



Developmental biology

with Professor Andy Groves

Talking points

Knowledge

1. What are the auditory and vestibular systems?
2. What are hair cells?

Comprehension

3. What processes occur in the ear to allow someone to hear sound?
4. What processes occur in the ear to allow someone to balance?
5. What did the team discover about how chemical signals control the development of hair cells?
6. What are the similarities and differences in mechanosensory cells in vertebrates, squid and tunicates?

Application

7. If it is discovered that mechanosensory cells have evolved by convergent evolution, what new questions would this raise for developmental and evolutionary biologists?
8. How might the team's research lead to new methods to prevent or reverse hearing loss?

Analysis

9. Why is it important to understand how each part of our body develops?
10. Why do you think developmental biologists often use research methods that disrupt normal development, such as mutating genes in mice?
11. Why do you think that hearing loss is more common in elderly people?

Evaluation

12. Developmental biology research involves studying animal embryos, which can be a contentious ethical issue. What arguments for and against using animals in research can you think of? To what extent do you agree that it is necessary to use animals to understand human conditions such as hearing loss?

Activities

Model organisms

Developmental biologists use a wide range of different animals in their research. Some of the most common include mice, zebrafish, fruit flies (*Drosophila*) and nematode worms (*C. elegans*). These species are known as 'model organisms', and each has specific traits that make it suitable or unsuitable for specific research questions.

Use the internet to find out more about these model organisms (and any other species used in biology research that interest you). What are the advantages and limitations of each species? What research questions can each species help to answer? How relevant is each species for understanding human development? What are the practicalities and logistics of conducting research on each species, such as cost and time taken for the organism to grow? What ethical issues does each species present?

Design an informative and engaging poster or set of fact cards that summarises the information about each species of model organism. Then, design a quiz based on the information from your poster or fact cards, that asks which model organism(s) would be most suitable for answering different research questions. For example: "Scientists want to examine the role of a particular gene in limb development in vertebrates."

Present your poster or fact cards to your class, then present your quiz. How much did your classmates learn about different model organisms?

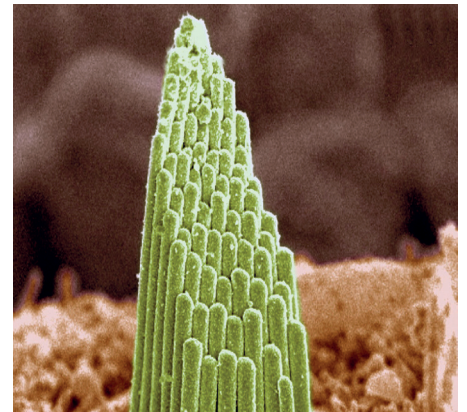
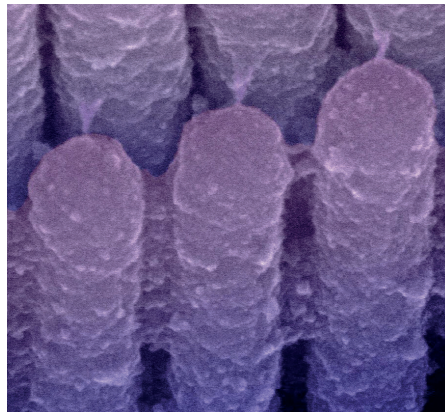
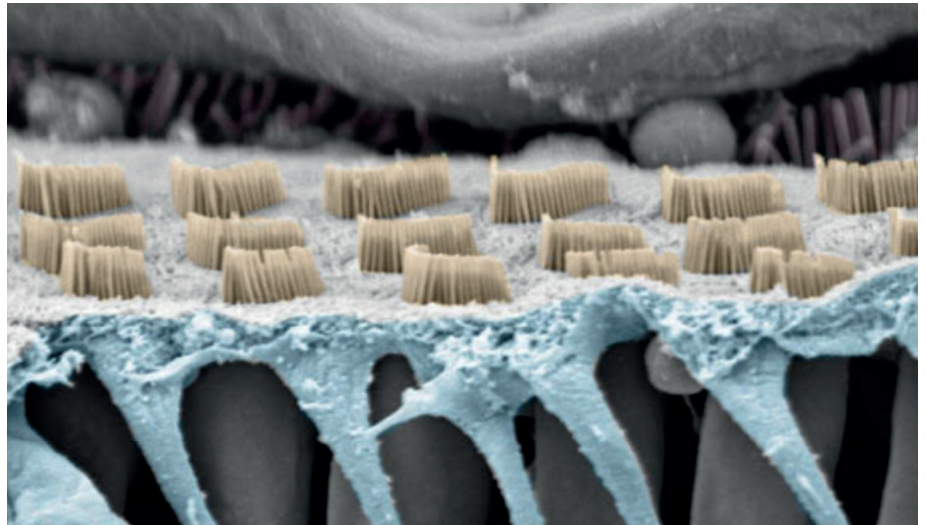
Locating sounds

Typically, animals have two ears, rather than one, because hearing the same sound in different ears allows the brain to identify where the noise comes from.

Design an experiment to test this theory. How accurately can you or your classmates locate the source of a sound if both ears are uncovered compared to if your left ear is covered and to if your right ear is covered? Which sounds are easiest to locate? Why do you think this is? Are certain angles better or worse for detecting sound? Why do you think this is?

You or someone you know may have a hearing impairment. How can other senses help people to experience the world without hearing?

Images right: Hair cells in the inner ear form precise and intricate patterns
top: © Professor Andrew Forge;
bottom: © Dr David Furness, Wellcome Collection, CC BY-NC 4.0



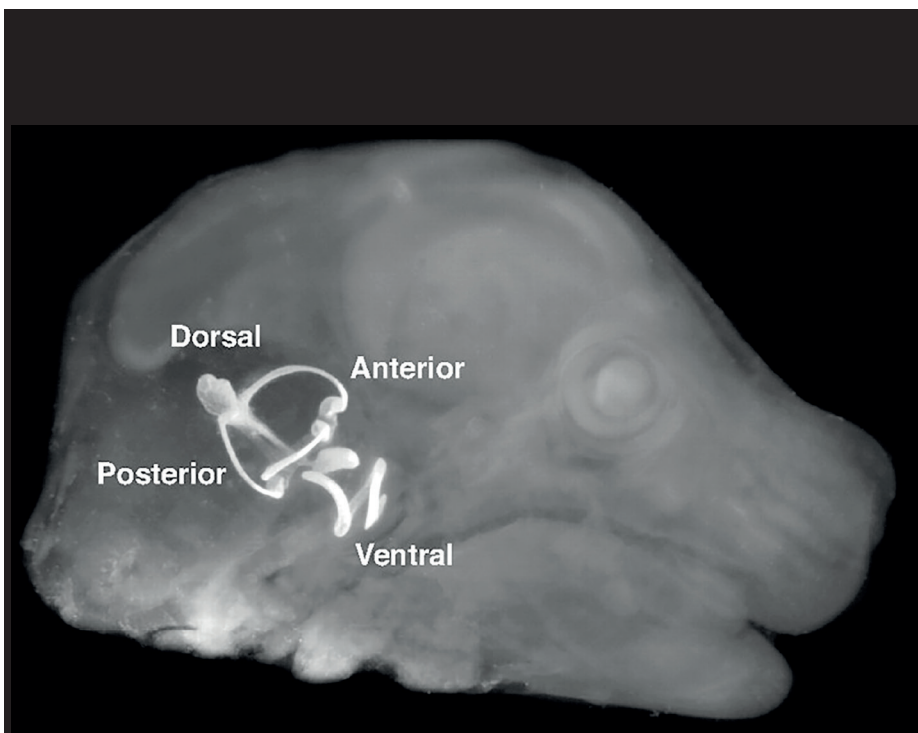
More resources

Learn more about the research being conducted in Andy's lab:
www.bcm.edu/research/faculty-labs/andy-groves-lab/projects

The 'Day in the Life' articles from The Node reveal the range of model organisms that are used in developmental biology research and the questions they can help answer:
thenode.biologists.com/tag/a-day-in-the-life

This video from CrashCourse provides a quick and accessible overview of the fundamentals of developmental biology:

▶ www.youtube.com/watch?v=k_9MTZgAhv0



The components of the inner ear highlighted on a mouse's head
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