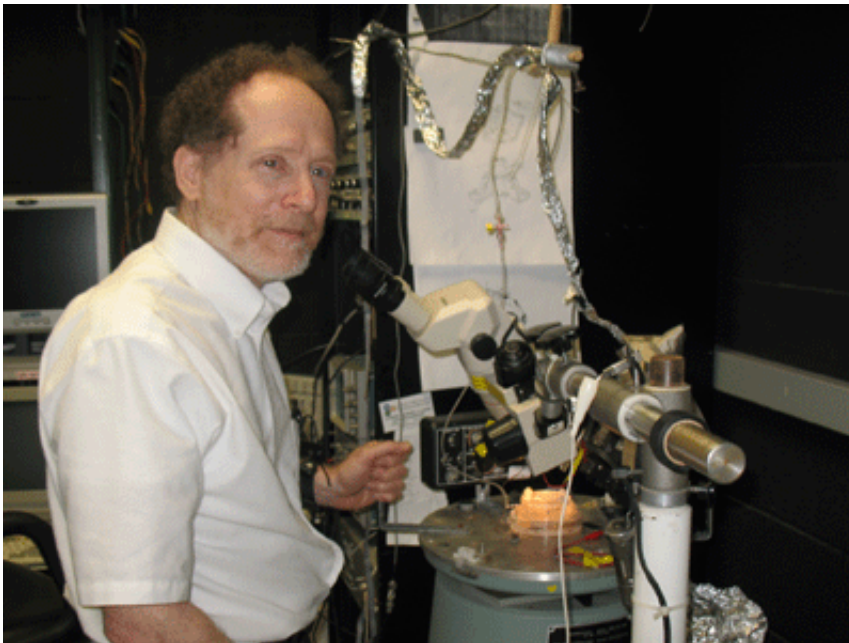


Researcher finds a turtle eye muscle adapts to deal with obstructed vision

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Michael Ariel, Ph.D., professor of pharmacological and physiological science, reported surprising findings about the eye movements of pond turtles.

In a recent study published in *The Journal of Comparative Neurology*, Saint Louis University professor of pharmacological and physiological science Michael Ariel, Ph.D., reported surprising findings about the eye movements of pond turtles who can retract their head deep into their shell. While researchers expected that the pond turtle's eyes would operate like other animals with eyes on the side of their heads, this particular species of turtle appears to have characteristics of both front

and side-eyed animals, affecting a specific eye muscle's direction of pull and the turtle's eye position when its peripheral vision is blocked by its shell.

Humans, and many mammals like cats and monkeys, have their eyes viewing forward. In contrast, most lower vertebrates, including turtles, have eyes that are lateral—on the side of their heads. Of the six muscles that move each [eye](#), the muscles that move lateral eyes differ from the muscles of animals that move eyes viewing forward. In an earlier study, Ariel and his research team made an unexpected observation that a nerve that moves one of the pond turtle's [eye muscles](#), the superior oblique muscle, was active when that turtle moved its head from side to side, much like that of animals whose eyes view forward.

In the current study, Ariel and the research team tested his theory that the pond turtle had characteristics of a front-eyed animal in three ways: physiologically, looking at the eye movement response to [nerve stimulation](#); anatomically, examining how muscles were attached to the eyes and head; and behaviorally, examining eye positions.

And, indeed, the researchers found that a turtle pulls its eyes in different directions when its head is out of its shell compared to when its head is retracted deep within its shell. Because the pond turtle can pull its head entirely into its shell, resulting in an obstructed [field of vision](#), it appears that this turtle has developed a way to compensate and direct its eyes forward to best examine its environment. Moreover, the superior oblique muscle may play a role in this behavior as its direction of pull is more like that of a front-eyed animal than that of animals with eyes on the side of their heads.

Eye movements are related to the vestibulo-ocular reflex (VOR), a reflex whose brain pathways are also studied by Ariel. The VOR allows your eyes to adjust their position when you move your head. For example,

when you turn your head to the right, your eyes move to the left to keep the image you're looking at within your field of view. The VOR also is a clinical test used to check eye reflexes in people. When this process is not working, people can experience vertigo, for example.

Ariel, who has studied pond turtles for 25 years, says they are unique among all animals because they block their [peripheral vision](#) by pulling their heads into their shell. "Not all turtles can do this. A sea turtle, for example, cannot pull its head into its shell. We expected that pond turtles would be like other turtles and other lateral eye [animals](#)" said Ariel. "That wasn't the case. Surprising, their [eye movements](#) can also be like that of humans".

More information:

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