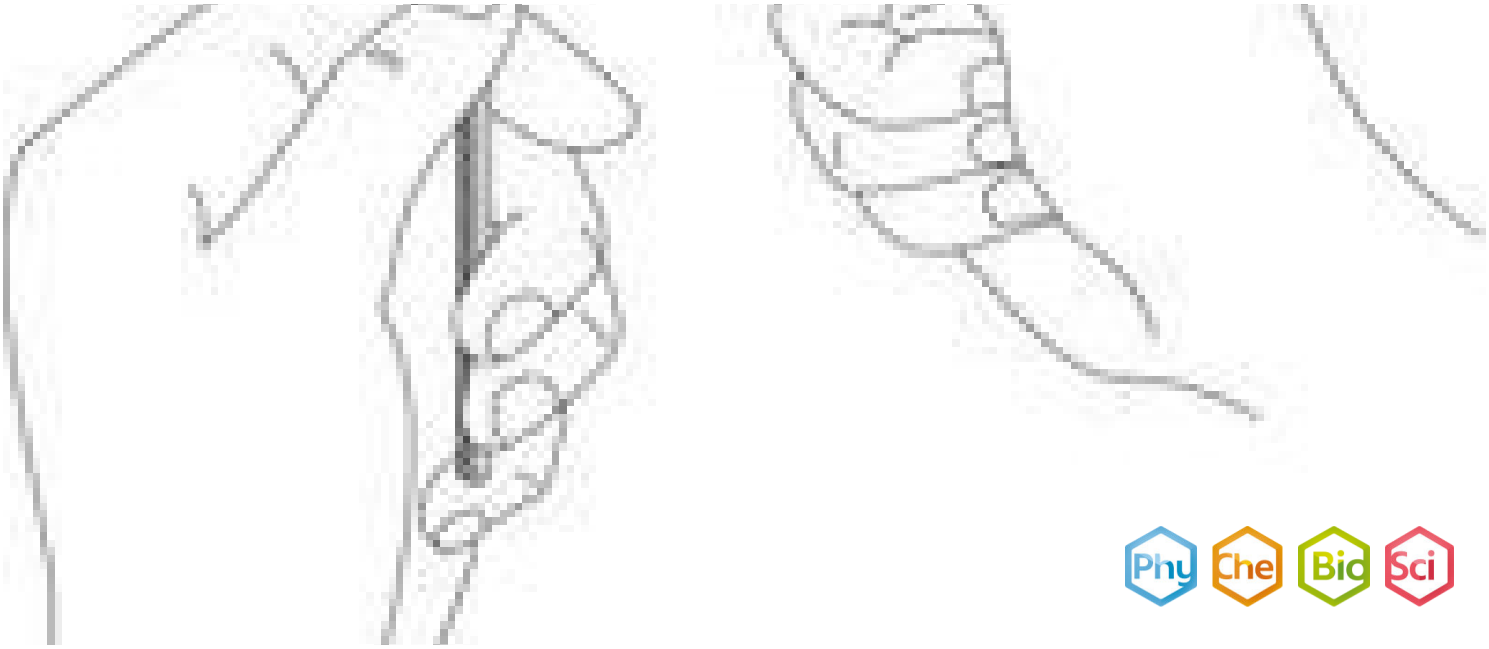
Manual cutting technique



Biology > Microscopy / Cell Biology > Basics of Microscopy & Work Technology

Nature & technology > From the very small & the very big

Nature & technology > Plants & animals

Difficulty level	Group size	Preparation time	Execution time
easy	1	10 minutes	30 minutes

This content can also be found online at:

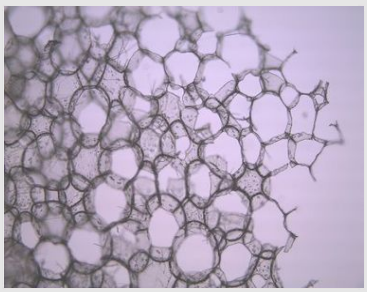
http://localhost:1337/c/5f508a9237ffe20003f1017d

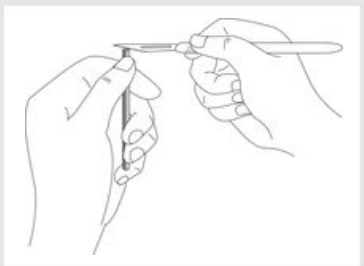
PHYWE

Teacher information

Application

PHYWE





A hand cut is generally about 50 µm thick. If you are very skilled, you can also achieve a cut thickness of 20 µm.

The elderberry marrow is held with the first three fingers of one hand, after a smooth cut surface has been made at one end. Grasp the scalpel with the thumb and index finger of the other hand, place the blade on the incision a little away from the edge and pull it horizontally through the object in its entire length. Shortly before the object is cut through, push the blade back up a little. Then you can easily obtain the desired thickness at one point in the cut.

If a cut has the right thickness, it consists of a single layer of cells. You can see the upper and lower boundaries of the cells and in the cell walls the spots.

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Other teacher information (1/3)

PHYWE

Prior knowledge

In principle, all materials are suitable for embedding plant parts that have sufficient stabilizing strength, can enclose soft parts and at the same time do not destroy the blades of the scalpel. Regardless of which material is used, it must be cut lengthwise and the material clamped in between. Before cutting, the whole block can be wrapped with adhesive tape.

Scientific principle

For light microscopy we have to produce nearly transparent preparations. For this purpose, a cut with a maximum thickness of 50 µm (preferably lower).

Other teacher information (2/3)

PHYWE

Learning objective

The students learn the hand cutting technique with the help of elderberry marrow, in order to obtain high-quality objects for microscopy afterwards.

Tasks

1. Cutting exercises with elderberry marrow
2. Elderberry marrow as an aid - an indication for later work

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Other teacher information (3/3)

PHYWE

Notes on material procurement

A good object to practice cutting with a scalpel and to easily control the thickness of the incisions is elderberry marrow. One looks for dry, leafless branches for this purpose, which are usually found inside the elder bush (Sambucus spec.). These are perennial water shoots that reach up to two meters in height and from which the bark can be peeled off very easily. Woody branches are not suitable!

99%

Notes on implementation

Many biological objects cannot easily be examined microscopically because of their size and thickness. They must first be dissected into the thinnest possible sections. These sections can be made either with a free hand, with the help of a hand microtome or with an automatic microtome. For school work, the hand cut technique is more motivating and sufficient.

Safety instructions

PHYWE

- In order to avoid accidents even after the lessons, all distributed blades must be collected at the end of the lessons!
- Great care must be taken when handling the blades.
- During the cutting movement the knife is always moved away from the body, never towards the body.
- It is advisable to tape one side of the blade with adhesive tape to reduce the risk of accidents.
- The general instructions for safe experimentation in science lessons apply to this experiment.

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

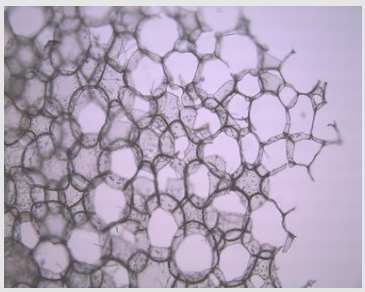
info@phywe.de
www.phywe.de

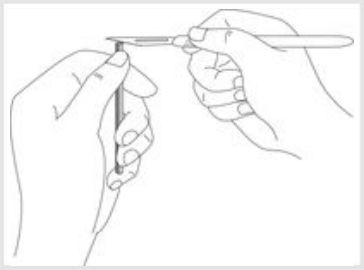
PHYWE

Student Information

Motivation

PHYWE





For light microscopy we have to produce nearly transparent preparations. This is possible by cutting the specimens very thin.

Then the light can shine through our object and the inner structures become visible, as shown on the left in the image of a perfect section showing a single cell layer.

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Tasks

Elderberry (Sambucus spec.)

1. Cutting exercises with elderberry marrow
2. Elderberry marrow as an aid - an indication for later work

PHYWE
Robert-Bosch-Breite 10
37079 Göttingen
Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
www.phywe.de

Equipment

Position	Material	Item No.	Quantity
1	PHYWE Binocular student microscope, 1000x, mechanical stage	MIC-129A	1
2	Microscopic slides, 50 pcs	64691-00	1
3	Cover glasses 18x18 mm, 50 pcs	64685-00	1
4	Scalpel holder	64615-00	1
5	Scalpel blades,rounded tip,10 off	64615-02	1
6	Elder pith, 10 sticks	31372-00	1

PHYWE
Robert-Bosch-Breite 10
37079 Göttingen
Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
www.phywe.de

Procedure (1/2)

(1) Cutting exercises with elderberry marrow

- Pull the blade evenly and quickly through the medulla.
- Repeat the cut until you get a wafer-thin elderberry pulp. The cut need not be complete (circular), a small cut is sufficient.
- Microscope dry with increasing magnification. The edge of your incisions must be thin enough!

Procedure (2/2)

PHYWE

(2) Elderberry marrow as an aid - an indication for later work

Very many objects are too small or too soft to be held in the hand and cut. Therefore you put them in elderberry marrow and cut them together with it. To pinch flat pieces, e.g. leaves, an elderberry marrow piece is cut lengthwise. To cut moist objects, wet the blade with the same liquid that has soaked the object, generally water. Wooden objects are softened for a few days by placing them in a mixture of alcohol and glycerine (in equal parts).

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

PHYWE

Report

Task 1

PHYWE

What other embedding possibilities are there for soft plant parts?

- [ ] Styrofoam
- [ ] Soap
- [ ] Sugar Beet
- [ ] Coal

Check

Soap

Sugar Beet

Coal

Styrofoam

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Task 2

PHYWE

Why do many biological objects first have to be dissected into the thinnest possible sections in order to be able to view them?

That's not true. Even large and thick objects can be viewed under a microscope without any problems.

Due to legal requirements, which specify a fixed size according to a DIN standard for preparations.

Because of the thickness and size. Otherwise they will not fit on the stage and light cannot pass through them.

Slide	Score / Total
Slide 14: Embedding possibilities	0/3
Slide 15: Preparation of biological objects	0/1

Total amount 0 / 4

Solutions Repeat

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de