Amoeba proteus

(Pallas, 1766) Leidy, 1878

Most likely ID: n.a.

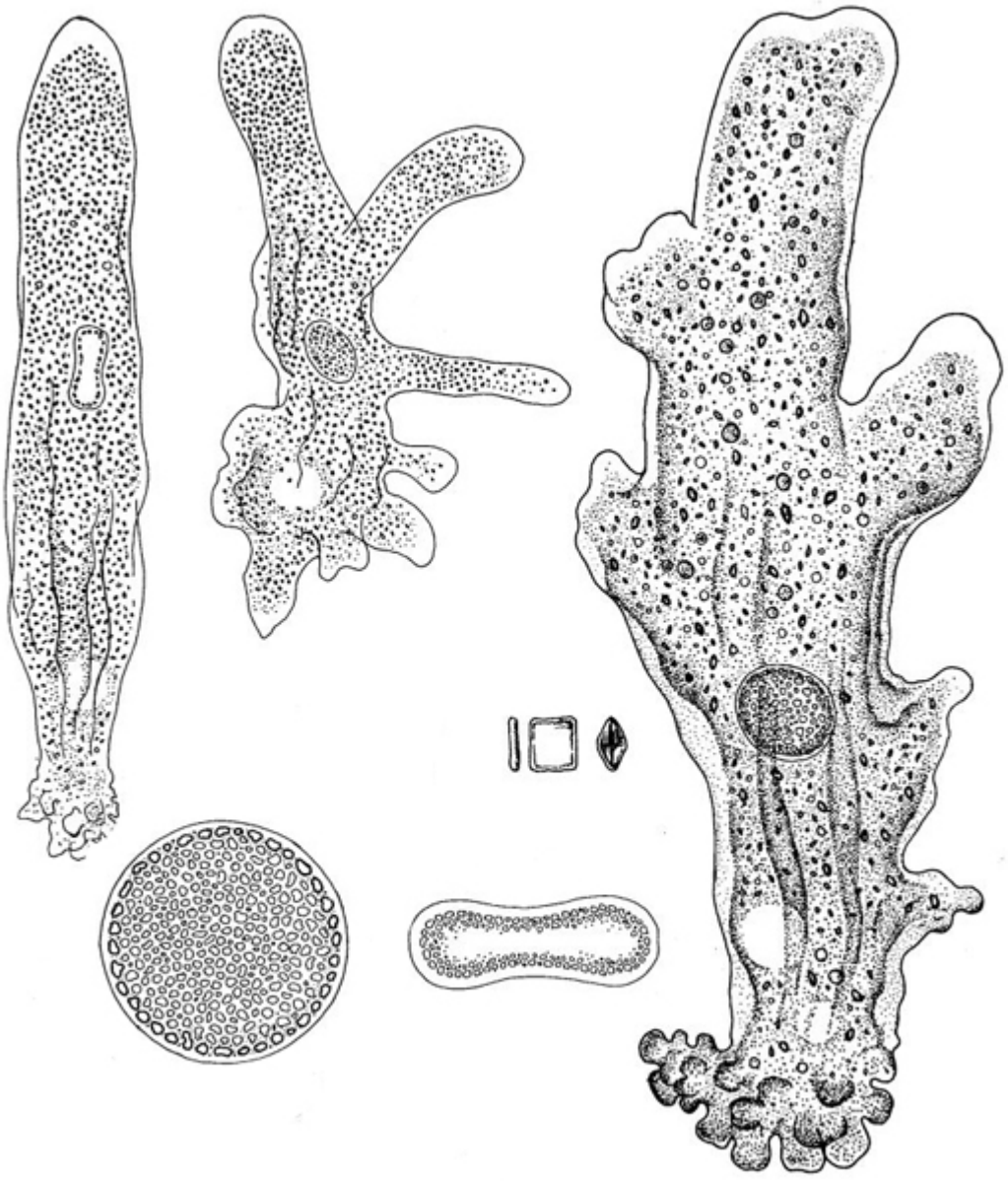
Synonym: n.a.

Sampling location: Simmelried, Purren pond, Mainau pond, Ulmisried, Bündtlisried, Pond of the convent Hegne

Phylogenetic tree: *Amoeba proteus*

Diagnosis:

- body polypodial, with longitudinal folds
- sometimes monopodial movement
- pseudopodia with thin clear caps
- length 160–760 µm
- one lens-shaped or ovoid nucleus, diameter 22–62 µm
- uroid bulbuous
- one contractile vacuole, often near uroid
- numerous crystals scattered in cytoplasm, mainly truncate bipyramids



Amoeba proteus

Amoeba proteus is one of the largest and most common naked amoebae. I find them in almost all of my sampling sites. In old samples, the specimens often collect on the surface of the bottom mud.

Amoeba proteus usually moves polypodially. The pseudopodia are quite broad and broadly rounded at the front. The hyaline caps at the end of the pseudopodia are only very thin. The locomotion can be quite fast, although sometimes a monopodial form is adopted, which is not maintained for long. An important identifying feature is the nucleus, which is usually quite large with a diameter of 20–40 µm (s. fig. 4 a-b). It is somewhat flattened and sometimes has dents on both sides, making its shape reminiscent of that of a red blood cell. On the surface of the nucleus there is

often clod-shaped nuclear material (s. fig. 4 b). The contractile vacuole is also large and conspicuous. It is often located near the uroid (s. fig. 2 b). The cytoplasm contains almost exclusively bipyramidal crystals, which are between 2–4 µm in size (s. fig. 5). The cytoplasm is sometimes very slightly reddish in color.

The similar species *Chaos nobile* has several cell nuclei (usually more than 10) and the amoebae of the genus *Polychaos* have an uroid consisting of almost finger-shaped protrusions. *Polychaos* also moves almost exclusively monopodially.

More images and information on *Amoeba proteus*: Ferry Siemensma-Microworld-*Amoeba proteus*

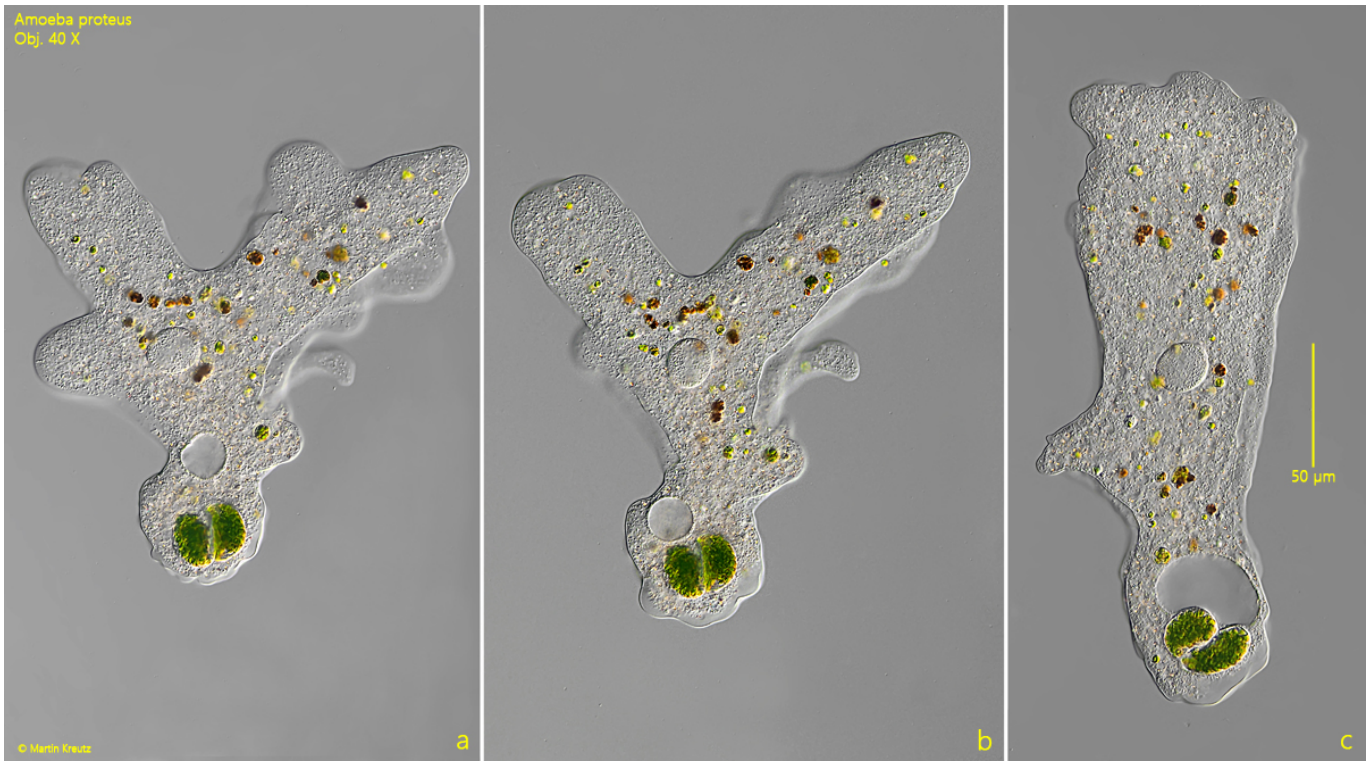


Fig. 1 a-c: *Amoeba proteus*. L = 240 µm. A freely moving specimen. Obj. 40 X.

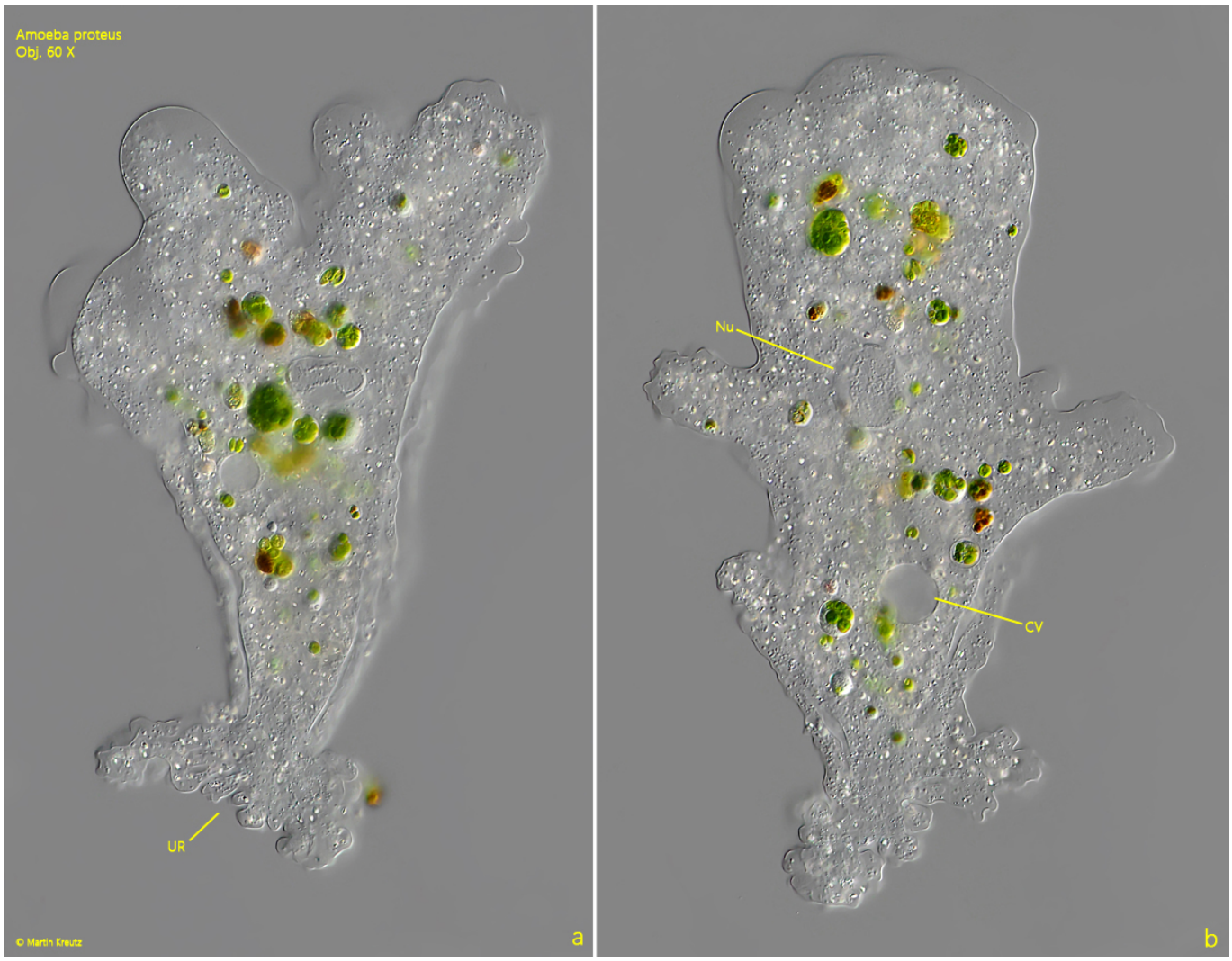


Fig. 2 a-b: *Amoeba proteus*. L = 340 µm. A second freely moving specimen. CV = contractile vacuole, Nu = nucleus, UR = uroid. Obj. 60 X.

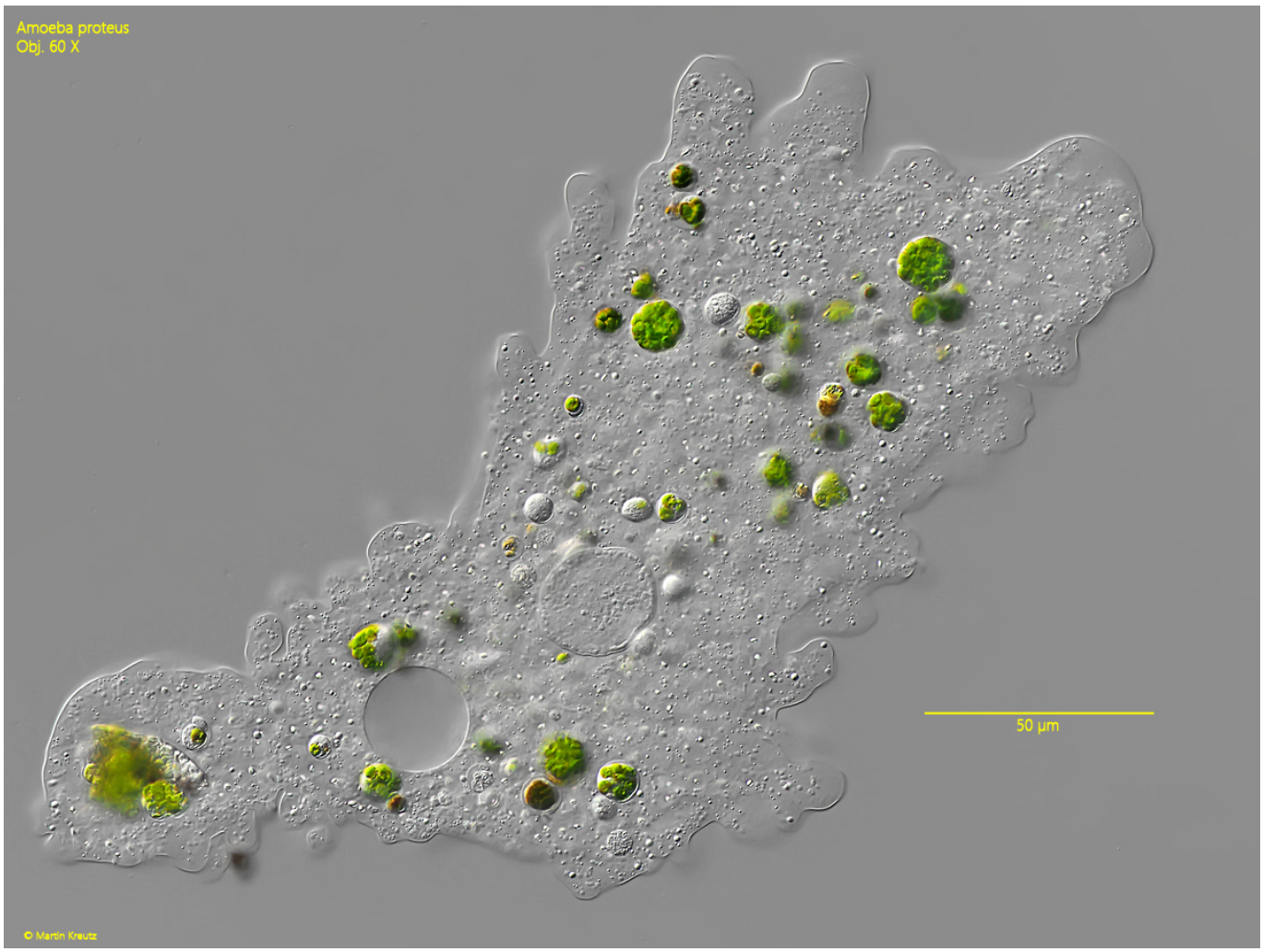


Fig. 3: *Amoeba proteus*. L = 340 µm. The same specimen as shown in fig. 2 a-b in detail. Obj. 60 X.

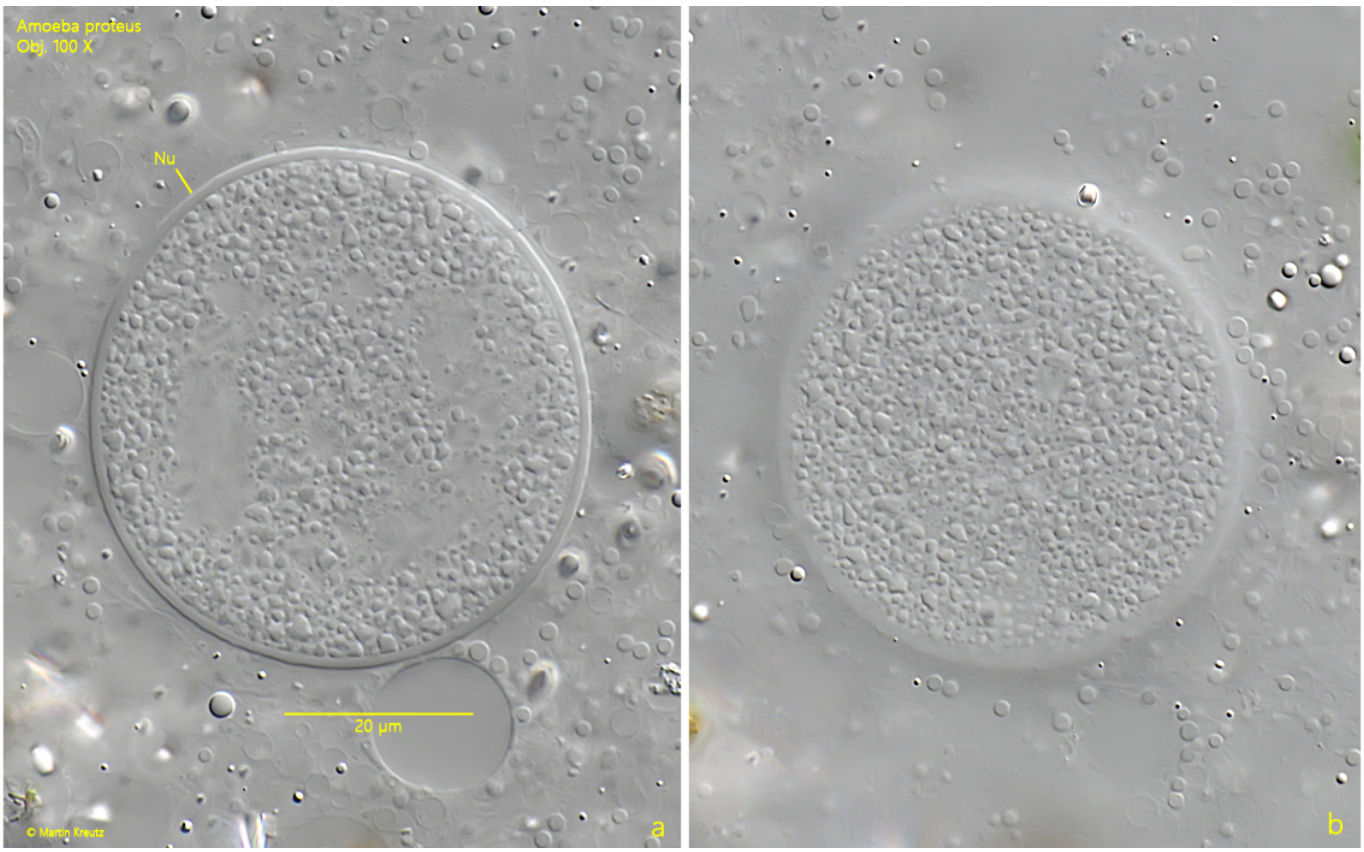


Fig. 4 a-b: *Amoeba proteus*. Two focal planes of the slightly squashed nucleus (Nu). Obj. 100 X.

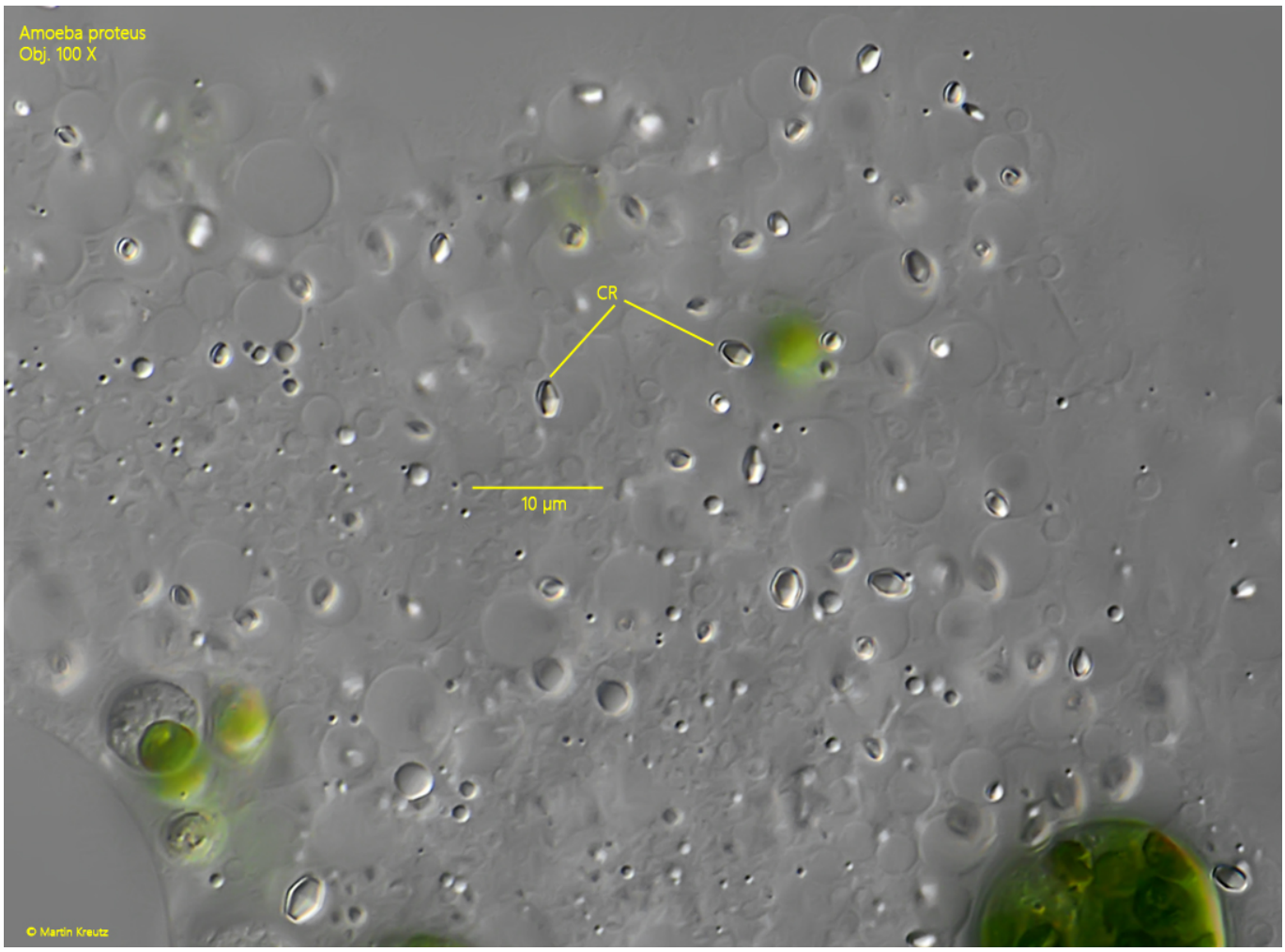


Fig. 5: *Amoeba proteus*. The scattered crystal (CR) in the cytoplasm are 2-4 µm long with the shape of truncate bipyramids. Obj. 100 X.

In 2009, I found specimens of *Amoeba proteus* for the first time, from whose uroids long threads emerged, which were pulled behind and which obviously could not be stripped off (s. figs. 6 a-b and 7 a-b). The affected specimens were also very densely filled with bipyramidal crystals and often had a yellowish to brownish color. These threads are the conidia of an exoparasitic fungus which, as far as I know, has not yet been described and named. All the specimens I have found so far come from the Simmelried. I have not yet been able to detect this type of fungal infestation in *Amoeba proteus* in my other sampling sites. However, the finds from the Simmelried are also rare. I find specimens about every 3–4 years. The fungus seems to be specialized on *Amoeba proteus*. I have never found it on other naked amoebae from the Simmelried like Chaos nobile or Polychaos dubium.

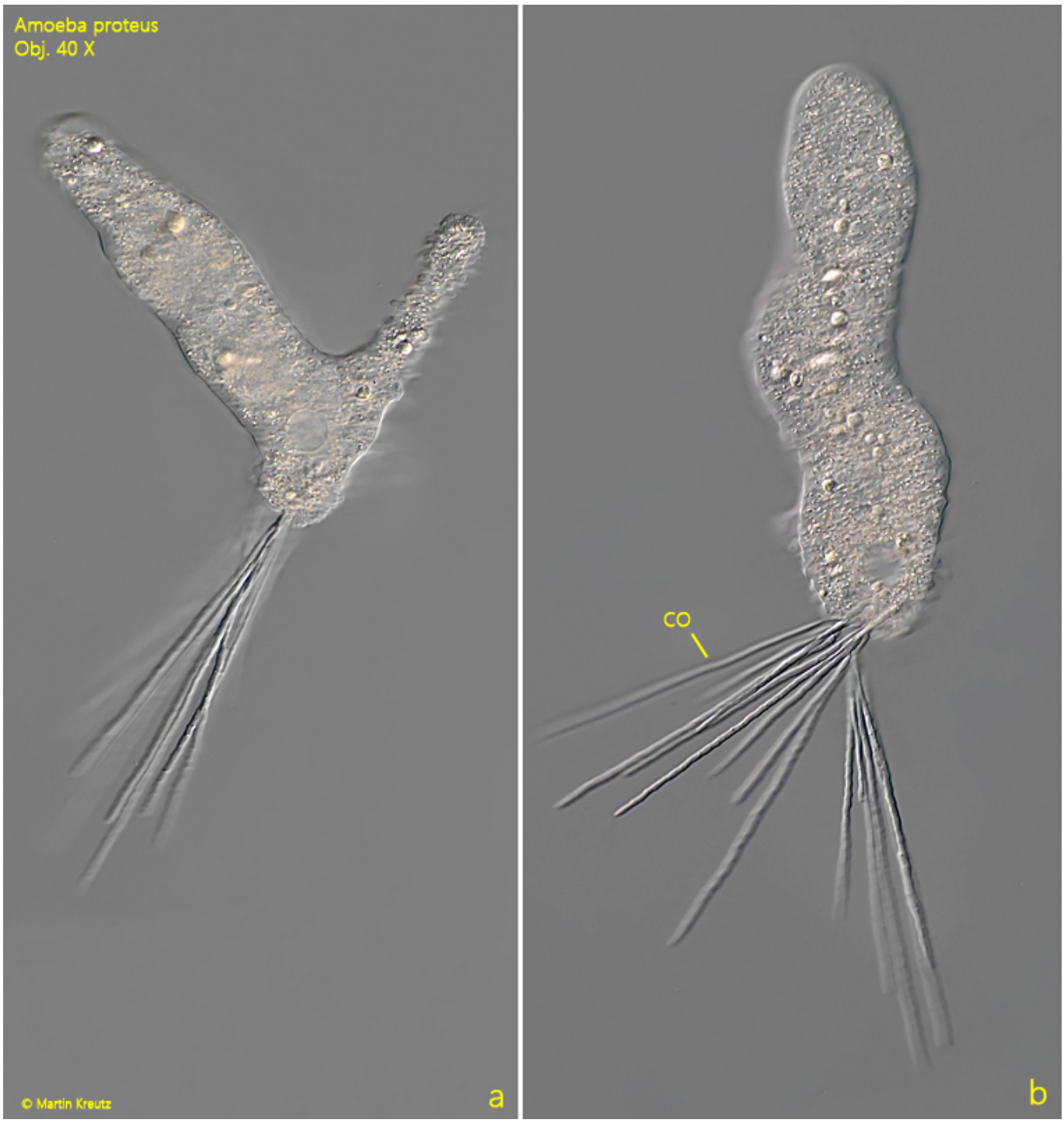


Fig. 6 a-b: *Amoeba proteus*. A specimen infested by an exoparasitic fungus. The thread-like conidia (CO) of the fungus arise from the uroid. Obj. 40 X.

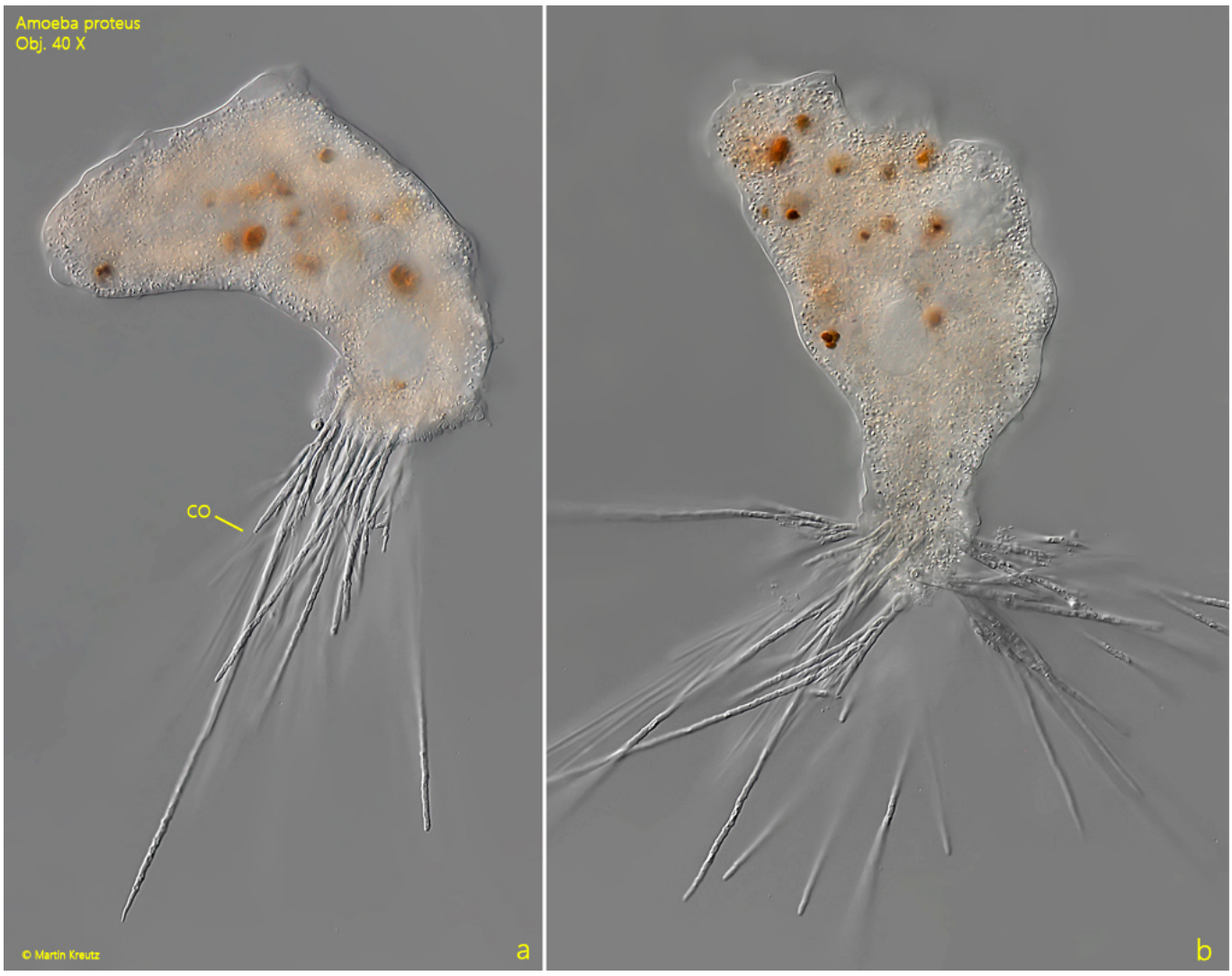


Fig. 7 a-b: *Amoeba proteus*. A second specimen infested by the exoparasitic fungus. CO = conidia. Obj. 40 X.

This parasitic fungus of *Amoeba proteus* was already found by Leidy in 1879 and was described by him in great detail (s. fig. 8). However, Leidy believed that the filaments were a special form of the uroid and he treated infested specimens as a new species, which he named *Ouramoeba vorax*.

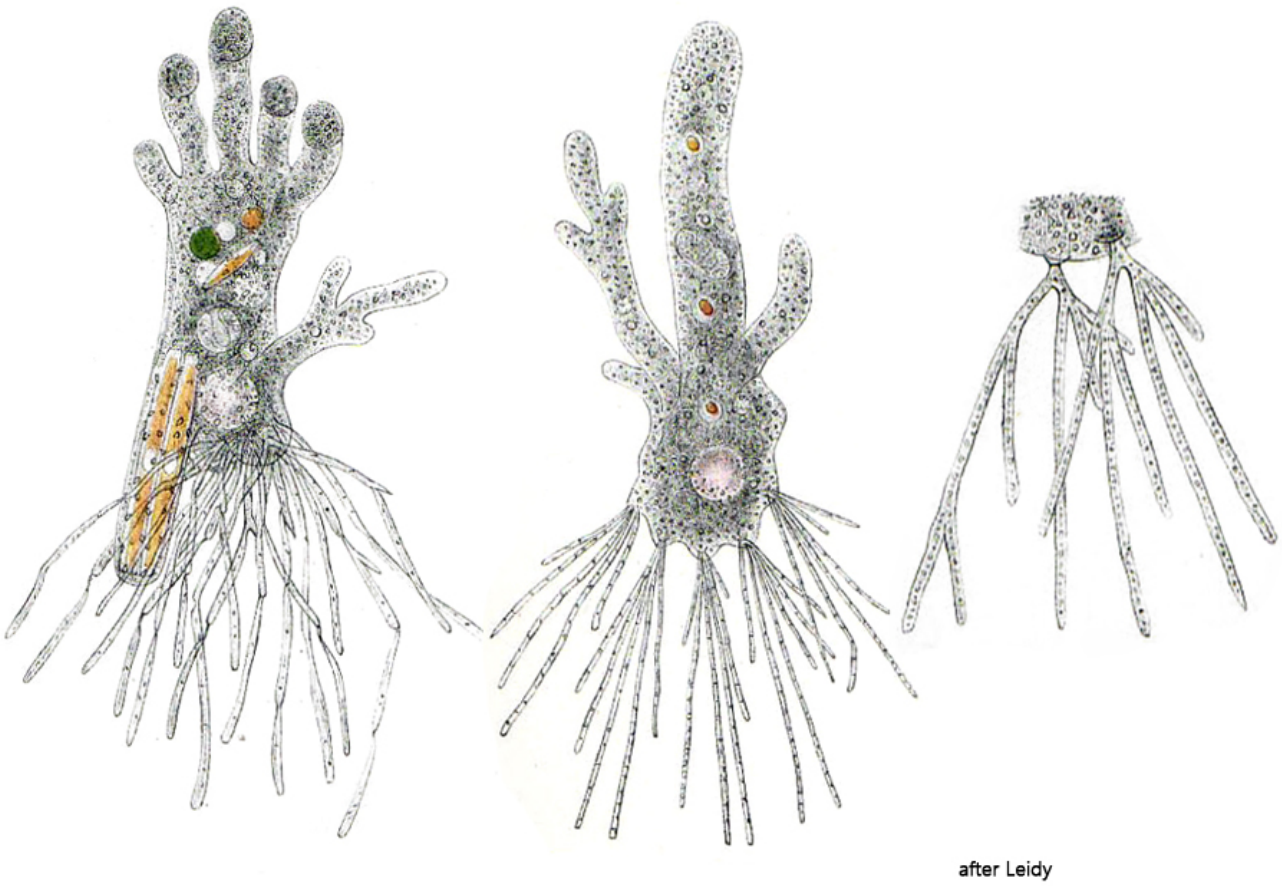


Fig. 8: *Amoeba proteus*. Some of the detailed drawings of Leidy from infested specimen of *Amoeba proteus*. Erroneously he considered the fungal filaments (conidia) to be a form of the uroid and treated the form as a new species he named *Ouramoeba vorax*.

When observing the infested specimens, one wonders how the fungus manages to anchor itself in the cytoplasm of the host cell, which is constantly in motion. The conidia always originate from the uroid. When the amoeba changes direction, the conidia collect again at the uroid. In a squashed host cell, it can be seen that the conidia are anchored in the outer 20 µm of the cytoplasm (s. fig. 9). They do not extend deep into the cytoplasm.

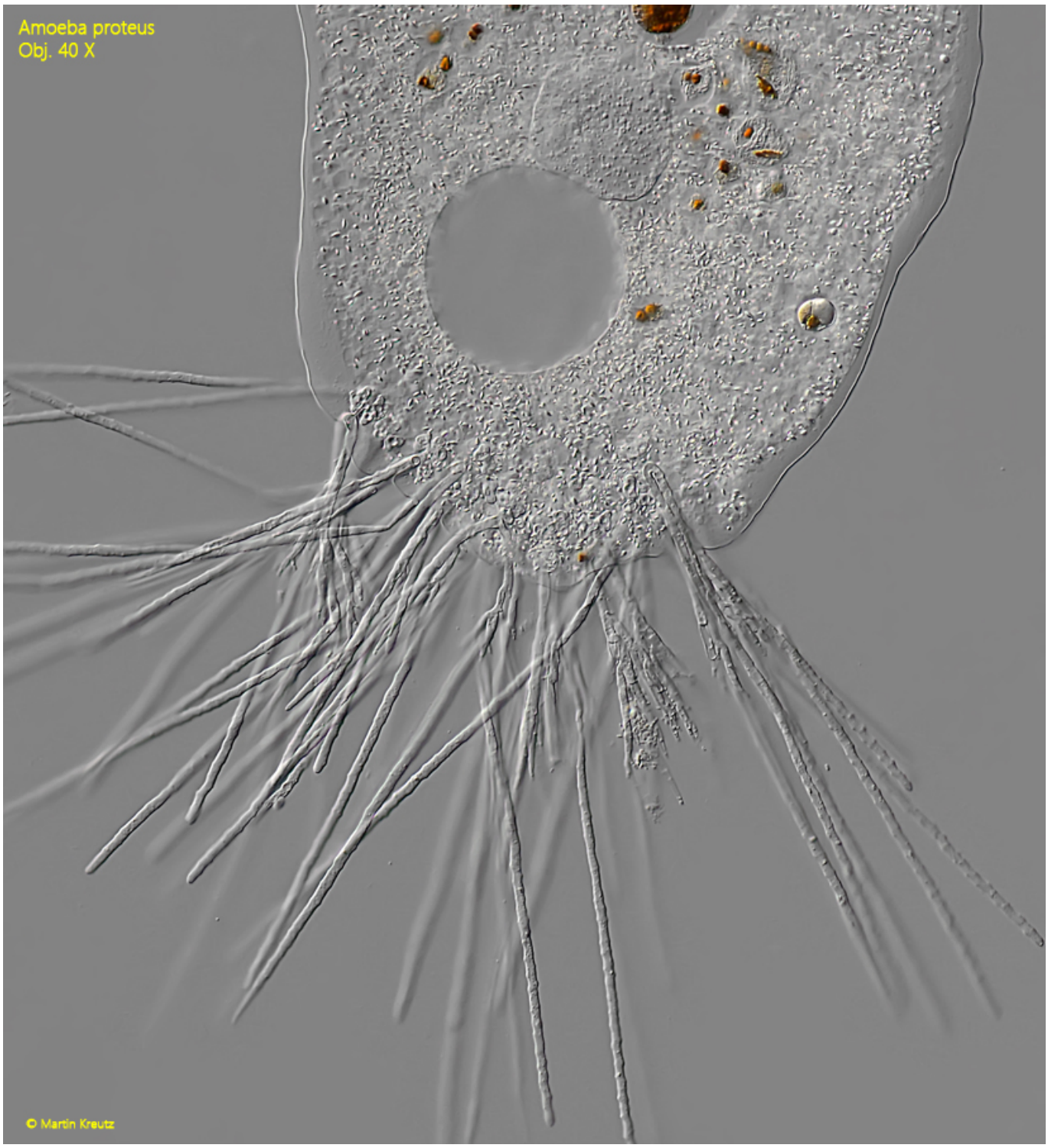


Fig. 9: *Amoeba proteus*. The uroid of a squashed, infested specimen. The conidia are anchored in the outer 20 µm of the host cell. Obj. 40 X.

At high magnification it can be seen that the conidia are shaped like a hair clip and form a tight loop in the cytoplasm of the host cell (s. fig. 10). At the strongest bend, a bulbous haustorium (HA) is formed, which appears cloverleaf-shaped or sometimes butterfly-shaped. The haustorium is a specialized organelle of the fungal cell that can absorb nutrients from the cytoplasm of the host cell. This haustorium obviously cannot simply be expelled from the plasm membrane of the host cell,

which results in anchoring.

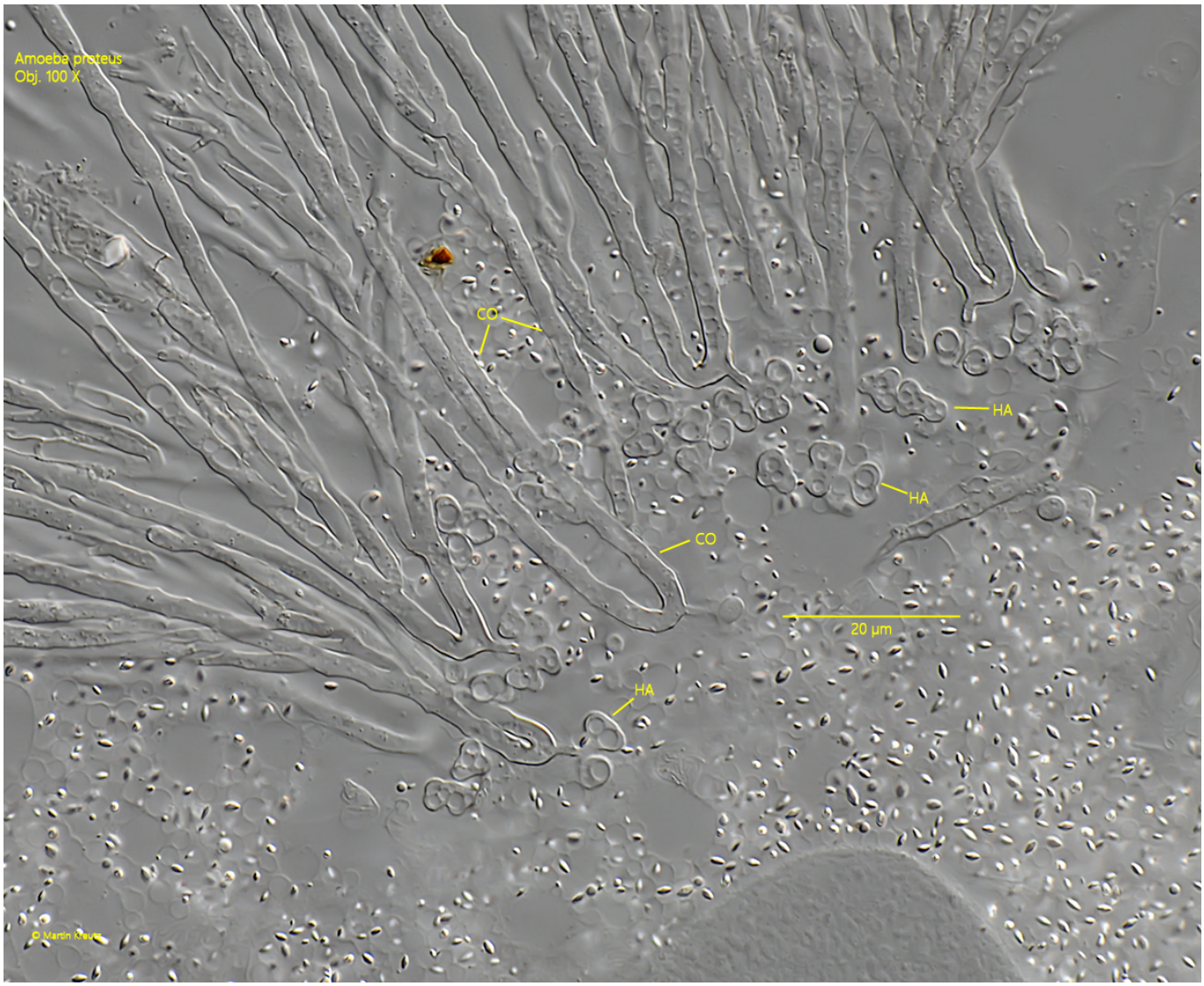


Fig. 10: *Amoeba proteus*. The strongly squashed uroid of a infested specimen. The conidia (CO) of the parasitic fungus form a loop in the cytoplasm. At the strongest bend, a bulbous haustorium (HA) is formed. This organell is specialized to absorb nutrients from the cytoplasm of the host cell. The haustorium cannot simply be expelled from the host cell through the plasm membrane, which results in anchoring. Obj. 100 X.