear openings in the way that we do, or many, more familiar animals might have, this does not necessarily mean that they are completely deaf and incapable of hearing, which is still a common misconception. Snakes, in fact, do still have **Inner, or Internal Ear Structures** which do in fact allow them to "hear" limited or "low frequency" airborne sounds.

-A snake's Quadrate Bones, or Lower Jaw Bones also have numerous, sensitive tactile receptors as well, which allow them to "hear" or at least detect these low frequency sounds and vibrations as well through the ground or other external surfaces they are upon.

The Verdict: While snakes might lack external ears, and the ability to "hear" most sounds, thereby putting humans at an overall better and more developed sense of hearing than snakes, snakes still do possess the internal organs and capabilities of hearing and detecting some airborne sounds more so than might commonly be believed, in that snakes are erroneously "deaf".

Sense of Touch and Feeling:

**Figure 9.Battling Behavior between two male Cottonmouths, displaying an example of intraspecies tactile communication. Photo Credit: Gulf State Park.*

-While it might seem as though a snake's, or other reptile's body is covered with hardened scales or scutes, which lack any hands, fingers, feet, or toes, and therefore seem imperceptible to touch and feeling, this is actually far from the case. These animal's tactile or sense of touch can actually be quite sensitive, and to at least a large extent, overlaps with their sense of hearing. Studies have found that snakes, and other reptiles have numerous, sensitive **Tactile Receptors** throughout their scales and bodies which serve these functions. These tactile receptors may possibly be especially sensitive and/or numerous along their lower jawlines, ventral surfaces, or bellies, and/or tails.

-Many bodies of research, studies, and observations also have indicated that a snake's tactile, or sense of touch is used in at the very least, in their **Intraspecies Communication**, or being able to identify and recognize the sexes of their own species, and in order to perform many of their behaviors, including but not limited to mating and copulation, territorial or mating rights among two males of the same species, or even in being able to detect the heartbeats of their prey, in the case of constrictors.

The Verdict: While It is not yet clear whether humans or snakes have a greater, or more sensitive sense of touch, or tactile abilities, we still have yet much to learn and discover when it comes to these senses in snakes and other reptiles. This potentially either places snakes at a tie with, or even slightly above humans in their tactile abilities overall, despite obviously lacking the hands and feet that humans have for many of these sensory functions!