Eye Injuries: To Rehabilitate or Not

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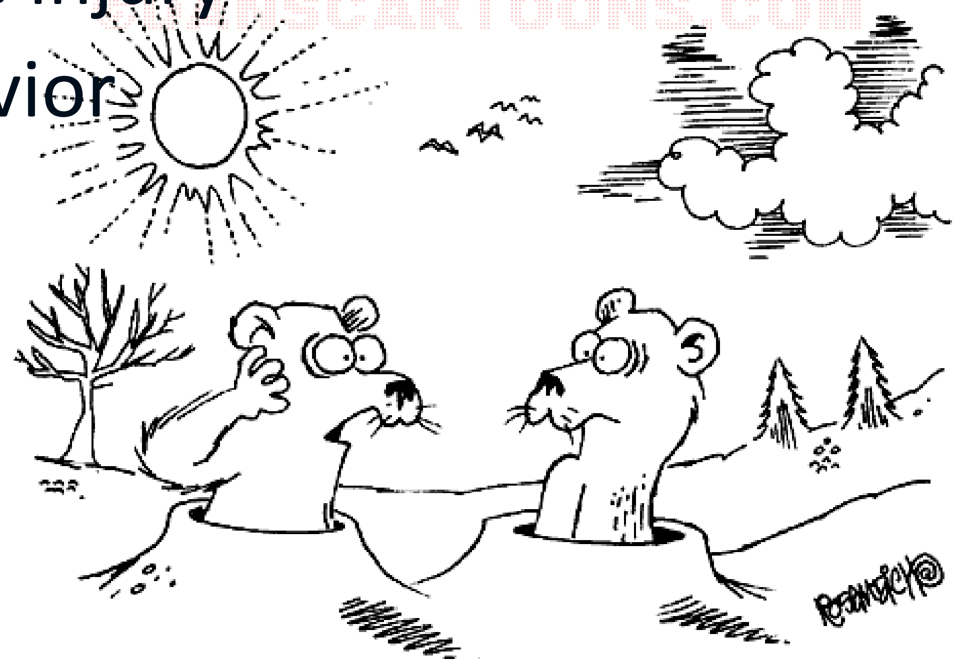
Audience Participation!

- This is NOT a test!
- No right or wrong answers!
  - (well, mostly not....)

Considerations

- species and type of flying they need to do
- do they have proven hunting skills
- type and extent of eye injury
- social vs solitary behavior
- type of prey or food
- do they migrate
- release location
- other injuries
- age



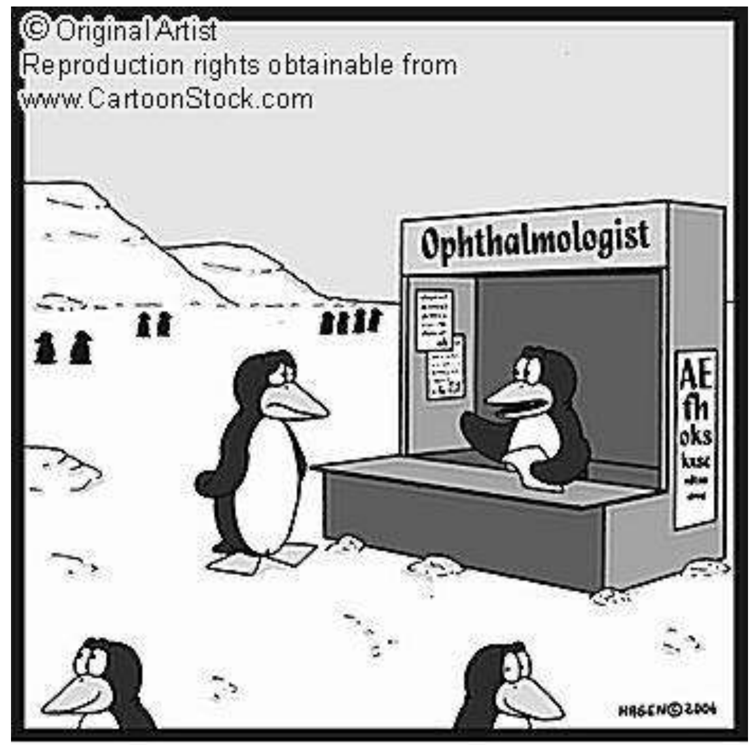
“Egads! I can’t see my shadow! I must need a cataract operation!”

http://www.danscartoons.com/oph3_demo.gif

Considerations

Type of eye injury

- Can it be treated?
- How much of the eye affected?
- What part of the eye?
- Could it progress to become worse?
- Does the injury extend beyond the eye?
- Might the problem recur?
- Is the other eye affected?



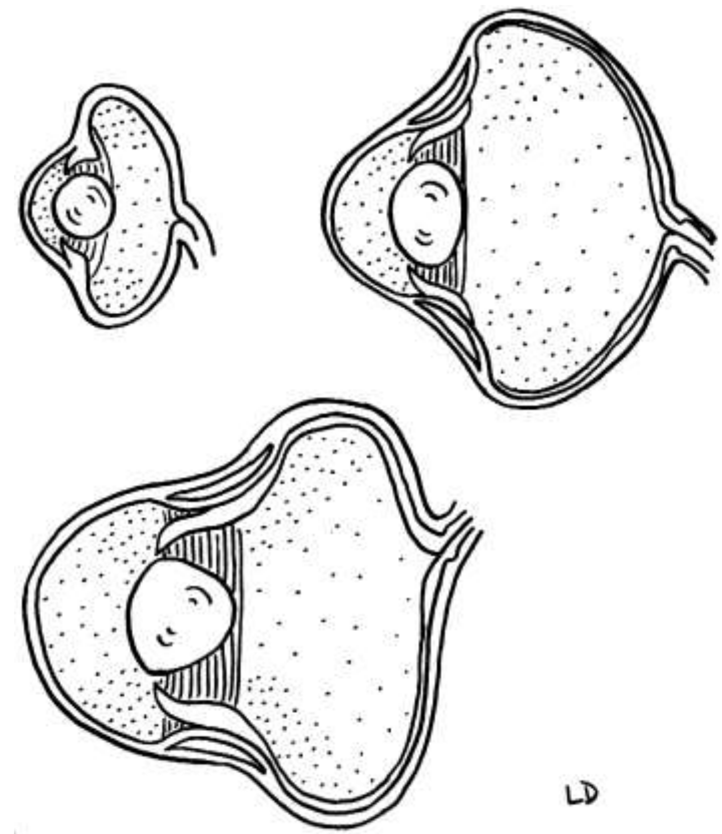
Don't worry Sir, being colour-blind is not much of a problem around here...

Considerations

Species

- How important is vision?
  - Find food
  - Avoid predators
  - Recognize mate
- What type of vision?
  - Monocular
  - Binocular/depth perception
  - Distance focusing
  - Nocturnal / diurnal

Type of eye



Drawing: Liza Dadone

Considerations

Proven hunting/foraging skills?

- Body condition at entry
- Age
  - Have they survived a winter?

Type of prey/food

- Do they have to see through water?
- Do they randomly probe and find food with beaks?
- Do they catch food in the air?
- Do they need to fit beak into a small flower aperture?

Considerations

Social vs. Solitary

- Solitary need to be able to function independently
- Solitary prey species may be more prone to predation
- Social/flock species have others to keep watch

Migratory vs Resident

- Resident birds may encounter fewer “new” obstacles
- Will migratory species have problems in new surroundings?
- How much vision do they need to migrate?

Considerations

Other injuries

- Will visual deficit create a greater disadvantage when combined with other injuries?
  - If flight isn't perfect, will poor vision make hunting even harder?

Release location

- Can it be released in a familiar area?
- Are there potential visual hazards in the area?
  - Windows
  - Lights
  - Windmills
  - Predators

Audience Participation!

- Get out your cell phones
- Go to text messaging
- At “To:”, enter **37607**
- Text: “ERICAMILLER387”
- Warning! There may be a text message charge, depending on your carrier! You don’t need to participate if you don’t want to!

But Doc, I am an eagle: I can't be seen wearing glasses... Can't you prescribe contact lenses?

Audience Participation

- When instructed by the slide, send the letter of the answer to 37607
- My apologies to those who don't have cell phones or choose to not participate…

Text **ERICAMILLER387** to **37607** once to join

Which of the following describes you best?

A I have never done a poll using my cell phone

B I really miss my rotary phone

C I don't know what a rotary phone is

D I do these polls all the time

None of the above

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Now back to eye problems…

Case 1: Hatch Year GHOW

- Corneal lesion left eye (stain uptake)
- Right eye is fine
- Good body condition

- Considerations?

Should this bird be released?

A The injury is minor, it can be released now

B No, the injury is serious; euthanize or place

C Yes, release after treatment

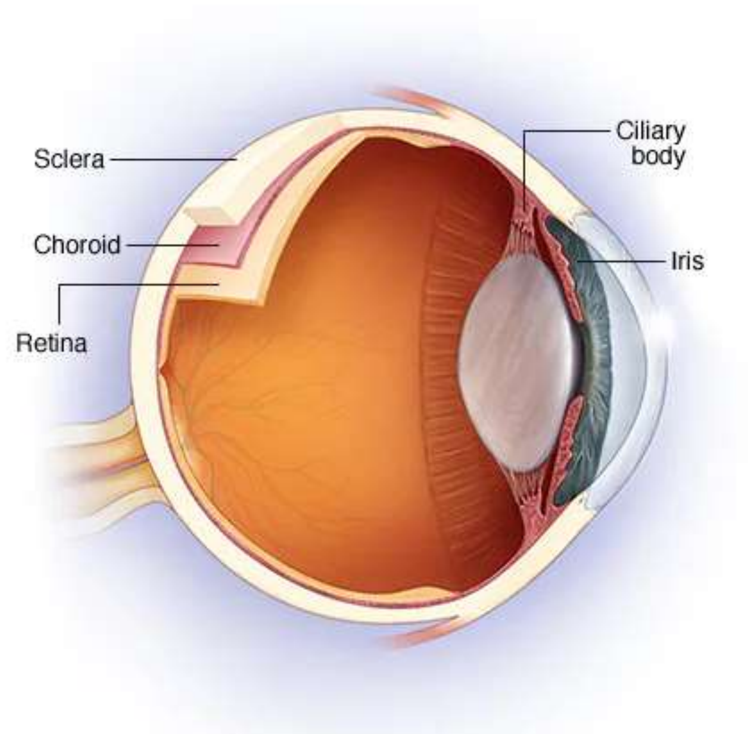
D Maybe; treat and release if it can catch live prey

Maybe; it depends on why the pupil is dilated

Case 2: Adult GHOW

- Good body condition; right eye okay
- Hyphema & Uveitis
- Lens luxated posteriorly
- Posterior Synechia → Iris Bombé; Glaucoma

Case 2: Adult GHOW



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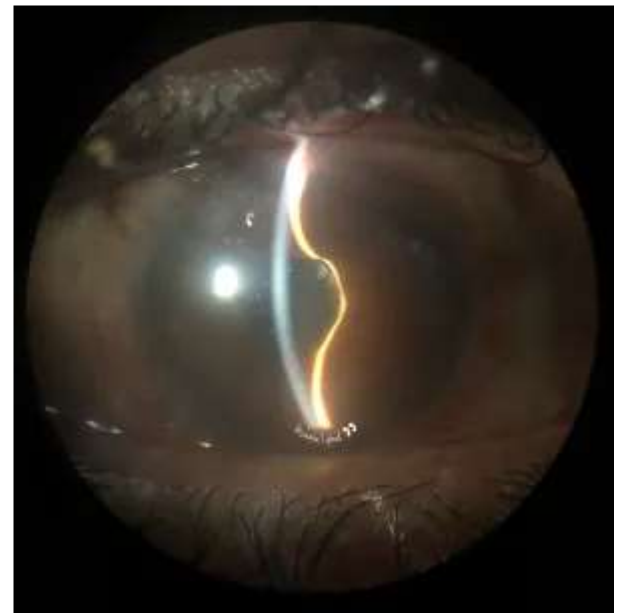

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- Good body condition; right eye okay
- Hyphema & Uveitis
- Lens luxated posteriorly
- Posterior Synechia → Iris Bombé; Glaucoma

Should this bird be treated for release?

A Yes, this bird has a good chance of release

B No, this is not a treatable condition

C Maybe. Start treatment and re-evaluate

D I'm not sure

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Case 3: Fledgling American Robin

- Ruptured cornea
- Collapsed globe
- No other injuries

- Considerations?

What things about this bird and the injury need to be considered when deciding treatment?

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Should this bird be treated and released?

A Yes!

B No!

C Start treatment and re-evaluate as needed

D I'm still confused

None of the above

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What if it was this bird?

www.birdforum.net

Current Biology 2010 20, 1259-1262DOI: (10.1016/j.cub.2010.05.070)
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Robins Not Only Sense, But Actually SEE, Magnetic Fields… But in Only One Eye

Some birds can sense the Earth's magnetic field and orient themselves accordingly. As you can imagine, this is a huge benefit for the "frequent flyers" of the avian world, migrating birds.

But one type of bird in particular, the robin, can actually *see* magnetic fields thanks to a special molecule called a cryptochrome in the retina. The fields appear as patterns of light, shade or color superimposed onto what the birds normally see.

Scientists have learned that in robins, the magnetoception ability is dependent on good vision in the right eye. If the right eye is covered, the birds become disoriented when they fly, but if the left eye is covered, they navigate without a problem. This means the robin's vision in the right eye acts as a doorway for its magnetic sense. If there is darkness or cloudiness in the right eye, the door stays shut, but light in that eye opens the door and activates the bird's internal compass.

The guidance mechanism seems to work in such a way that the magnetic field-generated patterns of light, shade or color overlaying what a robin normally sees change as the bird turns and tilts its head during flight. This provides a visual compass composed of contrasting shades of light. But the compass doesn't depend solely on light – the birds must also have a clear image with their right eye in order to accurately navigate. Their magnetic sense is only a transparent overlay to the images their normal vision provides. If that vision is impaired in any way, the magnetic sense is of no use. (Imagine trying to follow your car's GPS navigation instructions with a couple inches of heavy wet snow covering your windshield.)

Experts believe robins probably require a clear, focused image to distinguish between inputs from their visual and magnetic senses. Since the magnetic field lies on top of what is seen through normal vision, and both incorporate differences in light and shade, it would seem the birds could become easily confused. However, the images the birds see through normal vision tend to have sharp transitions between light and shade, whereas changes in the patterns superimposed by magnetic fields are smoother and more gradual. Birds are probably aware that sharp changes in contrast are due to the boundaries of actual objects, while more subtle changes are the result of magnetic effects.

While adult robins have a magnetic compass in their right eye only, as babies, they had a compass in each eye. It seems they lose the left one as they mature.

The change from both eyes to just the right eye occurs gradually. In robins that are no longer babies but not fully grown, the magnetic compass in the left eye can be revived for a time by covering the right eye. According to scientists, this means the eyes themselves aren't changing. Instead, the brain begins processing input from the eyes in different ways.

Left eye—no effect on migration

Wiltschko, et al. NATURE | VOL 419 | 3 OCTOBER 2002 | www.nature.com/nature

Or Maybe Not??

BRIEF COMMUNICATIONS ARISING

Robins have a magnetic compass in both eyes

ARISING FROM W. Wiltschko *et al.* *Nature* **419**, 467–470 (2002)

The magnetic compass of migratory birds is embedded in the visual system[1-3] and it has been reported by Wiltschko *et al.*[1] that European Robins, *Erithacus rubecula*, cannot show magnetic compass orientation using their left eye only. This has led to the notion that the magnetic compass should be located only in the right eye of birds[1,3-5]. However, a complete right lateralization of the magnetic compass would be very surprising, and functional neuroanatomical data have questioned this notion[2,6-8]. Here we show that the results of Wiltschko *et al.*[1] could not be independently confirmed using double-blind protocols. European Robins can perform magnetic compass orientation with both eyes open, with the left eye open only, and with the right eye open only. No clear lateralization is observed.

More or less pronounced lateralization is a common feature of the avian brain[9], but an all-or-nothing lateralization like the one reported only, or their left eye only. In all three conditions, the birds oriented in their expected autumn migratory direction towards the South-West in the unchanged geomagnetic field (normal magnetic field, NMF; both eyes open: $236^\circ \pm 20^\circ$ (95% confidence intervals), $r = 0.69$, $N = 27$, $P < 0.001$, Fig. 1a; left eye open: $217^\circ \pm 27^\circ$, $r = 0.57$, $N = 27$, $P = 0.001$, Fig. 1c; right eye open: $192^\circ \pm 24^\circ$, $r = 0.65$, $N = 26$, $P < 0.001$, Fig. 1e) and towards the East in a magnetic field turned 120° counter-clockwise (changed magnetic field, CMF; both eyes open: $78^\circ \pm 20^\circ$, $r = 0.72$, $N = 27$, $P < 0.001$, Fig. 1b; left eye open: $47^\circ \pm 45^\circ$, $r = 0.38$, $N = 26$, $P < 0.03$, Fig. 1d; right eye open: $112^\circ \pm 30^\circ$, $r = 0.52$, $N = 27$, $P = 0.001$, Fig. 1f). In all cases, the CMF direction is significantly (no 95% confidence intervals overlap) turned in the expected direction compared to the NMF direction.

Our results showing that European Robins have a magnetic com-

Wiltschko *et al.* reply

REPLYING TO C. M. Hein, S. Engels, D. Kishkinev & H. Mouritsen *Nature* **471**, doi:10.1038/nature09875 (2011)

Hein and colleagues[1] challenge our 2002 paper[2], claiming that they cannot replicate our findings. The paper had two conclusions: (1) magnetic compass information is mediated by the eyes, as had been proposed by Ritz and colleagues[3], and (2) the magnetic compass is lateralized in favour of the right eye. The new data do not contradict the first conclusion; in fact, this has been supported by a recent paper from the authors[4]. It is only the second conclusion they question, although it has been demonstrated not only in two species of migrants[2,5], but also in domestic chickens[6] and

longer. It would mean that although the avian magnetic compass is normally mediated by the right eye only, left-eye input is able to substitute the process after a critical amount of time.

In summary, there are considerable differences between the studies. Which of them or which possible combination of them caused the difference in findings cannot be decided at present, but will be determined by future experiments.

NATURE | VOL 471 | 31 MARCH 2011

Case 4: Juvenile Red-tailed Hawk

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Is this condition treatable?

A Yes

B No

C Maybe

D I don't know

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Ankyloblepharon

Photo courtesy Rene Schott, DVM
NWRA Bulletin Vol 26, No. 2, Fall 2008

Case 5: Adult GHOW

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Can this condition be treated successfully?

A Yes

B No

C Maybe

D Not long-term

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Case 6: Juvenile House Finch

- *Mycoplasma gallisepticum*
- Conjunctivitis, peri-ocular inflammation, respiratory difficulty (dyspnea), sinusitis

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Do you treat this and release the bird?

A
Yes

B
No

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Case 7: Adult Woodcock

- Complete cataract of left eye
- Non-visual on left
- Self-feeding well in captivity

http://flickrhivemind.net/Tags/birds,woodcock/

What concerns do you (should you) have?

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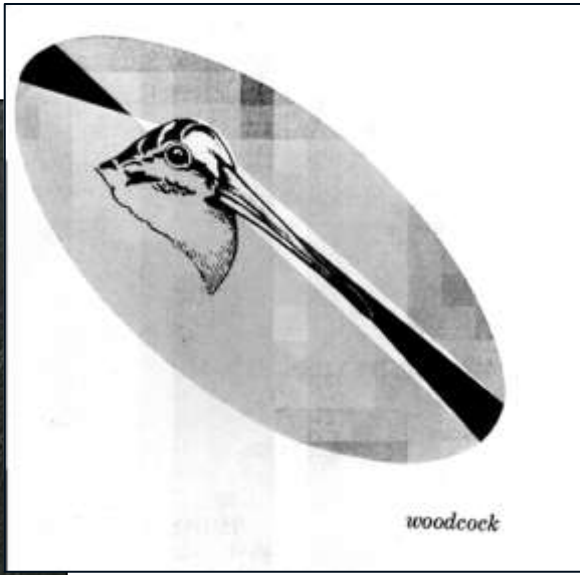
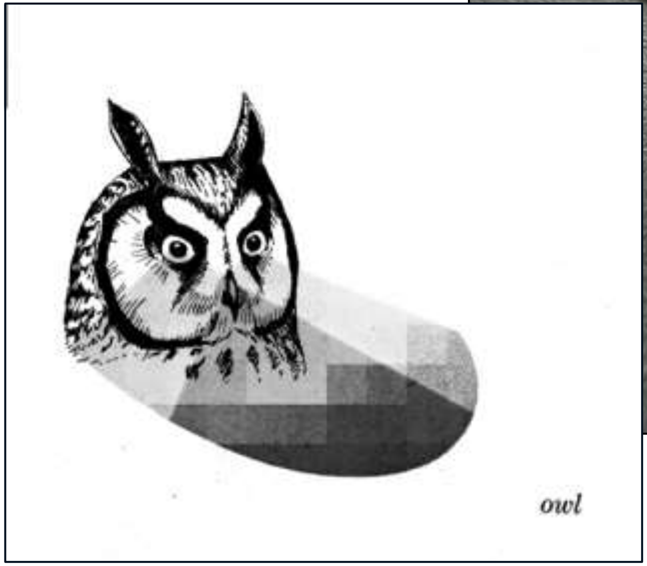
Case 7: Adult Woodcock





Case 8: Immature Northern Gannet

- Opacity in left eye
- Bird is thin
- Has some lice

- Diagnosis?
- Concerns?

http://captainjohnboats.blogspot.com/2012/10/october-20-2012-whale-watch.html

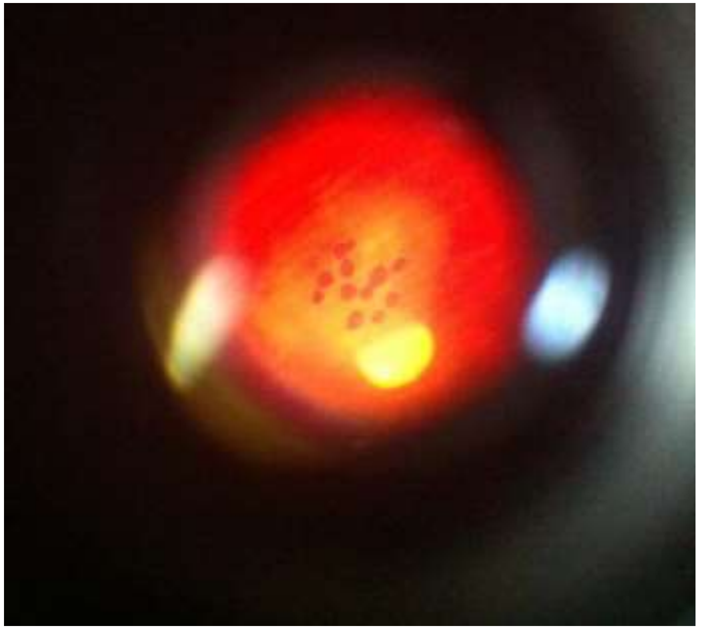
Case 9: Mute Swan

Case 10: Second Year GHOW

- Recovered from WNV signs
- Eating & flying well
- Intermittent ‘staring’

GHOW Fundic Exam

- Chorioretinitis
- ‘hole’-like lesions in retina
- Common with both WNV & Toxoplasmosis



Thank you