

1.2: Animals Storyline Reading Learning from the Work of Hans Krebs

Purpose for reading: As you read this text, work to make sense of the roles you will take on during this unit and how those roles relate to the work scientists do.

In *Systems and Scale*, you worked with your classmates as questioners, investigators, and explainers to figure out what happens to ethanol when it burns. You then used that understanding to explain what happens to other materials when they burn. Now, you will be taking on the roles of questioner, investigator, and explainer to figure out how animals use matter and energy to grow and move. Scientists move through these same roles to understand more about how the material world works.

Let's see how Hans Krebs – a medical doctor and biochemist – studied how the matter and energy that animals take in is used for growth and movement. More than 80 years ago, Krebs was a refugee. He had to flee Nazi Germany because of his Jewish faith. He moved to England, where he did work that is so important that it is still a key part of biochemistry textbooks today. In his work, he was a questioner, investigator, and explainer.



Hans Krebs, 1953 (PD-1996|Sweden)

Krebs was a questioner. He stressed that "it is of prime importance of the progress in science that the researcher learns to formulate the right kinds of questions" (1981, p. 7). The questions scientists ask about the material world can be explored through collecting evidence. Building on work of other scientists, Krebs asked questions about how animals' cells get energy for growth and movement from food and oxygen molecules. During this unit, you'll be a questioner. You will develop good scientific questions through discussions with your peers and the Expressing Ideas Tool.

Krebs was an investigator. Working with colleagues, he conducted investigations to answer his questions about how cells get energy by reacting food and oxygen molecules. His investigations built on the methods and results of other scientists. For example, he used Albert-Görgyi's method of studying pieces of pigeon muscle to investigate his questions.

During the unit, you'll be an investigator. You'll make predictions and then collect evidence to help answer the questions you asked earlier in the unit. Your methods will build on what you learned during the *Systems & Scale* unit. It will be important to keep notes of your predictions, your methods, and the evidence you collect on the Predictions Tool, the investigation worksheets, and the Evidence-Based Arguments Tool. Your notes will help you remember your ideas and evidence and to them with your peers.

After Krebs completed his initial investigations, he had evidence about how some molecules in animal cells were reacting to enable animals to grow and move. However, his evidence left some questions unanswered which prompted more questions. He wondered about the details of what was happening. He also wondered whether his findings would be true of the cells in other animals. Similarly, the evidence you collect will help answer some of your questions, but may lead to more questions or leave some unanswered questions.

Krebs was an explainer. As scientists answer their questions, they write explanations to share with other scientists. Krebs put together evidence from his investigations and the work of other scientists, like "pieces of a jigsaw puzzle" to write an explanation of how chemical reactions in animal cells provide energy (Krebs & Martin, 1981, p. 118). Other scientists read and critiqued his explanation. Other scientists conducted their own investigations to confirm, refute, and build on Krebs' explanation.

When you have enough evidence, you'll take on the role of explainer to put together the evidence and tell a scientific story. The Explanation Tools will help you figure out how to put the pieces together to tell a single story. Toward the end of the unit, you'll explain how a specific animal grows and then how other animals grow. Your peers will read and critique your explanations, providing feedback to help you improve your explanations.

At the end of the unit, you'll be able to answer some of your initial questions about how animals move and grow. While your answers will be based on evidence and tell a scientific story, there will still be more to investigate and understand. Krebs died in 1981, but scientists continue to ask questions that build on his ideas. These scientific questions may lead to better understanding of health problems. Likewise, you'll be able to apply what you learn about animals to other science units as you continue to ask scientific questions to deepen your understanding as well as the understanding of your peers about the material world.

References

- Krebs, H. A. (1981). On asking the right kind of question in biological research. In *On asking the right kind of question in biological research. Neue Aussichten für die Pflanzenzüchtung: Gen-Übertragung mit dem Ti-Plasmid: 268. Sitzung am 7. März 1979 in Düsseldorf* (pp. 7–20). Wiesbaden: VS Verlag für Sozialwissenschaften. http://doi.org/10.1007/978-3-322-87853-3_1
- Krebs, H. A., & Martin, A. (1981). *Reminiscences and reflections*. Oxford: Clarendon Press.