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TRICKS OF THE TRADE

Cleaning a Microscope's Field Diaphragm

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As instructors at the McCrone Research Institute, we also perform some routine maintenance on our fleet of microscopes. It is fair to say that they have seen more than their average share of service over the years! Several times a year we line up all of our scopes and inspect them one by one, cleaning all the lenses and noting any problems that require attention.

On a recent maintenance day, we noted that a number of microscopes had field diaphragms that were a little "sticky," meaning that they could not be opened or closed easily. Others had just become a little dusty over the years with tiny bits of fibers sticking to the iris leaf edges. While these things were not necessarily affecting image quality or the functionality of the microscope, they were certainly becoming annoying!

If you have ever looked closely at a field diaphragm or taken one apart, you will notice that it is a complicated puzzle.

Although we are comfortable with handling most of the maintenance on our microscopes, we decided that we were better off consulting an expert for some guidance on this delicate technique. If you have ever looked closely at a field diaphragm or taken one apart, you will notice that it is a complicated puzzle, and careful attention needs to be paid to exactly where things go. One leaf out of place and it will no longer be functional. We were a bit apprehensive about removing the field diaphragms, dumping out all of the leaves and trying to put them back together. Many have tried, few have succeeded!

We enlisted the help of Steven Fryer, the Midwest Customer Service Technician for Nikon Instruments Inc., who taught us the following method. We started out with a Nikon Optiphot-POL and were also able to adapt the method for an Olympus BH-2. We hope this method will work on a variety of microscopes.

Supplies needed: Ultrasound bath (common jewelry ultrasonic cleaner works well), spanner wrench, light lithium grease, mineral spirits, isopropyl alcohol, acetone, lint free wipes, cotton swabs, rubber gloves. Note: It is helpful to have a few small Petri dishes to contain and separate screws you will be removing.

1. Remove field diaphragm (FD) from microscope base. Often the screws holding the FD in position are glued so it may be necessary to use a small amount of acetone to dissolve the glue (Figure 1).

2. Make sure the FD is *open all the way*, carefully mark positions of one of the screws holding the knurled diaphragm wheel in position, then remove the FD wheel (Figure 2).

3. Remove outer locking ring with a spanner wrench (Figure 3).

4. Carefully remove inner diaphragm spacer (Figure 4).

5. Pay attention to how the leaves are fitting, and check for symmetry in the leaves. Note any special

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notches and the specific orientations of the leaves (Figure 5).

6. Remove the leaves and place them in an ultrasound bath of mineral spirits, sonicate for about one minute (Figure 6).

7. Remove the leaves from the bath and carefully dry them with a lint-free wipe and set aside (Figure 7).

8. Clean FD components and any metal rings with alcohol. This will remove grease build up.

9. Carefully replace the leaves one by one (Figures 8-11). When all open positions have been filled, replace in the order shown in Figure 10.

10. Spread a very thin layer of light lithium grease on the edge of the inner diaphragm spacer (Figure 12).

11. Re-assemble FD unit (Figures 13 and 14).

12. Reposition in scope with the FD in the *fully open* position.

Figure 1. Nikon Optiphot-POL showing location of field diaphragm (FD) unit.

Figure 2. Marking screw orientation.

Figure 3. Removing inner locking ring.

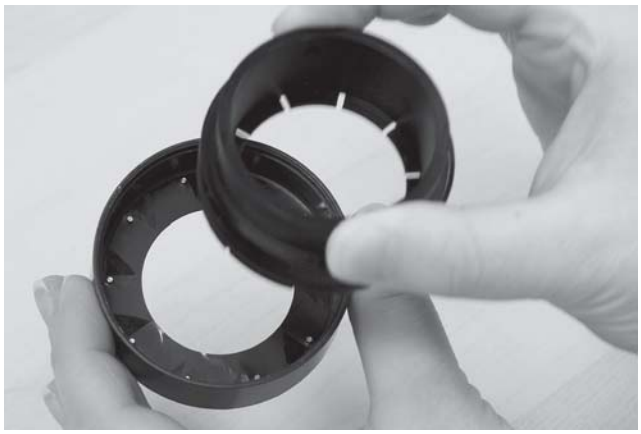

Figure 4. Removing inner diaphragm spacer.

Figure 5. Upper leaf is from the Nikon Optiphot-POL, note the leaf is symmetrical. Lower leaf is from a Nikon Alphaphot. Note that one end us curved meaning that there is only one orientation in which the leaf will fit into the FD.

Figure 6. Ultrasonic cleaner.

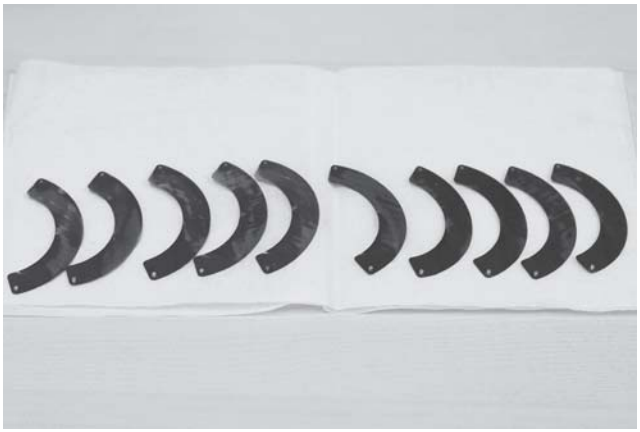

Figure 7. Clean, dry leaves.

Figure 8. Replacing individual leaves, leaf pin fits into opening.

Figure 9. All visible positions filled, some leaves remaining.

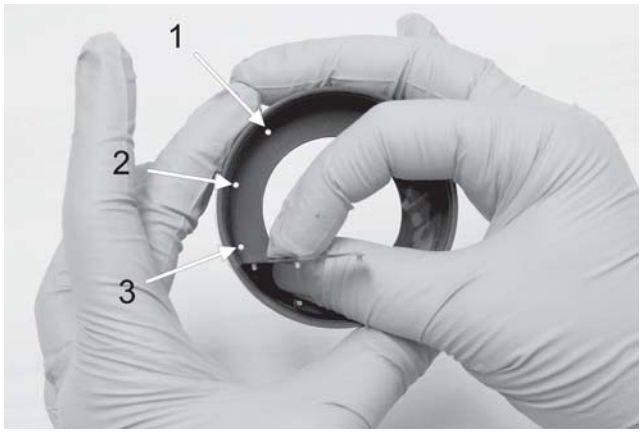

Figure 10. Remaining leaves inserted by carefully lifting fitted leaves to expose open positions.

Figure 11. Fitting remaining leaves into open positions.

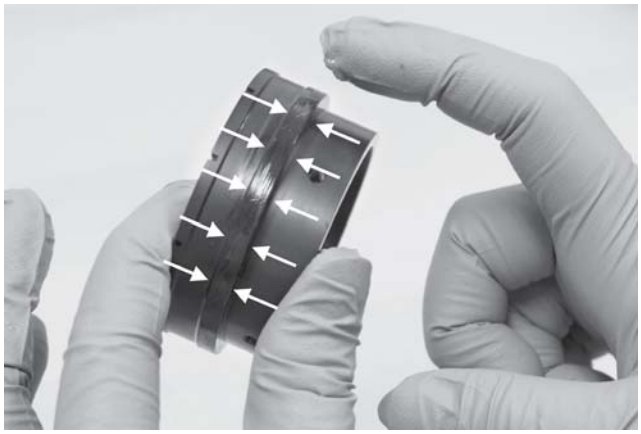

Figure 12. Light lithium grease spread on only one *area of inner diaphragm spacer.*

Figure 13. Individual FD components ready for re-assembly.

Figure 14. Re-assembled FD.