

### What do we do?

We are scientists from University of Oklahoma. We study animal communication signals, with a special emphasis on the functioning of bioelectric signaling systems.

In this research, our mission is:  
*We make discoveries and we train scientists.*

### Scientific Method

1. Ask Questions
2. Make a Hypothesis (thoughtful guess of the answer)
3. Test the Hypothesis with an experiment
4. Make a conclusion based on the results
5. Communicate your findings- tell others

### Bioelectric signaling systems

Bioelectric signaling systems are how animals make electric signals. Your body does this!

- **The Brain** – uses electric signals to think and command your body.
- **The Heart** – uses electric signals to pump your blood.
- **The Spinal Cord** –uses electric signals to tell brain what the body senses.
- **Muscles** – use electric signals to move .

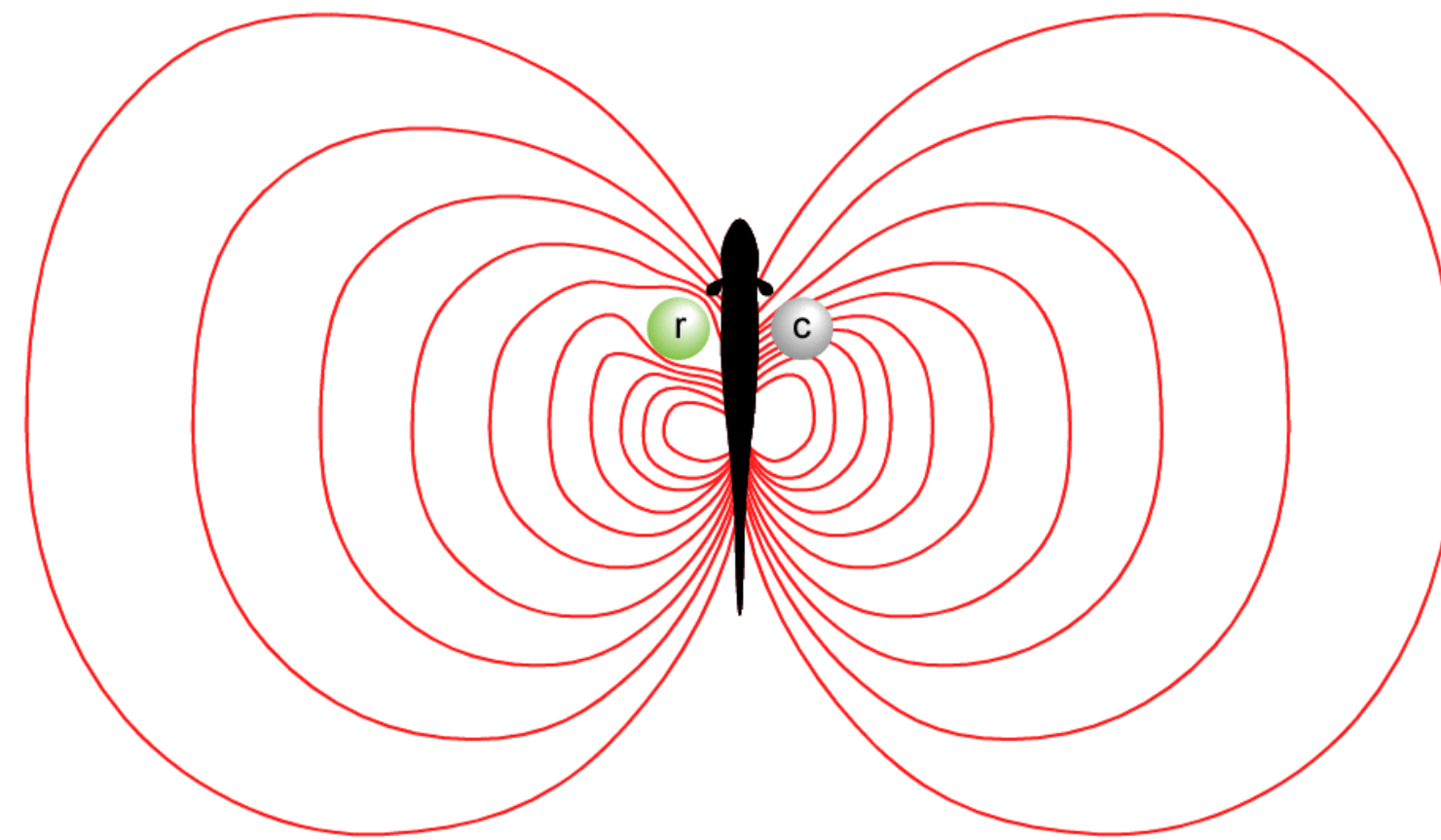
### You can be a scientist!

A scientist is anyone who observes and asks questions. Use the notebook to write down or draw your observations. Ask any questions you have to any of the presenters here today.

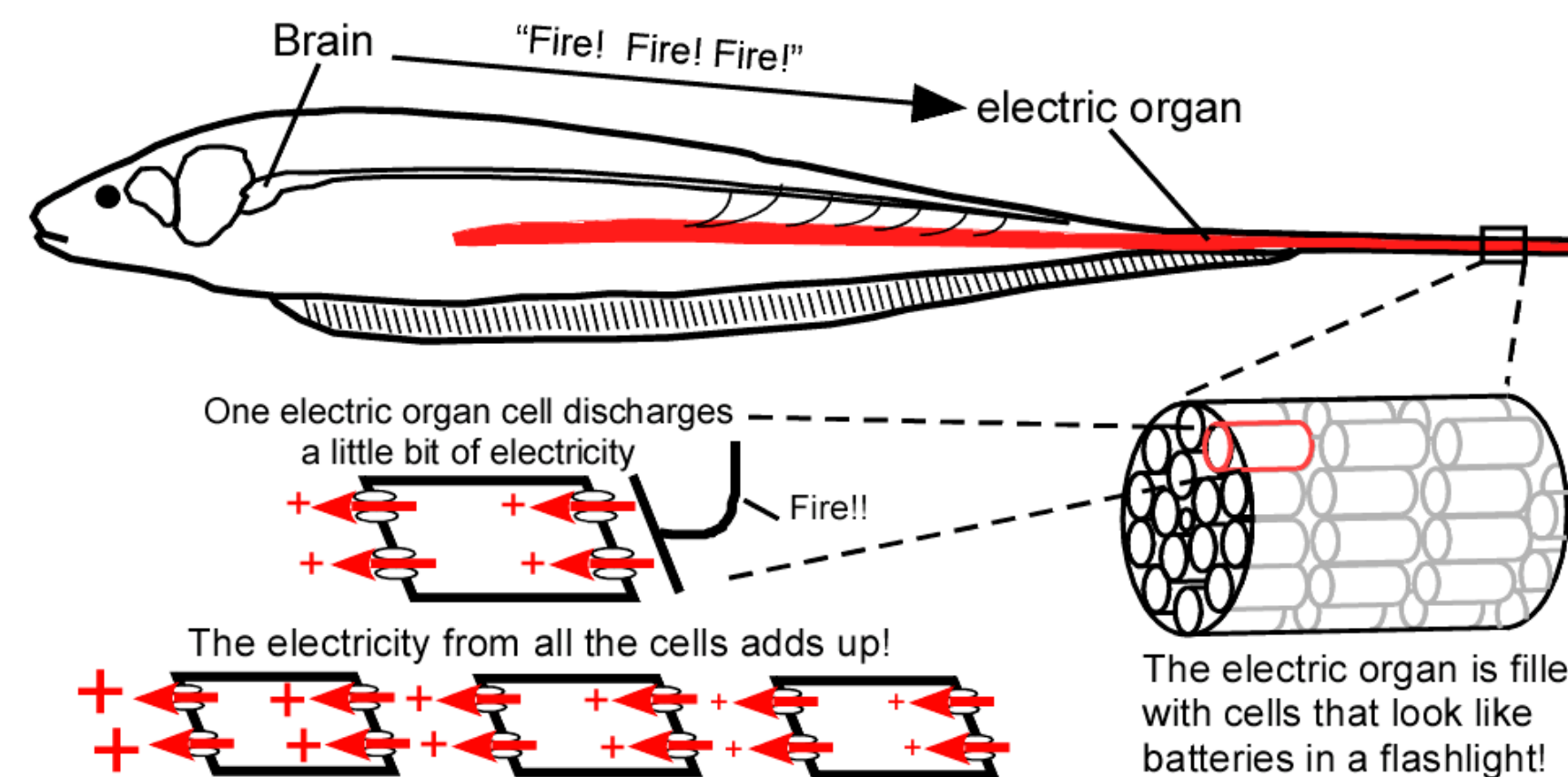
### But wait! Why do we work with electric fish?!?

We do most of our research with electric fish, which leads to three related questions:

**1. Why do fish make electricity?** In South America and Africa, these fish generate weak electric fields to “see” in turbid waters at night when they are active. Specialized skin detects these electric fields. Objects in the water distort the electric fields and these distortions are analyzed by the brain to produce a very high-resolution electric “image” of the environment. These fish also use their electric signals to communicate with each other.



**2. How do fish make electricity?** Electric fish make electricity a specialized electric organ. This special body part makes enough electricity to make a “field” around the body. We don’t have special receptors to sense the field with our bodies. But we can use special equipment to turn the electricity into something we can hear and see.

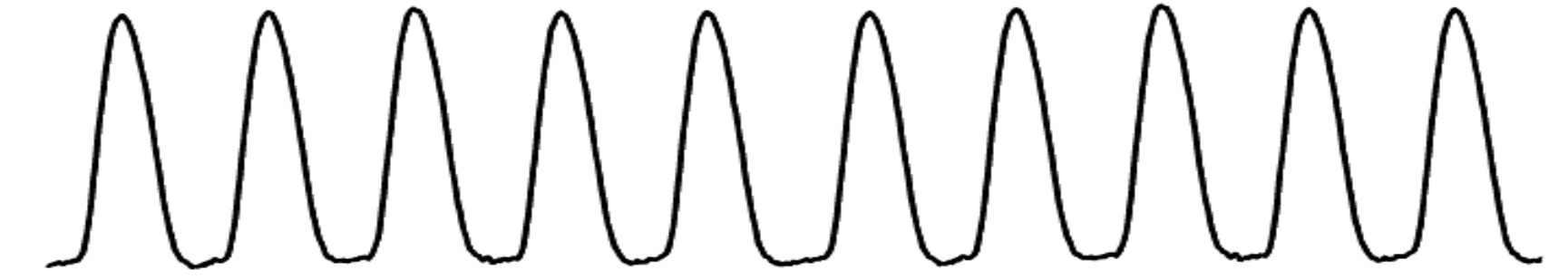


**3. What can we learn by working with electric fish?** Our bodies make electricity the same way as these fish do, just not so much of it. We can learn about how our bodies work from learning how these fish make electric signals.

### Signal Forms

Two different groups of electric fish make two kinds of signals

- **Wave signals** look like a wave, and sound like a tone.
- **Pulse signals** look like a pulse, and sound like a stuttering engine.



### Super Fish

The special abilities an animal has can depend on the area where they live, called their habitat. Electric fish live in rivers and lakes in South America and Africa. The waters can be murky, and the fish are active at night. Electric signals give them “X-ray vision” to sense objects without being able to see them and gives them a “secret code” to communicate without being heard.



### Find out more:

Principal Investigator: Michael R. Markham, Ph.D.  
[markham@ou.edu](mailto:markham@ou.edu) [www.michaelmarkham.net](http://www.michaelmarkham.net)  
 Outreach Coordinator: Rosalie Maltby, M.S.  
[rmaltby@ou.edu](mailto:rmaltby@ou.edu) [rosaliemaltby.com](http://rosaliemaltby.com)  
 Our website: [www.markhamlab.com](http://www.markhamlab.com)

