

'Gecko vision': Key to the multifocal contact lens of the future?

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Nocturnal geckos are among the very few living creatures able to see colors at night, and scientists' discovery of series of distinct concentric zones may lead to insight into better cameras and contact lenses.

The key to the exceptional night [vision](#) of the nocturnal helmet gecko is a series of distinct concentric zones of different refractive powers, according to a study published in the Association for Research in Vision and Ophthalmology's peer-reviewed, online *Journal of Vision* ("The pupils and optical systems of gecko eyes," <http://www.journalofvision.org/9/3/27>).

This multifocal optical system is comprised of large cones, which the researchers calculated to be more than 350 times more sensitive than human cone vision at the human color vision threshold.

"We were interested in the [geckos](#) because they - and other lizards - differ from most other vertebrates in having only cones in their retina," said project leader Lina Roth, PhD, from the Department of Cell and Organism Biology at Lund University in Sweden. "With the knowledge from the gecko eyes we might be able to develop more effective cameras and maybe even useful multifocal [contact lenses](#)."

The nocturnal geckos' multifocal optical system gives them an advantage because light of different ranges of wavelengths can focus simultaneously on the retina. Another possible advantage of their optical structure is that their eyes allow them to focus on objects at different

distances. Therefore the multifocal eye would generate a sharp image for at least two different depths. Geckos that are active during the day do not possess the distinct concentric zones and are considered monofocal, Roth said.

The scientists also developed a new method to gather optical data from live animals without harm with their modifications to the Hartmann-Shack wavefront sensor.

"Studies of animals with relatively large eyes, such as owls and cats, have included surgery and fixation of the head," the article states. "In this study, we demonstrate that it is possible to obtain high-resolution wavefront measurements of small, unharmed gecko eyes without completely controlling the gaze or the accommodation of the animal eyes."

Source: Association for Research in Vision and Ophthalmology ([news : web](#))

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