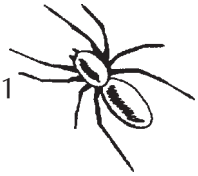


Activity #2

Haleakalā Detective Work

● ● ● In Advance *Student Reading and Questions*

- Assign the Student Page "Haleakalā Detective Work" (pp. 17-24) and "Haleakalā Detective Work: Questions About the Reading" (pp. 25-26).

● ● ● Class Period One *Detective Work Discussion*

Materials & Setup

- A piece of light-colored string about a foot long
- Several colored markers

For each student

- Student Page "Haleakalā Detective Work" (pp. 17-24)
- Student Page "Haleakalā Detective Work: Questions About the Reading" (pp. 25-26)
- Student Page "The Dating Game: How Geologists Study the Age of Haleakalā Lava Flows" (pp. 27-31)

Instructions

1) To begin a discussion about the reading, ask students to share their responses to each of the four questions from the Student Page "Haleakalā Detective Work: Questions About the Reading."

2) Ask for student questions about the reading. Be sure to review how radiocarbon (carbon-14) dating works to be sure that students understand the process and how it is applied to dating lava flows. This is important background for the next part of this activity.

3) Hand out the Student Page "The Dating Game: How Geologists Study the Age of Haleakalā Lava Flows." Have students read the student page, skimming through the table that compares dating techniques (p. 31) for now. (Students will also take this student page home to read more carefully as homework.)

4) Use the information in the reading as background for a discussion of the difference between absolute dating methods, such as radiometric techniques, which yield a numeric age for rocks, and comparative methods such as paleomagnetic dating.

5) To illustrate the results of using a comparative technique, follow the instructions on pp. 29-30 of the reading to perform a demonstration using string and colored markers. Ask students to discuss what additional information would be needed to assign a correct date to a lava flow using a comparative method (e.g., cross checking against dates established through absolute methods, using the rule of superposition).

6) As homework, have students read the Student Page "The Dating Game" more carefully. Assign one or more of the journal entries as written homework as well.

Journal Ideas

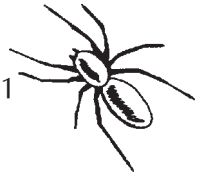
- Describe the difference between a dating method that yields an absolute age and one that is comparative. Illustrate the difference using examples of things that you know for certain (and how you know or learned them) and knowledge that you've needed to cross-check before feeling confident about it. These examples could be from everyday life.

- Using drawings and/or writing, illustrate the process of radioactive decay. Explain why it is important in determining the age of rocks.

- Describe the environmental conditions created by the geology of the summit area of Haleakalā. How do you think plants and animals would be adapted to live in this environment?

Assessment Tools

- Student Page "Haleakalā Detective Work: Questions About the Reading" (teacher version, pp. 15-16)
- Participation in class discussions
- Journal entries



Teacher Version

Haleakalā Detective Work—Questions About the Reading

1) Why would Dave Sherrod be focusing on the lava laid down in the last 50,000 years to develop his "personality profile" of Haleakalā? Why isn't he mapping the Kula Volcanic and Honomanū Basalt formations?

These are the lava flows produced during the most recent period of volcanic activity, in the volcanic life of Haleakalā. The patterns of these more recent flows should tell scientists more about what is likely to happen in the future than the patterns of volcanic activity in earlier stages (such as the alkalic capping stage, which corresponds to the Kula Volcanics, or the shield-building stage, which corresponds to the Honomanū Basalt).

2) Why does Dave Sherrod call radiocarbon dating "one of the worst ways to determine the age of a lava flow"? How does he make it work anyway?

Lava is not an organic (carbon-containing) substance, so the flows cannot be dated directly. In order to use radiocarbon dating, Dave finds charcoal under the lava flow and tries to figure out whether the charcoal was formed by that flow. Once he is confident of that, he performs the radiocarbon analysis on the charcoal and assigns that age to the associated lava flow.

3) Identify one hypothesis that Dave Sherrod is testing in his research and describe how he is testing it.

Possible answers include:

- There were never glaciers on Haleakalā. To test it, Dave has made calculations of the volcano's height over time by considering erosion, mountain building by eruptions, and subsidence. He correlated his calculations with the dates of the last ice age.
- The scarcity of rocks between 200,000 and 50,000 years old is linked to the erosion that formed the summit basin of Haleakalā. To test it, Dave is looking for rocks that might help fill this time gap, in places where they may have been deposited by erosion such as the southwest rift zone and stream canyons near Haʻikū, near Hāna, and in Kīpahulu Valley.
- The Hāna formation lava flows were produced during the waning stages of the alkalic capping stage of volcanic activity. Based on chemical analyses, the rocks of the Hāna and Kula formations are indistinguishable. Dave and a Japanese graduate student are dating flows from the Kula Volcanics looking for long quiet periods within the Kula sequence that could set a precedent for the long lull that took place between production of the Kula and Hāna Volcanics.
- Where and how will Haleakalā erupt again? Dave's just going to have to wait and see on this one!

4) A future eruption could take place in the Haleakalā summit basin. Describe the likely effects that an eruption of the type that Dave Sherrod anticipates would have on the plants and animals in the alpine/aeolian ecosystem.

Well-reasoned responses are acceptable. Dave predicts that the eruption will begin with an eruption of jagged cinder or spatter, along with ash, followed by lava flows. Large volumes of ash may blanket parts of the alpine/aeolian ecosystem, killing or displacing plant and animal life. Smaller parts of the ecosystem would be covered by the new cinder cone or the ensuing lava flows. Parts of the ecosystem will probably remain intact, especially if they are upwind from the ash plume and out of the path of the lava flow. Once the eruption has stopped, it will probably be a long time before significant plant growth is established on the new lava.