NSW Department of Primary Industries
SCHOOLS PROGRAM

Preserving the Scientific Collection of the NSW Department of Primary Industries

Teacher's Guide

In this video – synopsis

5 mins 52 secs

This video outlines the processes used to preserve the plant, insect and live culture scientific collections of the NSW DPI. It includes some tips on collecting and preserving your own plant or insect specimens including pressing plants and drying insects. The method of preserving live cultures for use in research is also covered.

Careers highlighted: entomologist, plant pathologist, and scientific curator.

We recommend that teachers watch these videos before showing them to students to assess their suitability. There are some scientific terms used in the videos that your students may not be familiar with. We have provided some definitions in this document for teachers who would like to use the videos as an opportunity to develop the scientific literacy of their students.

Other videos in this series include:

- The Scientific Collection at the Orange Agricultural Institute
- Let's talk about aphids
- Biosecurity monitoring and surveillance with the NSW Department of Primary Industries

Curriculum links

This video can support students understanding of the following outcomes:

Stage 3

Science and Technology

A student:

ST3-10LW - describes how structural features and other adaptations of living things help them to survive in their environment

Stage 4

Science and Technology

A student:

SC4-14LW relates the structure and function of living things to their classification, survival and reproduction

SC4-15LW explains how new biological evidence changes people's understanding of the world

Vocabulary used:

Unless otherwise stated definitions are from the Macquarie Dictionary online (https://www.macquariedictionary.com.au/)

Note: Where (Biology) appears in brackets before a definition, this indicates that there are other definitions (usually in different disciplines) but that this definition relates to the way the term is used in this video.

Ampoules	(noun) a sealed glass bulb used to hold hypodermic solutions
Agar	(noun) (Biology)- a culture medium with an agar-agar base: a spore agar Chemically, agar is a polymer made up of … the sugar galactose, and is a component of the cell walls of several species of red algae … Dissolved in boiling water and cooled, laboratory agar looks gelatinous… agar's chief use is as a culture medium for various microorganisms, particularly for bacteria (http://www.sciencebuddies.org/science-fair-projects/project_ideas/MicroBio_Agar.shtml)
Characteristics	(noun) a distinguishing feature or quality
Culture	(Biology) a. the cultivation of microorganisms, as bacteria, or of tissues, for scientific study, medicinal use, etc. b. the product or growth resulting from such cultivation.
Exoskeleton	(noun) an external protective covering … the shell of crustaceans, the scales and plates of fishes, etc. (opposed to endoskeleton)
Freeze dry	(verb) to dry (food, blood, serum, etc.) while frozen and under high vacuum, as for prolonged storage.
Galls	Galls are abnormal growths that occur on leaves, twigs, or branches. They may be simple lumps or complicated structures, plain brown or brightly coloured. There are 1500 species of gall producers, the majority of which are insects and mites. Some galls form where insects or mites feed or lay eggs. They may also develop as a response to infections by several kinds of fungi, bacteria, and viruses. Galls affecting

	leaves are seldom if ever a serious problem. (from http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/help-for-the-home-gardener/advice-tips-resources/pests-and-problems/other/galls/galls-on-trees.aspx)
Humidity	(noun) humid condition; dampness
Invertebrates	(adjective) (Zoology) not vertebrate; without a backbone
Keratin	(noun) a fibrous protein found in the outer layer of human and animal skin, also in horn, feathers, hair, hoofs, nails, etc.
Media	(Biology) plural of medium ie the substance by which specimens are displayed or preserved eg agar.
Microbank	registered trade name of a product NSW DPI uses to store cultures in -80C freezers. Tubes containing liquid (made up of a glycerol solution) protect the cells of living cultures from shattering when placed into low temperature freezers. Other commercial products are available and it also can be made in the lab (information provided by NSW DPI)
Mycelium	noun (plural mycelia) the vegetative part or thallus of the fungi, when composed of one or more filamentous elements, or hyphae.
NSW DPI	New South Wales Department of Primary Industries
Preserve	(verb) to keep alive or in existence; make lasting
Specimen	(noun) a part or an individual taken as exemplifying a whole mass or number; a typical animal, plant, mineral, part, etc.
Sterile	(adjective) free from living germs or microorganisms eg sterile bandage
Vertebrate	(noun) 1. a vertebrate animal. (adjective) 2. having vertebrae; having a backbone or spinal column. 3. belonging or relating to the Vertebrata, a subphylum of the phylum Chordata, all members of which have backbones.

Transcript of video

Text:	Preserving the specimens of the scientific collections of the NSW Department of Primary Industries. Preserving plants
Jordan:	So you will notice this specimen is nicely flat, the leaves haven't curled up or dried up or anything like that because when you collect them, we use newspaper mostly or any paper you have lying around in the field. And you place the plant between here, this absorbs all the moisture and then you put it between your two planks of

wood and we use a belt to tighten it. They'll also some drying rooms or drying cabinets at some collections so you can put it in there with a fan and a heater to speed that process up. And then everything gets put into freezers to kill any insect pests because if anything gets in here it will just eat everything and you won't notice 'til it's too late.

So if you are interested in pressing plants yourself, either uninfected or infected diseased plants you just pick a ... it's good to include the stem and leaves because that helps you for identifying it and then also if there is any fruit or flowers, the more material the better, and then you'll place it in your newspaper. And if you have a fancy press, press it like that and tie your belt to keep it tight. Alternatively just, if you still have phone books, grab a pile of them and dump them on top and give it a couple of weeks. The more fleshy and wet the specimen is you might need to change the newspaper out and you can't press mushrooms but we dry them in silica - you know the little packets of silica you get when you buy things to keep them dry? We have lots of that and we put them in a container and its sucks all the moisture out of them that way.

Text: Preserving insects

Peter: Insects can last for hundreds of years, the part you see in drawers like here, is the outer shell, unlike vertebrates that have an internal structure that keeps them upright, insects have all their hardened parts on the outside allowing them to stay - once correctly dried and preserved - they can last hundreds of years.

Some insects in this case are galling insects they get on Eucalypts and they form these great big woody galls, they're quite specific. Which you can see here these are the original wooden bits and labels that they made form the 1890s. So whilst these aren't actually insect specimens, they are plant specimens that have insects in them. And if they're dried and you can keep the humidity out of them they're fine. This is in an air conditioned room, it's essentially library conditions where we have fire prevention arrangements - they can burn quite easily.

Ainsley: Part of what makes these insect specimens last so long, virtually indefinitely, is because the exoskeleton, the outside part of the body that Peter was talking about is made up of a carbohydrate called chitin, that is very structurally similar to the keratin that makes up our fingernails and our hair. So the exoskeleton of these beetles is made of all of these long fibres that cross like chiton that are laid down in overlapping, rotated layers which is essentially how they make Kevlar, the stuff that they make bullet proof vest out of. So essentially these insects invented Kevlar long before humans ever did and that's part of why they are so incredibly durable.

Text: Preserving live cultures

Karren: When we get a culture it is put onto ta particular media and it grows across. These ones are put onto a water agar media with a carnation leaf that has been put on to it as well. So once it's grown across the carnation leaf we put them into these glass

ampules and then they are freeze dried. So the beauty of this technique is that they last a long long time. Some of these cultures that we have go back to the mid-1970s and they are still viable and grow well.

We also have another method that is an older method where cultures were grown on an agar. These were stored under a sterile mineral oil which stops the air getting to them and it basically stops them from going any further. They're good on this for about three years but we have to continuously grow them and put them on to a new media otherwise they will die. So the disadvantage of a technique like this is that their characteristics do change of the years.

Another method that we have is storing them into the -80 freezer and that's reasonably new, probably in the last 10-15 years I suppose. Again the mycelium is stored no put into a special preservation liquid that preserves them and keeps them there - we don't know for how long at this stage but it seems to be pretty exciting that that's going to be a pretty good method as well for storing and keeping them alive for as long as we can. Unfortunately some of the fungi that we have don't actually like the two newer methods or the freeze drying or the Micro-banking so we still have to store them on this, it's quite labour intensive so the less we have on these the better.

This room is kept at a constant temperature and humidity to help the cultures survive long term.