

# Hints on photographing gems

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Cheap high-resolution digital cameras are often equipped with a built-in lens capable of focusing very close, so it is now easy to take photographs of gems. However, it is not at all easy to get perfect pictures.

There are several reasons for this:

One is that the focussed gem may have to be so close to the camera (Fig 1a) that it is difficult to illuminate properly. The centre of the gem tends to look dark. The reason for this is that cutting angles have been optimised, by trial and error over history, for a pattern of illumination where the only dark area in the environment of the gem is that due to a human head at a distance of about 300 mm (Harding).

As shown in Figure 1a, the body of a small digital camera may subtend a much larger solid angle at the gem than this (as shown by the dotted lines). The effect of this is that the centre of the gem is shaded by the camera body and cannot return light to the lens.

Another problem is that the viewfinder screen in such cameras have a lower resolution than the final image, making it difficult to judge focus.

Thirdly, a rigid stand is necessary to prevent the picture being ruined by vibration, particularly when tiny control buttons on the camera are being pressed. (With other macro subjects, such as insects or flowers, the depth of field can be increased, and the vibration problem eliminated, by using electronic flash. This works so well that the camera can be hand-held, but, unfortunately, direct flash does not work well with gems).

A big advantage of using a firm camera stand with a focus rack is that a series of photographs can be obtained at different positions of focus, and the sharply focused regions combined into a single digital projection, using the freeware CombineZM (see previous edition of Stonechat Issue 72).

In spite of these problems, a small consumer camera is extremely useful for photographing gems at shows or museums.

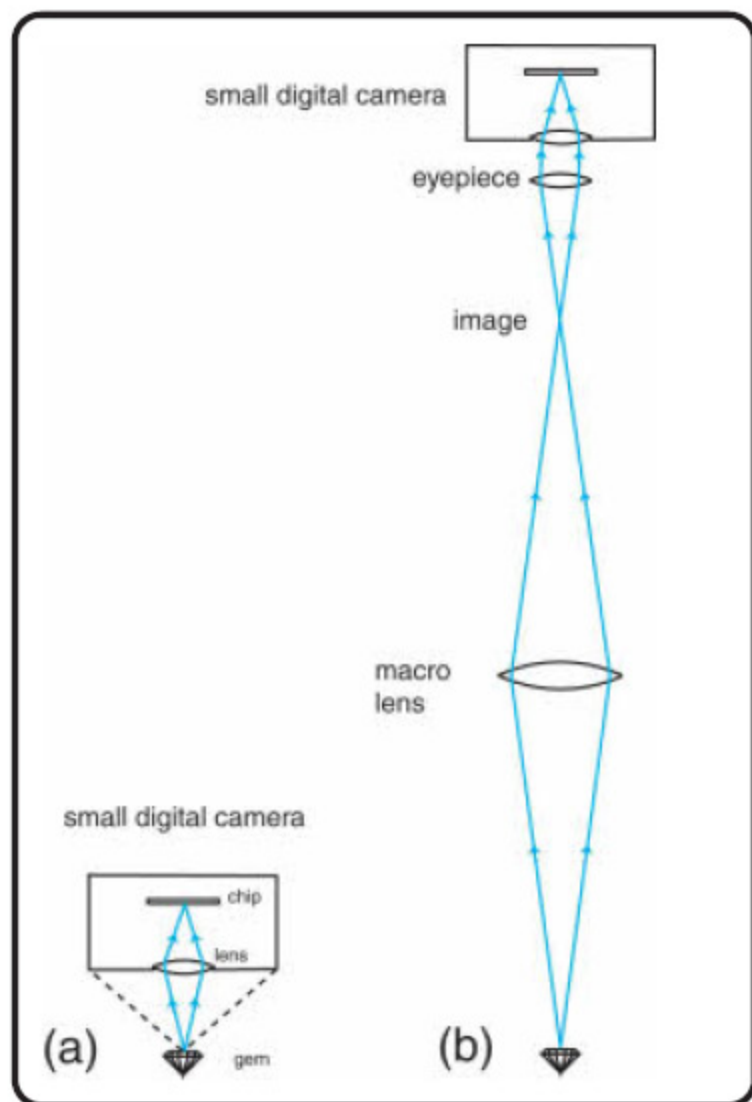
To go beyond this and achieve better illumination and control is surprisingly expensive. The purpose of this article is to describe some improved arrangements which the author has used, and others might like to read about, before choosing elaborate equipment.

The first improvement I tried was to add, to a consumer digital camera with a built-in lens, an eyepiece and a macro lens. In this setup, the imaging is done in two stages, as shown in 1(b). The consumer camera is left with its focus set at infinity at all times, and the eyepiece is used to enable the camera to focus on an intermediate image formed by the macro lens. If you are making your own setup, you need an eyepiece lens of the type found in a microscope and designed to be used with the eye quite distant from the top of the lens (called a 'high eyepoint eyepiece', such as is made for spectacle-wearers). The macrolens can be the kind used for 35 mm macrophotography.

Unfortunately, a setup like this cannot be purchased, you have to build it from parts obtained from a number of different suppliers. The setup in Figs 2 and 3 was made in this way on the basis of a Nikon Coolpix 995 camera, with a 'Navitar' eyepiece unit (see references).

As Figure 3 shows, the distance from gem to lens can thus be extended to many centimetres, so there is no problem with arranging lighting.

I found that the best form of illumination was obtained by placing over the gem a bell-shaped frosted glass lampshade, 150 mm high, with a hole at the upper end (where the handle of a handbell would be) about 30 mm in diameter (Figure 5).



**Figure 1.**

*Comparison of photography with a small digital consumer camera, which can focus as close as 20 mm or less and with a two-stage imaging system, using a macro lens and eyepiece in conjunction with the same camera set at infinity focus.*