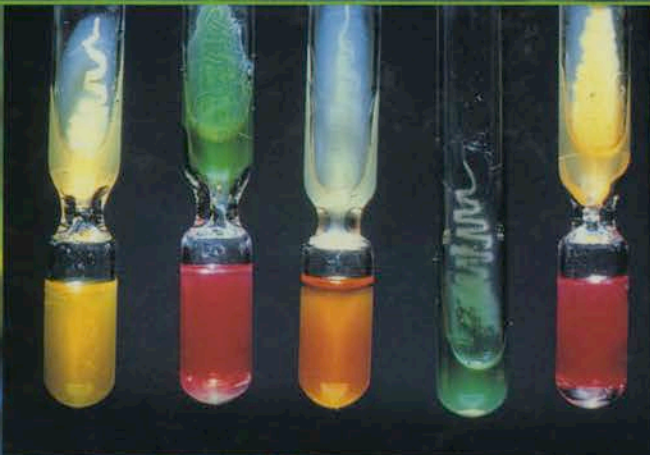
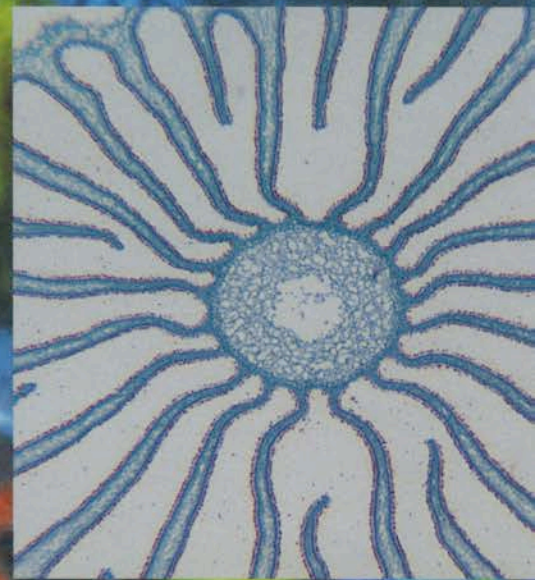


BIOMEDICAL PHOTOGRAPHY

John Paul Vetter



Chapter 8

Close-up Photography and Photomacrography

Michael Peres

"The world is full of small things which no one, by any chance, ever observes."

A. Conan Doyle (Sherlock Holmes) 1859–1930

This chapter discusses equipment and techniques suitable for close-up photography and photomacrography at various levels. It demonstrates the basic differences between the optical factors involved and those for ordinary photography. The chapter also includes basic theories and applications of close-up photography and photomacrography. Some points of discussion provide cross-references to other chapters to assist in concept development.

The basic premise of this chapter is that the reader is involved with photography at some level. Some of the concepts may be difficult to understand, but every effort has been made to simplify them. The chapter presents strategies for close-up photography and photomacrography, to enable photographs to be produced in many situations.

TERMINOLOGY

Language and Definitions

Before discussing the theory of close-up photography and photomacrography, some of the language and definitions will be introduced. Use of the proper terms is imperative for accurate communication and understanding of principles.

Reproduction Ratio

In close-up photography, as with general photography, the image is generally smaller than the object. Close-up photography includes images with an image ratio or size relationship to object of 1 : 1 (or life-size) down through images that are 1 : 10 (or one-tenth life size). The name given to this type of relationship is the *reproduction ratio* or *repro image ratio*. It is a mathematical ratio of image size to object size (I : O) and can easily be calculated. These ratios are inscribed on most good-quality close-up lenses

for use in applied situations. *Reproduction* or *repro* ratios are used unless stated otherwise.

Magnification

When the image size is larger than the subject, the image has been *magnified*. The ratio will have a larger first term, such as 20 : 1. The term *photomacrography* is used when photographic pictures are made by enlarging or magnifying the subject. The similar-sounding term *macrophotography* refers to the same process; however, *photomacrography* is preferred.

When indicating magnification properly, the upper case "X" or the multiplication sign "×", should be placed in front of the number. For example, if an image were magnified 20 times, it would be indicated X20, which eliminates the need to write the reproduction ratio as 20 : 1. Unlike some things that are easily defined, there is some confusion and debate as to where photomacrography ends and photomicrography begins.

Anything greater than 1 : 1 is universally accepted as a photomacrograph; however, there is disagreement about where photomacrography ends. In many writings, it is clearly stated as being either X40 or X80. The maximum degree of magnification achievable in photomacrography is better decided visually. Photomacrography can no longer be used when image loses its resolution. Another way to look at this decision is: At what magnification is the information still well defined? *Major considerations are. What is the final image going to be used for? and At what distance will the image be viewed?*

In photomicrography, there is a defined point where the magnified image potentially no longer contains fine detail. This point is called *empty magnification* (see Chapter 7). This also happens in photomacrography, but this point is not as clearly defined as in photomicrography. The point where the image is no longer resolved must be visually noted and is dependent on the photographic system used. It can be as low as ×40 in some cases and