DISCUSSION 4

CHARLES DARWIN AND THE EYE

PART 1. The Variety of Eyes

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OUTLINE

1. The eye problem
2. Variety of eyes
3. Four optical systems
4. Three problems the variety of eyes poses for evolution
5. The evolutionary solution
6. Conclusions
7. Review questions

1. THE EYE PROBLEM

1. THE EYE PROBLEM

When we look at more advanced structures of organisms such as the eye, the ear or the brain, we see deep problems for evolution.

Evolutionists keep on suggesting that the eye could evolve all by itself as the eye gradually adapts to more advanced stages. The evolutionist Douglas Futuyma of the University of Michigan (and SUNYSB) in his book *Evolutionary Biology* (3rd edition, p. 683), - which has been the most popular textbook on evolution in the United States, - writes "The evolution of eyes is apparently not so improbable! Each of the many grades of photoreceptors [eyes], from the simplest to the most complex, serves an adaptive function." What he is inferring is that the great variety of eyes that we find work and thus represent adaptations through an evolutionary process.

1. THE EYE PROBLEM

On the other hand, the Bible gives a very different view of how the eye and the ear came to be.

In Proverbs 20:12 we are told "The hearing ear, and the seeing eye, the Lord hath made even both of them."

Which is true: the evolutionists' viewpoint that eyes gradually formed by themselves, or the Bible that states that God made them?

1. THE EYE PROBLEM

The question of how complex organs came to be is one of the more important problems for evolution. Over the past two centuries there has been a persistent intellectual conflagration between creationists and evolutionists about the origin of the eye. It makes a fascinating story.

As can be seen in the next two slides, the general evolutionary argument is that since simple to complex eyes work, they must have evolutionary survival value, and if they have survival value they evolved from each other. As we will illustrate below, in several ways, this latter assumption does not seem to work.

1. THE EYE PROBLEM

Charles Darwin, in his famous book, (1859) *The Origin of Species*, p 168-171, states in a section titled "ORGANS OF EXTREME PERFECTION AND COMPLICATION"

"To suppose that the eye with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by natural selection, seems, I freely confess, absurd in the highest degree."

1. THE EYE PROBLEM

Darwin then points out that throughout the animal kingdom there are many varieties of eyes, from a simple light sensitive spot on up to the eye of an eagle. He further argues that it is not unreasonable to think that "natural selection or the survival of the fittest" operating for millions of years in millions of individuals, might produce living optical instruments "superior to one of glass." [Darwin's reference to "one of glass" is probably to a telescope.]

Other leading evolutionists follow Darwin:

George Simpson, **from Harvard University, in the 1967 book: *The Meaning of Evolution,* p 168-175.**

Argues, as Darwin does, that since all eyes from simple to complex are functional, they all have survival value.

Richard Dawkins, Oxford University, 1986, in *The Blind Watchmaker,* p 77-87.

Suggests that all eyes are useful and provide survival value.

Douglas Futuyma, University of Michigan. 1998. *Evolutionary Biology, 3rd Edition,* p 682-684.

Proposes that various eyes have survival value, and advanced features like the lens would evolve starting as a vitreous mass.

COMMENT: It needs to be kept in perspective that eyes can provide survival value, whether they evolved or they were created by God.

2. THE VARIETY OF EYES

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Two general kinds of eyes

a. Some eyes are very simple. They just tell if it is dark or if there is some light present or how bright the light is. They do not detect details. We call these light-detecting eyes.

b. More advanced eyes, like yours, detect a picture of the shape of things looked at. We call these image-forming eyes. There are several kinds of image-forming eyes. The four main ones are:

2. THE VARIETY OF EYES

Four kinds of image-forming eyes

a. Compound eye of trilobites and insects. These have many tiny tubes called *ommatidia*, each aimed in a slightly different direction. An image is put together by combining what each tube sees.

b. Simple (camera) eye of many animals. This is found in a variety of animals such as vertebrates like you and also squids and octopuses. This eye is characterized by having a single lens that focuses the light rays on a light-sensitive retina that lines a cavity.

2. THE VARIETY OF EYES

Four kinds of image-forming eyes

c. Pinhole eye of chambered nautilus. This eye is somewhat like the simple camera eye, but it does not have a lens. Instead it lets the light in through a tiny pin-size hole, the light from slightly different directions landing on different parts of the retina. It works like an old fashioned pinhole camera that had no lens.

d. Scanning eye of the tiny crustacean (crab-like) *Copilia,* and possibly some other animals. This eye forms an image by scanning across the region being looked at, somewhat like a television camera does.

Details about these four kinds of image-forming eyes will be given in section 3 below, but first are more introductory ideas.

2. THE VARIETY OF EYES

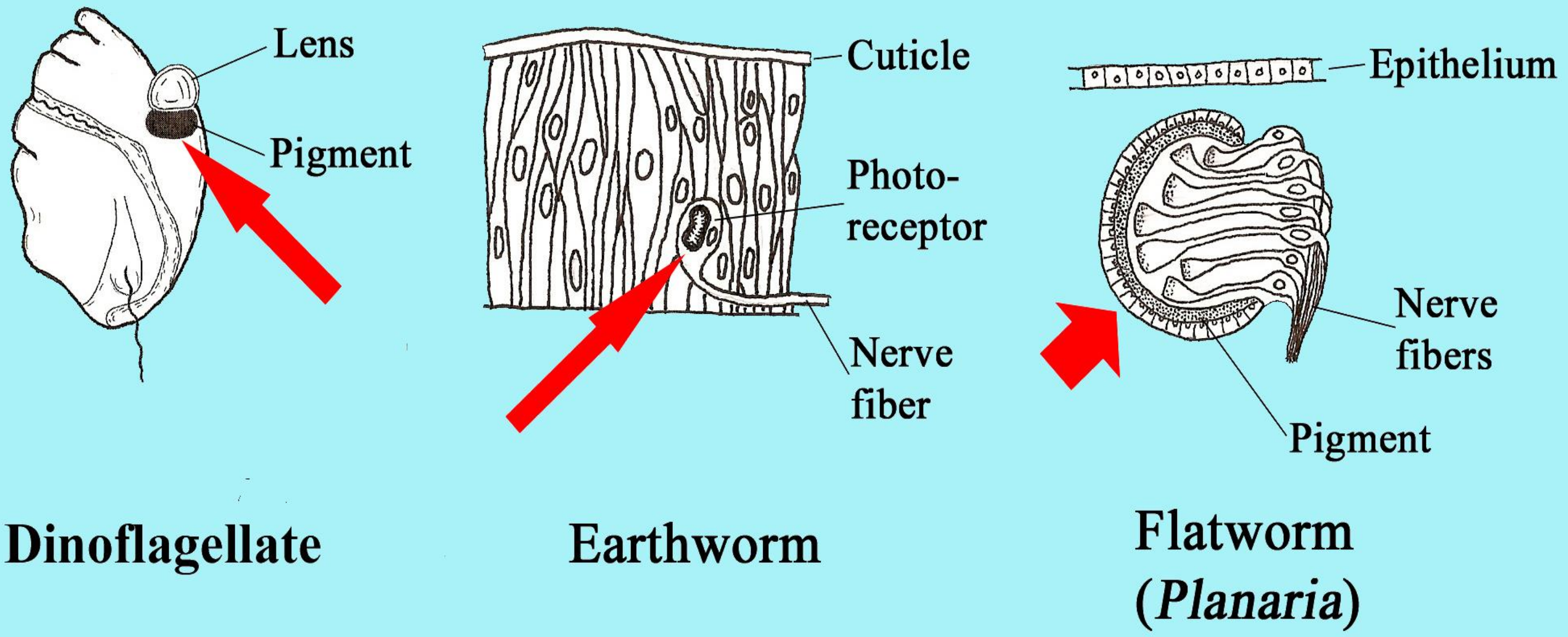
On the next slide are three illustrations of light-detecting "eyes." They do not make a picture. The associated pigment absorbs or reflects light.

The dinoflagellate illustrated below is a tiny one-celled protozoan.

In the two worms illustrated, the light sensitive organs (photoreceptors) are near the outer surface (skin) of the organisms (cuticle, epithelium). That surface is illustrated at the top of the diagrams. The light comes from above.

In earthworms the many light sensitive organs they have tend to be concentrated near the ends of the worm.

LIGHT-DETECTING "EYES"



Mmodified from Cronly-Dillion and Grgory . 1991. Evolution of the Eye and Visual Systems.

Three examples of light-detecting eyes. These eyes detect light, but do not form an image (a picture) of the environment the organism finds itself in.

2. THE VARIETY OF EYES

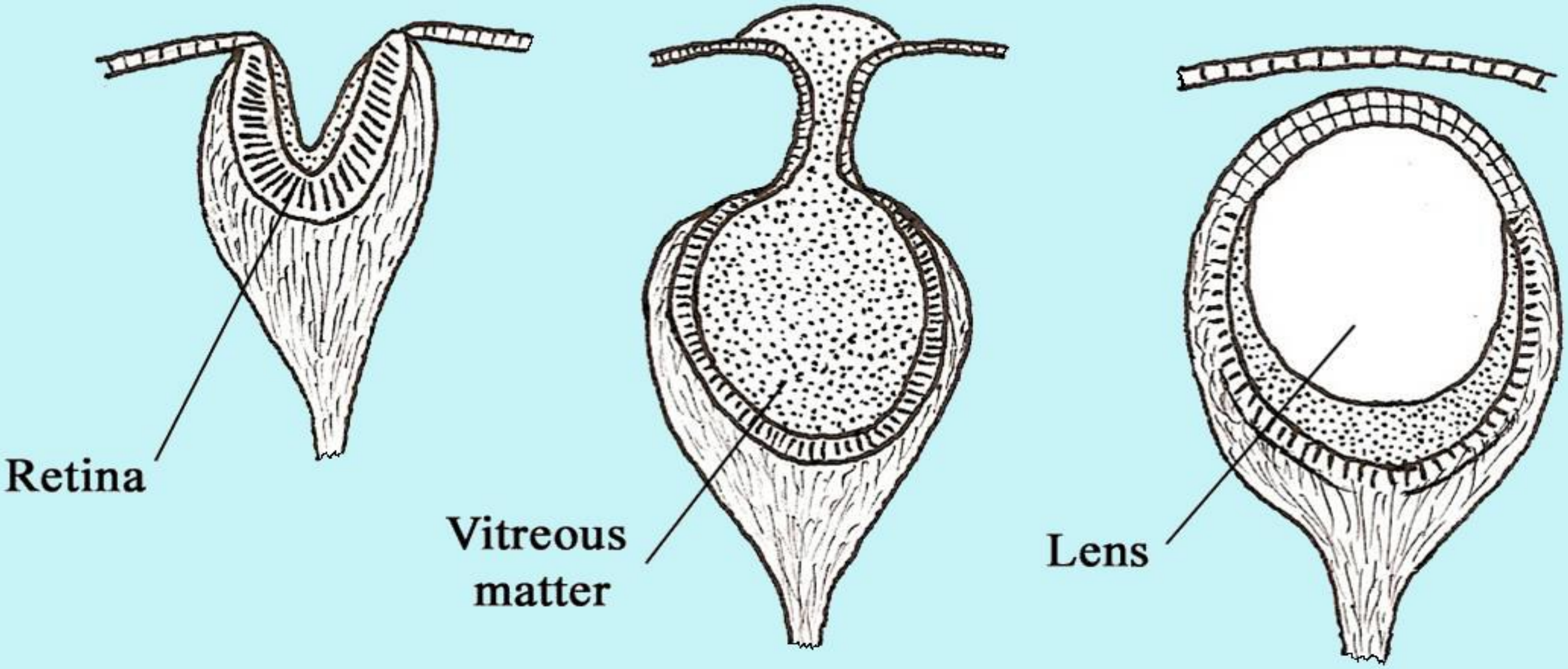
EYES OF SNAILS

Snails have a variety of kinds of eyes from a simple cup to an eye with a lens.

Whether these eyes can detect direction or form any kind of an image is a debatable point. Their structure indicates that they cannot provide anything beyond the crudest kind of image.

The varieties of the eyes of snails, as you go from left to right in the next figure, are presented by evolutionists as an example of how the eye can evolve from simpler to more advanced. This seems to be their best example. This is limited change in the same basic kind of animal. In nature, however, various eyes can be very different in basic structure and function from each other. Because of these great differences in other animals, it is difficult to imagine how they might evolve from each other.

EYES OF SNAILS



Based on Salvini-Plawen, and Mayr 1977, from Hilger and Hess.

Three kinds of eyes found in different kinds of snails. These eyes likely do not form images.

2. THE VARIETY OF EYES
IMAGE-FORMING EYES

In order to have an image-forming eye that shows details, a light-focusing mechanism is needed. We will consider this for the normal (simple) eye, also called the camera eye. This is the kind of eye that we have and it is really not so simple. We will then consider more details about the 4 main kinds of eyes found in the animal kingdom.

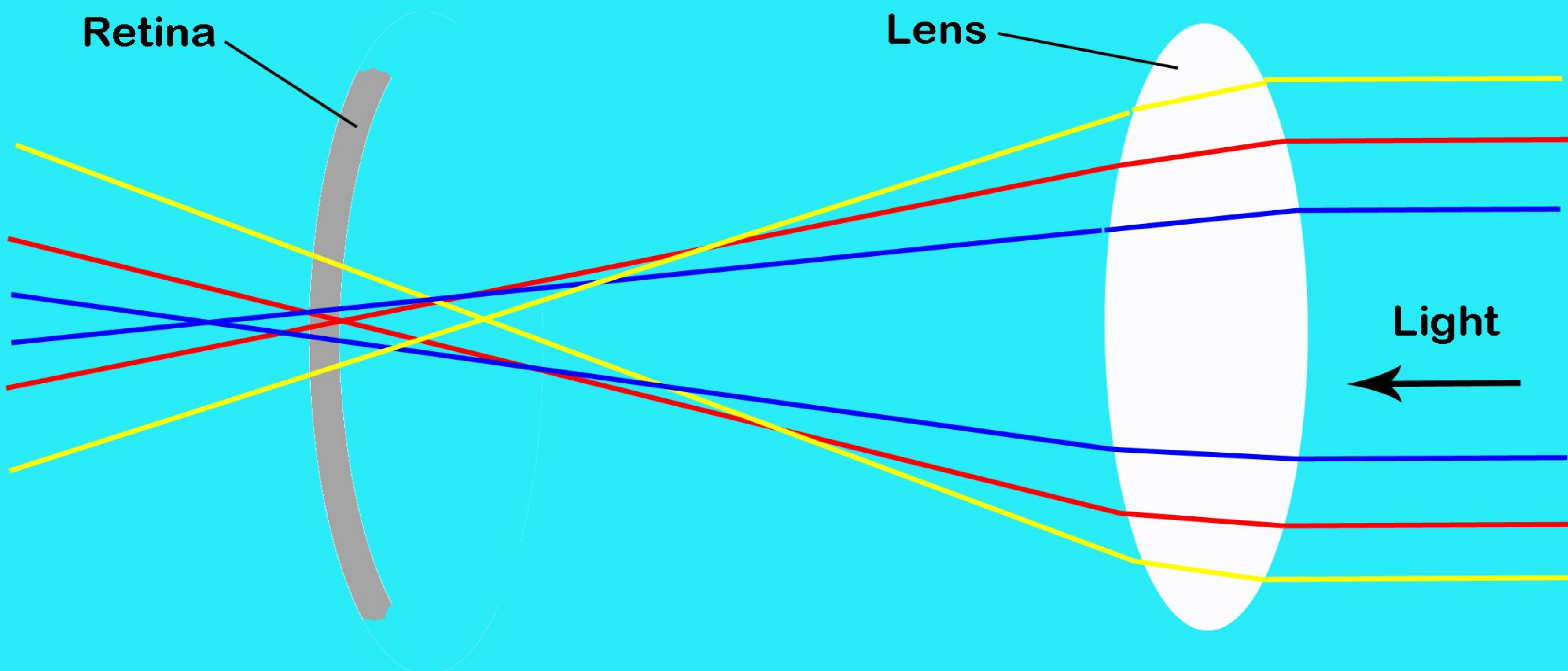
2. THE VARIETY OF EYES

FOCUSING

To form an image that shows details, the light rays coming from various views must cross each other, i.e. focus (*converge*) on the retina. If the focus is behind or in front of the retina the image on the retina itself will be blurred. The next slide illustrates this. The colored lines going through the diagram represent some light rays. It is critical for viewing details, that the lens of the eye focus the light rays right on the retina, as the red lines illustrate.

In many vertebrates, including you, focusing is done by muscles in the eye that change the shape of the lens so the rays converge right on the surface of the retina. In focusing, a complex system detects that the image is out of focus and directs the muscles that change the shape of the lens until a sharp image is formed on the retina.

THE NEED FOR PRECISE FOCUSING



Note that the red lines cross each other (i.e. converge or focus) right in front of the retina, while the blue lines focus behind and the yellow lines in front of the retina. The pattern of where the blue and yellow lines cross the retina results in a blurred image. In order to get a sharp image, the lens must focus all the light rays right on the retina.

2. THE VARIETY OF EYES
FOCUSING

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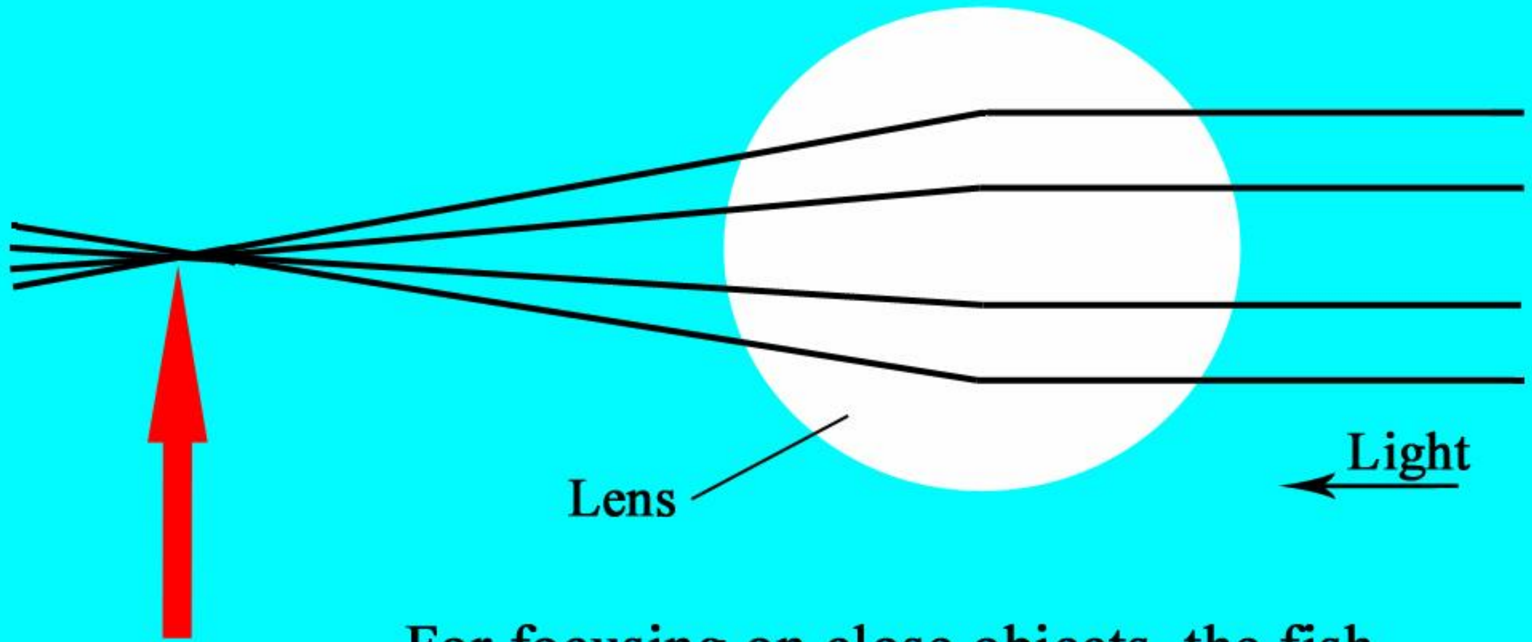
Fish use a slightly different system for focusing than you do. As illustrated in the next slide, they have a spherical lens that under ordinary circumstances would not be able to focus on the retina. However, by using a **gradational** ***index of refraction***, light focuses on the retina (red arrow). The index of refraction is the amount of bending of the light rays that takes place as light travels from one part to another. Fish have this unusual gradational index of refraction in the lens that focuses the light on the retina. Our manufactured lenses do not have this sophisticated kind of variable index of refraction in a single lens.

When a fish looks at a close object, it changes focus by using muscles in the eye that move its spherical lens forward.

FISH EYE HAS A SPHERICAL LENS

The light rays converge on one plane (arrow), because the lens has a gradational index of refraction, with greater refraction in the middle of the lens compared to the ouside.



For focusing on close objects, the fish moves the lens forward.

2. THE VARIETY OF EYES
FOCUSING

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The school of fish in the following slide is from Enewetak Atoll in the Pacific Ocean. Fish move their eyes around to look in various directions, so they obviously see details. Note that the eyes are much larger than the little dark pupils. Of trivial interest is the odd fish just right of center that is swimming in the opposite direction from the rest of the school. Independence! Just an interesting sidelight on our fascinating world.

A school of fish at Enewetak Atoll, Marshall Islands. The bright lower background is from whitish coral sand.

3. FOUR OPTICAL SYSTEMS OF IMAGE-FORMING EYES

3. FOUR OPTICAL SYSTEMS
IMAGE-FORMING EYES

As mentioned earlier, the four main kinds of image-forming eyes are:

Compound

Simple

Pinhole

Scanning

They all use very different optical systems to form sharp images. They will be discussed and illustrated in the next 8 slides.

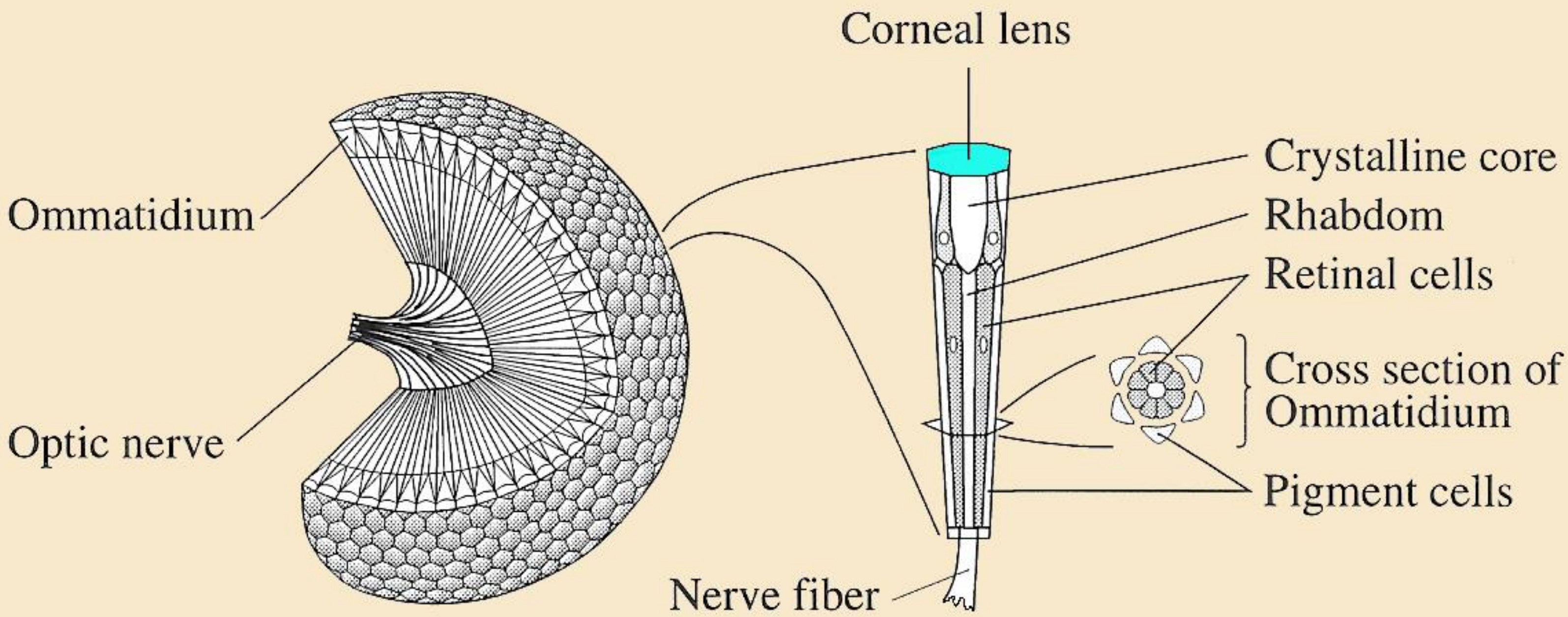
3. FOUR OPTICAL SYSTEMS
COMPOUND EYE

The compound eye is illustrated on the next slide. It forms a good image. It is found in many insects and some crab-like organisms.

The eye is called "compound" because it is made up of a very large number of tiny tubes called *ommatidia* (one ommatidium), each with its own lens and each aimed in a slightly different direction than the surrounding ommatidia. By combining the input from each ommatidium, the organism puts together a picture of what is out there.

A familiar example of compound eyes is the huge bulging eyes on either side of the head of a dragonfly. Those eyes may contain as many as 28,000 ommatidia.

COMPOUND EYE



After: Raven and Johnson, 1992, p. 831

THE COMPOUND EYE. Each ommatidium points in a slightly different direction and detects what is in that direction.

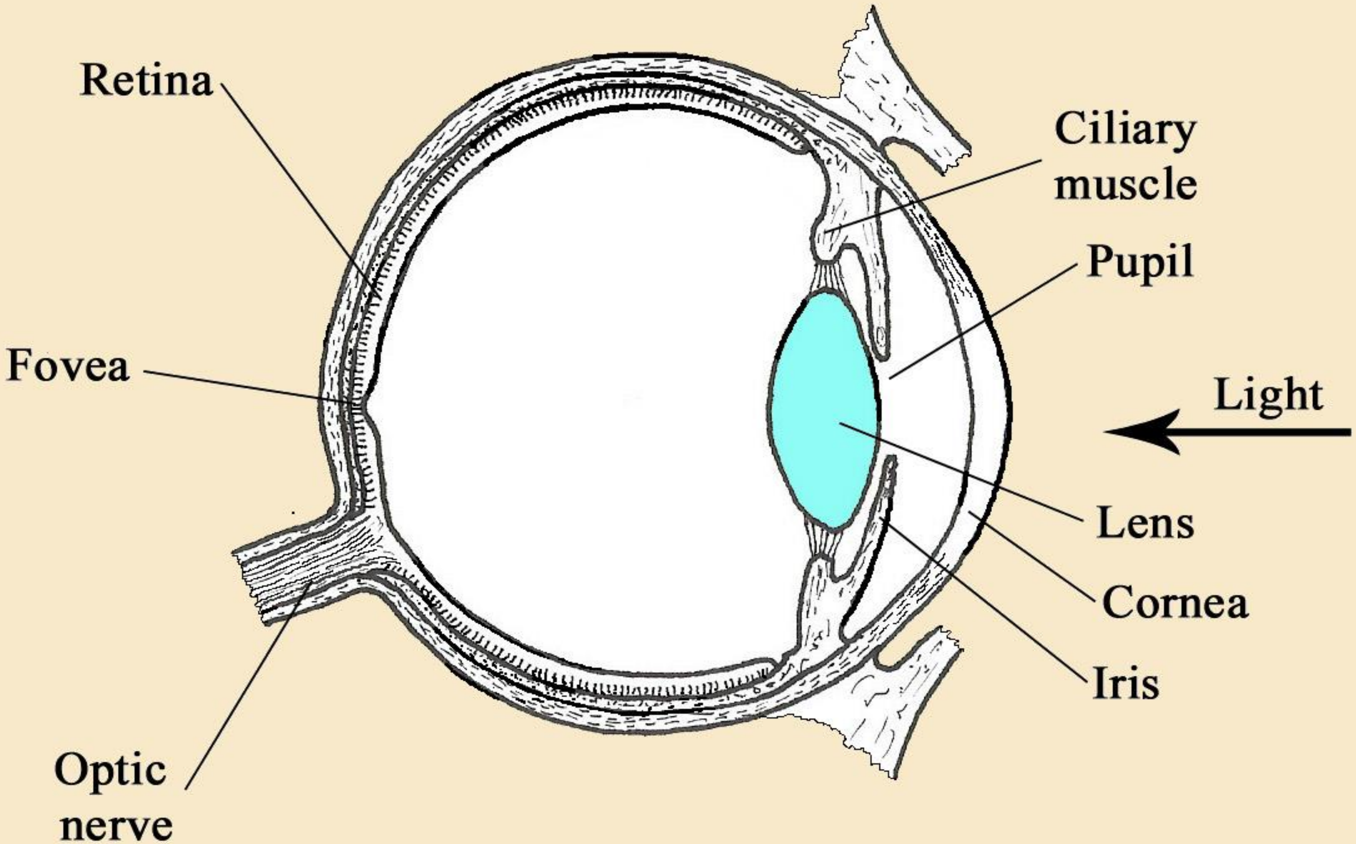
3. FOUR OPTICAL SYSTEMS

SIMPLE EYE OR CAMERA EYE

The vertebrates, which include our most familiar animals such as fishes, amphibians, reptiles, birds, and mammals, have what is called a simple or camera eye. It is so designated because it has a single lens like an ordinary camera does. That single lens focuses the light rays entering the eye onto the retina that lines a large essentially empty spherical cavity, as illustrated in the next slide.

Your retina has some one hundred million light sensitive cells (i.e. *photoreceptors*, also called *rods and cones*). It has a small special area that lies opposite to the lens called the *fovea*. This area consists of some 30,000 light sensitive cells where your vision is especially acute. You are using your foveae to read these words.

TYPICAL VERTEBRATE EYE



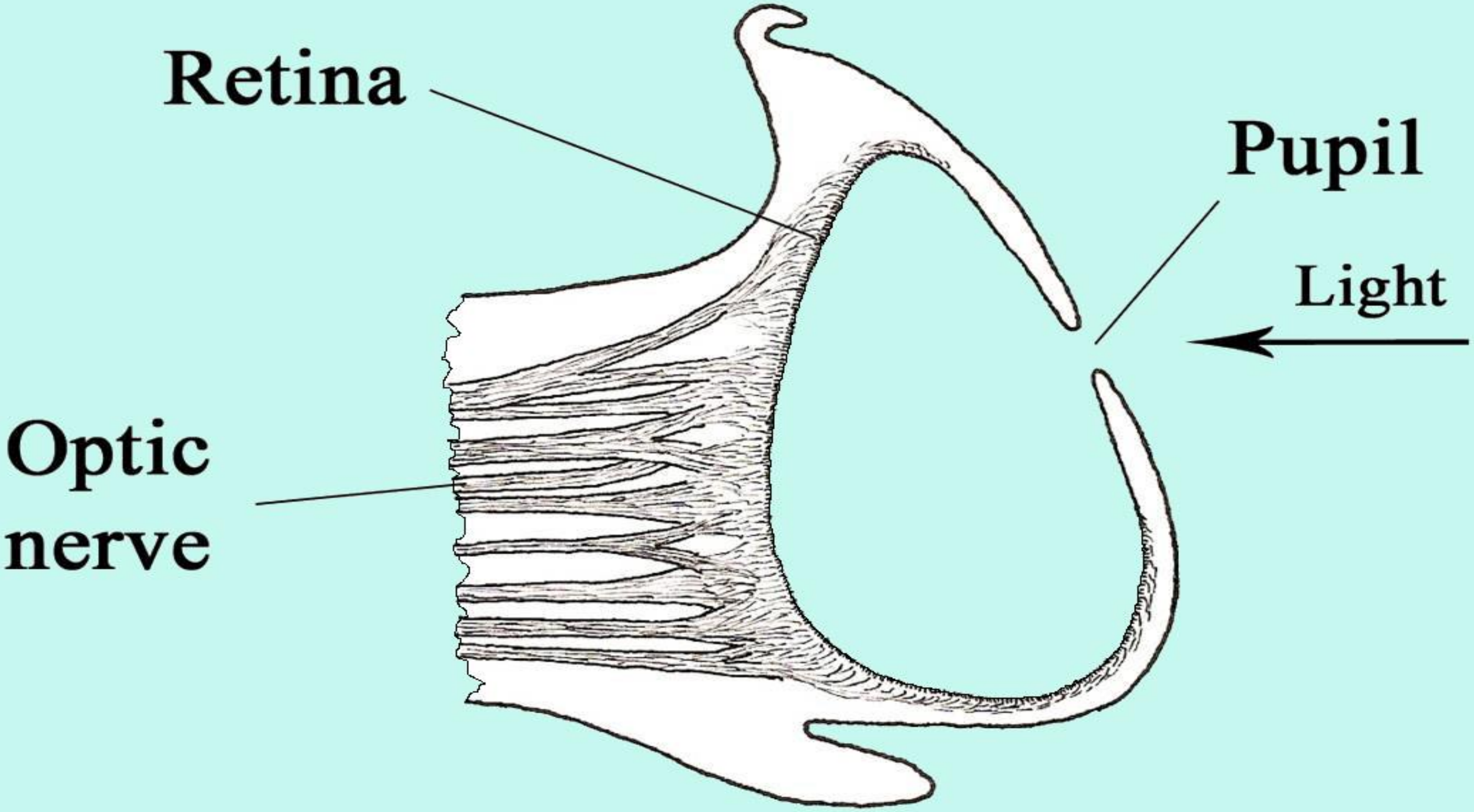
THE SIMPLE OR CAMERA EYE. A single lens focuses the light rays from various directions on the retina.

3. FOUR OPTICAL SYSTEMS
PINHOLE EYE

The **pinhole** eye is the simplest of the four image-forming eyes that we will consider. It is found in the octopus-like chambered nautilus, that lives in the ocean, and is especially noted for the beautiful chambered shell that it builds.

This eye has no focusing lens. Instead, it has a very small pupil (pinhole) that limits the size of the details of the light reaching the retina from various directions. This gives the nautilus a moderately accurate image of what is out there in its environment. The cavity of the eye is open to the sea and is filled with sea water. A figure follows.

EYE OF CHAMBERED NAUTILUS



After Cronly-Dillion, Vol2 p 374, from Young, 1985

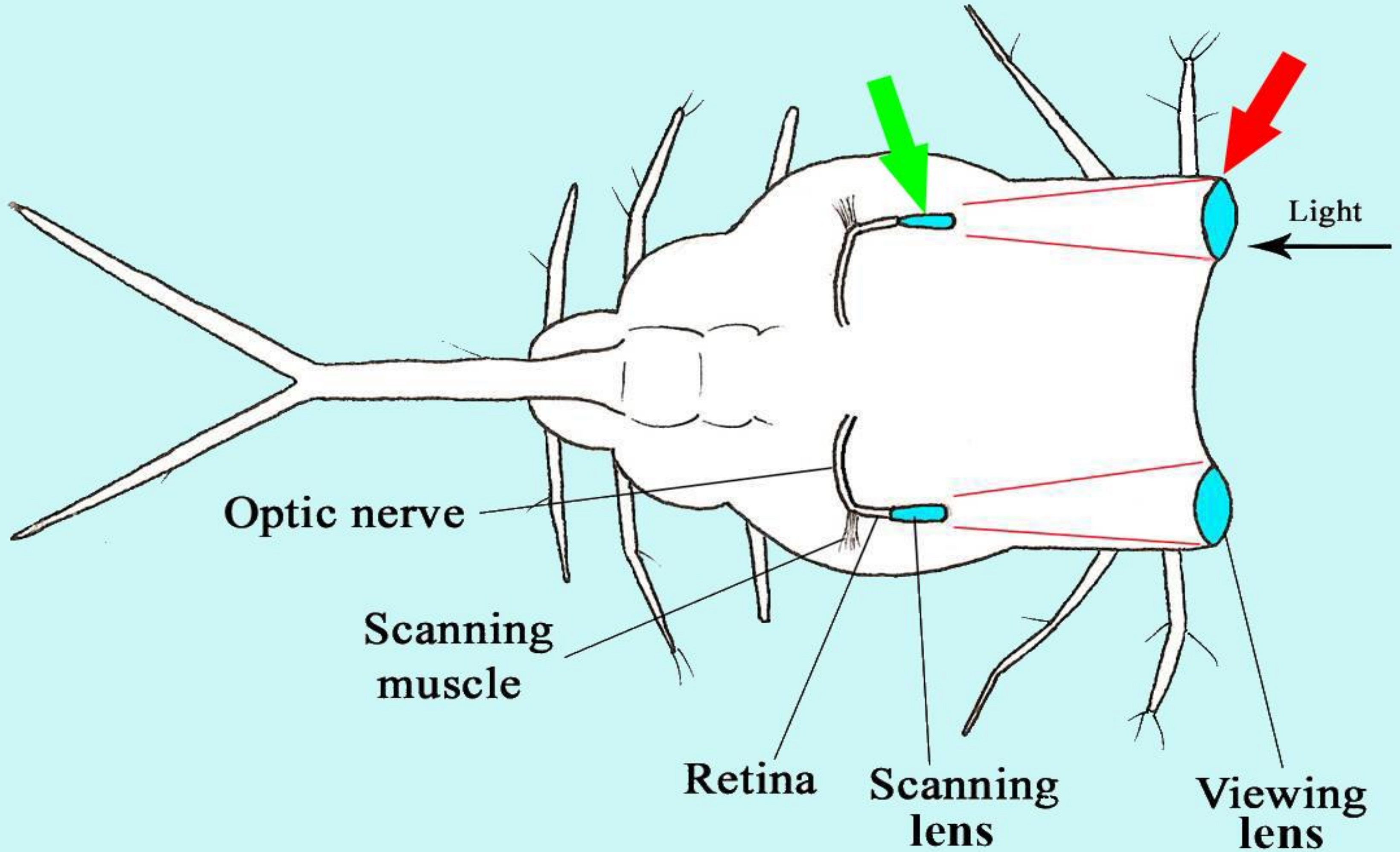
THE PINHOLE EYE. Light from different directions lands on different parts of the retina because there is only one small hole that admits the light.

3. FOUR OPTICAL SYSTEMS
SCANNING EYE

A **scanning eye** is an astonishing image-producing eye. It does this somewhat like a television camera does: by scanning. The best example is found in the tiny 1 millimeter wide, crab-like copepod called *Copilia* that lives in the Mediterranean Sea.

The next slide illustrates the organism. The small blue scanning lens (green arrow), vibrates back and forth as it scans the image brought into focus by the larger viewing lens (red arrow).

SCANNING OPTICAL SYSTEM OF *Copilia*



THE SCANNING SYSTEM. An image is formed by a vibrating scanning lens (green arrow) analyzing the image brought into focus by a viewing lens (red arrow).

3. FOUR OPTICAL SYSTEMS
IMAGE-FORMING EYES

Note that the four types of eyes use very different mechanisms to form an image. It does not seem that you could evolve one type from the other because they are basically so different. Each kind of image-forming system has to develop more or less independently. So the view that eyes could gradually evolve from simple to complex is more complicated. Some evolutionists recognize the problem and we will discuss that later below.

4. THREE PROBLEMS THE VARIETY OF EYES POSES FOR EVOLUTION

4. THREE PROBLEMS THE VARIETY OF EYES POSES FOR EVOLUTION: THE LIST IS PROVIDED HERE FOR COMPARISON

a. We find advanced eyes in simple organisms and simple eyes in advanced organisms.

b. Evolutionarily isolated animals have similar eyes.

c. Organisms that are evolutionarily closely related sometimes have very different eyes.

4. DETAILS OF THREE PROBLEMS THE VARIETY OF EYES POSES FOR EVOLUTION

(a) We find advanced eyes in simple organisms and simple eyes in advanced organisms.

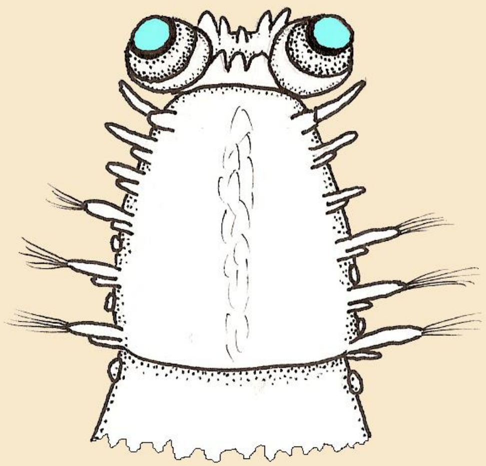
4. THREE PROBLEMS FOR EVOLUTION

a. Advanced eyes in simple organisms and simple eyes in advanced organisms.

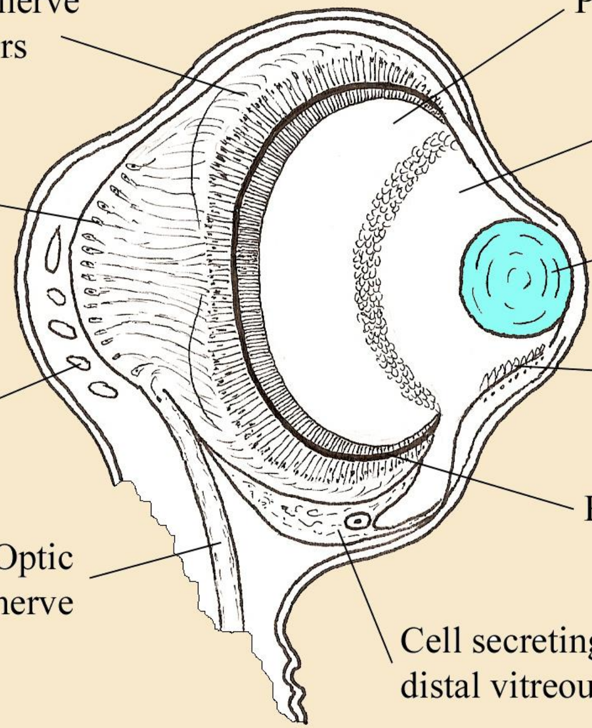
There are many surprises when we compare the degree of advancement of eyes to the degree of advancement in various animals. Some simple animals have advanced eyes and some more advanced animals have simple eyes.

There is a small marine worm (polychaete type), illustrated in the next slide, that has advanced eyes that focus by adjusting the volume of the distal vitreous compartment. These are image-forming eyes. Furthermore, since this worm has muscles that move its eyes around in different directions, it appears that this “simple” worm, that is only around 6-8 millimeters long, is doing more with its eyes than just detecting light. It is looking at different things.

EYES OF SOME POLYCHAETE WORMS



Anterior end showing the two large eyes.



Details of the eye

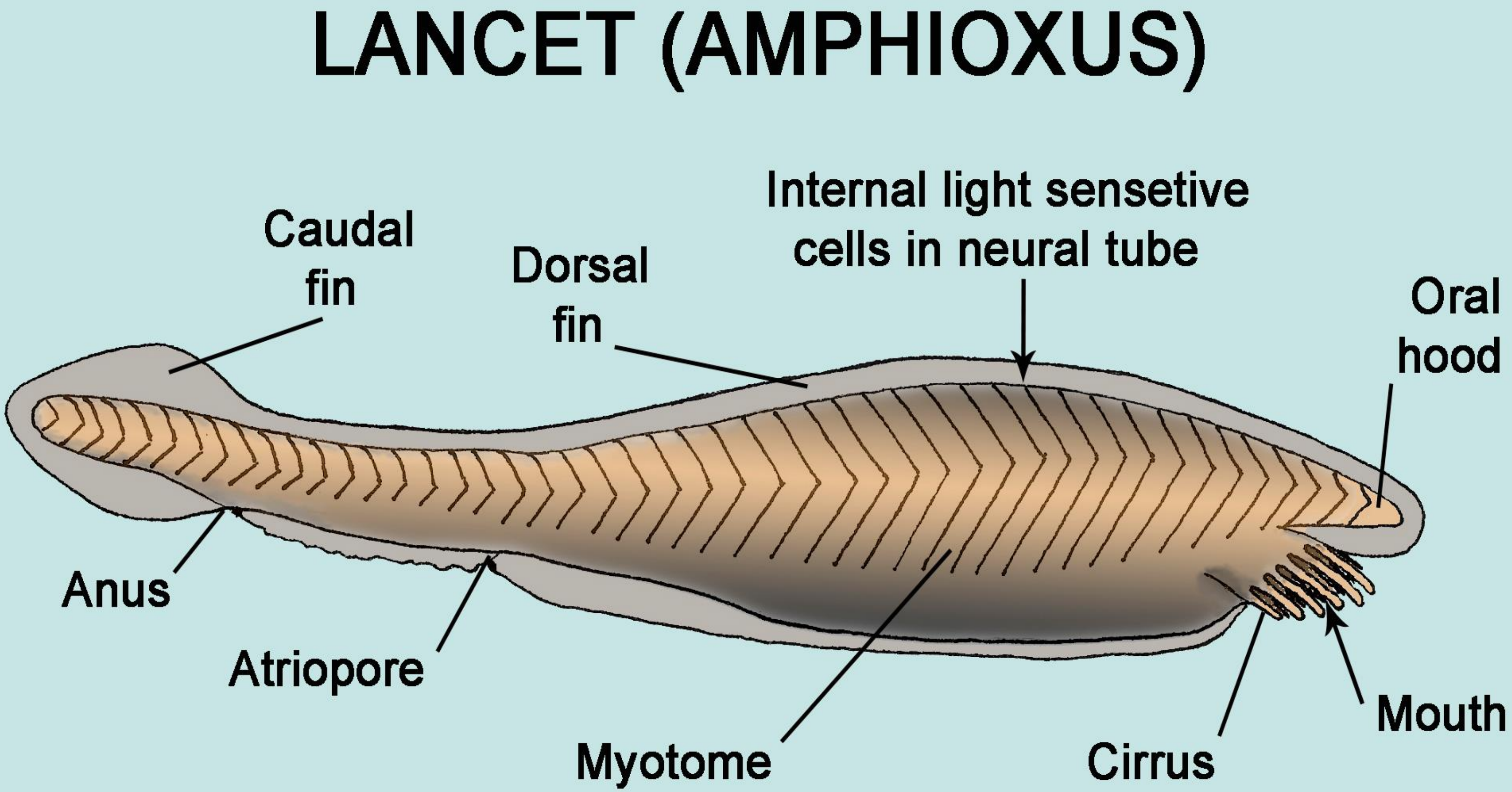
After Duke-Elder . 1958. The eye in Evolution, from Hesse and Greeff.

EYES OF *Vanadis,* a tiny polychaete marine worm less than 1 centimeter long.

4. THREE PROBLEMS FOR EVOLUTION

a. Advanced eyes in simple organisms and simple eyes in advanced organisms.

On the other hand, advanced organisms like the lancets (next slide), don’t have any kind of real eyes at all, just light sensitive cells in the neural tube. Lancets, often called “amphioxus,” belong to the phylum Chordata, which is the phylum we belong to. It is considered to be the most advanced phylum. Lancets can reach 10 centimeters in length. They live in the ocean often with their posterior end buried in clean sand, and anterior end protruding in the ocean..



The marine lancet *Branchiostoma* (Amphioxus). It is a member of the most advanced animal phylum (Chordata), yet has no image-forming eyes.

4. DETAILS OF THREE PROBLEMS THE VARIETY OF EYES POSES FOR EVOLUTION

(b) Evolutionarily isolated animals have similar eyes

4. THREE PROBLEMS FOR EVOLUTION

b. Evolutionarily isolated animals have similar eyes.

The basic structure of the eye of some invertebrates like the squid and octopus, is basically like that of vertebrates such as reptiles, birds and us. How could random mutations produce such similar structures in such varied animals?

4. THREE PROBLEMS FOR EVOLUTION

b. Evolutionarily isolated animals have similar eyes.

Evolutionists try to explain this by suggesting what they call *convergent evolution (parallel evolution)*. This means that these similar structures evolved independently by themselves. But it would require an unreasonable amount of fortuitous happenstance to produce the same kind of eye by chance mutations of the DNA.

Furthermore, if in order to get similar eyes in very different kinds of animals, you are going to suggest some kind of major gene transplant process between the two animals, so as to transfer thousands of genes necessary to produce the parts of an advanced eye; this is likewise unrealistic. Such large transfers are not known to occur in animals by themselves.

4. THREE PROBLEMS FOR EVOLUTION

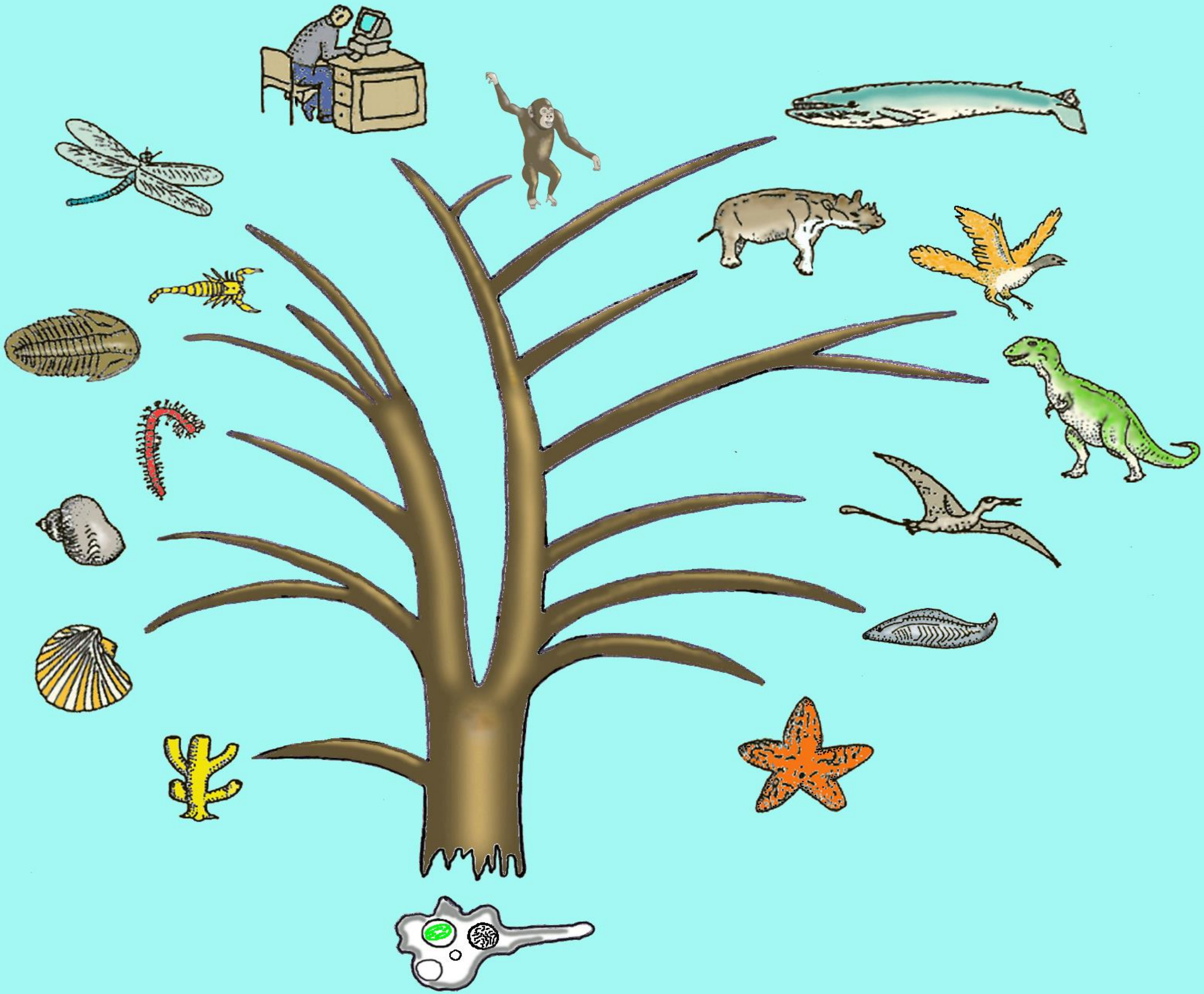
b. Evolutionarily isolated animals have similar eyes.

The case is especially difficult for evolutionists because according to their theory, they divide the animal kingdom into two main groups: Deuterostomes, which include vertebrates like us and echinoderms (sea urchins, starfish, etc.); and Protostomes, which are most other animal phyla and include snails, squids and insects. These groups are assumed to have evolved apart from each other from a hypothetical common ancestor some 630 million years ago, long before we find their fossils or their eyes. Yet the general anatomy of some of the eyes from the two groups is incredibly similar. How did that happen?

4. THREE PROBLEMS FOR EVOLUTION

b. Evolutionarily isolated animals have similar eyes.

The next illustration is that of an evolutionary tree. Such trees will be studied further on in the fossil discussions. However, you can easily see in the figure the two main branches of the tree. The Protostomes are on the left branch, and that side includes the snails and related squids (mollusks). The other branch of the tree on the right represents the Deuterostome part of the animal kingdom that includes starfish and vertebrates like us.



AN EVOLUTIONARY TREE FOR THE ANIMALS. The left main branch represents the Protostomes, while the right main branch represents the Deuterostomes.

4. THREE PROBLEMS FOR EVOLUTION

b. Evolutionarily isolated animals have similar eyes.

The next illustration of geese represents the Deuterostome part of the animal kingdom. The eyes of geese and your eyes are remarkably similar to those of a squid or octopus that are in the Protostome part.

Friendly but cautious geese. The anatomy of the eye of geese and squids is remarkably similar.

Photo by Lenore Roth.

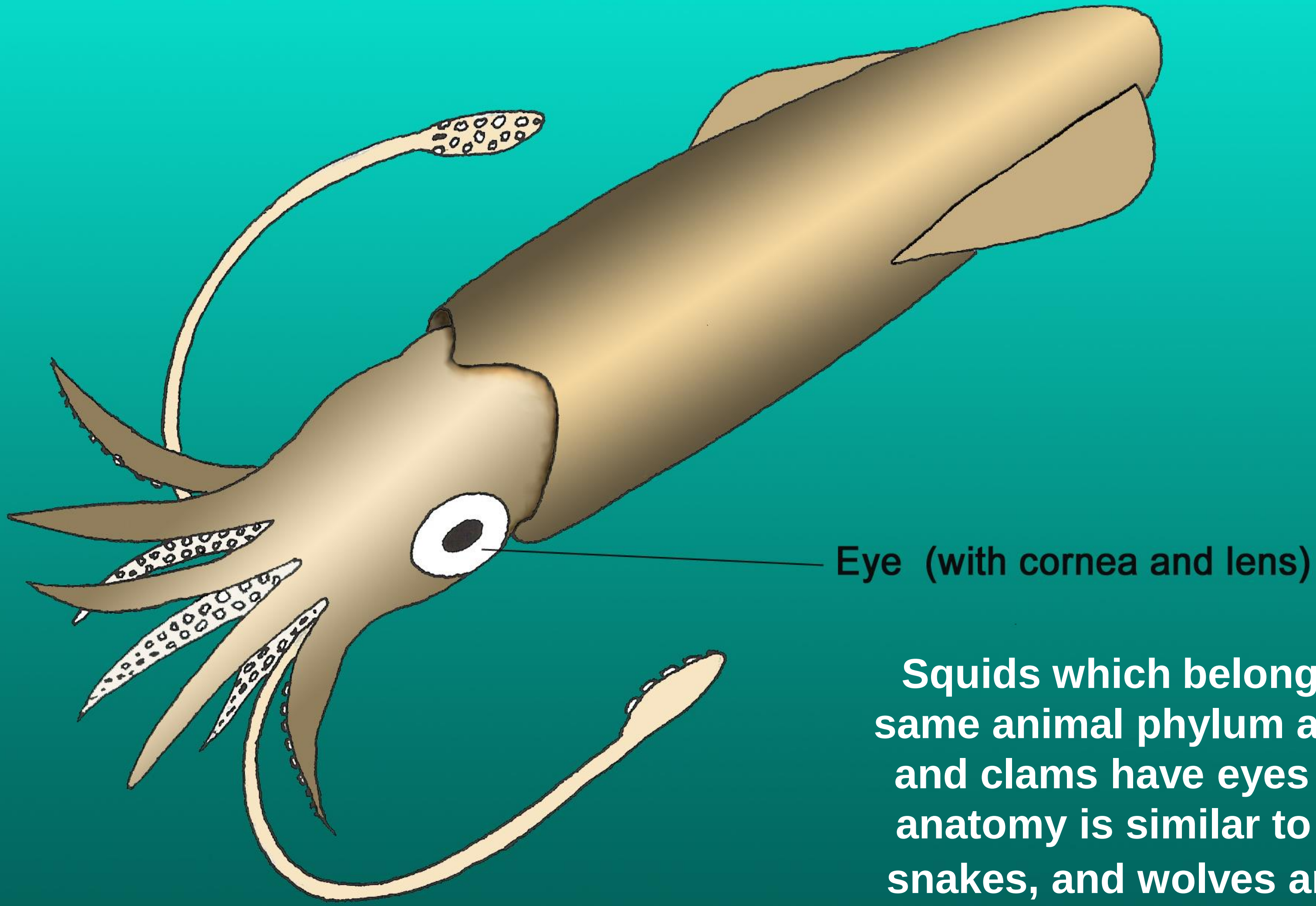
3. THREE PROBLEMS FOR EVOLUTION

b. Evolutionarily isolated animals have similar eyes.

The next slide illustrates a squid that is in the Protostome group of animals. Many squids are in the one meter (3 feet) size range, however some giant squids are among the largest animals we know of, reaching to 20 meters (60 feet) including their long tentacles.

Squids also have the largest eyes we know of. They live in the deep ocean where there is hardly any light and they need large eyes to collect as much light as possible so as to see anything. The eye of a giant squid can be bigger than a basketball and reach 40 centimeters (16 inches) in diameter. One of these giant eyes can harbor one billion light sensitive cells (photoreceptors).

SQUID



Squids which belong to the same animal phylum as snails and clams have eyes whose anatomy is similar to that of snakes, and wolves and you.

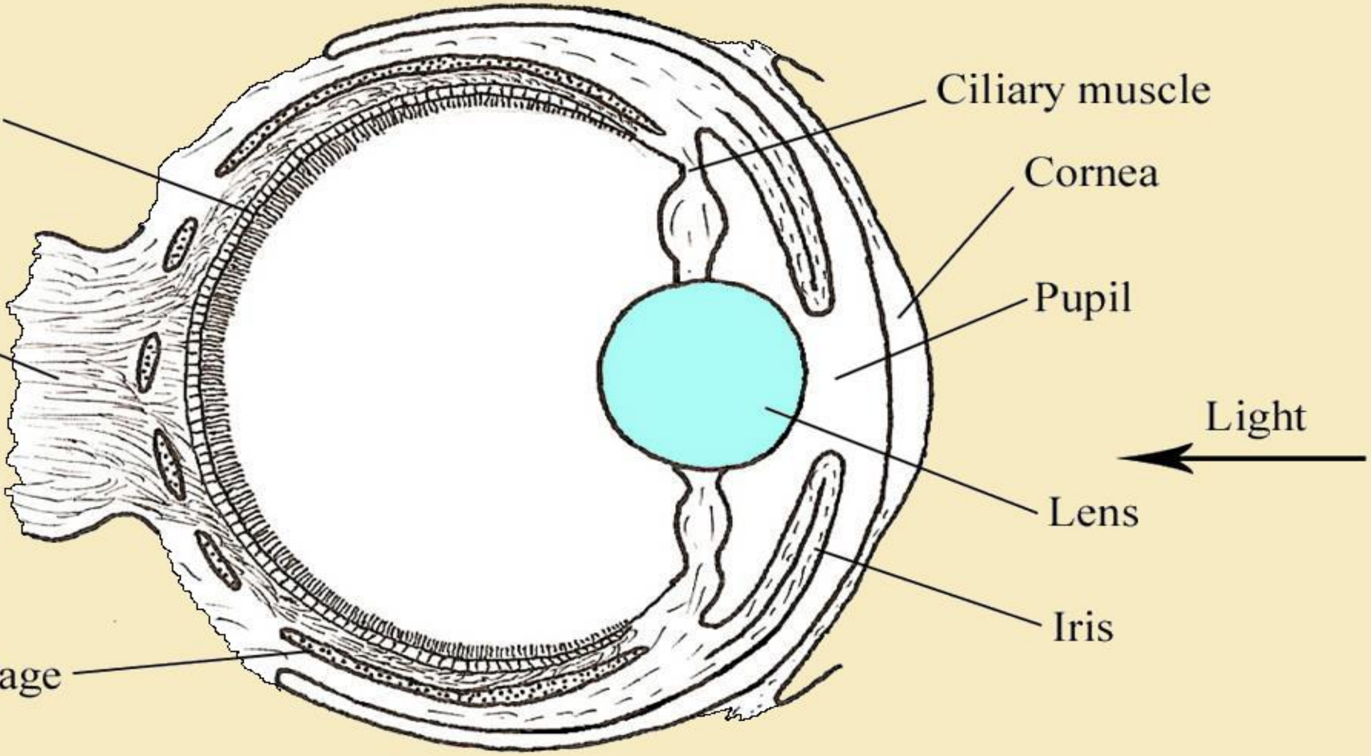
4. THREE PROBLEMS FOR EVOLUTION

b. Evolutionarily isolated animals have similar eyes.

The structure of the eye of the squid (a cephalopod) is illustrated in the next slide. Its basic arrangement is identical to that of a vertebrate eye. On a microscopic scale, the light sensitive cells of the retina in the two groups are different and, as we will discuss later, this results in a different internal arrangement for the retina, but the basic anatomy of the squid and the vertebrate eye is the same.

EYE OF A CEPHALOPOD

The normal kind of cephalopod eye is found in squids, octopuses, and cuttlefishes.

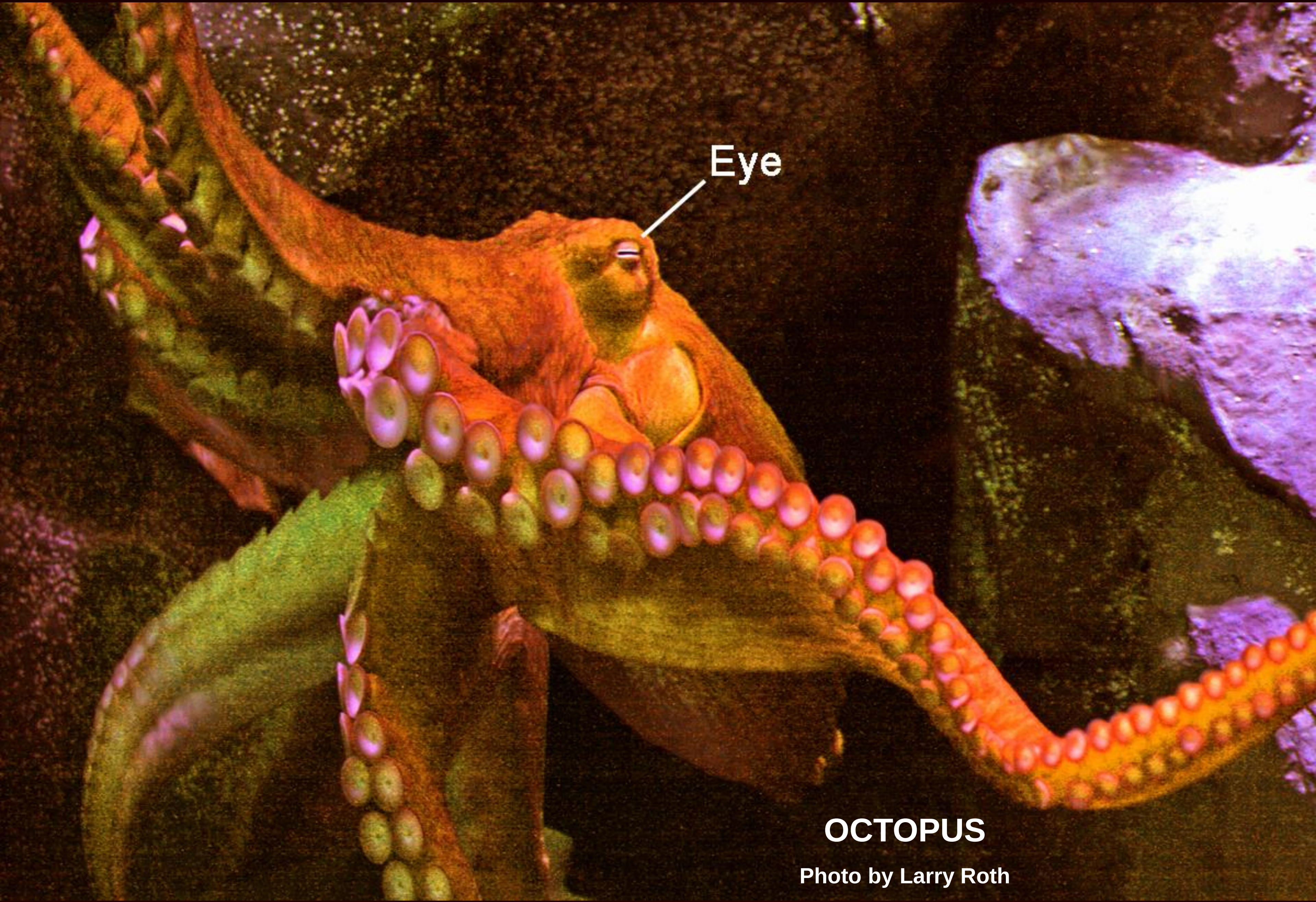


Based in part on Hegner RW. 1933. The Invertebrates, Fig 274.

4. THREE PROBLEMS FOR EVOLUTION

b. Evolutionarily isolated animals have similar eyes.

The next slide is a picture of an octopus, and the octopus (also a cephalopod) has a simple, camera type of eye similar to that of a squid and a bird.


Eye
OCTOPUS
Photo by Larry Roth

4. THREE PROBLEMS FOR EVOLUTION

b. Evolutionarily isolated animals have similar eyes.

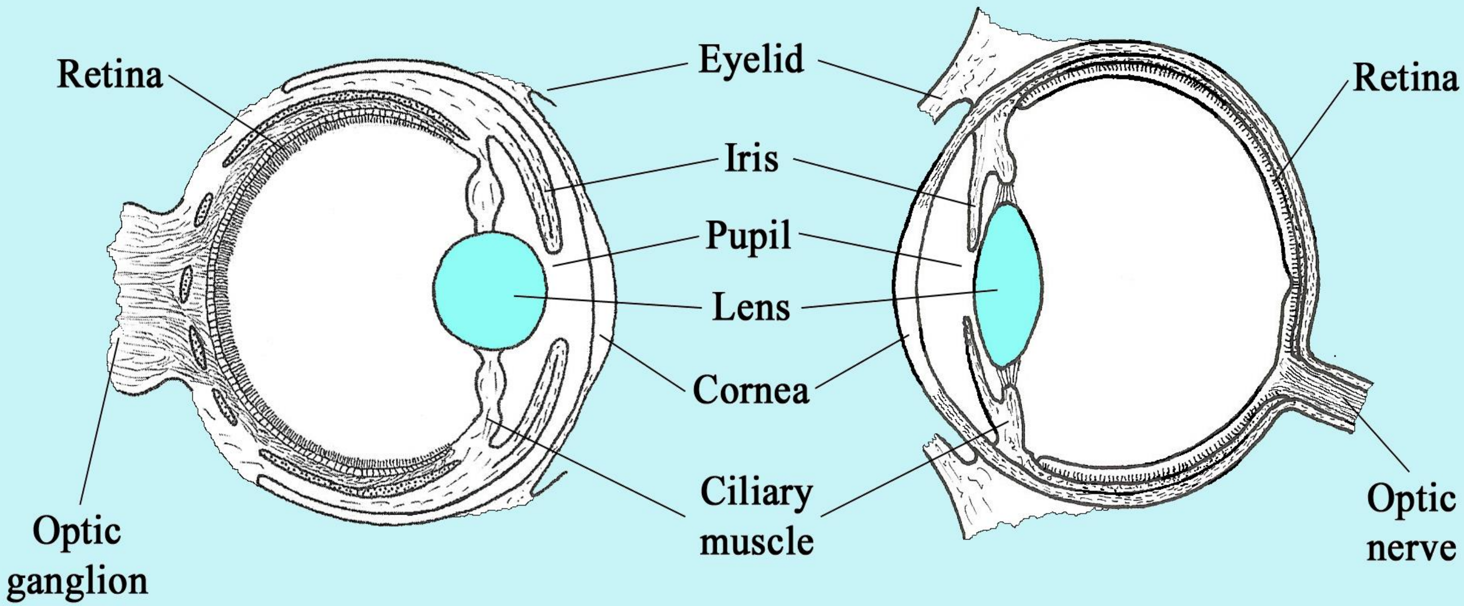
The next slide compares the squid eye with the vertebrate eye showing their nearly identical anatomy. The convergent evolution problem is significant also because the squid and related octopus and cuttlefish (not a fish, it is a little like a flat squid and is called *Sepia*) are such different animals from vertebrates. Like snails, they are mollusks, and are grouped in the class Cephalopoda. They have no vertebral column (backbone) as vertebrates do, and they have fleshy arms around their head region. They move mainly by directing a jet of water in diverse directions. Vertebrates belong to the phylum Chordata and include fish, amphibians, reptiles, birds and mammals. They have a well-developed vertebral column.

These different kinds of animals have very similar eyes. Could random evolutionary mutations produce such similar eyes in these two very different groups? This seems very unlikely. The similarity would seem to indicate a common Designer.

SIMILARITY IN THE BASIC STRUCTURE OF THE EYES OF TWO VERY DIFFERENT KINDS OF ANIMALS

CEPHALOPOD EYE
Octopus, squid, Sepia

VERTEBRATE EYE
Fish, amphibians, (reptiles), birds, mammals



Based on Hegner, 1933, Fig. 274; and Futuyma, 1998, Fig.5:20

4. THREE PROBLEMS FOR EVOLUTION

(c) Organisms that are evolutionarily closely related sometimes have very different eyes

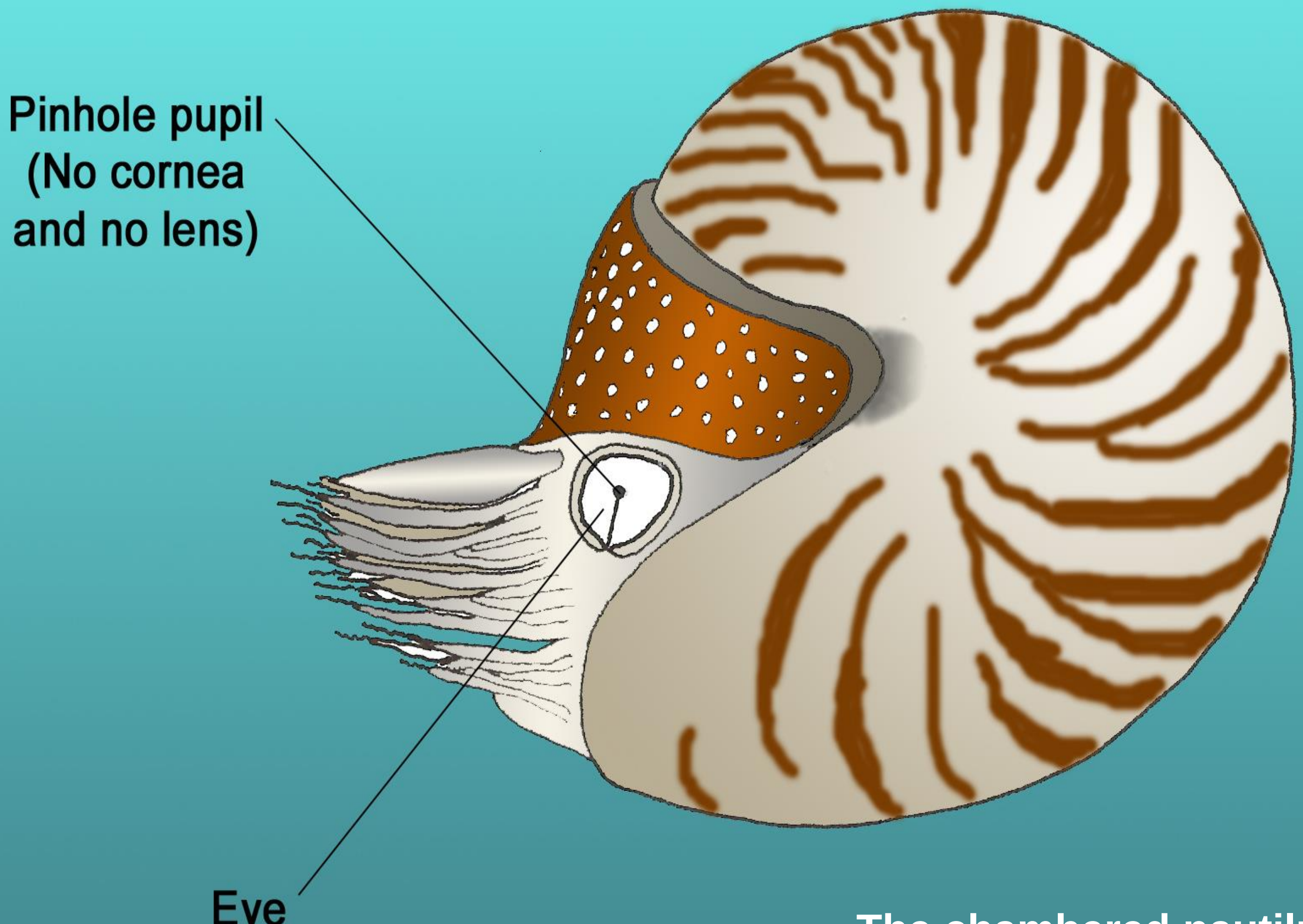
4. THREE PROBLEMS FOR EVOLUTION

c. Organisms that are evolutionarily closely related sometimes have different eyes.

Recall that we referred to the similarity of the cephalopod (squid, octopus, and *Sepia*) eye to the vertebrate eye. Strangely, in the squid group (Class Cephalopoda) we find the chambered nautilus that has an entirely different kind of eye. The chambered nautilus has the basic anatomy of a squid, with lots of arms around its head region like the squid and octopus. It has the additional accoutrement of a coiled shell that is built one chamber at a time. As it builds its shell and grows, it lives in the last chamber built, which is the largest one.

In the next slide, note the many arms and especially the peculiar eye of the chambered nautilus.

CHAMBERED NAUTILUS



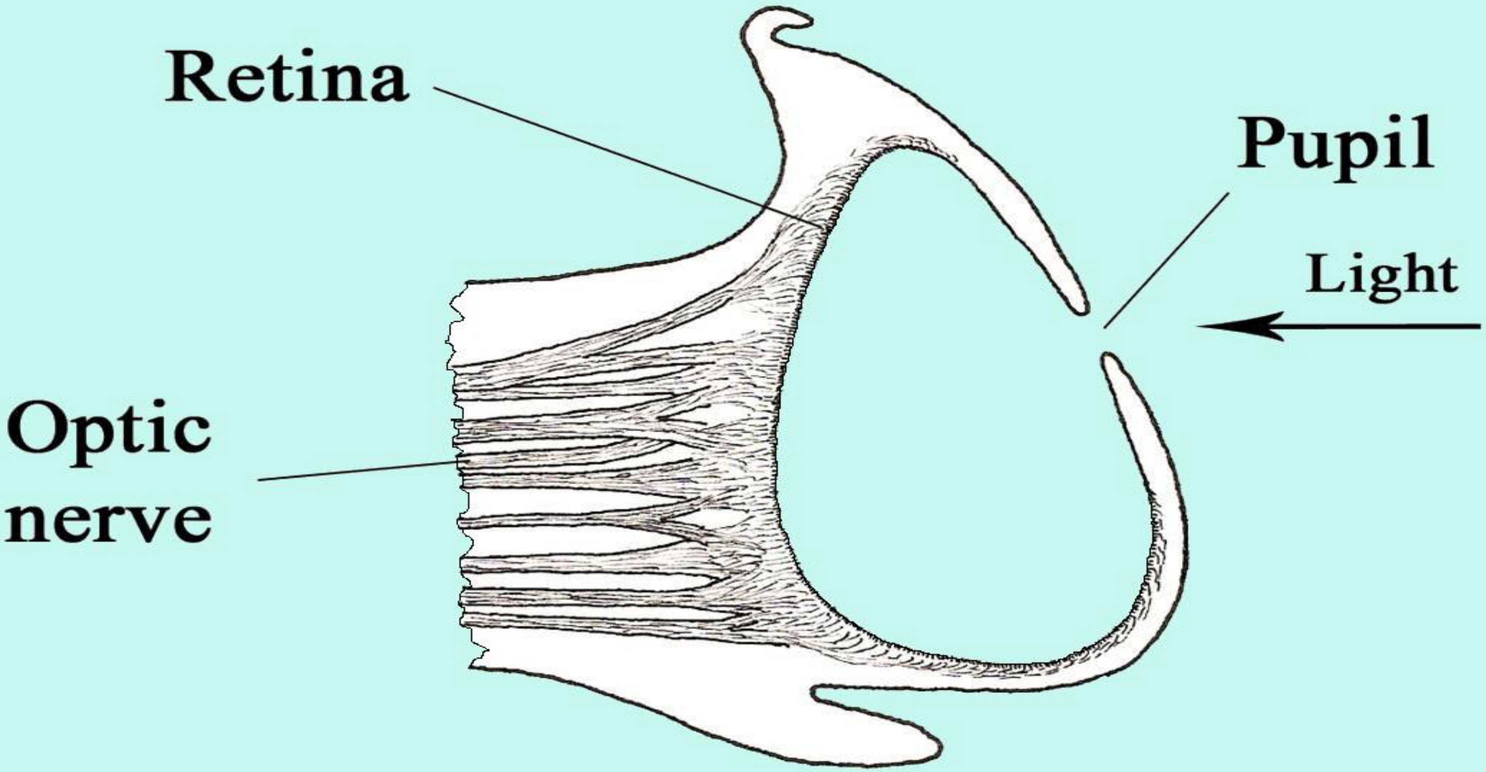
The chambered nautilus is quite similar to the squid and octopus. The many small gray arms that you see to the left of the eye region correspond to the longer arms of the octopus and squid.

4. THREE PROBLEMS FOR EVOLUTION

c. Organisms that are evolutionarily closely related have different eyes.

The eye of the chambered nautilus is relatively simple. It is the pinhole eye type mentioned earlier. It consists of just a chamber (pocket) lined in its back part with a light sensitive retina and a little hole at the front. That is all. The chambered nautilus lives in the ocean and the cavity of the eye is filled with sea water. There is no cornea, lens or iris. The hole, designated as "pupil" in the next figure, is around one millimeter in diameter. This is an image-forming eye. Because the pupil is so small, light coming into the eye from a small object will only strike a small area of the retina, and thus will be seen as a small object; and a whole picture of what is being looked at is put together in this same fashion.

EYE OF CHAMBERED NAUTILUS



After Cronly-Dillion, Vol2 p 374, from Young, 1985

THE PINHOLE EYE OF THE CHAMBERED NAUTILUS. Note that there is no lens, no iris, no cornea.

4. THREE PROBLEMS FOR EVOLUTION

c. Organisms that are evolutionarily closely related have different eyes.

It seems strange that the chambered nautilus that is similar to the squid, octopus, and cuttlefish (*Sepia*) should have such a different kind of eye. As mentioned above, these organisms are all mollusks and are members of even the same class, the Cephalopoda. Evolutionists would assume that they all had one common evolutionary ancestor. If that is the case, it raises the question of why the chambered nautilus evolved such a different kind of eye than its close relatives and ancestors? Instead, could these just be different created kinds of cephalopods?

4. THREE PROBLEMS FOR EVOLUTION
(Summary)

We find similar animals, like the squid and chambered nautilus, with very different kinds of eyes. We find simple eyes in advanced animals, like the lancet (amphioxus), that hardly has an eye, and complex eyes in simple animals, like the eyes of some polychaete worms. Furthermore, evolutionarily isolated animals, like the squid and vertebrates, have similar eyes. **The development of the complexity of the eye does not follow the order expected in proposed evolutionary relationships.**

5. THE EVOLUTIONARY SOLUTION

5. THE EVOLUTIONARY SOLUTION

Some evolutionists recognize the incongruities presented above. To resolve this, they propose that the eye evolved independently many times, perhaps 16, 20, 40, or even 65 times! In that model, the different kinds of eyes did not evolve from each other.

This tends to greatly weaken the argument for evolution suggested by leading evolutionists, that we presented earlier, namely that the simple to complex eyes we see work and have survival value and this implies they could evolve from each other as Darwin stated. Can evolutionists use the different kinds of eyes we see to support both the general evolution of the eye from simple to complex, and then propose separate evolution for different kinds of eyes when general evolution seems implausible? These are conflicting generalizations.

5. THE EVOLUTIONARY SOLUTION

The classic report suggesting different kinds of eyes evolved independently is:

L. Salvini-Plawen (Univ. Vienna), Ernst Mayr, (Harvard). 1977. *On the Evolution of Photoreceptors and Eyes.* Evolutionary Biology 10:207-263.

In this comprehensive paper, these authors conclude that the eye evolved many times and state: "The results of our analysis completely substantiate Darwin's claims, but also reveal numerous still unsolved problems."

COMMENT: Unfortunately the first part of this conclusion [in blue above] appears invalid. The thesis they propose is that many various kinds of eyes evolved independently while Charles Darwin proposed that gradual natural selection produced advanced eyes from simple ones.

6. SUMMARY AND CONCLUSIONS FOR PART 1, "THE VARIETY OF EYES"

DARWIN AND THE EYE, PART 1:
6. SUMMARY AND CONCLUSIONS

1. A variety of completely different optical systems are used by animals to form images.

2. The pattern of distribution of the different viewing systems through the animal kingdom confounds proposed evolutionary relationships (lineages).

3. Because of this, some evolutionists propose that when a new kind of eye appears it represents a new evolutionary lineage for that eye. In other words, the new kind did not evolve gradually from other eyes, it evolved independently. Yet Darwin and others suggest that since we have a variety of eyes from simple to complex that all work, this illustrates how survival could produce simple to advanced eyes. Which is it? Can evolutionists have their general explanations going both ways?

7. REVIEW QUESTIONS

(Answers provided later below)

7. REVIEW QUESTIONS - 1

(Answers provided later below)

1. Describe the difference in what one sees if one has a light-detecting kind of eye, or if one has an image-forming eye.

2. Four basic kinds of image-forming eyes that use very different optical systems to form an image were described, namely: compound, simple, pinhole, and scanning. What are the implications for evolution for such varied methods of seeing?

REVIEW QUESTIONS - 2

(Answers given later below)

3. What are the implications for creation and for evolution of the fact that the general anatomy of vertebrate and squid eyes are essentially identical; that the eyes of the chambered nautilus and the octopus are very different; and that the eyes of a polychaete worm are so much more advanced than those of the lancet (Amphioxus)?

4. Evolutionist claim that simple eyes could gradually evolve into advanced ones because all these eyes obviously have survival value. At the same time, because very different kinds of eyes are found in animals assumed to be evolutionarily closely related, and because advanced eyes are found in simple animals and vice versa, they assume that eyes evolved many times independently. What are the implications of these different lines of reasoning?

REVIEW QUESTIONS AND ANSWERS - 1

1. Describe the difference in what one sees if one has a light-detecting kind of eye or if one has an image-forming eye.

The light-detecting eye cannot detect directions, hence it only tells if there is light or possibly how bright the light is. In an image-forming eye you see the shape of what is out there because the eye is able to analyze the difference in light coming from various directions.

2. Four basic kinds of image-forming eyes that use very different optical systems to form an image were described, namely: compound, simple, pinhole, and scanning. What are the implications for evolution for such varied methods of seeing?

The systems are so varied, using very different parts and systems to form an image, that it does not seem possible that one system could gradually evolve into another while also providing survival of the fittest advantages all along the way. Some evolutionists recognize this problem.

REVIEW QUESTIONS AND ANSWERS - 2

3. What are the implications for creation and for evolution of the fact that the general anatomy of vertebrate and squid eyes are essentially identical; that the eyes of the chambered nautilus and the octopus are very different; and that the eyes of a polychaete worm are so much more advanced than those of the lancet (Amphioxus)?

Squids and vertebrates are very different kinds of animals that evolutionists assume evolved from a common ancestor long before we can find any of their kinds of fossils. It seems essentially impossible that random mutations over millions of years could end up producing such similar eyes. Eyes don't have to be similar; we find many very different kinds of eyes in all kinds of animals. The similarity of these eyes in such different kinds of animals suggest that the same creator designed both of these eyes.

The chambered nautilus is evolutionarily closely related to the octopus. They should have the same basic kind of eyes.

The lancet belongs to the phylum Chordata, which is our phylum, the most advanced phylum. Yet its "eye," which is but a patch, is very inferior to the sophisticated eyes of some primitive polychaete worms.

REVIEW QUESTIONS AND ANSWERS - 3

4. Evolutionist claim that simple eyes could gradually evolve into advanced ones because all these eyes have survival value. At the same time, because very different kinds of eyes are found in animals assumed to be evolutionarily closely related, and because advanced eyes are found in simple animals and vice versa, they assume that eyes evolved many times independently. What are the implications of these different lines of reasoning?

This is an example of the great flexibility of evolutionary explanations used to explain different kinds of data. Evolutionists should be more cautious in using the increasing degree of complexity of various eyes to explain eye evolution when convenient, and when it does not fit the data, assume eyes evolved independently. At times evolution has several suggested conflicting explanations and it becomes difficult to determine which one is supposed to be the correct one.

ADDITIONAL REFERENCES

For further discussions by the author (Ariel A. Roth) and many additional references, see the author's books titled:

1. ORIGINS: LINKING SCIENCE AND SCRIPTURE. Hagerstown, MD. Review and Herald Publishing Association.
2. SCIENCE DISCOVERS GOD: Seven Convincing Lines of Evidence for His Existence. Hagerstown, MD. Autumn House Publishing, an imprint of Review and Herald Publishing Association.

Additional information is available on the author's Web Page: Sciences and Scriptures. www.sciencesandscriptures.com. Also see many articles published by the author and others in the journal ORIGINS which the author edited for 23 years. For access see the Web Page of the Geoscience Research Institute www.grisda.org.

Highly Recommended URLs are:

Earth History Research Center http://origins.swau.edu

Theological Crossroads www.theox.org

Sean Pitman www.detectingdesign.com

Scientific Theology www.scientifictheology.com

Geoscience Research Institute www.grisda.org

Sciences and Scriptures www.sciencesandscriptures.com

Other Web Pages providing a variety of related answers are: Creation-Evolution Headlines, Creation Ministries International, Institute for Creation Research, and Answers in Genesis.

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