



# Poultry Extension Collaborative newsletter

A collaboration between Purdue University, University of Maryland,  
University of Georgia and Virginia Tech

## A bird's eye view: the chicken visual system

Avian species rely heavily on vision to provide them with necessary information about their surroundings. Chickens rely on their sense of vision to recognize:

- Other chickens.
- Predators.
- Another chicken's intentions:
  - Which allows birds to avoid unwanted aggression.
- Location of resources, such as food and water.

Although there is evidence that domestication has weakened a chicken's sense of sight, they still rely on their vision to navigate the world.



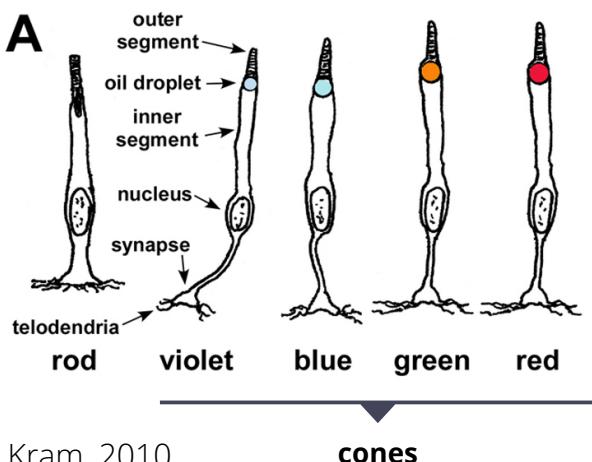
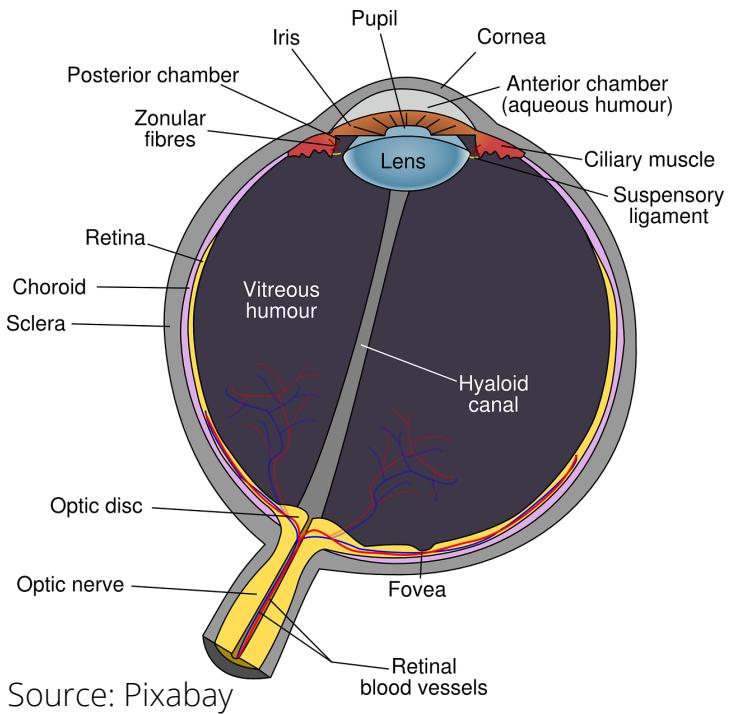
Source: Pixabay

# Eye anatomy

There are a few key anatomical differences of the eye between chickens and humans that account for the differences in our vision. Before diving into these vision differences, we need to discuss some basic anatomy of the eye.

When light enters the eye it first travels through the cornea and lens. Next, light travels through the vitreous chamber, which has a jelly like fluid that helps transmit light.

The light then reaches the retina. The retina is rich with sensory cells which transfer the visual information to the brain. In the retina, two types of cells are responsible for the perception of light, these are known as the rods and cones.



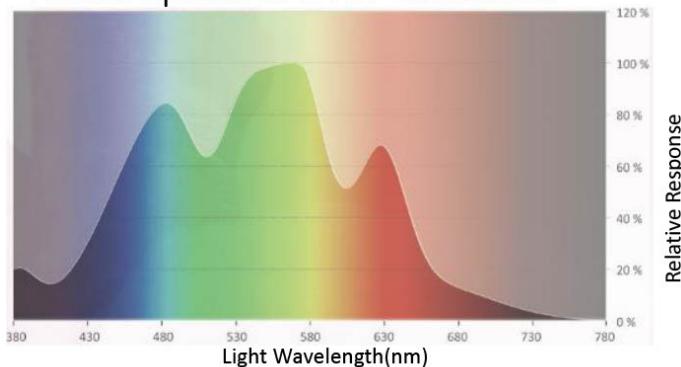
The rods are responsible for forming images in situations of low light intensity, and do not relay any information associated with color to the brain. On the other hand, cones (violet, blue, green, red) are active in situations of higher light intensity and allow for color vision.

# Chickens are tetrachromatic

Humans have 3 types of cones and all 3 of these cones are associated with wavelength peaks in the visual color spectrum (419, 531, and 558 nm), meaning humans are trichromatic.

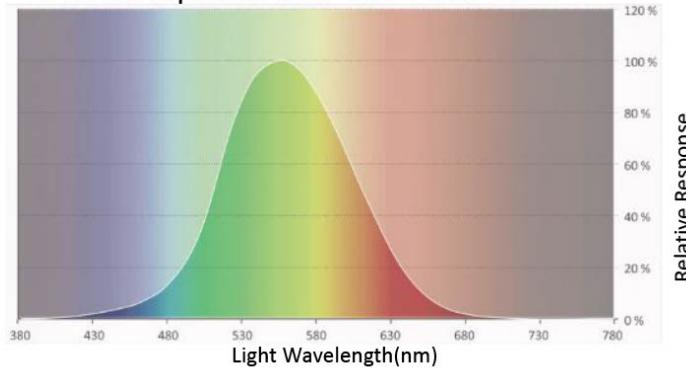
Chickens have 4 cone types known to be associated with peaks in the visual color spectrum at 4 different wavelengths (415, 455, 508, and 571 nm), making chickens tetrachromatic.

Visual Spectrum for Chickens



Source: [Once Animal Lighting](#)

Visual Spectrum for Humans



Source: [Once Animal Lighting](#)

This extended visible spectrum means that chickens can not only see color, they can also see wavelengths of light that are not visible to the human eye!

# Even if chickens have better color vision than we do, how does the rest of their vision compare?

## Acuity:

The level of detail an animal sees is called acuity. Acuity can be compared to the resolution of a digital image.

- Chickens have better acuity in brighter lit environments
- Conversely chickens have less acuity when in a dimly lit environment.
- When comparing chickens to humans, we are able to see with much higher acuity than chickens are able to see.

## Depth Perception:

Chickens have eyes on the sides of their head, this allows them to have a wide field of vision. Chickens have both monocular and binocular vision.

- Monocular vision means that separate images are received from the retina of each eye, while binocular vision means that images from both eyes overlap.
- Chickens can see a total of 300 degrees around them, with only 30 degrees of that being binocular. Monocular vision is common in prey species, so they can see predators in their surrounding environment.
- A large field of binocular vision allows animals to develop strong depth perception.
- Humans and other predators often have good depth perception because our eyes are forward facing on our heads, allowing for more binocular vision. Binocular vision is common in predator species so they can locate prey.
- It is thought that the small area of binocular vision is likely not enough to provide chickens with depth perception.



### Fun fact:



The right eye in chicks is larger at hatching than the left eye, but by 2-3 weeks of age the eyes are about the same size!

## How does light affect chicken welfare?

There are many ways that light can influence animal welfare. Chickens see better in brighter environments.

Dimly lit environments may not provide chickens with the opportunity to view color since the cones are not active at low levels of light, similar to how humans can not see colors as well late at night.

Current lighting systems are designed around human vision. Because humans and chickens perceive light differently, we still need to understand how the artificial light we provide them affects their development and emotional state.

### What important lighting system factors should you consider to promote chicken welfare?



Anna Magnaterra

- Photoperiod: Birds need a minimum of at least 6, preferably 8, hours of complete darkness
- Intensity: Although chickens see better in bright light, brightly lit environments contribute to damaging behavior such as feather pecking and cannibalism (see PEC newsletter vol. 7 Injurious pecking)
- Flicker: Poultry can see flicker associated with bright fluorescent lighting

## Lighting recommendations

There is no one size fits all recommendation for chicken lighting.

Specific lighting requirements vary depending on: the age of the birds, if they are raised for meat or eggs, and the housing environments they are provided with.

- It is important to provide birds with periods of darkness:
  - This allows the birds to develop normal hormonal fluctuations associated with the circadian rhythm.
  - 6-8 hours of darkness is best.
- Typically young chicks prefer to rest in brightly lit areas.
- As the birds age they prefer to rest in dimly lit areas, and reserve the brighter areas for time they spend active.
  - For this reason it is a good idea to provide lighting which allows for variation in light intensity across the house.



Source: Pixabay

## References

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