NOTES
· AND ·
NEW TECHNIQUES

THE EYEPIECE POINTER: A USEFUL MICROSCOPE ACCESSORY

By C. W. Fryer and John I. Koivula

The eyepiece pointer is a very useful microscope accessory for the gemologist. It is always in focus and points to the center of the microscope's field of view regardless of the magnification or plane of focus within the stone. The eyepiece pointer simplifies the task of pointing out microscopic features on or in any gemstone, whether mounted or unmounted. It can be fashioned easily for use on virtually any microscope.

Almost every jeweler–gemologist who has occasion to use a microscope has run into the problem of trying to point out something in the field of vision to a client, co-worker, student, or friend. If the microscope subject is subtle and/or the person being shown the subject is not a gemologist or microscopist, that person may have difficulty seeing what you see. Although the external needle-type pointer offers some help, it has limitations that the eyepiece pointer overcomes.

The eyepiece pointer is basically a thin, strong, acicular fiber that is affixed to the inner diaphragm of the microscope eyepiece (figure 1). Because it is actually part of the eyepiece unit, it is always in the same plane of focus as the subject and is always the same size no matter what magnification is used. Even at 50× magnification, when the subject is in focus, it can be lined up precisely with the tip of the eyepiece pointer, just as if the pointer were inside the host gemstone with the subject.

By contrast, an external needle-type pointer is never in the same plane of focus as the subject unless the subject is on the surface of the stone or only a low magnification is used; even at 10× difficulties begin to arise. The tip of a needle-type pointer is large in comparison to many inclusions

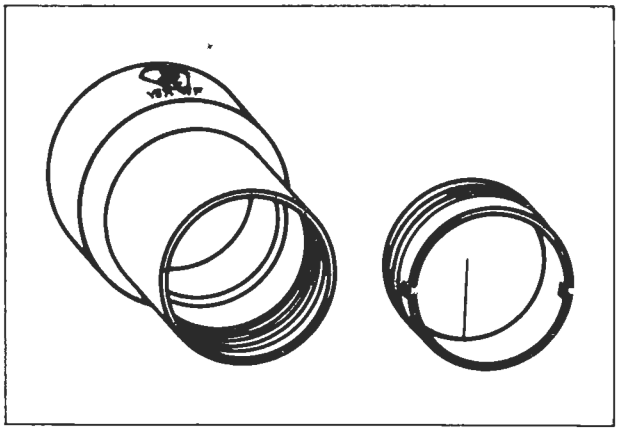

Figure 1. The eyepiece pointer is simply a strong, thin, acicular fiber that can be attached to the inner diaphragm of the eyepiece on virtually any microscope.

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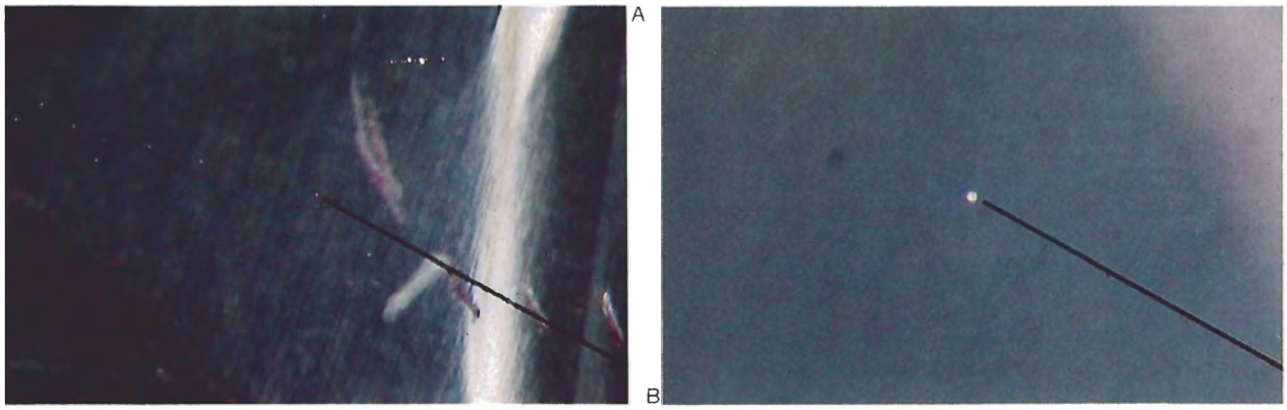

Figure 2. (A) A tiny gas bubble in a man-made glass being "pointed out" at 10× magnification by the eyepiece pointer. Notice how both the pointer and the bubble are in focus. (B) The same gas bubble in glass at 50× magnification. Notice that both the pointer and the bubble are still in focus and that the pointer is still the same size while the bubble has been highly magnified.

and, unlike the eyepiece pointer, its apparent size increases as the magnification is increased. With needle-type pointers you can focus on either the pointer or the inclusion, but rarely on both at the same time. This can be a serious drawback if, for example, you are trying to point out a tiny gas bubble in a glass imitation or a flame-fusion synthetic ruby at 50×. Pinpoint inclusions in diamonds are extremely difficult to see at 10× except to a skilled diamond grader. Pointing these out in a client's supposedly "flawless" diamond is almost impossible with a standard needle-type pointer, but is easy with the eyepiece pointer.

A COMPARISON

For comparison purposes, a faceted man-made glass was selected that contains a gas bubble that is just visible at 10×. First, the subject was photographed at 10×, then at 50×, with the eyepiece pointer in place. The results are shown in figure 2. Notice that both the pointer and the gas bubble are clear and sharply in focus. Even at 10× magnification, the subject is obvious. However, figure 3 tells another story. The same gas bubble in glass was again photographed, this time using the external needle-type pointer. Again, starting at 10× (figure 3A), both pointer and inclusion are visible, although the pointer is slightly out of focus. In figure 3B, also at 10×, the pointer is now in focus but the gas bubble is blurred and almost invisible. As magnification is increased, this problem with the needle pointer becomes more obvious. If we increase the magnification to 50× and focus on the needle pointer, as in figure 3C, the bubble cannot be seen at all. If we then refocus on the bubble, as in figure 3D, the needle pointer is now nothing more than a vague blur. This simple example makes the usefulness of the eyepiece pointer readily apparent.

In addition to its value as an inclusion pointer, the eyepiece pointer has a number of other applications. For example:

1. To point out manufacturing details of a jewelry item such as the gold stamp or a manufacturer's hallmark.
2. To make clients aware of existing damage to their jewelry before the items are taken in for repair and/or appraisal.
3. To make clients aware of damage to a watch such as a broken balance staff.
4. As an educational aid for training employees in the proper use of the microscope.

CONSTRUCTION

The eyepiece pointer is easy to make and can be adapted to virtually any microscope. All that is required is a straight, hair-line fiber of fiberglass (e.g., from a fiberglass eraser), camel hair (e.g., from a painter's brush), or some similar thin, acicular, strong material, plus a small drop of glue or cement. Basically, the eyepiece pointer is fashioned by cementing this thin, straight material in the appropriate place inside the microscope eyepiece.

The fiber used for the pointer must be placed in the eyepiece in a position where it is sharply in focus at all times. This is accomplished in the following manner. Remove the eyepiece from the microscope, turn the eyepiece over and look in the bottom. You will see a black ring that protrudes approximately ⅛ of an inch all around from the inner wall of the tube. The location of this diaphragm will vary slightly with each different make

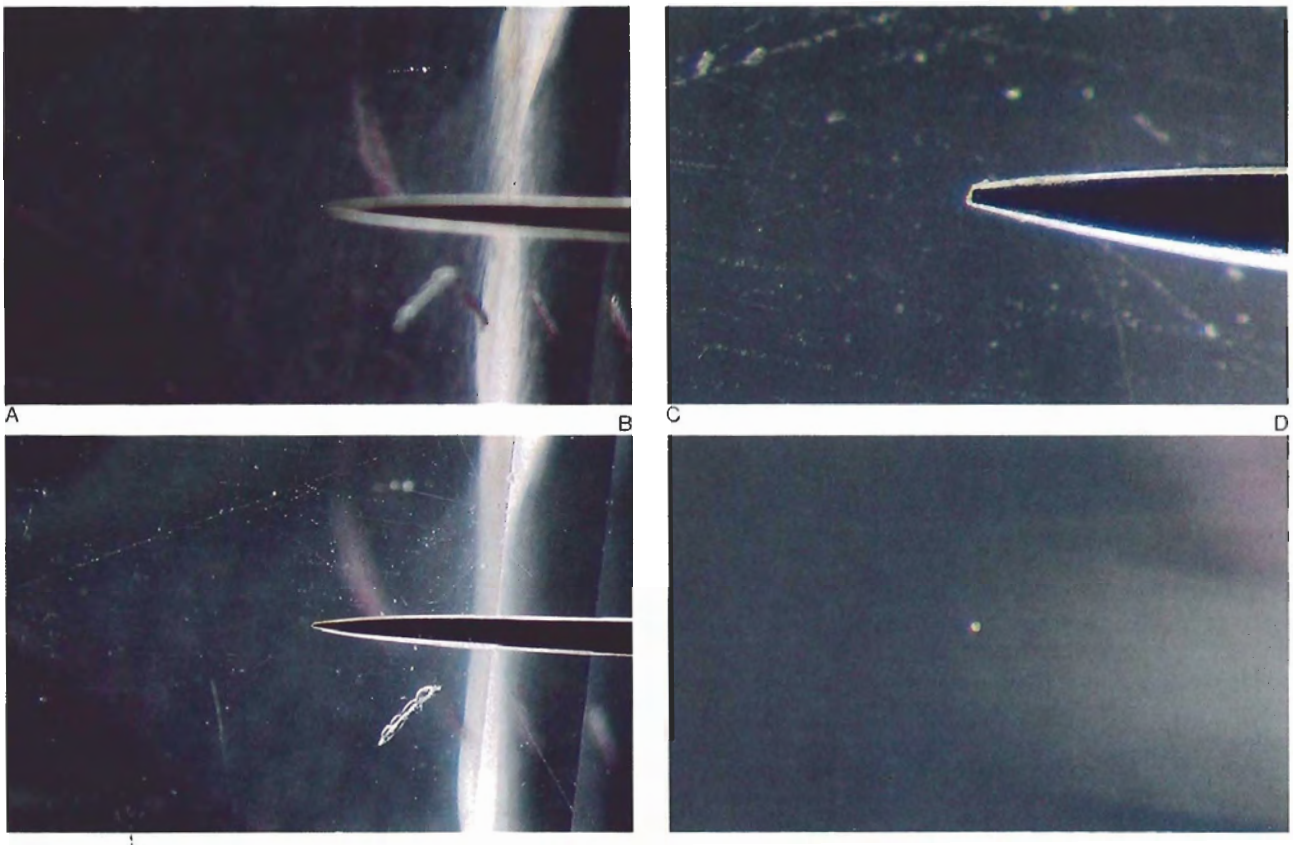

Figure 3. (A) The gas bubble in glass is again shown at 10× magnification, but the eyepiece pointer has now been replaced by the needle-type pointer; notice that the needle pointer is slightly out of focus. (B) Again at 10×, the needle pointer is now in focus but the gas bubble is only a blur. (C) Increasing the magnification to 50× and focusing on the pointer we completely lose the image of the gas bubble we were trying to point out. (D) If we maintain the 50× magnification and refocus on the gas bubble, the image of the needle pointer is almost completely lost.

of microscope, but it is present in all makes. The fiber must be cemented to the *top* surface of this ring (the surface closest to the lens) so that it protrudes from the edge into the center of the field of view.

Bausch & Lomb eyepieces have a removable diaphragm ring that can simply be unscrewed from inside the bottom of the eyepiece tube. Place a small drop of cement on the top surface of this diaphragm ring and then put one end of the fiber pointer in the cement. Position the fiber so that it is perpendicular to the edge and points toward the center of the diaphragm. Adjust the length of the fiber so that it reaches halfway across the opening. This will place the end of the pointer in the center of the field of view. When the cement has dried, simply screw the diaphragm back into the eyepiece until it is sharply in focus when looking through the lens.

American Optical eyepieces have a fixed diaphragm, and the lens must be removed from the top to gain access to the top surface of the diaphragm. Cement the fiber to the top surface as previously instructed and reassemble the lens, taking care that the lens surfaces are clean and do not have any fingerprints or dust on them.

Other microscope eyepieces will have either a fixed diaphragm or a removable one. To make your own eyepiece pointer, simply follow the appropriate instructions from the preceding paragraphs.

CONCLUSION

While the needle-type pointer is useful for pointing out surface characteristics and internal features requiring low magnification, the eyepiece pointer offers added range and flexibility. Anyone who has ever experienced the frustration of trying to show another person something through the microscope will greatly appreciate this handy little device.