



Highly Commended

Science Writing

Year 5-6

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SPECIES SURVIVAL – The Jacobson’s organ in snakes

For centuries, snakes have been perceived as evil dangerous killers. Maybe you even believe this. But when you take a closer look, snakes are actually amazing, extraordinary creatures and experts in species survival. This is thanks to an incredible adaptation to the environment they have made, the Jacobson’s organ!



Figure 1: Snake with typical forked tongue (source: <https://scitechdaily>)

DISCOVERY OF THE JACOBSON’S ORGAN

The Jacobson’s organ, also called the Vomerinal organ (VNO), is named after its discoverer Ludwig Levin Jacobson, a Danish anatomist and physician. He first described the organ in his article “Anatomical description of a new organ in the nose of domesticated animals” in 1813 in a large number of mammals including some rodents, horses, pigs, dogs and cats.

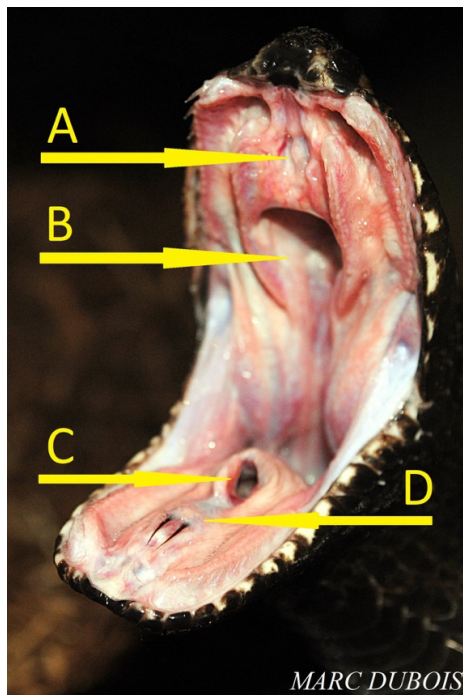


Figure 2: A Jacobson organ located at the top of the snake’s mouth, B nasal cavity, C glottis (windpipe opening)) and D tongue protector sheath with tongue tips sticking out (source: <https://owlcation.com> – Marc Dubois)

THE JACOBSON'S ORGAN: HOW DOES IT WORK?

The Jacobson's organ is most developed in snakes and lizards. It consists of two circular structures sitting on top of the mouth's roof (pink in the picture below) which have each one tiny opening into the mouth cavity as well as nerve connections to the brain (white in the picture below). Scientists believe that the Jacobson organ developed from nose tissue and is actually connected to the same part of the brain as the nose. Snakes have nostrils (purple in the picture below) that detect the "normal" airborne odour particles, similar to the nose in humans. But thanks to the Jacobson's organ snakes can also pick up heavy (high-molecular) moisture borne odour particles from the ground with their forked tongue, and I will explain to you how:

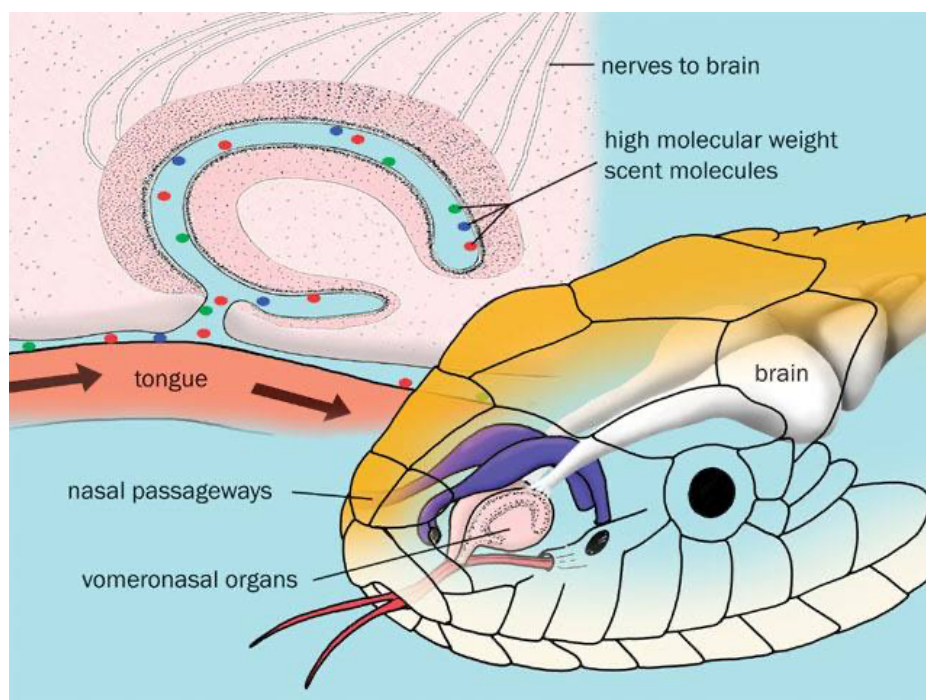


Figure 3: Jacobson organ in pink, Brain connection in white and Nostrils in purple (source: facebook)

When snakes slither on the ground, their cleverly designed forked tongue constantly flicks in and out of their mouth. Each tongue tip picks up odour particles from the ground and when the tongue goes back into the mouth, each tip delivers particles to one of the two tiny openings of the Jacobson's organ: the right tongue tip to the right opening and the left tongue tip to the left opening. The odour particles bind to receptors located in the Jacobson's organ and as a result nerve signals are sent to the snake's brain. The snake's brain then processes the signal and determines the necessary reaction. This is an extremely fast and repetitive process - you have all seen a snake constantly flicking its tongue in and out every few seconds. Snakes have two tongue tips for the same reason humans have two ears to provide them with a "stereo smell" allowing them to instantly assess which side has the stronger smell with every tongue flick.

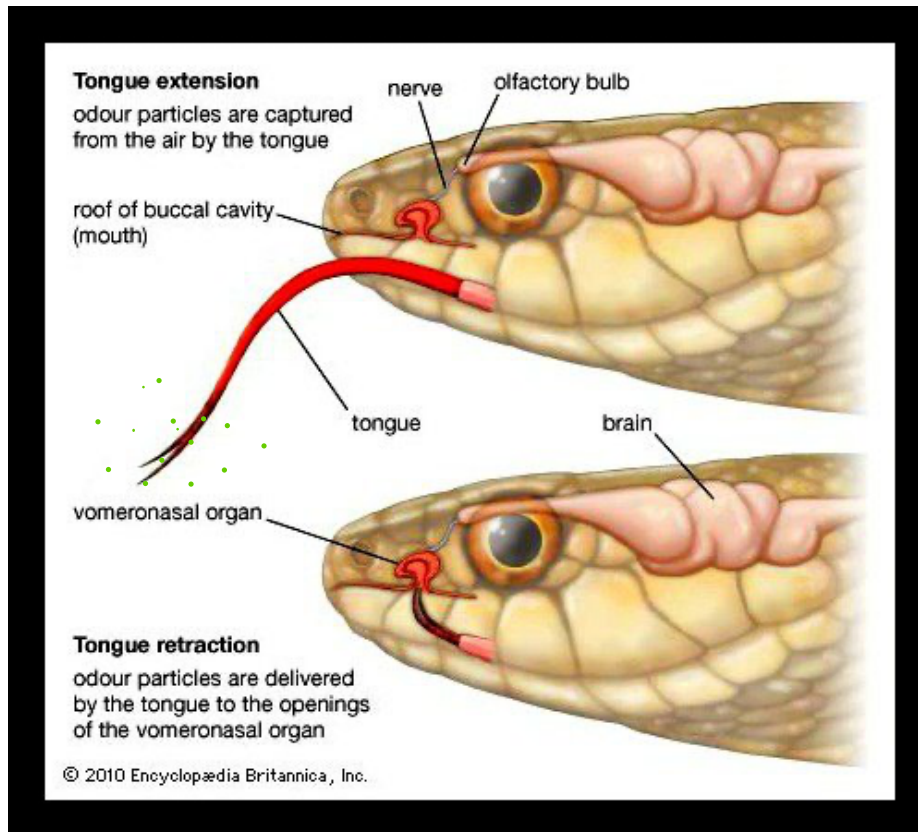


Figure 4: Tongue delivers odour molecules to the Jacobson organ (source: encyclopedia britannica)

HOW DOES THE JACOBSON'S ORGAN HELP SNAKES SURVIVE?

All snakes are either carnivores or egg eating snakes which means they need to hunt prey or find nests with eggs. Animals leave odours on the ground and these animals might be potential prey or predators for the snake. Think about it like knowing what direction a mouse has gone. For example, the snake picks up a heavier mouse scent on the ground towards the left, and a weaker to the right with its tongue tips. It will follow the stronger scent to the left and continue to flick its tongue to collect more information on where the mouse has gone until the snake has found the mouse. Being able to locate other animals early in their surroundings will help the snake to find some lunch but also keep safe from becoming lunch! Male snakes can also pick up odours of female snakes during mating seasons, making it easier to breed.

With this fantastic adaptation snakes are able to taste as well as smell the air. Due to their forked tongue and the 2 openings of the Jacobson organ, they can also work out instantly in which direction the scent is stronger. The Jacobson's organ provides snakes with a "super sense" and therefore an advantage in survival. Wow, I told you they are amazing creatures!!!!

Word count: 714

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