The Evolution of My Zeiss Photomicroscope I Fritz Schulze, Canada

No sooner than photography "developed" did microscopists endeavour to capture their images in a permanent form. Bulky camera set-ups were attached to microscopes and special microscopes were constructed that incorporated a camera, new, bright light sources were invented, even "flash" systems appeared to freeze moving objects on the photographic medium. This situation persisted until the mid 1950s. By that time 35mm roll film had taken over from rigid plates or large negative sheet film for most routine photomicrography except for high performance work, where the 9x12cm format was still preferred.

Microscopes were by now so widely used that the need to record one's findings became ever more pressing. Microscopists were, however, primarily visual observers and rarely qualified photographers, familiar with the intricacies of photography. In order to obtain quality photomicrographs, particular with colour film, one had to consider the colour temperature of the light source, the sensitivity of the film and the Schwarzschild effect at long exposure times, whether to choose spot or integrated measurement etc. Some companies offered sophisticated cameras where all necessary parameters could be selected, provided you knew what they were. Particularly pathologists needed records of their work and did not have the time to fiddle with elaborate apparatus. The result of such over-engineered instrumentation was that the frustrated average user left them set at the basic parameters and probably produced a lot of waste.

The institutions attempted to solve this problem by establishing a central "Biological Photography Department" (BPD) equipped with the best instrumentation and manned by experienced photographers. The researcher, once he had identified an object of interest, had to mark it, make an appointment with the BPD, go there at the appointed time, explain to the photographer what exactly he wanted to have photographed etc., an awkward and highly time consuming process. No wonder it never really caught on.

It was, therefore, a propitious time when Carl Zeiss Oberkochen (West Germany) introduced their new Photomicroscope in 1955, a large and versatile research microscope, designed by Dr. Kurt Michel, with an integrated automatic 35mm camera configured so that the user could obtain in 90% of all cases a useable photomicrograph. The Photomicroscope (Phomi) was an immediate hit and sold like the proverbial hotcakes as it was almost any pathologist's dream to own one.

So far so good. Nothing lasts for ever and after about one generation inevitable progress made this beautiful instrument obsolete and it was put aside in favour of more modern microscopes - and this is where the story of my Phomi begins.

One fine day an old customer/friend of mine called me and asked if I wanted an old Phomi. It had become redundant and is in his way, he needs the space and if I am interested, I could come and take it away. I did not need to be told twice! I found, ironically, that it was the same first Phomi I sold in Canada after my arrival in 1963! I was now the proud owner of a 1962 Phomi I with personal significance. This article describes how in the course of time I added to and modified this instrument to make it my main all-round microscope.



The Carl Zeiss Oberkochen (West Germany) Photomicroscope I serial #64798 in metallic hammered paint with already the second generation control/transformer unit, shown with the original 6V 15W illuminator, the rotatable mechanical stage, and a 0.9Z condenser. Film advance was by clockwork. The sliding prism in the tube head allowed for direct observation, photography position with focusing frame, and projection upwards for special attachments. The optics included the standard set of Planachromat 2.5/0.15, Planachromat 10/0.2, Planachromat 40/0.65, Planachromat 100/1.25, and a pair of Kpl 8x eyepieces. I added later a

Planachromat 6.3/0.16, an Achromat 40/0.85 oil and a Planachromat 63/0.90. Note that the silica gel in the drying cartridge for the photocell is exhausted: pink instead of cobalt blue. By the way, the Phomi II of 1969 had electric motor drive for film advance and came in light grey paintwork. Phomi III ca. 1968 had all electronics and control functions built into the base. The introduction by Zeiss of the Axio-line of microscopes with infinity-corrected optics in 1986 sounded the death knell for the Phomi.



Original 6V 15W illuminator

Right: Phomi I with 12V 30W illuminator, shown separately below. Note the connecting tube.



2) My first improvement was the installation of a 12V 30W illuminator with separate regulating transformer to replace the somewhat weak 6V 15W light source.



3) A few years later I substituted the 12V 30W illuminator for the new 12V 100W halogen illuminator with the large square lamp housing. Both of these illuminators require a special connecting tube which is often difficult to get hold of and a separate regulating transformer. This larger lamp housing also necessitated raising the microscope. A homemade wooden plate of 15mm thickness achieved this.





4) Thanks to similar "connexions" I could obtain a large Ultraphot including table. I managed to sell the Ultraphot minus the table. As the power supply for the Ultraphot is an integral part of the table, I needed another power supply. Fortunately, several years earlier the company discarded several such power supply units and I salvaged one. This came now in most handy. The Ultraphot table includes the power supply for the regular illuminator plus for an HBO mercury burner or CSJ burner in a fixed drawer unit. It also features 4 fitted drawers that can be pulled out to their entire length. Only one of the wooden fittings did I retain and use. A kneehole drawer is practical for pencils and small stuff. This very heavy Mauser steel table, 75x156cm, is of the highest quality with a special extremely well wearing surface. It also weighs "a ton" and in two house moves it was a miracle we got it through the doors and up the stairs (with the help of some good strong friends, none of whom suffered a hernia!).



5) My next upgrade was the acquisition of a gliding stage, a rare object indeed, but very useful for following moving objects such as protozoae. To effect an easy exchange of stages it was

necessary to have also another stage carrier. I first tried to make one myself (right in picture) but it turned out too shaky, so e-Bay had to help out again (left in picture).



6) I also obtained a phase-contrast condenser VZ 1.4 oil with the appropriate objectives: Neofluar 16/0,40 Ph2, Neofluar 25/0,60 Ph2, Planachromat 20/0,45 Ph2.

Neofluar 16/0,40 Ph2, Neofluar 25/0,60 Ph2, Planachromat 20/0,45 Ph2, Neofluar 40/0.75 Ph 2, and a Neofluar 100/1.30 Ph3 as well as a Planapochromat 100/1,30 Ph 3. To this I added a dry and an oil immersion darkfield condenser. The latter is a pre-war CZ Jena Kardioid condenser adapted for the Phomi substage (left). A pair of wide angle high eyepoint Kpl 8x eyepieces made observation more comfortable. For my objectives I have 3 quintuple revolving nosepieces.



7) A rare find was the diaphragm insert for incident light which I needed to be able to use my vertical illuminator IIC for individual objectives. I also had already the necessary reflectors H-PI for brightfield and D for darkfield. My one objective Epi-achromat 6.3/0,12 HD was complemented by an Epi-planachromat 16/0,35 HD which I bought from a Chinese seller on e-Bay. He most honestly informed me that, unfortunately, he had dropped the objective and its outer reflective collar is now damaged. I could have it for free with his apologies! Now, that was indeed nice of him. It turned out the objective was optically undamaged, although it shows external signs of considerable use.

8) An overseas friend who worked for an electronics company salvaged a number of stereomicroscope bodies and other microscope parts that had been discarded. Included were

4 Vickers epi-objectives and 2 as good as new Olympus NeoSPlan HD objectives 10 and 20x, the latter for an infinity light path. The Vickers objectives were two brightfield objectives Microplan 10x and 20x and two bright/darkfield objectives Microplan 40x and 80x, with the matching quadruple revolver, all with standard RMS thread (except the Olympus ones).



The vertical illuminator IIC is shown with an adapter ring for Epiplan brightfield objectives. Front row: Epi-achromat 6.3/0.12 HD and Epi-planachromat 16/0.35 HD. Behind: the two Olympus Neo S Plan objectives. Top row: the epi-diaphragm insert for Phomi and two reflector inserts for darkfield D and brightfield H-Pl.

My Zeiss vertical illuminator was designed for epi-objectives with the new standard M24/0.75mm thread and the correspondingly large darkfield "ring". Vickers had to squeeze both brightfield and darkfield light paths through the comparatively small diameter of the RMS thread. This meant also that my Zeiss darkfield reflector D could not be used. I decided to make a darkfield reflector to match the Vickers objectives (see <u>Micscape magazine</u> issue #197 March 2012). This was a challenging but successful project. Finally I also adapted the revolver to fit the Zeiss vertical illuminator IIC. I have now a fully workable incident light equipment, alas, not much use for it as I have few opaque metallographic or petrographic specimens and neither the means nor the need to make more.



The Vickers revolver with two brightfield objectives (left) and two darkfield objectives (right). My home- made darkfield reflector on the left

9) Again a kind friend let me have an achromatic-aplanatic DIC condenser 1.4 Z of the second generation with specific DIC sliders for each objective, to be used with a polarizing filter insert above the Optovar. The problem is that very specific objectives only work with this system. I only have the sliders for the objectives Plan 40/0.65 and Neofluar 63/1.25 or Planachromat 63/0.9 (without coverglass). My Planachromat 40 is the only objective I can use - financial considerations prevented me from searching e-Bay for a suitable 63x objective, particularly as I understand there are serial number restrictions. This system requires for each objective an intermediate ring for the sliding prism and a blank ring with optical compensation for non-DIC objectives on the same revolving nosepiece, of the latter I have only one.

10) To continue with the saga: although it is said that the tube head of the Phomi is optically matched to the body, hence the little red stickers!, I figured this applies mainly to the internal camera. So I took a chance to buy on e-Bay a new tube head with a slider that included a beam splitter between observation and vertical exit. It works fine and allows me now to have a camera on top while observing through the binocular tube. I use my old Nikon Coolpix 995 (3.34 Megapixels) which screws onto a Leitz Periplan 10x/18 highpoint eyepiece and can be easily attached without further supporting gadgets. A remote control helps to avoid camera shaking when pressing the release button.

As the original binocular tube was not ideally compatible with the new eyepieces so I also bought a new tube of the "butterfly" (Siedentopf) type. These tubes, with a magnification factor of 1.6, appear fairly frequently on e-Bay. But one has to watch out, they look all the same, but some are angled for use on the Standard Gfl series of Zeiss microscopes, others for the Universal, Phomi and Ultraphot. I looked carefully and being familiar with the general construction principles of Zeiss I realized that the latest version can be converted to fit either type of microscope. This is indeed so, and the tube I bought is adaptable. It is also of the type that holds the two keyed eyepiece sleeves parallel so that for example a crosshair remains horizontal when changing the interpupillary distance. One fly in the ointment is that one of the prisms is partly delaminated, but unless one is very critical and looks sharply, it is hardly noticeable.

I have 4 film magazines, one with a frame counter but none with a data recording device. Now that 35mm film seems to come en vogue again, it is not a bad idea to have several magazines. The first, older Phomis were designed for the relatively slow colour films available at the time. When faster films came on the market, Zeiss provided a filter insert that corrected this deficiency. This can be inserted in the internal optical light path. I do have one such filter which will be necessary if ever the built-in camera will be used again.



A variety of accessories: a choice of filters, a stage centering slide, a stage micrometer, an analyzer slide with polarizer and two auxiliary specimens Quartz Red I and Mica $\lambda/4$.

The last two illustrations show on the left a set of phase-contrast mounting media and a bottle of immersion oil. Two hardening mounting media $n_D 1.515$ and $n_D 1.525$ for unstained histological specimens and a non-hardening one for aqueous specimens. The edging lacquer in the small bottle has long since hardened. Never used, I kept this set only for historical reasons. On the right is an extended drawer of my table with the bulk of the accessories.



I have kept all the original parts so that the Photomicroscope can be assembled in its original form. If it will ever be used again for 35mm film, then the old control unit is indispensable as is the compensating filter insert, in all likelihood it may also be necessary to install again the old black tube head.

I have now reached the point in life where I have to think of slowly disposing of my collected treasures. As for my Phomi I hate the thought of having to sell all items piecemeal. Ideally the entire system ought to go to a practical talented hobby microscopist who can make use of all the various accessories and even complement them as necessary. I realize that such a person is difficult to find. Furthermore, such a comprehensive microscope system would by its very nature demand a rather high price. But I had a lot of fun putting it all together, not to talk about using it.

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> Published in the March 2018 issue of *Micscape* magazine. <u>www.micscape.org</u>