2. Preparation techniques

– Making anatomical structures visible

As the title of this book suggests, the main objective of the book is to explain anatomical structures on the basis of microscopic slides. Since comparability is one of its major goals, most micro-photographs are based on recently prepared microscopic slides. Gärtner & Schweingruber 2013 explain sample design and preparation techniques in detail.

Taxonomically and ecologically labeled fresh material is collected in the field and stored in 40% ethanol before sectioning. The heart of the laboratory work is the newly developed sledge microtome (Gärtner *et al.* 2015), a modified copy of the Reichert sledge microtome. New are its low weight, two very stable knife guides and the blade holder, which is modified for disposable blades. These innovations made it possible to section the majority of stems without prior embedding.

Almost all sections are stained for a few minutes with a one to one mixture of Astrablue/Safranin. Staining and dehydration with 96% ethanol, absolute ethanol and xylene occurs directly on the glass slide. Permanent slides, lasting for more than 100 years, are embedded in Canada balsam. Photographs were made under transmitting, normal and polarized light with an Olympus BX51 microscope. Slides are conventionally stored in preparation boxes. A digital databank allows queries by any taxonomical, morphological, geographical or anatomical characteristic of each slide.

2.1 Plastic bag containing 40% ethanol with a sample of a herb stem. The label contains information about the taxon and its morphology, ecology and the sampling date.

2.2 A new laboratory microtome designed by Gärtner *et al.* 2015; distributed by the Research Institute WSL, CH-8903 Birmensdorf, Switzerland.

2.3 Holder with chemicals for preparation of permanent slides. It contains dyes, ethanol and xylene and corresponding pipettes.

2.4 Principle of staining and dehydrating the cut sample on the glass slide.

2.5 Flattening of microscopic sections with magnets on an iron plate.

2.6 Section of *Vitis vinifera*, stained with Astrablue/Safranin, photographed under normal and polarized light.

2.7 Old-fashioned, but safe and handy storage of labeled microscopic slides in prefabricated cardboard boxes.

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