This colorful specimen from the family of cleaner shrimps inhabiting the tropical indopacific also has eyes on stalks, despite being hard to see due to somatolysis.

Marbled shrimp
(Saron marmoratus, Hypolitidae*)*

Newts and salamanders

Young common newt female *(Triturus vulgaris)*

Newts and salamanders belong to the caudates among amphibians. Usually, they experience their development as larvae in the water. In order to accomplish the transition to land during metamorphosis into the adult stage, a few alterations are necessary. Gills, for instance, are converted into lungs. The visual system likewise undergoes important changes. In the larval stage, tadpoles absorb light on their retina by means of porphyropsin (like freshwater fish), while adult animals use rhopsodin (like land vertebrates). Due to the porphyropsin's propensity for the absorption of long-wavelength light, we might conclude that this represents a special adaptation for underwater vision.

W. Himstedt **Das Elektroretinogramm des Feuersalamanders *(Salamandra Salamandra L.)* vor und nach der Metamorphose** 1970, Pflügers Archiv 318: 176-184
G. Luthardt, G. Roth **The Interaction of the Visual and the Olfactory Systems in Guiding Prey Catching Behaviour in *Salamandra Salamandra L.*** 1983, Behaviour, 83, (1-2): 69-79

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The Axolotl (Ambystoma mexicanum) is a Mexican caudate from the family of mole salamanders (Ambystomatidae) that lives exclusively in the water. Remarkably, the animal is only encountered in its larval stage and achieves sexual maturity without leaving this developmental form. This particular species reaches adulthood without metamorphosis, and without undergoing significant changes to its morphology. It retains its gills for all of its life.

The name Axolotl stems from the Aztec language Nahuatl and refers either to a “water monster” or – in a different translation – to a “water doll”. In nature, these animals are only found in a few lakes near Mexico City. They are famous for their regenerative abilities, which are widely tested in laboratories of biology. These animals are able to completely grow back extremities, gills, and even their brain and heart!

Olm *(Proteus anguinus)*

Fire salamander *(Salamandra salamandra)*

Fire salamanders are mostly active at twilight, for which they require excellent vision. It was shown that they are able to discern prey at luminosity levels of only a few Lux. In addition, their ability to return to their home location is extraordinary – indeed, individuals may be found for years upon years in the same spot, although this skill might be supported by their sense of smell as much as by their vision.

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Reptiles and amphibians in the same biotope

Grass snake *(Natrix natrix)* swallowing a water frog

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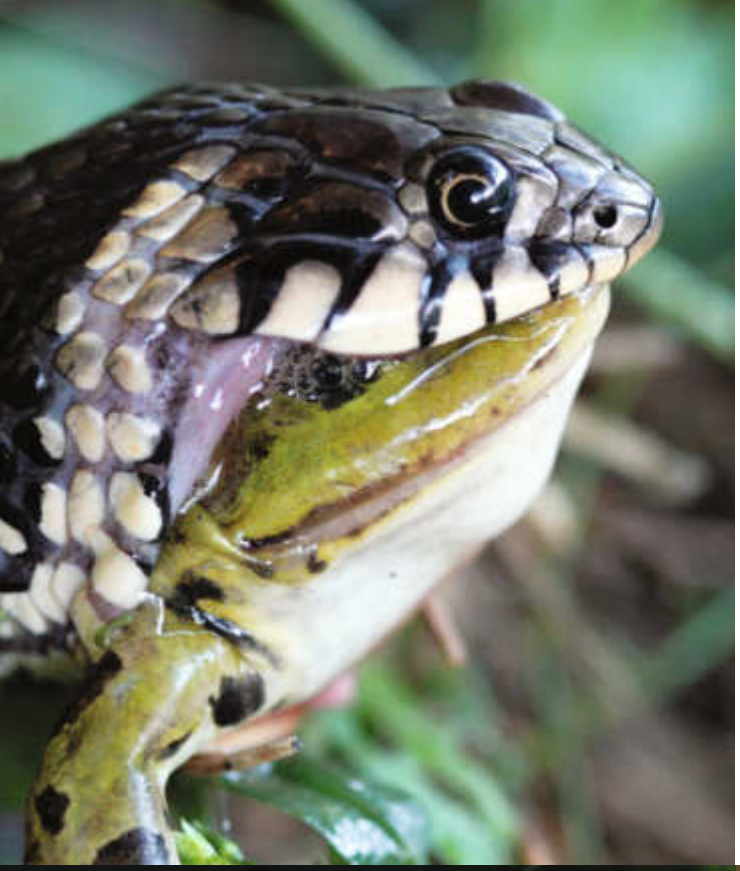

A grass snake hunts for pray in a frog pond. As a reptile, it requires food only comparatively rarely. Remarkably, it smells its prey with its tongue! The way in which its jaws open as it engulfs its unfortunate victim is reminiscent of the moray (p. 48), though they are not closely related. In evolutionary history, reptiles evolved from amphibians, which themselves evolved from bony fish, to which the moray still belongs.

The eyes of both animals share a strong resemblance. For the purpose of protection, the frog pulls its third eyelid over its eye from below. Alas, this does not ultimately alter its fate.

The eyes of frogs

Indonesian shrub frog *(Polypedates spec., Rhacophoridae)*

Frogs are unable to move their eyes, and if they wish to focus their gaze on a prey animal, they need to reposition their entire body towards it. By default, their noticeably spherical lens is set towards a focus on infinite distances. During accommodation, the lens is pushed forward, and the focal point is moved closer to the animal. Their retina contains only two types of light-sensitive cells designed primarily to discern light from darkness.

In a manner similar to toads, their hunting strategy requires that their prey move across the retina in order to be perceived. A frog would starve to death if surrounded only by piles of immobile food. A common toad requires only very simple information about the shape of the moving object or pattern. It interprets a horizontal black strip as prey if it is moving lengthwise. If the strip is moving in a perpendicular direction, then it is interpreted as a predator.

J.-P. Ewert **Motion perception shapes the visual world of amphibians** (2004): In: Prete F.R. (Ed.) Complex Worlds from Simpler Nervous Systems. Cambridge, MA, MIT Press, pp. 117–160

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