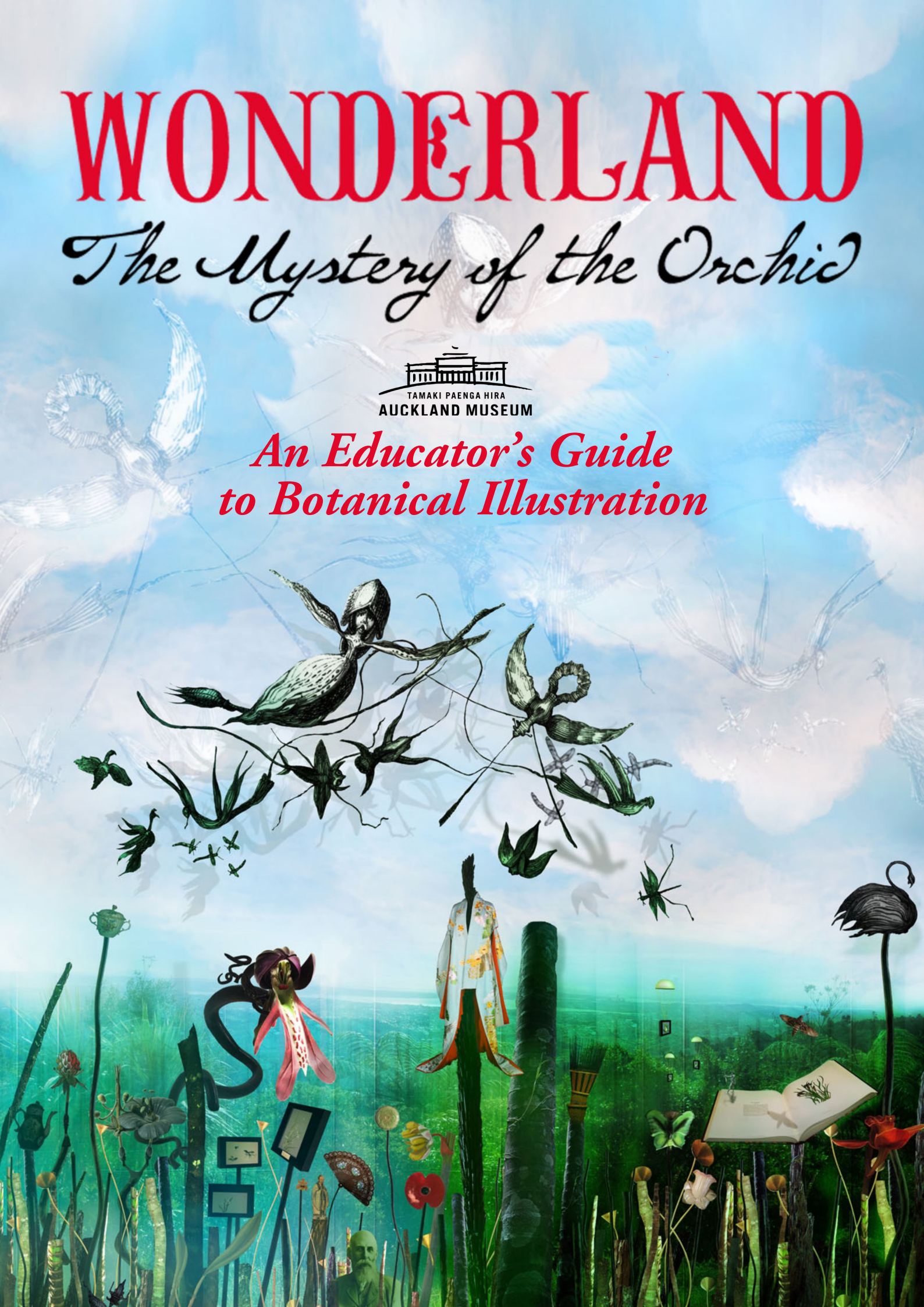


WONDERLAND

The Mystery of the Orchid



An Educator's Guide to Botanical Illustration



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INTRODUCTION

This guide is designed to accompany Auckland Museum's exhibitions *Wonderland: The Mystery of the Orchid* & *Wonderland: The Magic of the Rose*.

Wonderland: The Mystery of the Orchid runs from 3 July to 8 November 2009.

Wonderland: The Magic of the Rose runs from 3 December 2009 to 16 April 2010.

These evocative exhibitions are suitable for all year levels and provide many learning opportunities related to the New Zealand Curriculum, Te Marautanga o Aotearoa. The learning areas that are specifically addressed are strands from the Science, Art and Social Sciences curricula. The exhibition also provides a variety of material for the practice of the key competencies and values exploration.

This Botanical Illustration and this guide sit nicely in both the Science and Visual Arts curriculums.

This guide accompanies the Museum education programme, Botanical Illustration, run in conjunction with the *Wonderland* exhibitions. However it can be used independent of the programme and even of the exhibition with some independent research.

This resource is intended as an introduction to the science of botanical illustration. For more detailed information we recommend Keith West's *How to Draw Plants: The Techniques of Botanical Illustration*. David Mabberley's book on the works of Arthur Harry Church *Arthur Harry Church: The Anatomy of Flowers* makes some of the most extraordinary examples of botanical illustrations accessible to a wider audience.

In this guide we will look at the science of flowers: the anatomy and symmetry and will explore the practice of dissection for drawing purposes. These are essential concepts for any competent botanical illustrator to understand.

Following these fundamentals we will move on to the different mediums and methods used by botanical illustrators. And finally we will look at two case studies of botanical illustration: orchids and roses.

We hope that you will find this resource useful for both class and personal use.



FIGURE 1. Plate 7692 *Coryanthes macrantha* Matilda Smith, 1900

THE PURPOSE OF BOTANICAL ILLUSTRATION

First we must make the distinction between botanical art and botanical illustration. Botanical art is the aesthetically focussed art of a botanical subject. The artist is able to take artistic licence and the representation does not have to be anatomically accurate. Examples of famous artists that often used botanical subjects are Van Gogh and Monet. Whereas botanical art is an interpretation of the subject, botanical illustration is a true and lifelike representation. All aspects of the plant or flower must be accurately drawn, as the purpose of a botanical illustration is to aid the study and understanding of plants and flowers. While we use the terms illustration and illustrator, a good botanical illustrator is a true artist whose creations are not only practical but also beautiful.

Before starting to draw you must consider the medium you will use. This is largely informed by the purpose of the illustration. There are three main mediums used for botanical illustrations, pencil, ink, and watercolour. Other mediums include scraperboard, gouache, acrylic and oils.

For scientific studies the most frequently used medium is ink.

Many published popular books use watercolours due to their beauty and accurate representation of colour. Likewise, pencils are often used in publishing to show depth of tone when cost prevents the use of colour.

So why use an illustration and not a photograph? As Keith West points out “The artist can often interpret in a way that is beyond the capacity of the camera; for example, certain characteristics such as hair-type and pigment may have a much greater relevance in some groups than others, and the illustrator can reflect this significance.”¹ Details that may be important to the botanist can be obscured by other parts of the flower, or more prominent features may divert attention from the more subtle features the botanist wants focussed on. An illustrator is able to work around these complications with more ease than a photographer.

Now that we have briefly looked at when and why we use botanical illustrations, we need to look at flowers themselves and how to best show them.

¹ West, Keith How to Draw Plants: The Techniques of Botanical Illustration, page 9



FIGURE 2. Plate 7119 *Rosa multiflora* Matilda Smith, 1891

ANATOMY

A complete flower is defined as having sepals, petals, stamens and carpels, but all flowers contain at least one stamen or one carpel.

However, the form of these anatomical parts varies widely between species. Highly evolved flowers such as orchids have a complex pollination structure, where-as roses have a more typical flower structure.

A botanist may want certain anatomical features represented in an illustration, thus it is important for botanical illustrators to be familiar with flower anatomy.

General Flower Anatomy Terms

PERIANTH	The collective term for the non-reproductive parts of a flower.
SEPALS	Leaf-like parts that surround the flower. They cover the bud before it opens.
CALYX	The collective term for the sepals.
PETALS	The colourful segments forming the outside of the flower.
COROLLA	The collective term for the petals.
PEDICEL	The stem of the flower.
RECEPTACLE	The expanded part of the pedicel which bears the flower parts.
ANDROECIUM	The collective term for the male reproductive parts: the stamens.
STAMEN	Male portion of flower consisting of filament and anther.
FILAMENT	Long thin stalk of the stamen.
ANTHER	Section of the stamen where the pollen is produced.
GYNOCYTIUM/PISTIL ...	The collective term for the female reproductive parts: the carpels.
CARPEL	Female part of the flower consisting of stigma, style and ovary
STIGMA	The part that receives the pollen for pollination to take place.
STYLE	Connects the stigma to the ovary.
OVARY	The part of the carpel that encloses the ovules.
OVULES	After fertilisation they develop into seeds.

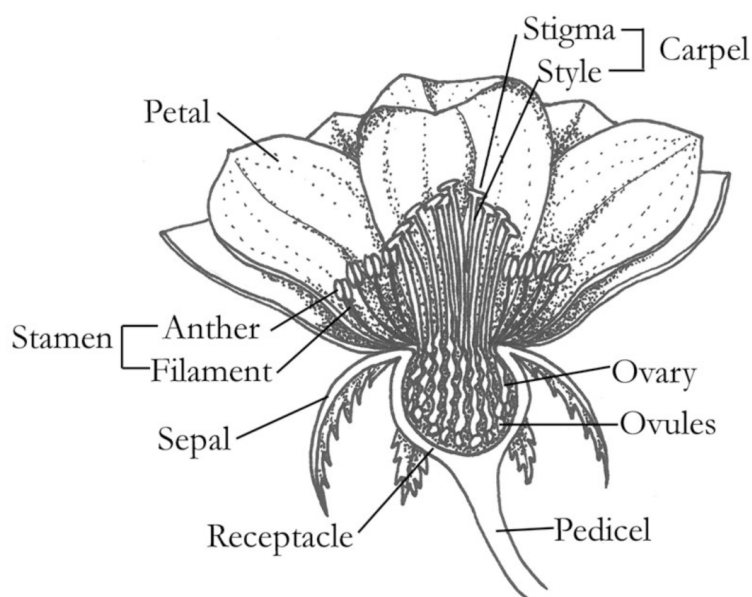


FIGURE 3. Generalised flower structure Life Long Learning, Auckland Museum 2009

Some additional vocabulary will be needed for the highly evolved orchid.

- COLUMN The fused structure of the male and female reproductive parts.
 STIGMATIC SURFACE Located on the underside of the column, below the pollinia.
 Receives the pollen.
 ANTHER CAP Covers the pollinia.
 POLLINIA Structures of pollinium, a mass of pollen held together by
 a glue-like substance
 LABELLUM Also called the lip. The lower petal of an orchid, often used by the
 pollinator (usually an insect) as a landing platform. Appearance varies
 but can be very showy.

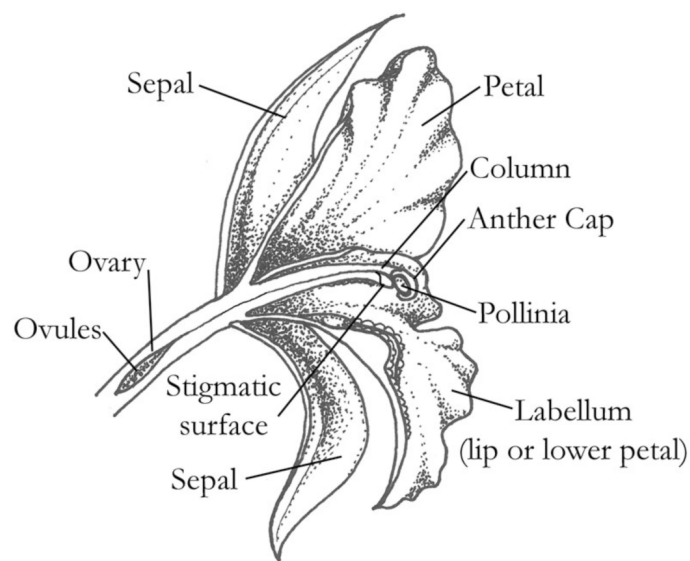


FIGURE 4. Generalised orchid structure Life Long Learning, Auckland Museum 2009



FIGURE 5. *Victoria regia waterlily* Walter Hood Fitch, 1854 (held in collection of National Museum of Wales)

FLOWER SYMMETRY

In addition to knowledge of flower anatomy, a botanical illustrator should decide which symmetry category the flower belongs to, actinomorphic or zygomorphic.

This will help determine how to approach the flower for dissection and drawing.

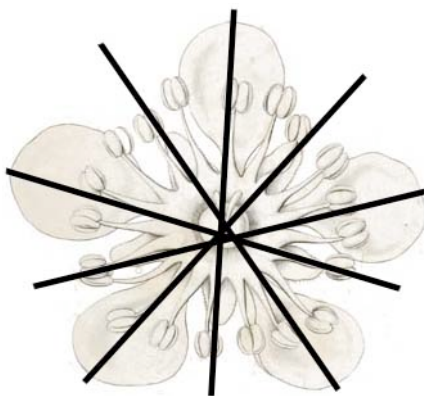
Actinomorphic flowers have radial symmetry patterns, or are regular. Actinomorphic translates from Latin to “star-shaped”. As the name suggests, the petals of an actinomorphic flower radiate from the centre. They can be divided into two identical halves if a line is drawn through the centre. This line is called the line of symmetry. More than one line of symmetry can be drawn on an actinomorphic flower. An example of this is a rose or a poppy. When drawing an actinomorphic flower, you should start from the centre and work your way out, this will help to maintain accurate scale and angles.

Zygomorphic flowers are bilaterally symmetrical or irregular. Zygomorphic translates to “yoke-shaped” and it means that the flower can only be divided into two identical parts if it is halved in a particular place. There is only one line of symmetry. An example of a zygomorphic flower is an orchid. It is helpful to have zygomorphic flowers at a slight angle when drawing them as much of the intricate details can be obscured by a directly frontal view.

Some flowers may appear to be zygomorphic at first glance, but upon closer inspection the radial symmetry is disclosed, such as an iris. The opposite can also occur, such as a daisy, which may look to be actinomorphic, but is actually a collection of zygomorphic and actinomorphic florets. Flowers that appear complicated should gently be unfurled, or dissected if there are two flowers available, to reveal the details prior to drawing. This will lead to a more accurate drawing.

ACTINOMORPHIC SYMMETRY

Can be halved at many points of symmetry



ZYGOMORPHIC SYMMETRY

Split into 2 identical halves

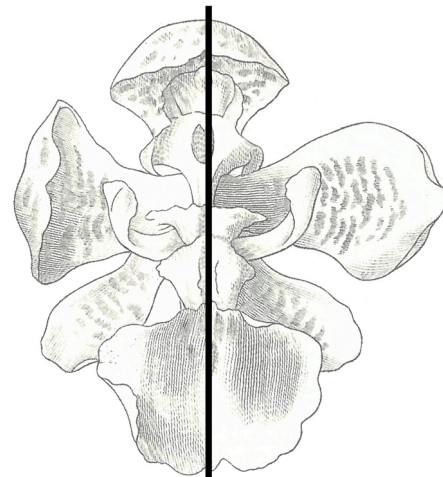


FIGURE 6. Detail from Figure 8. *Photinia dubia*, 1822

FIGURE 7. Detail from Fig. 12 Plate 3486 *Oncidium cornigerum*, 1836 (Image courtesy Biodiversity Heritage Library. <http://www.biodiversitylibrary.org>)

DISSECTION

Flower dissection need not be a complicated matter. On large flowers it can be done with just a dissecting knife, small sharp scissors, tweezers and dissecting needles. A small, sharp craft knife can be substituted for a dissecting knife if one is unavailable. With smaller flowers a magnifying glass on a stand can be used. For the smallest of flowers a microscope will be needed.

Dissections are used to see the smallest and enclosed details of a flower. The various details are often drawn on the same plate using different scales of enlargement, the scale should always be recorded on the plate or using a key.

When cutting the flower from the plant, try to leave at least 2-cm of the stem to ensure you do not cut off the ovary. Once cut open the flower will deteriorate at an accelerated rate, therefore as much as possible should be drawn before the dissection starts. Before cutting the flower open it will be possible to determine the scale, mark the outside measurements and draw the outline.

The dissection will depend upon the symmetry type and the feature you are aiming to expose. Here we will discuss how to do a simplified dissection to get a clean cross section along the line of symmetry.

Place the flower on some firm foam.

Actinomorphic flowers should be pinned with the length of the stem flat on the surface. The front sepals and petals can then be removed to expose the carpels. If it is a complete flower (has both carpel and stamen) remove the stamen at the front to reveal the pistil (the section with the carpels). Cut out one of the carpels and draw its complete form. Returning to the main dissection, slice through the pistil, down to the end of the stem section to expose the ovary. Draw what you see.

Zygomorphic flowers should be pinned with the line of symmetry parallel to the table surface. Cut away the parts of the flower to expose the anatomical features piece by piece. Once you get to the line of symmetry stop. If there is a part of the flower, such as the column in an orchid, that is on the line of symmetry, slice down the middle lengthways to expose the true line of symmetry.



FIGURE 8. *Photinia Dubia*, Trans. Linn. Soc., 1822



FIGURE 9. Plate 3332 *Caularthron bicornutum* William Jackson Hooker, 1834 (Image courtesy Biodiversity Heritage Library. <http://www.biodiversitylibrary.org>)

MEDIUMS

As mentioned previously, there are many mediums for botanical illustration. You should select the medium that best suits your purpose. Here we will briefly look at some of the techniques involved in the three main mediums of botanical illustration, pencil, ink and watercolour.

Ink

Ink is the main medium used in scientific studies. It is economical for publication, yet with ink it is possible to get depth, but not obscure the details through techniques such as stippling and hatching. It is best to draw a light line drawing in pencil then to ink over the top and add in the tone. We will look at the two main techniques to do this, stippling and hatching.

Stippling is the use of small dots to show tone and depth when working in ink. It is possible to buy special stippling pens, but it is not necessary. Stippling can be achieved through the use of fibre tip pens such as Artline® drawing system pens. The closer together the dots, the deeper the tone.

Hatching is similar to stippling, except it is done with small lines. The closer together the lines, the more depth of tone. To hatch place pen at the point where the tone is the darkest and make a short line with a flick. Cross hatching is a variation on hatching where rather than just parallel lines the hatching lines are at right angles with each other.

Be careful not to use excessive tone when hatching and stippling. You want to create tone to show folds and depth, not colour in the flower.



EXAMPLE OF STIPLING



EXAMPLE OF HATCHING

Pencil

Ink is by far the preferred option for scientific publications, but pencil can be used to create a softer look with more gentle tone. Pencils are able to record tiny details that bolder inks cannot. Normally artists prefer to use softer pencils, however this is not suitable for botanical illustrations. Botanical illustrations require a sharp point to capture the fine details, and this is best achieved by using a 2H-HB pencil. Hatching, such as described in the ink section, can be used in pencil work along with continual tone. Hatching with pencil is usually reserved for rough paper or when less detail is required.

Continual tone is the rubbing of the pencil along the paper. A light pencil sketch should be done first and then the tone added in afterwards. When moving the pencil to make the tone, make the movement from your elbow rather than just your hand. This will produce a more even tone. The type of paper you use will affect the tone as well.



EXAMPLE OF CONTINUAL TONING

Watercolour

Watercolours have been the preferred colour medium for botanical illustrators for centuries. Before colour printing systems evolved, an ink outline would be printed and then the images individually coloured by hand. Watercolours are transparent and need to be layered to achieve bold colours. When using watercolours it is useful to do a light pencil sketch outline, plan where the white will be and then fill in the colour. Both tube and pan paints are acceptable. The paint brushes should be soft bristled. The paper is a personal choice. Rag based paper is a good choice, but there are other suitable options.

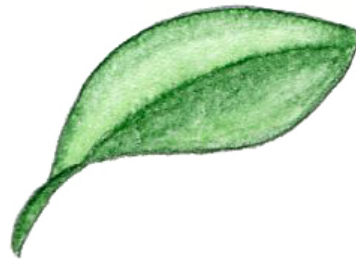
The surface is best to be slightly textured to “grab” the pigment. If you are using a lighter weight paper it should be stretched with water before use. This is unnecessary for heavier paper. Rendering paper can be a good cheap alternative to rag paper, and does not need to be stretched. To avoid different colours feathering together, let one colour dry before painting another colour next to or on it. A hairdryer can be used to speed up the process if you are in a hurry.

Choose the watercolour type you would like to use and create a wash by adding water. Place the brush in the wash mixture and allow it to soak up the liquid, it should be full, but not dripping. For smaller surface areas, take less liquid into the brush. Wherever the brush touches the paper first, the tone will be the deepest. As you brush the colour along the page the wash will be absorbed into the paper thus making the colour lighter. Adding more water to the wash will also lighten the colour. Once dry the watercolour can be painted over with another layer to deepen the colour or with another colour to change hues.

Watercolour pencils are a good option for botanical artists. They come in various qualities, only artist quality pencils are suitable. Use the continual tone method for the colouring as with normal graphite pencils, pressing harder for deeper tone and lighter for lighter tone. Colour layering can be done with different colour pencils. Soak the brush in water and swipe atop of the pencil colour to turn the pencil to watercolour.



EXAMPLE OF BRUSHED WATERCOLOUR



EXAMPLE OF WATERCOLOUR PENCIL

CASE STUDY – ROSE – ACTINOMORPHIC

The rose is an actinomorphic flower, thus it is best to start drawing at the centre of the main flower and work your way out to the calyx (sepals) and then down to the pedicel and leaves.

The specimen for this early botanical illustration in figure 10 has been cleverly selected to show the stages of flowering. It also shows the progression of the sepals from covering the bud, to sitting at the bottom of the flower.

Figure 11 shows not only the rose flower and stem, but also the hips (seed pod that forms after fertilisation), carpel detail and a dissected cross section of the flower with the petals removed to show the sepals, androecium and gynoecium in clearer detail.

If you are planning to do a main illustration with cross-sections and dissections on the same plate, you should plan the page layout first. Using pencil draw the approximate size of each drawing. It is acceptable to have a different scale for each drawing, but the magnification rate for each should be marked clearly. While it is fine to have different magnifications for different picture on the same plate, you should never change the scale within a picture i.e. have the flower shown larger in proportion to the stem. This sort of distortion defeats the purpose of botanical illustration, scientific accuracy.



FIGURE 10. Plate 69 *Rosa Muscosa* Curtis's Botanical Magazine, 1788 FIGURE 11. Plate 6857 *Rosa Pisocarpa* Matilda Smith 1886

CASE STUDY – ORCHID – ZYGOMORPHIC

Orchids are highly evolved flowers, which have a very complicated pollination structure. In the anatomy section of this guide we have already looked at the extra vocabulary needed for an explanation of an orchid, here we will look at how we show this in an illustration.

Firstly, when drawing a whole orchid flower it is best to start at the labellum (lip), then to the column, lateral petals and lastly the sepals. This will help to retain an accurate scale of the flower.

There is a huge variation between different orchid species. The two images on this page showcase this.

However, for the most part orchids have a double Y formation. The labellum and lateral petals make a Y shape and the three sepals make an upside down Y shape.

Due to their complex structure, illustrations of orchids are usually accompanied by dissection illustrations. Cross-section images for orchids are not as common as whole structures removed from the flower (see the column images in figure 13 and the labellum and pollinia image in figure 12).

The stem of the orchid chosen for illustration usually shows flowers on a slightly angled frontal view, side view and back view. This is made easier by the multiple blossoms on each stem in most orchid species. These multiple views help to give a better understanding of how the flower is formed. As you can see in figure 13, the side view gives a better visual of the “slipper” labellum but the frontal view shows the column better.



FIGURE 12. Plate 3486 *Oncidium cornigerum* William Jackson Hooker, 1836. (Image courtesy Biodiversity Heritage Library. <http://www.biodiversitylibrary.org>)



FIGURE 13. Plate 6175 *Paphiopedilum argus* Walter Hood Fitch, 1875

ACTIVITIES

Local Environment Flower Case Study

Document all of the steps in a field journal as you go, noting any difficulties or environmental notes.

1. Search your local environment and find two flowers of the same type. But never pull up or pick a wild New Zealand orchid because removing even one flower stops hundreds of seeds being formed. Remember many NZ orchids are threatened or naturally uncommon –sketch them in the field and only take photographs.
2. Pencil-sketch the plant they came from and the area. Add tone using pencil methods of hatching and continual tone. Note the other plants found in the area.

Cultivated Flower Case Study

Use cultivated plants to do a dissection case study. Cultivated plants are plants that are not growing in the wild, but in gardens and house plants.

1. On an A4 piece of paper, plan where you will draw your plant, whole flower, cross-section and various anatomical parts.
2. Pencil sketch the plant and one whole flower. Colour using watercolours.
3. Then cut the flower along the line of symmetry into a cross section. Draw what you see. Add tone using the ink methods of stipple and hatching.
6. Take the second flower and dissect it, drawing each piece as you remove it. Use a key to label the parts and the rate of magnification. Use the pencil methods of continual tone and hatching to add tone.

IMAGE ACKNOWLEDGEMENTS

Unless stated otherwise all images are sourced from the Auckland Museum collections.

FIGURE 1. SMITH, MATILDA (ARTIST), HOOKER, JOSEPH (ED). (1900). *Coryanthes macrantha*. Curtis's Botanical Magazine, V.126 Ser 3 no. 56, plate 7692

FIGURE 2. SMITH, MATILDA (ARTIST), HOOKER, JOSEPH (ED). (1891). *Rosa multiflora*. Curtis's Botanical Magazine, V.117 Ser 3 no. 47, plate 7119

FIGURE 3. LIFELONG LEANING DEPT (2009). Generalised Flower Structure. Auckland Museum

FIGURE 4. LIFELONG LEANING DEPT (2009). Generalised Flower Structure. Auckland Museum

FIGURE 5. FITCH, WALTER HOOD (ARTIST), (1854). *Victoria regia waterlily*. www.flickr.com/photos/museumwales/ (Held in the collection of National Museum of Wales. Reproduced with permission via Flickr Commons)

FIGURE 6 (ARTIST UNKNOWN). (1822). *Photinia Dubia*. The Transactions of the Linnean Society of London, XIII, page 104

FIGURE 7. HOOKER, WILLIAM JACKSON (ARTIST), LINDLEY, JOHN (ED). (1836). *Oncidium cornigerum*. Curtis's Botanical Magazine, V. 63 N.S II no. 10, plate 3486 (Image courtesy Biodiversity Heritage Library <http://www.biodiversitylibrary.org/item/14342>)

FIGURE 8. (ARTIST UNKNOWN). (1822). *Photinia Dubia*. The Transactions of the Linnean Society of London, XIII, page 104

FIGURE 9. HOOKER, WILLIAM JACKSON (ARTIST), LINDLEY, JOHN (ED). (1834). *Caularthron bicornutum*. Curtis's Botanical Magazine, V.61 N.S. II no. 8, plate 3332 (Image courtesy Biodiversity Heritage Library <http://www.biodiversitylibrary.org/item/14340>)

FIGURE 10. (ARTIST UNKNOWN). CURTIS, WILLIAM (ED). (1788). *Rosa Muscosa*. Curtis's Botanical Magazine, First Series, V.2, plate 69

FIGURE 11. SMITH, MATILDA (ARTIST), HOOKER, JOSEPH (ED). (1886). *Rosa Pisocarpa*. Curtis's Botanical Magazine, V.112 Ser 3 no. 42, plate 6857

FIGURE 12. HOOKER, WILLIAM JACKSON (ARTIST), LINDLEY, JOHN (ED). (1836). *Oncidium cornigerum*. Curtis's Botanical Magazine, V. 63 N.S II no. 10, plate 3486 (Image courtesy Biodiversity Heritage Library <http://www.biodiversitylibrary.org/item/14342>)

FIGURE 13. FITCH, WALTER HOOD (ARTIST), HOOKER, JOSEPH (ED). (1875). *Paphiopedilum argus*. Curtis's Botanical Magazine, V.101 Ser 3 no. 31, plate 6175

BIBLIOGRAPHY

BLUNT, WILFRID & STEARN W. (1994) *The Art of Botanical Illustration* London, England: The Antique Collectors' Club Ltd

COATS, ALICE M. (1973) *The Book of Flowers: Four Centuries of Flower Illustration* London, England: Phaidon Press Limited

HOLMRGEN, N & ANGELL, B (1986) *Botanical Illustration: Preparation for Publication* New York: USA: The New York Botanical Garden

MABBERLEY, DAVID (2000) ARTHUR HARRY CHURCH: *The Anatomy of Flowers* London, England: Merrell Publishers Ltd

SPRUNGER, SAMUEL (ED) (1986) *Orchids from Curtis's Botanical Magazine* Cambridge, England: Cambridge University Press

STEARNS, WILLIAM T. (1990) *Flower Artists of Kew London*, England: The Herbert Press Ltd

WEST, KEITH (1983) *How to Draw Plants: The Techniques of Botanical Illustration London*, England: The Herbert Press Ltd

ORCHIDACEAE, <http://en.wikipedia.org/wiki/Orchid>, retrieved 15/06/2009

ROSE, <http://en.wikipedia.org/wiki/Rose>, retrieved 15/06/2009