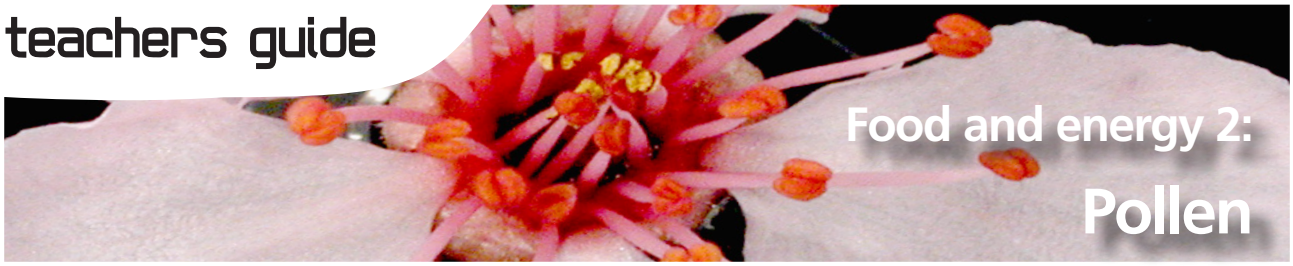
teachers guide



Food and energy 2: Pollen

Components

	NAME	DESCRIPTION	AUDIENCE
	Pollen teachers guide	The guide explains how to use the interactive learning object, *Virtual microscope: Pollen in focus*.	teachers
	What is pollen? background sheet	This background sheet for contains information about pollen and its features.	teachers
	Exploring pollen presentation	This presentation contains information about structural and functional differences that exist between pollen grains. Light and electron microscopy images are used to highlight differences.	teachers and students
Start	*Virtual microscope: Pollen in focus* learning object	Students use a learning object to explore characteristics of pollen, through measurement and observation.	students
	Pollen worksheet	This student worksheet includes observation and measuring tasks that use the virtual microscope. Students compare characteristics of pollen in order to identify pollen from an unknown sample.	students

Purpose

To **Explore** energy sources of the honey possum by examining techniques used to explore and identify pollen. The activity requires students to calculate magnification, field of view and estimate cell sizes.

Outcomes

Students:

- identify species of plants through analysing features of pollen: grain shape, pore width and surface structure;
- use scientific terminology relating to pollen, including triporate, convex, concave and verrucate; and
- use microscopy skills to identify specific plant species from slides containing a mixture of pollen grains that form part of honey possums' diet.

Activity summary

ACTIVITY	POSSIBLE STRATEGY
Teacher shows the presentation, *Exploring pollen*.	presentation to class
Students familiarise themselves with the learning object, *Virtual microscope: Pollen in focus*.	individual or small group
Students complete the worksheet, *Pollen*, and work either individually or in groups to respond to questions posed. Some information may be required from alternative sources, such as textbooks or the Internet.	callout with each group responsible for presenting responses to a specific question

Technical requirements

The guide, background sheet and worksheet require Adobe Reader (version five or later), which is a free download from adobe.com. The worksheet is also available in Microsoft Word format.

The learning object requires Adobe Flash Player version 8 or later (this is a free download from adobe.com). The presentation is provided in Microsoft Powerpoint and Adobe PDF format.

Using the resource

This SPICE resource is intended to challenge students to develop an understanding of pollen and to answer questions based on examples presented in the learning object.

- On each screen students may select from a variety of pollen types and view them under low, medium or high magnification. The screen also provides a description of what can be seen on the slide, for each magnification.
- Select **Grid** to place a grid over the pollen. Now, using the scale underneath, students may measure structures on the slide.
- Select **Labels** to display detailed labels for the pollen.
- The image may be moved around the slide by dragging it in the direction required.
- The **Rotate** control allows users to rotate the slide for better viewing or fit.
- Select **Split screen** to simultaneously view two slides side by side, either to compare different pollen types (eg *Banksia littoralis* and *Banksia occidentalis*) or to view the same pollen under different magnification.
- Select the **Padlock** between the two slides to move both images together. Use this to compare labelled and unlabelled views of a slide.

Worksheet activities

The student worksheet contains a range of questions that relate to the virtual microscope. Some questions may require students to use resources, other than those provided in the learning object, such as relevant textbooks and the internet.

The virtual microscope presents students with examples of native pollen types. Each example is presented on a single screen and includes a brief species description and photograph.

Students select a slide to view a particular pollen type under low, medium or high magnification. The student is provided with a description of observable characteristics for each magnification.

The worksheet allows students to identify eight features of pollen. Note, if teachers choose, this table may be used later in the SPICE resource, *Classifying pollen*. Students use this information to identify pollen types that are found in three mixed slides in the virtual microscope. Questions related to this process conclude the worksheet.

Acknowledgements

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Background sheet, *What is pollen?*

Pollen SEM images by Dr Lynne Milne (School of Earth and Environment, The University of Western Australia)

Presentation, *Exploring pollen*

'Bee collecting pollen' by Tanakawho. Used by permission, www.flickr.com/photos/28481088@N00/430117997/in/set-72157600002609288

'Seagrass' by Marion Cambridge, UWA Oceans Institute

'Bat pollinating a flower' by Nathan Muchhala, used by permission, www.bio.miami.edu/muchhala/Bat-Flower%20Photos/A_fistu_A_acanthus_2.JPG

'Honey possum (*Tarsipes rostratus*)' by C H Tyndale-Biscoe (American Society of Mammologists), used by permission

Pollen SEM images by Dr Lynne Milne (School of Earth and Environment, The University of Western Australia)

additional photography by Paul Ricketts

Virtual microscope: pollen in focus

Pollen SEM images by Dr Lynne Milne (School of Earth and Environment, The University of Western Australia)

Plant photographs by Mr Tom Alford (Friends of Kings Park)

Adenanthos meisneri photograph by J Scott, S D Hooper and M Hislop. Image used with permission of the Western Australian Herbarium, Department of Environment and Conservation

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Associated SPICE resources

Food and energy 2: Pollen may be used in conjunction with related SPICE resources to address the broader topic of how scientists determine the energy requirements of a species.

DESCRIPTION	LEARNING PURPOSE
Food and energy (overview) This learning path way shows how a number of SPICE resources may be combined to teach the topic of food and energy.	
Food and energy 1: The honey possum In a video interview, zoologist Professor Don Bradshaw tells how he became interested in the honey possum, a rare and unusual Australian marsupial, and describes some of their unique adaptations.	**Engage**
Food and energy 2: Pollen Students use a virtual microscope to examine pollen from a range of plants, measure the size of pollen grains, and learn about features such as pore width and cell wall width.	**Explore**
Food and energy 3: Fauna surveys Students explore factors controlling abundance and distribution of organisms and occupation of particular habitats.	**Explore**
Food and energy 4: Honey possum respiration Students use a worksheet to explore the process of respiration in heterotrophic organisms.	**Explain**
Food and energy 5: Animal release Students answer questions to identify an environment that will effectively sustain a released population of honey possums.	**Elaborate**

The following SPICE resource also uses the learning object, *Virtual microscope: Pollen in focus*.

Classifying pollen Techniques for pollen collection, observation and classification are described.	

SPICE resources and copyright

All SPICE resources are available from the Centre for Learning Technology at The University of Western Australia ("UWA"). Selected SPICE resources are available through the websites of Australian State and Territory Education Authorities.

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