Rediscover *Lumipan*, the superb black enamel Carl Zeiss Jena research microscope.

Articles and pictures by Stefano Barone, Italy.

1939 was the year of birth of two excellent and innovative microscopes: the Leitz *Ortholux I* and the Zeiss Jena *Lumipan*. Together with the Steindorff *Microbe Hunter* (produced almost a decade later, but almost impossible to find today) they represent the high-end black enamel microscopes that have left a mark on the history of microscopy. In fact the *Ortholux I*, in addition to its solemn design, has the primacy of being the first true modular microscope of history (having a very large number of interchangeable accessories for the different techniques); the *Microbe Hunter* is best known for its original, fascinating and massive trinocular double wishbone stand, while the *Lumipan* first introduced the pancratic condenser, which alone allows three types of observation.

Compared to the other two, this jewel manufactured in Jena combines the advantages of a high performance instrument with easy transportability, being of smaller dimensions, although in the original catalogs the words *große Forschungsmikroskop* (1 - 5), that is *Large Research Microscope* (4), were frequent: the stand measures 37 cm H x 25 cm D x 13 cm W, if fully lowered. It has gained a deserved success for more than twenty years, moreover the pancratic condenser was subsequently reproduced in other models of the same company (such as Nf or Amplival). Now let's get to know it better …

The *Lumipan* has never been produced in the trinocular version: the binocular one was the most widespread, it was also depicted in the catalogs more than the monocular model. Unlike subsequent Zeiss Jena Nf / Ng models, the coarse and the fine adjustment knobs are still on separate and distinct axes, as are the X and Y control knobs of the stage.

The lighting however is very innovative, considering the period of construction: the 6V / 15W incandescent lamp (with tungsten filament) housed under the stand and once inserted into position is almost precentered. However, to obtain an optimal view of the sample under medium or high magnifications, it is necessary to properly center the *radiant field* seen through eyepieces, by means of the two adjustment screws located on the front of the base: it becomes easily visible by increasing the condenser aperture to 1.4, using a 20x objective together with a maximum 7x eyepiece and placing the grey filter on the field lens (4). The latter is equipped with an adjustable iris and - by the ingenious screw mechanism - allows oblique illumination to be easily acquired. The specific set of filters (blue, green and gray) implements the lighting features.

The possibility of choice of objectives are varied: in 1939 (1) the achromatic set (3x without aperture specifications; 8x/0,20; 20x/0,40; 40x/0,65) juxtaposes the planachromatic set (3x/0,10; 9x/0,20; 40x/0,65; 75x/0,90 oil iris for immersion dark field; 100x/1,30 fluorite oil). In 1950 the same achromatic set was still commercialized, but the apochromatic set (10x/0,30; 20x/0,65; 40x/0,95 korr; 40x/0,95 without coverslip; 60/1,0 oil iris for immersion dark field; 90x/1,30 oil) substitutes the planachromatic one. In 1950 the objectives for Phase contrast appear too, that is the achromatic Ph 10x/0,30; Ph 20x/0,40; Ph 40x/0,65 and Ph 90x/1,25 oil. Eyepieces could be acquired at different magnification powers: both Huygens (5x, 7x, 10x) and compensator versions (5x, 7x, 10x e 15x) were produced.

The pancratic condenser, thanks to the ingenious revolver system, allows three types of observation, namely the bright field at low magnification, the bright field at medium and high magnification with variable aperture from 0.16 to 1.4 (with the possibility, therefore, to immerse the front lens when the opening is greater than 0.9) and finally the immersion dark field.

Instead, the phase contrast occurs by means of a specific accessory, which consists of a phase diaphragm coated by a metal ring that fits above the field lens: this contrast technique is set by observing using the special phase telescope and varying the pancratic condenser aperture until its annulus is aligned with the phase plate of the objective.

In 1956 (6) Zeiss-Jena introduces the Variable Phase contrast technique, very interesting and also applicable on the *Lumipan*, but achievable only with the specific planachromatic PHV objectives. The latter have not one, but two concentric phase plates (the set consists of 6,3x / 0.16 160 / -, 16x / 0.32 160 / 0.17, 40x / 0.65 160 / 0.17; HI 100x / 1.25 160 / 0.17): this technique includes a phase diaphragm differing from that mentioned previously, since it adheres to the bottom of the pancratic condenser, it has two centering screws with an adjustable iris and presents - like the PHV objectives - two concentric phase plates. In this case through the phase telescope the concentric plates of the phase diaphragm must be aligned with the concentric phase plates of the objective, after that during the observation of the sample we vary the opening of the iris diaphragm to activate the first or the second phase plate of the objective, responsible for a phase contrast which gradually varies from moderate to stronger effects.

The sets for the classical phase contrast and variable phase contrast that have survived to the present day are housed in an elegant wooden box in which - in addition to the phase telescope and the phase diaphragm - there are one or more green filters, which increase the contrast and definition during observations.

Over the years, the *Lumipan* stand has undergone very few changes and it's generally been marketed in two basic versions with the square table (LPG) or the circular rotating one (LPE); a third version (LPB), more rare and designed for the polarization (5), presents the monocular tube and eventually compensators. Other accessories that are almost impossible to find nowadays are the mirror to project onto paper (2 and 4) and the set for reflected light (2).

The long price list published in1951 contains the following prices: 1516 DM for the bare stand LPG (without objectives), DM 1,576 for the bare stand LPE (without objectives), 28 DM for the achromatic lens 8x / 0, 20 and 276 DM for the apochromatic objective 90x / 1.30 oil, just to mention a few.

Although I have verified the optical superiority of the high-end modern research microscopes (I am mainly referring to the Zeiss infinite M27 objectives), I am amazed by the quality of the images that this Zeiss Jena microscope (born more than seventy years ago) gives us: I took all the photomicrographs presented in this article using the three *Lumipan* microscopes of my collection, these images faithfully represent what I saw through the eyepieces.

Finally, I believe that the *Lumipan* - although it is quite rare and expensive - should not be missing in the showcase of every serious collector of vintage microscopes, but at the same time a specimen in good condition could also work very well on our laboratory tables, as the optics and mechanics of this jewel of eastern Zeiss are significantly higher than many mid-range modern instruments sold today.

Bibliography

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(3) Carl Zeiss Jena, *"Lumipan" Stand Lp – Description and Directions for use* (brochure), reference 30607/40, 1940
(4) Carl Zeiss Jena, *Large Research Microscope "Lumipan", descriptions and working directions* (brochure), reference 30612/41, 1950
(5) Carl Zeiss Jena, *"Lumipan" Großes Forschungsmikroskop* (brochure), reference 84790, 1951
(6) Carl Zeiss Jena, *Phasenkontrasteinrichtung Phv mit veränderlicher Kontrastwirkung zum Großen Forschungsmikroskop"Lumipan"* (brochure), reference 68444, 1956
(7) Carl Zeiss Jena, *Phasenkontrasteinrichtung variabel – Beschreibung und Gebrauchsanleitung* (brochure), reference 65154, 1960

The pictures are presented on the following pages.

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This English version translated by the author.

Stefano Barone, can be contacted at **info@stefanobarone.net**.

Editor's note: On **Stefano Barone's website** he shares his other microscopy interests including the sale of his own prepared and arranged slides of diatoms, radiolaria and forams. On his regularly updated **'Microworlds' blog** he also showcases and discusses the typical examples of the slides that he has prepared.

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URL: **www.microscopy-uk.org.uk/mag/artfeb16/sb-Lumipan.pdf**

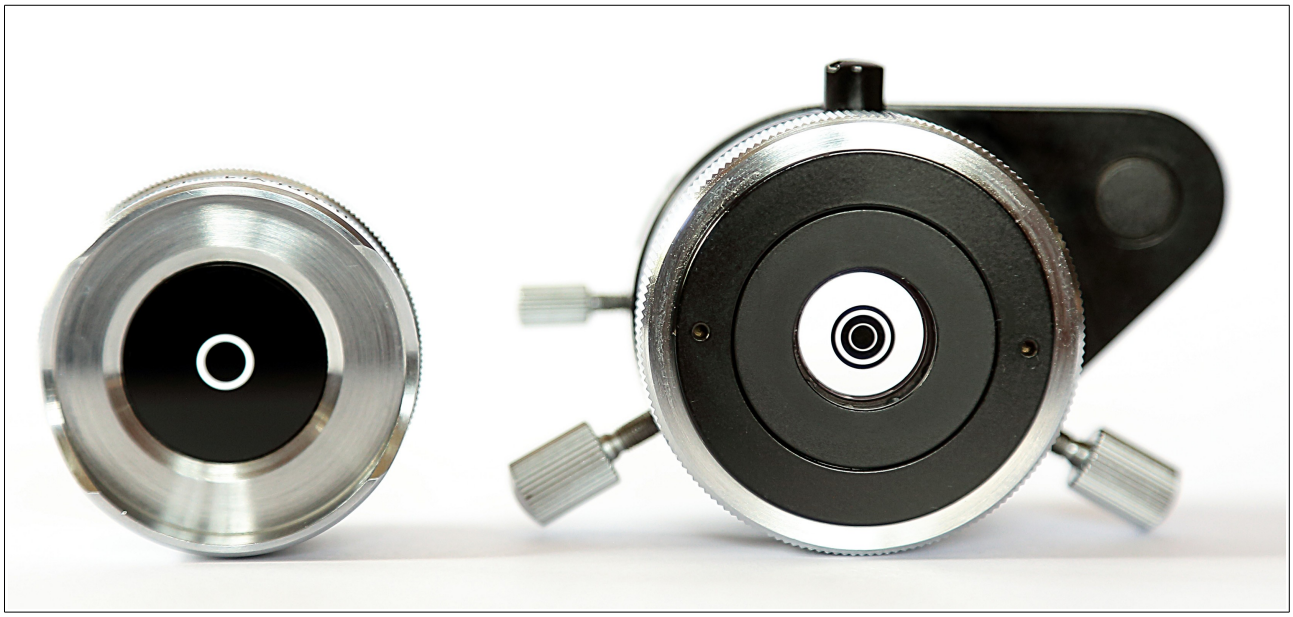
1. Lumipan microscope, LpE model (lateral view).

2. Lumipan microscope, LpE model (frontal view).

3. Lumipan microscope, LpG model (lateral view), belonged to the Faculty of Medicine of the Rostock University, according to the label on the stand.

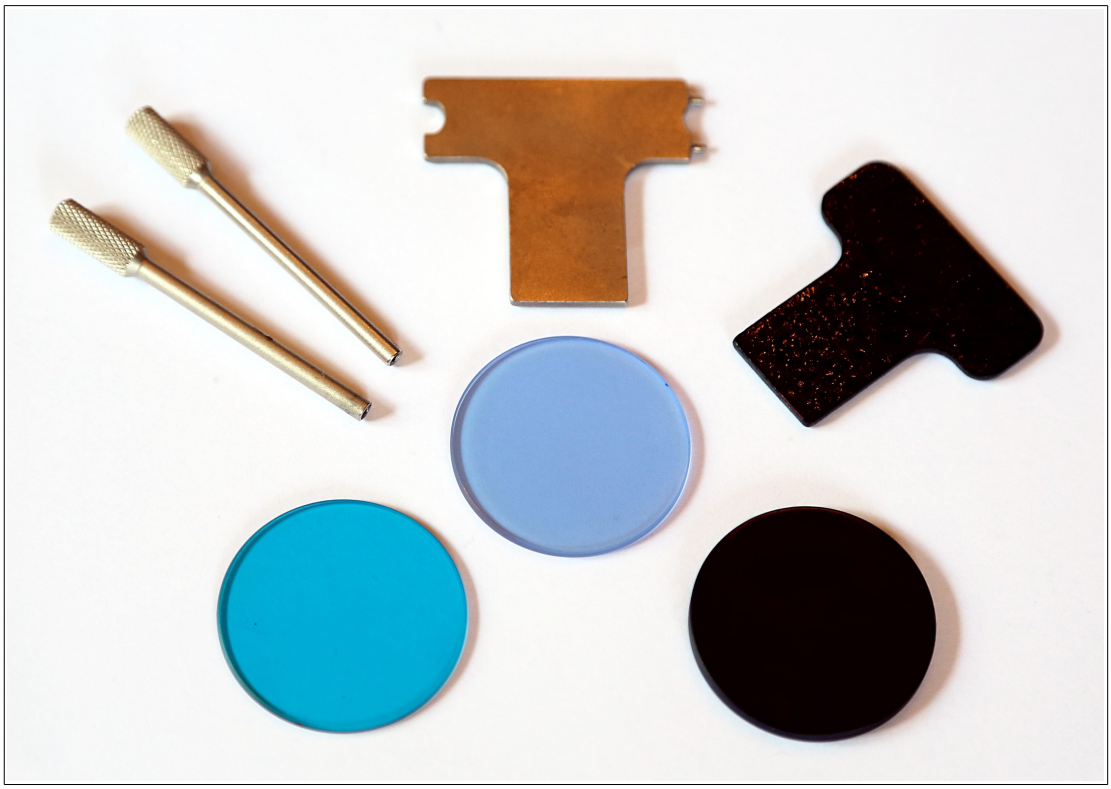
4. Transformer with lamp 6V / 15W.

5. Monocular tube and phototube.



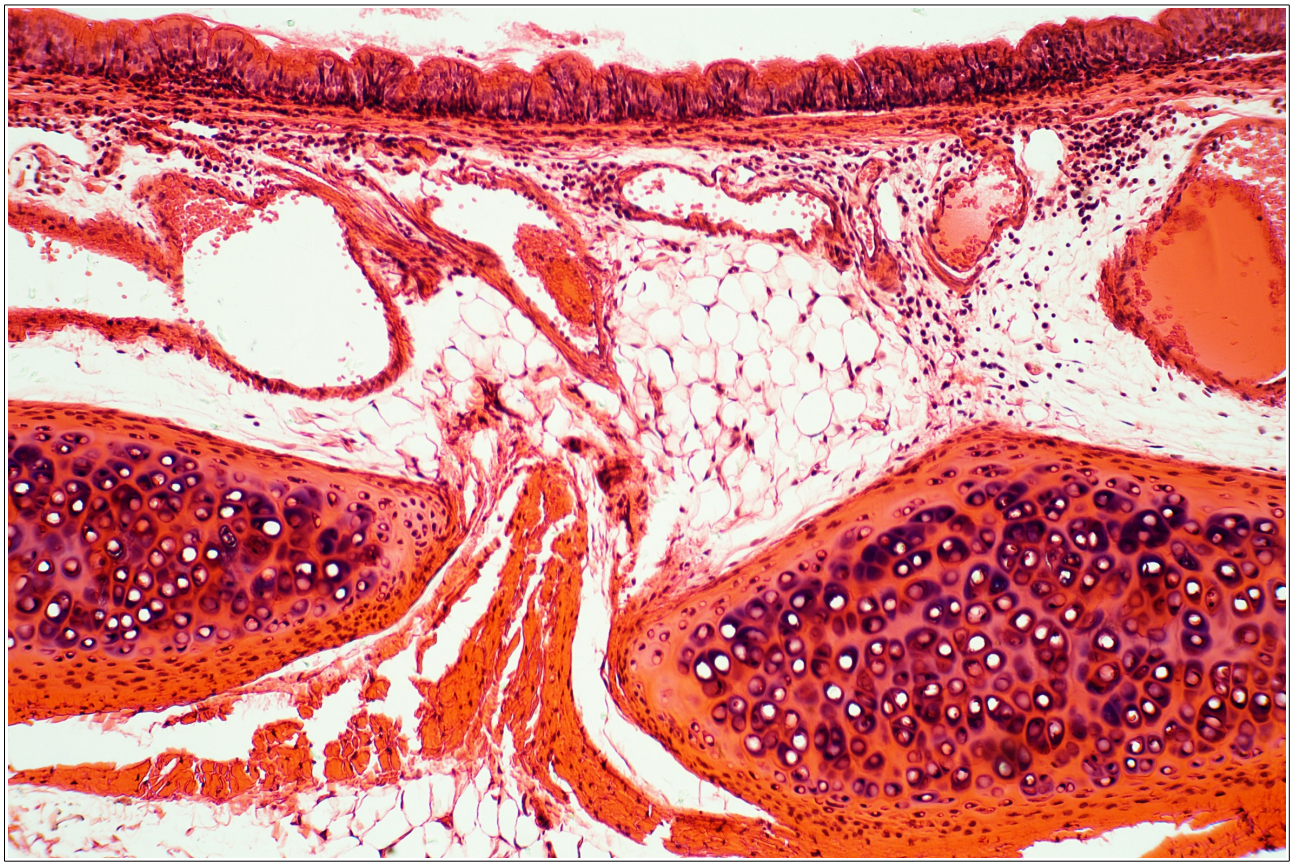
6. Accessories for Phase contrast (left) and Variable Phase contrast (right).

7. Complete sets for Phase contrast (left) and variable Phase contrast (right).

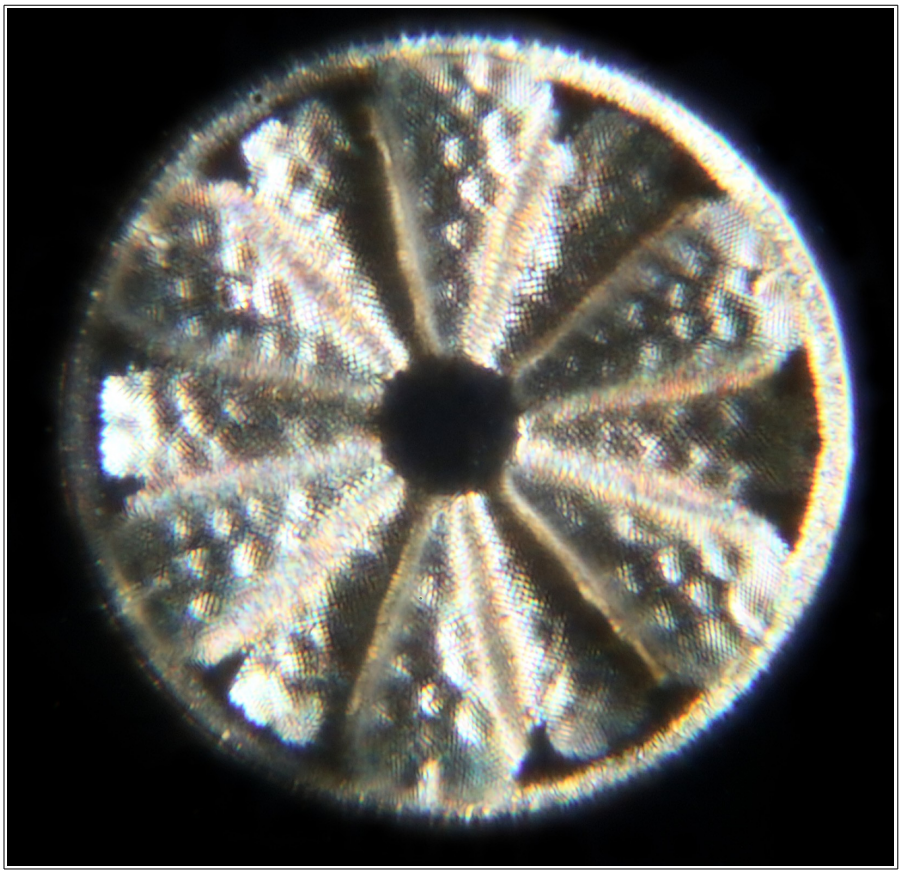


8. Several accessories: filters / key to adjust the condenser friction / key to adjust the microscope base to its wooden box / a couple of drilled screwdrivers for centering the radiant field.

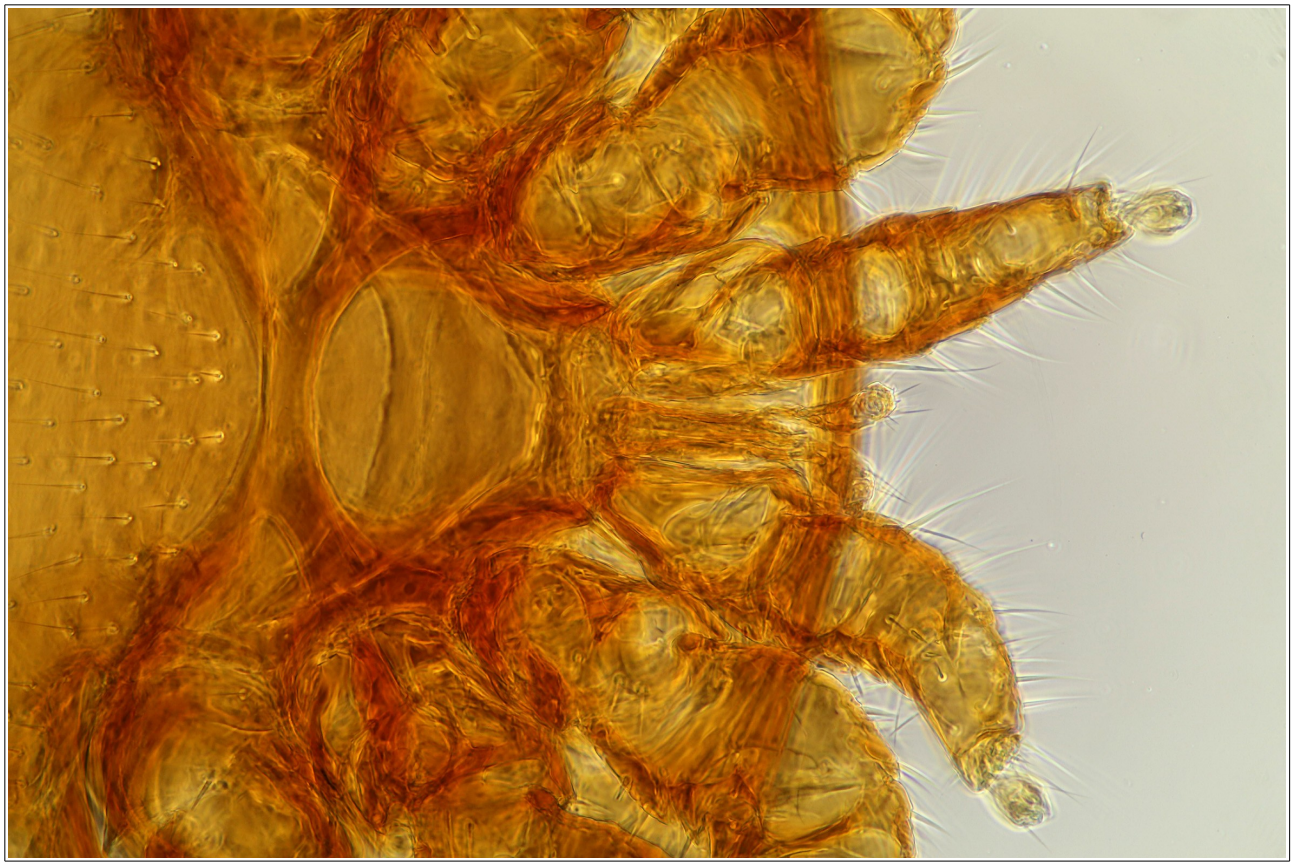
9. Original brochures with instructions.



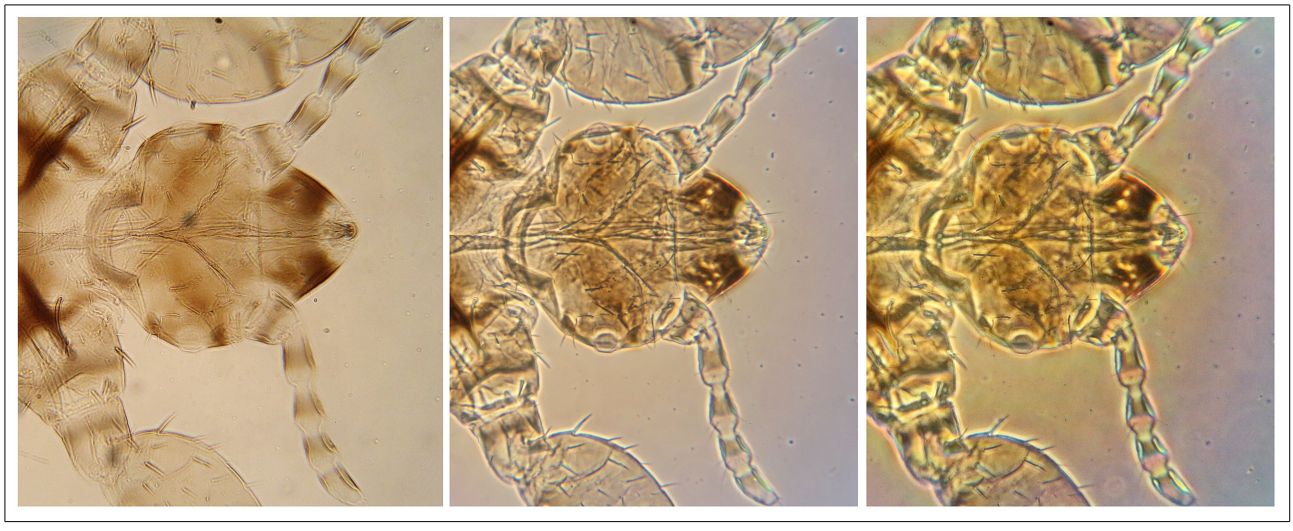
10. Photomicrography of an animal section: Bright field, Carl Zeiss Jena Achromat 8/0,20 objective.



11. Photomicrograph of a diatom: immersion dark field, Carl Zeiss Jena Apochromat 60/1,0 Iris objective



12. Photomicrograph of a Varroa mite (Varroa destructor): Phase contrast, Carl Zeiss Jena Achromat Ph 10/0,30 objective.



13. Photomicrographs of a head louse (Pediculus humanis capitis). From left to right: Brightfield, Variable Phase contrast with the moderate and the pushed effect. Carl Zeiss Jena Planachromat Phv 6,3/0,16 160/- objective.