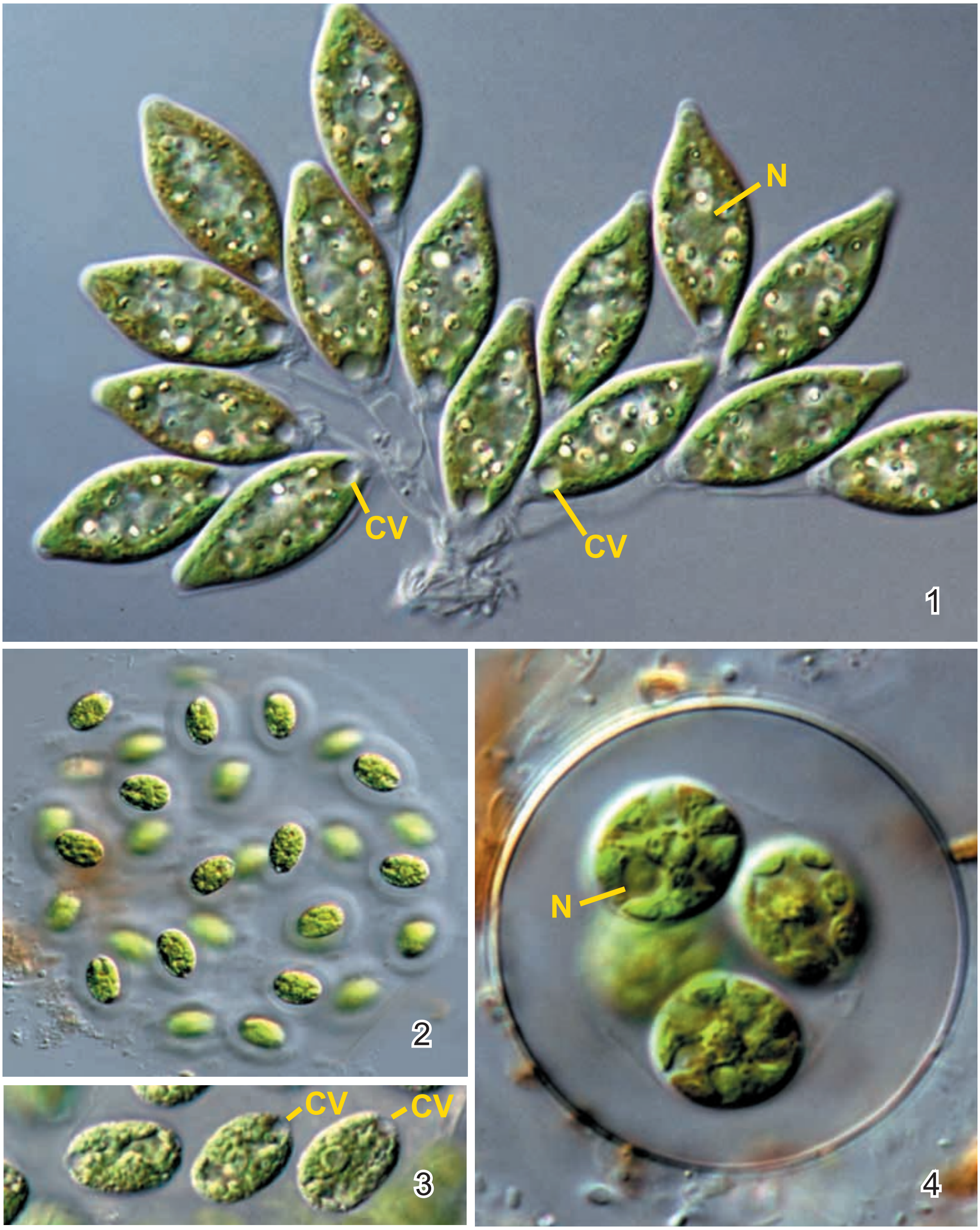
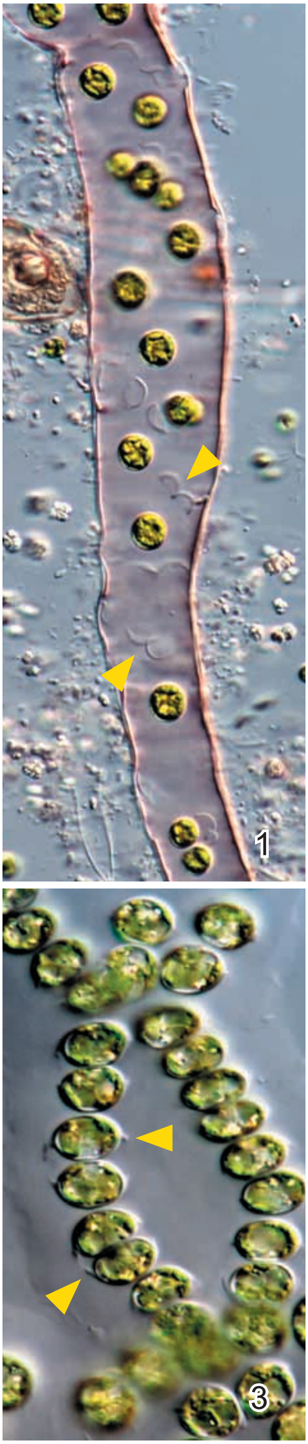


Fig. 1 – 4: Chlorophytes. 1: The pyriform cells of *Chlorangiella polychlora* are 20–40 µm long and are attached to branched, gelatinous stalks. At the base of each cell is a contractile vacuole. **2, 3:** *Gloeocystis ampla* occurs in globular aggregates of 5–10 µm long cells each in a mucous sheath. The ellipsoidal cells have an apically located contractile vacuole (3). **4:** *Gloeocystis gigas* can be distinguished from *G. ampla* by the almost globular cells, which are 15–30 µm across and tetrahedrically clustered in a sharply outlined gelatinous sheath. CV – contractile vacuole, N – nucleus.



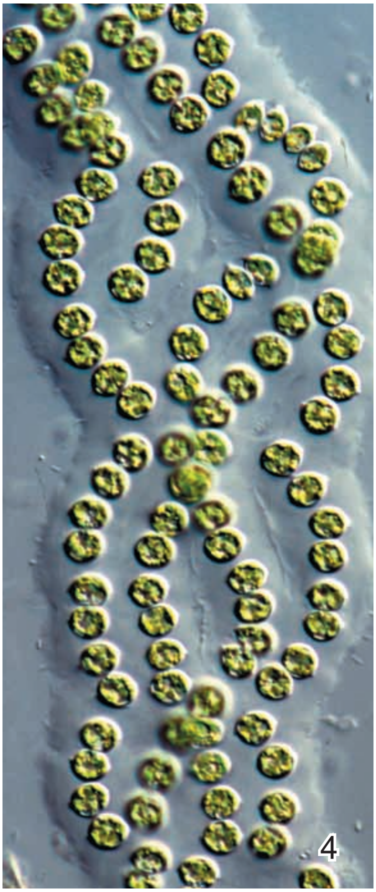


Fig. 1 – 4: Chlorophytes. 1, 2: *Palmodictyon viride* (cells ~ 20 µm cross) forms long, jelly filaments with cells embedded one by one. Remnants of the cup-shaped membranes of asexually produced autospores are often visible (1, arrowheads). The mucous sheath of *P. viride* can be reddish or brownish. Young colonies are globular and occur in large amounts (2). **3, 4:** *Radiofilum mesomorphum* (cells ~ 20 µm cross) is a member of the green algae order Ulothricales and forms unbranched chains of cells in a mucous coat. Each cell is covered by two cup-shaped membranes, at the contact site of which an inconspicuous fringe is recognizable (3, arrows) .

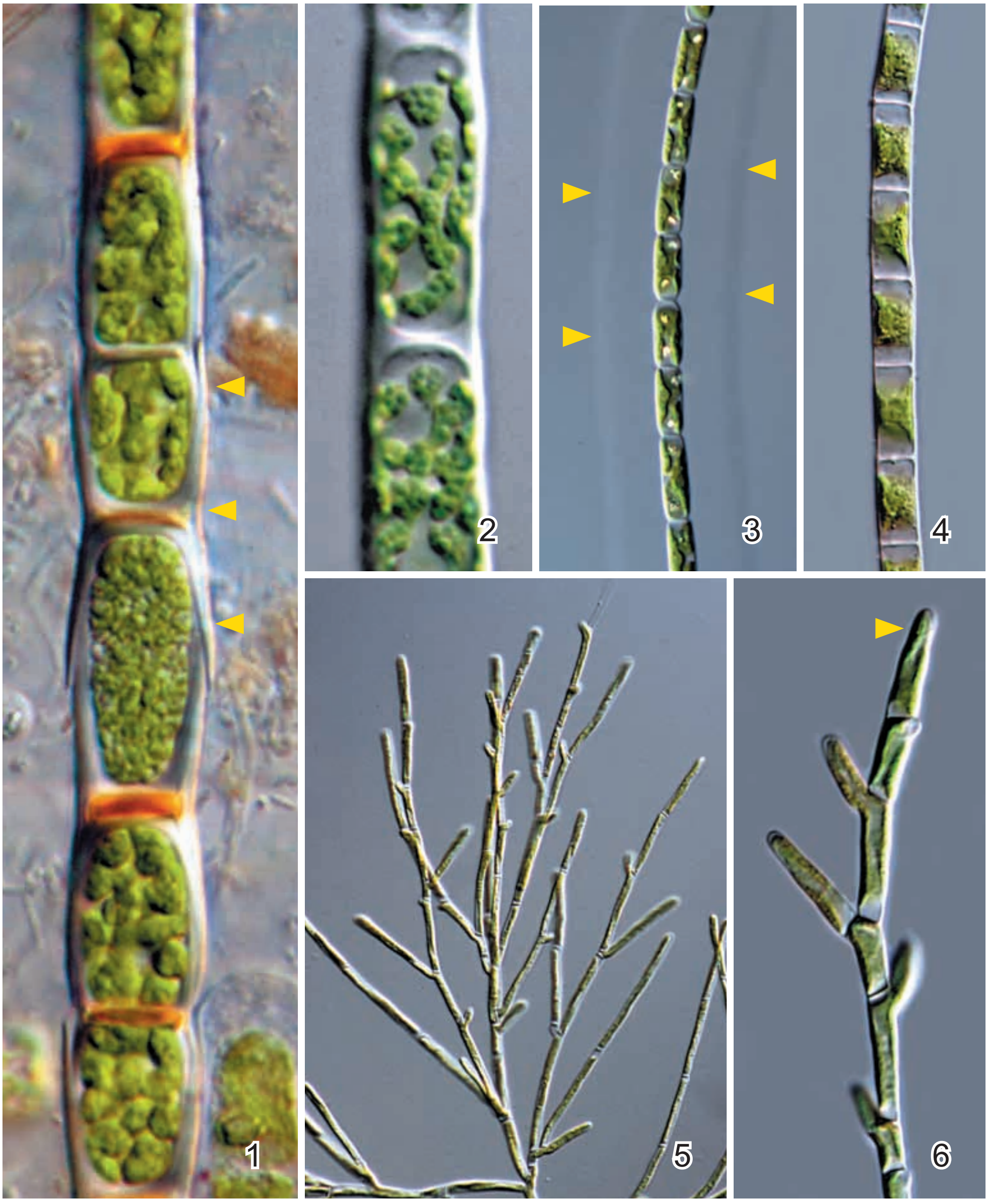


Fig. 1 – 6: Chlorophytes. These chlorophytes from Simmelried grow in linear or branched filaments. **1, 2:** *Microspora* has 5–15 µm wide filaments and can be identified by H-shaped crosswalls (1, arrowheads) and reticulate chloroplasts that lacking pyrenoids (2). **3:** The filament of *Geminella* is about 5 µm wide and covered with a delicate mucuos sheath (arrowheads). **4:** *Klebsmordium* has 8–10 µm wide, rectangular cells with a ribbon-shaped chloroplast. **5, 6:** *Microthamnion strictissima* has branched filaments and 2–5 µm wide cells (5). The chloroplasts lack a pyrenoid, and the terminal cells are tapered (6, arrowhead).

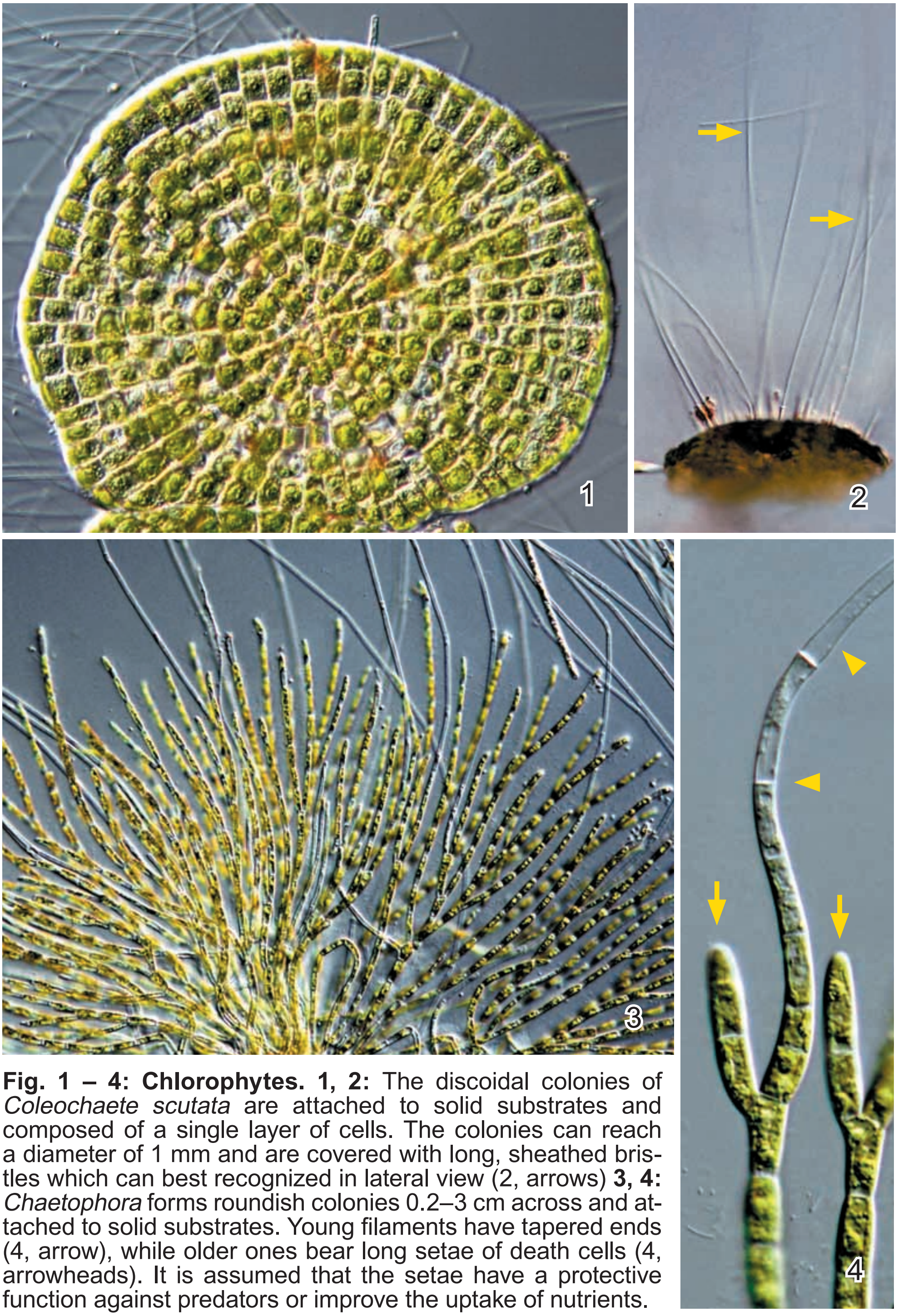


Fig. 1 – 4: Chlorophytes. 1, 2: The discoidal colonies of *Coleochaete scutata* are attached to solid substrates and composed of a single layer of cells. The colonies can reach a diameter of 1 mm and are covered with long, sheathed bristles which can best recognized in lateral view (2, arrows) **3, 4:** *Chaetophora* forms roundish colonies 0.2–3 cm across and attached to solid substrates. Young filaments have tapered ends (4, arrow), while older ones bear long setae of death cells (4, arrowheads). It is assumed that the setae have a protective function against predators or improve the uptake of nutrients.

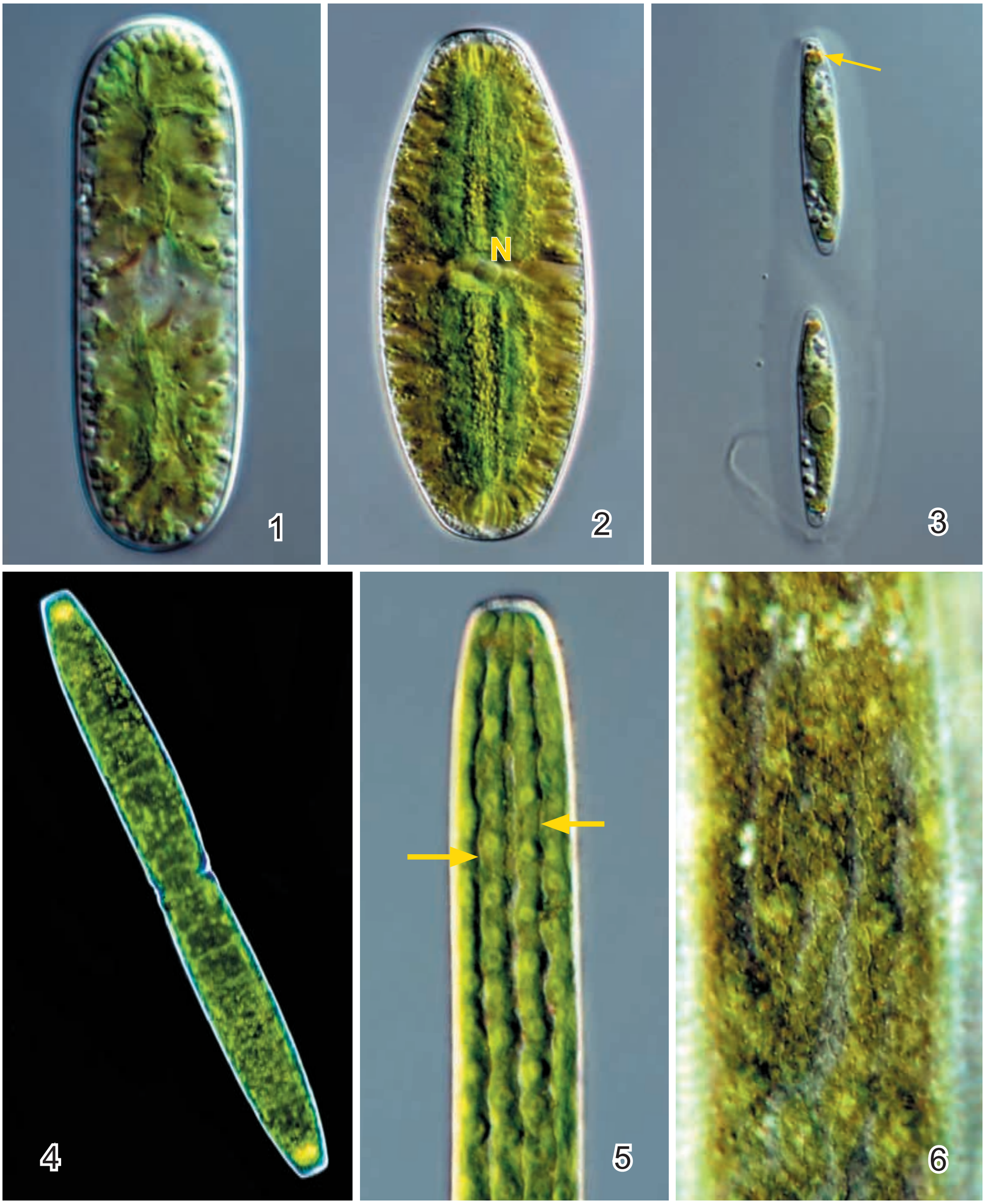


Fig. 1 – 6: Chlorophytes. 1 – 3: *Cylindrocystis brebissonii* (1; 70 µm), *Netrium digitus* (2; 85 µm), and *Spirotaenia erythrocephalum* (3; 30 µm) are desmids with a cylindrical or spindle-like shape. The nucleus of *N. digitus* (2) contains ~ 1200 chromosomes, the highest number ever found in eukaryonts! The ends of the spiral chloroplast of *S. erythrocephalum* contain reddish carotinoides (3, arrow). **4 – 6:** The chloroplasts of *Pleurotaenium ehrenbergii* (450 µm) are ribbon-shaped and aligned in parallel (5, arrows). On the surface of the cell wall, is a reticulate pattern caused by prismatic columns of mucus (6). N – nucleus.

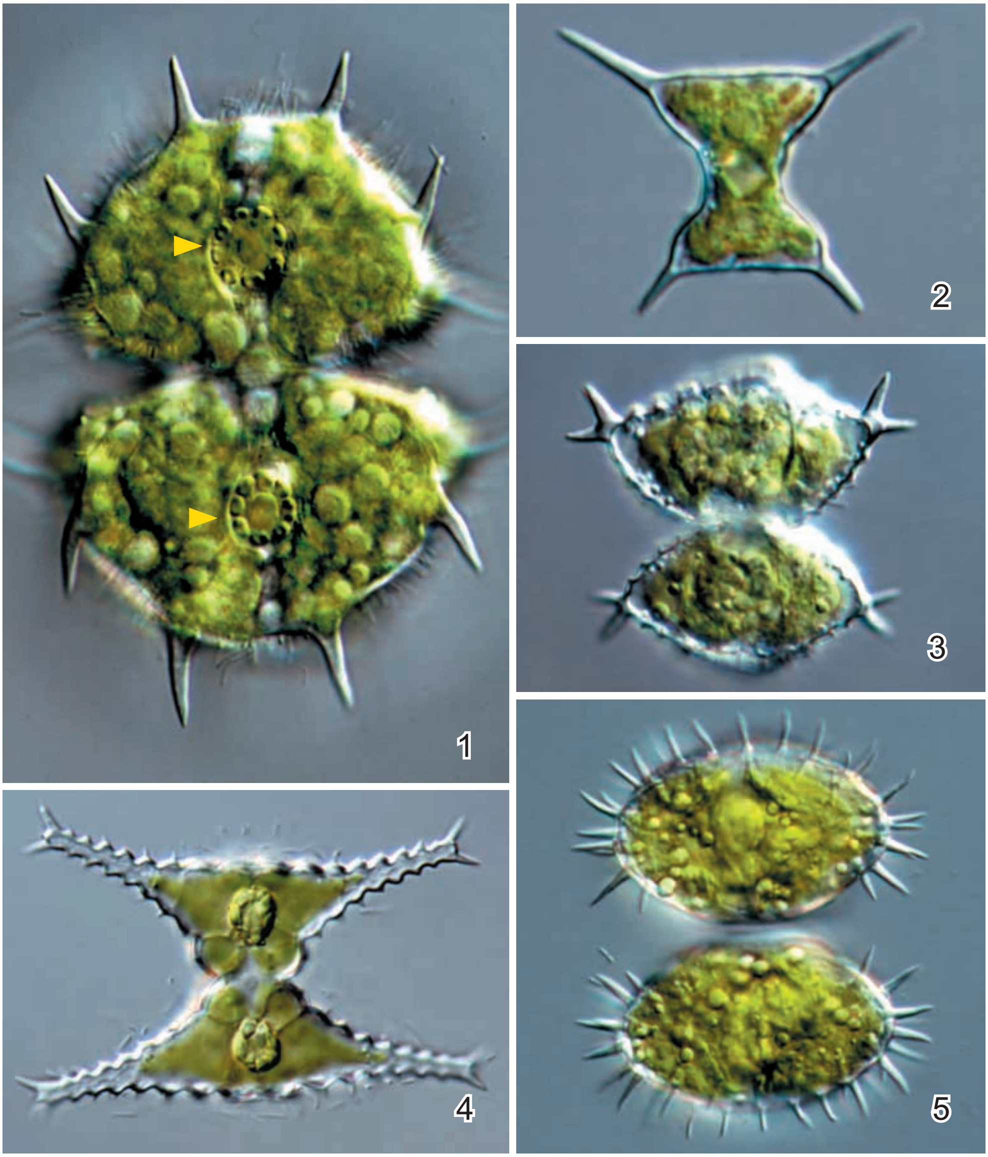
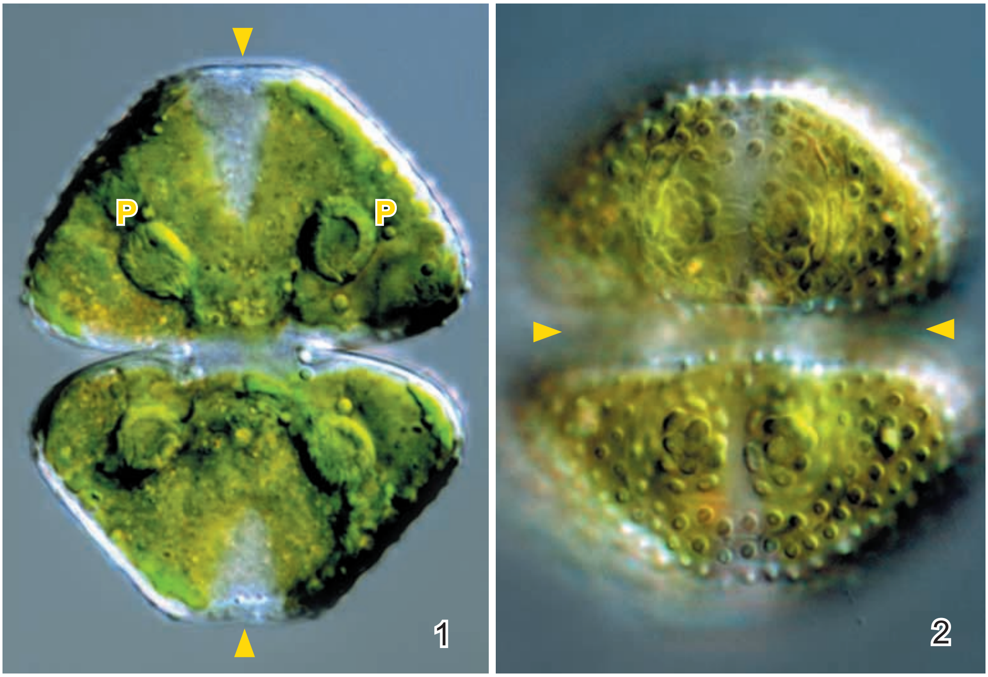


Fig. 1 – 5: Chlorophytes. 1: *Xanthidium cristatum* (70 µm) is divided into two polygonal semicells, each bearing about 10 lateral spines (four in focus). In the centre of the semicells occurs a characteristic pattern of pores and granules (arrowheads). In contrast to *Xanthidium,* the genus *Staurodesmus* (figure 2) has spines only at the apical edges. **2:** The minute *Staurodesmus extensus* (15 µm) has long spines extending from the apex in flat angles. **3:** The spines of *Staurodesmus avicula* (30 µm) are branched, and the surface is covered with warts. **4:** As an adaption to the planktonic habit, the spines of *Staurastrum simplicius* (30 µm) are branched and the semicells elongated laterally. **5:** The ellipsoidal semicells of *Staurastrum teliferum* (33 µm) are covered with many bristle-like spines.



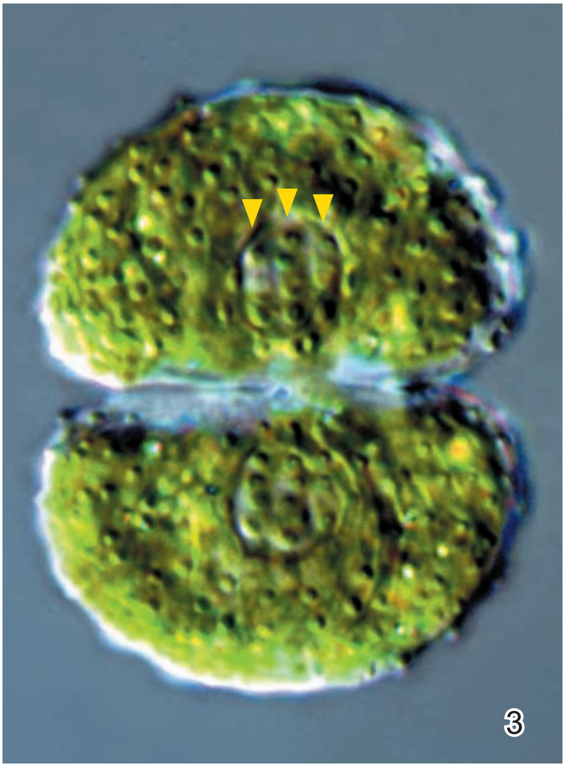
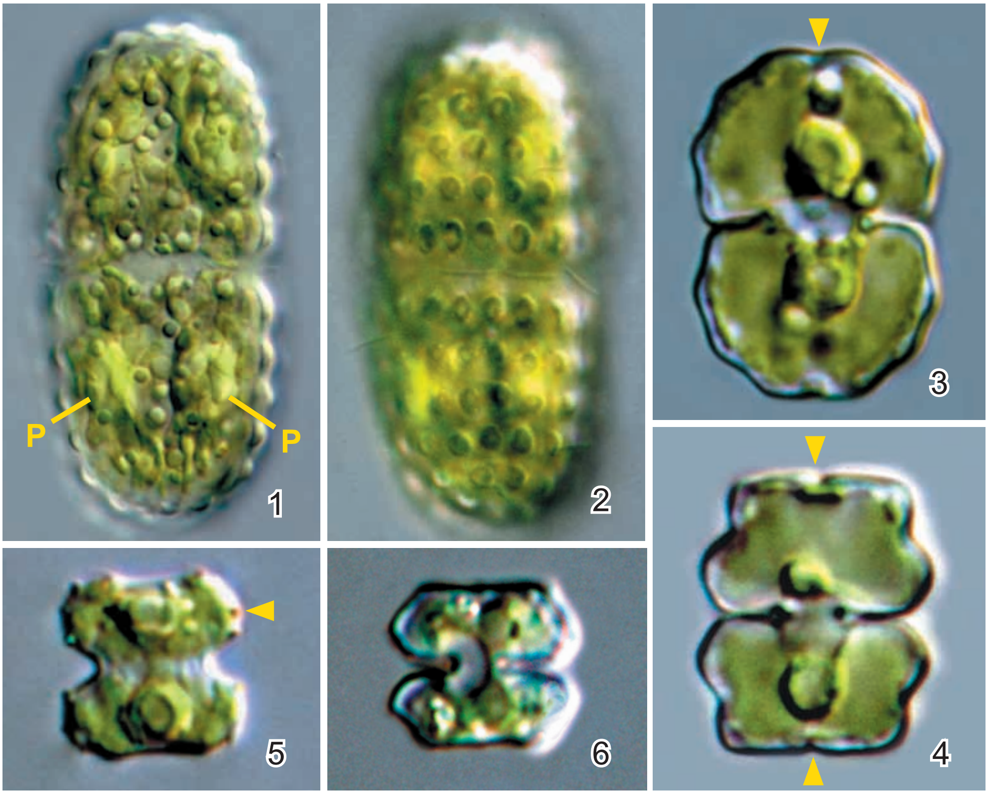


Fig. 1 – 3: Chlorophytes. *Cosmarium* is characterized by a clearly visible, central constriction called sinus. The hemispherical semicells are often conspicuously ornamented by warts, pores or granules. Most members of *Cosmarium* are adapted to nutrient-poor and slightly acidic water. Several species are common in Simmelried. **1, 2**: *Cosmarium turpinii* is about 70 µm long and the pyramidal semicells have flattened, sometimes even concave apices (1, arrowheads); and each semicell has two conspicuous pyrenoids (P). The angle (sinus) between the semicells is large (2, arrowheads), and the cell wall is ornamented by a concentric pattern of warts (2). **3:** *Cosmarium sexnotatum* is about 35 µm long and can be easily recognized by a circular field with three rows of warts in the mid of each semicell (arrowheads). P – pyrenoids.



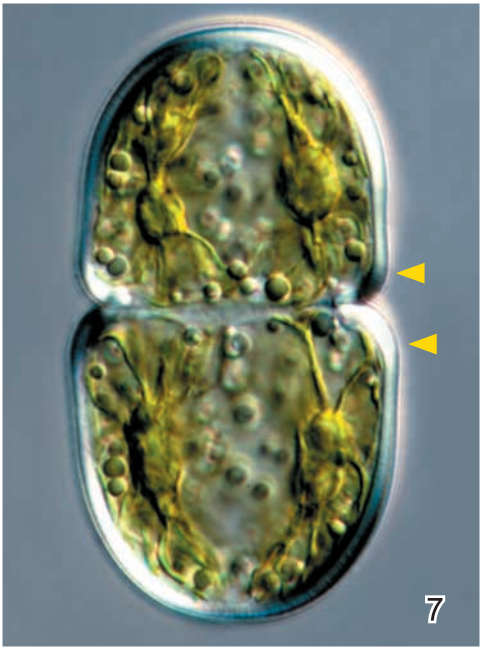


Fig. 1 – 7: Chlorophytes. 1, 2: *Cosmarium mansangense* is 50–80 µm long and covered with warts. It can be distinguished from *C. pseudamoenum* by the two pyrenoids per semicell (1). **3:** *Cosmarium venustum* is 25–50 µm long and has a wavy margin with concave apices (arrow). **4:** *Euastrum insulare* var. *sileacum*, the sole member of the genus in Simmelried, can be confused with the genus *Cosmarium*, but the 30 µm long cell has notched apices (arrowheads). **5, 6:** *Cosmarium regnesii* (5) and *C. abbreviatum* (6) are small, 15–20 µm long members of the genus. While *C. regnesii* has octagonal semicells with brownish warts (arrowhead), the semicells of *C. abbreviatum* are smooth and have a hexagonally distorted shape. **7:** *Cosmarium quadratum* is 50–90 µm lang and has a smooth cell wall with inconspicuous bulges near the sinus (arrowheads). P – pyrenoids.

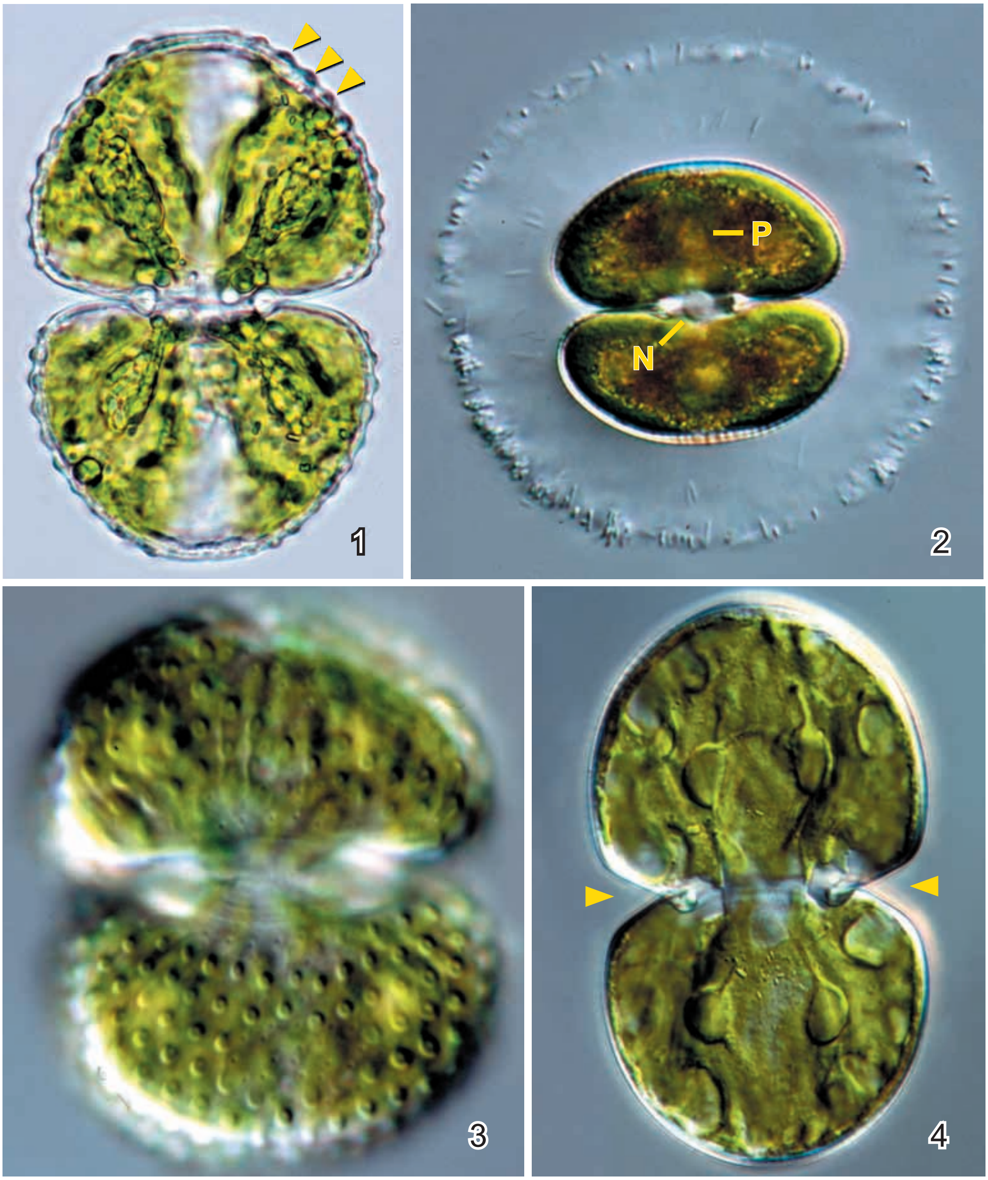


Fig. 1 – 4: Chlorophytes. 1: *Cosmarium botrytis* is about 70 µm long and is one of the most common species of the genus in Simmelried. It is easily recognized by the flattened apices and the regular convexities (warts, arrowheads) in optical section. **2:** The planktonic *C. depressum* is about 40 µm wide and has a single pyrenoid (P) in each semicell. The voluminous mucous coat improves buoyancy. **3:** *Cosmarium brebissonii* is about 50 µm long and has reniform semicells covered with a symmetric pattern of conical warts. **4:** *Cosmarium pachydermum* is about 90 µm long and has a smooth cell wall. The semicell edges are widely open (sinus, arrowheads). N – nucleus, P – pyrenoid.

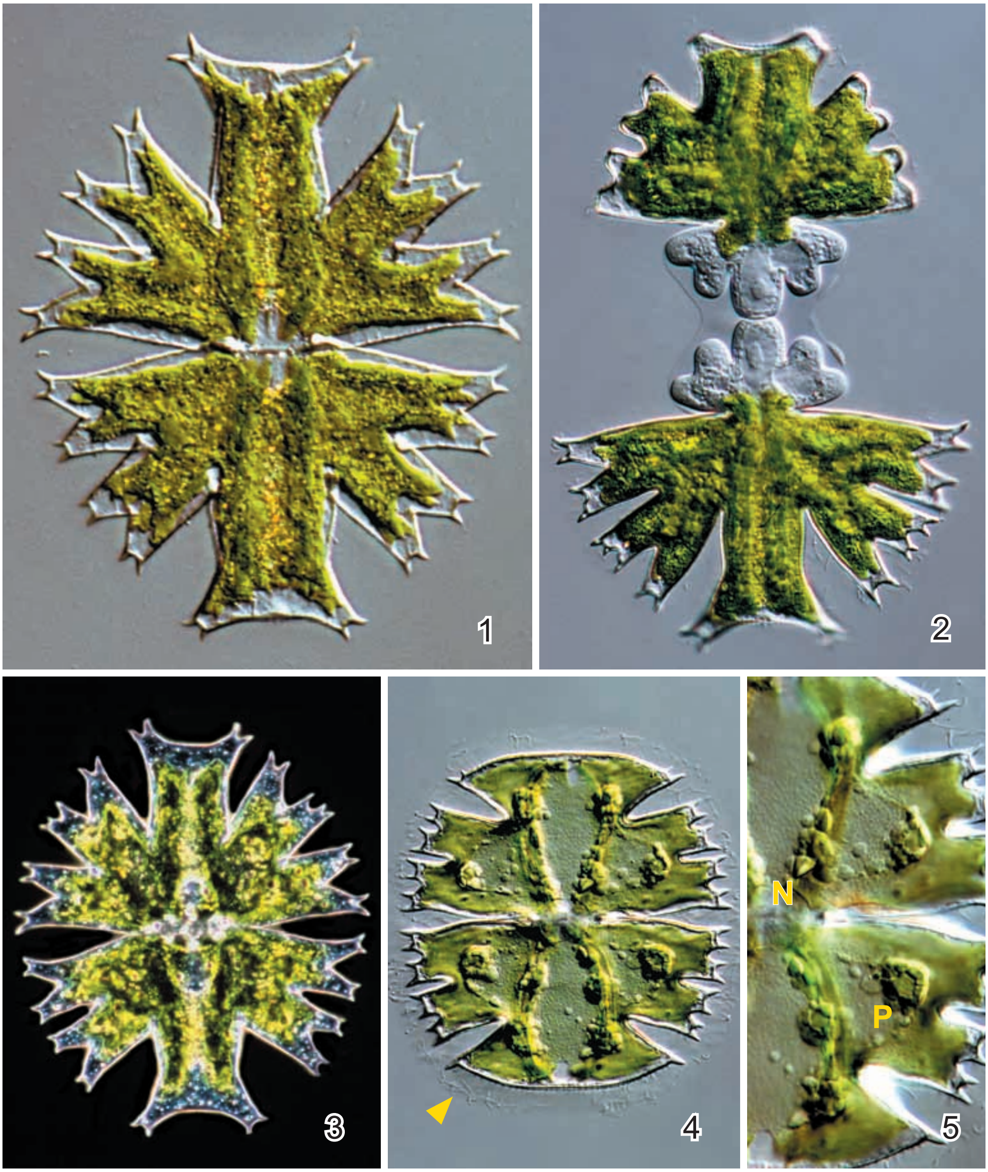


Fig. 1 – 5: Chlorophytes. Only two species of the genus *Micrasterias* occur in Simmelried. **1 – 3**: The semicells of *Micrasterias crux melitensis* (110 µm) show 5 lobes separated by deep notches. The apices are concave. **2**: Cell division. **3**: Dark field image. **4, 5 :** The lobes of *Micrasterias truncata* (100 µm) are much shorter and broader than those of *M. crux melitensis* shown above. The apices are convex and flattened. *Micrasterias truncata* is usually covered with a mucus layer, which is very hyaline and thus hardly recognizable (4, arrowhead). Note the pyrenoids (centres of starch production; 5, P) and the central nucleus (5, N). N – nucleus, P – pyrenoid.

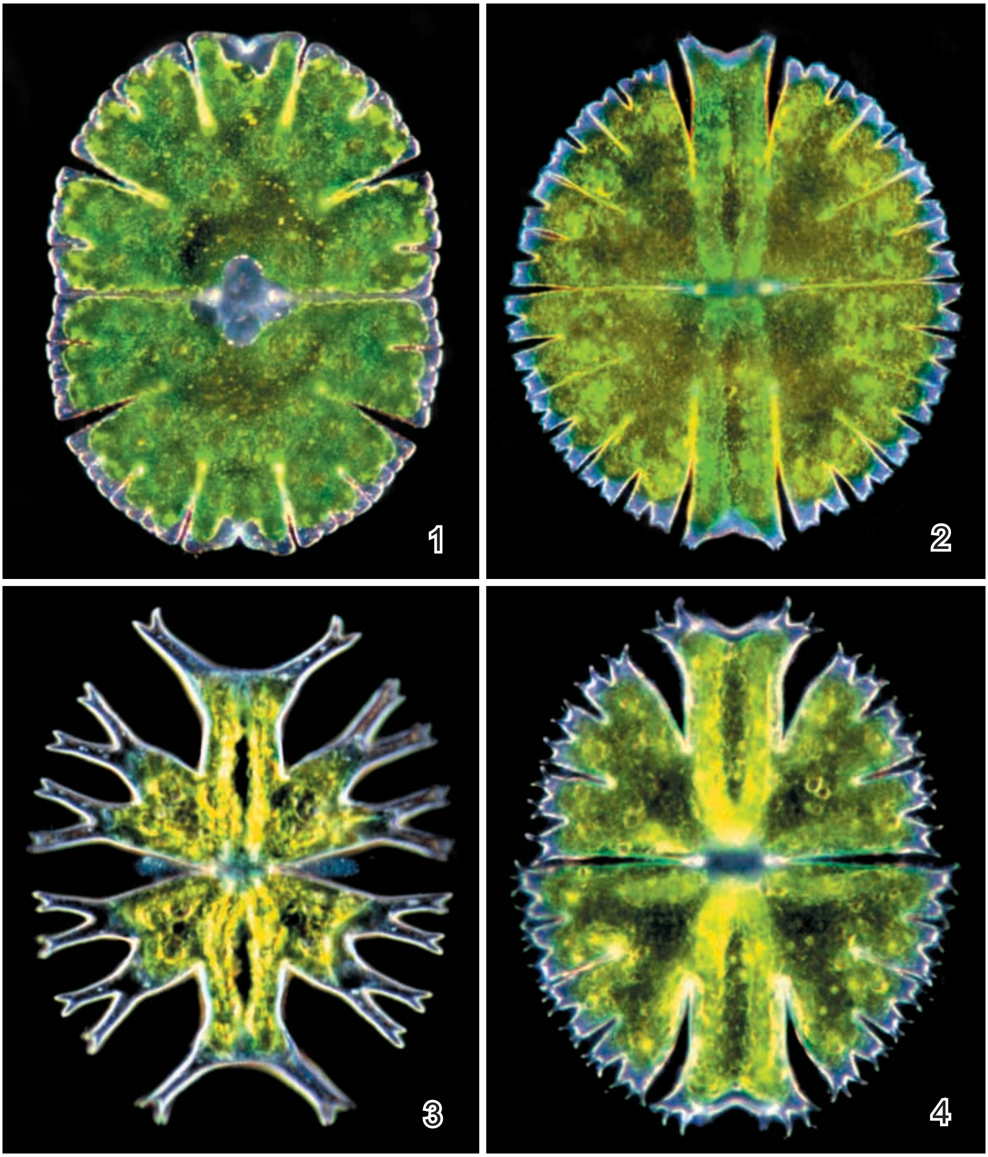


Fig. 1 – 4: Chlorophytes. Some further members of the genus *Micrasterias*, collected from the so-called Schwemm in the surroundings of the Walchsee (Tirol, Austria). *Micrasterias* is one of the most attractive genera within the desmids and an excellent example how nature create a high diversity on a simple, basic form. *Micrasterias* is highly adapted to nutrient poor, acidic water. Thus, it occurs mainly in *Spagnum* bogs and peat pools with a pH of << 5. In some cases, exceptionally large numbers of a single species can turn the water green. However, *Micrasterias* is now already fairly rare because most of its habitats have been destroyed ("ameliorated"). **1:** *Micrasterias denticulata* (150 µm). **2:** *Micrasterias rotata* (140 µm). **3:** *Micrasterias furcata* (170 µm). **4:** *Micrasterias apiculata* (120 µm).

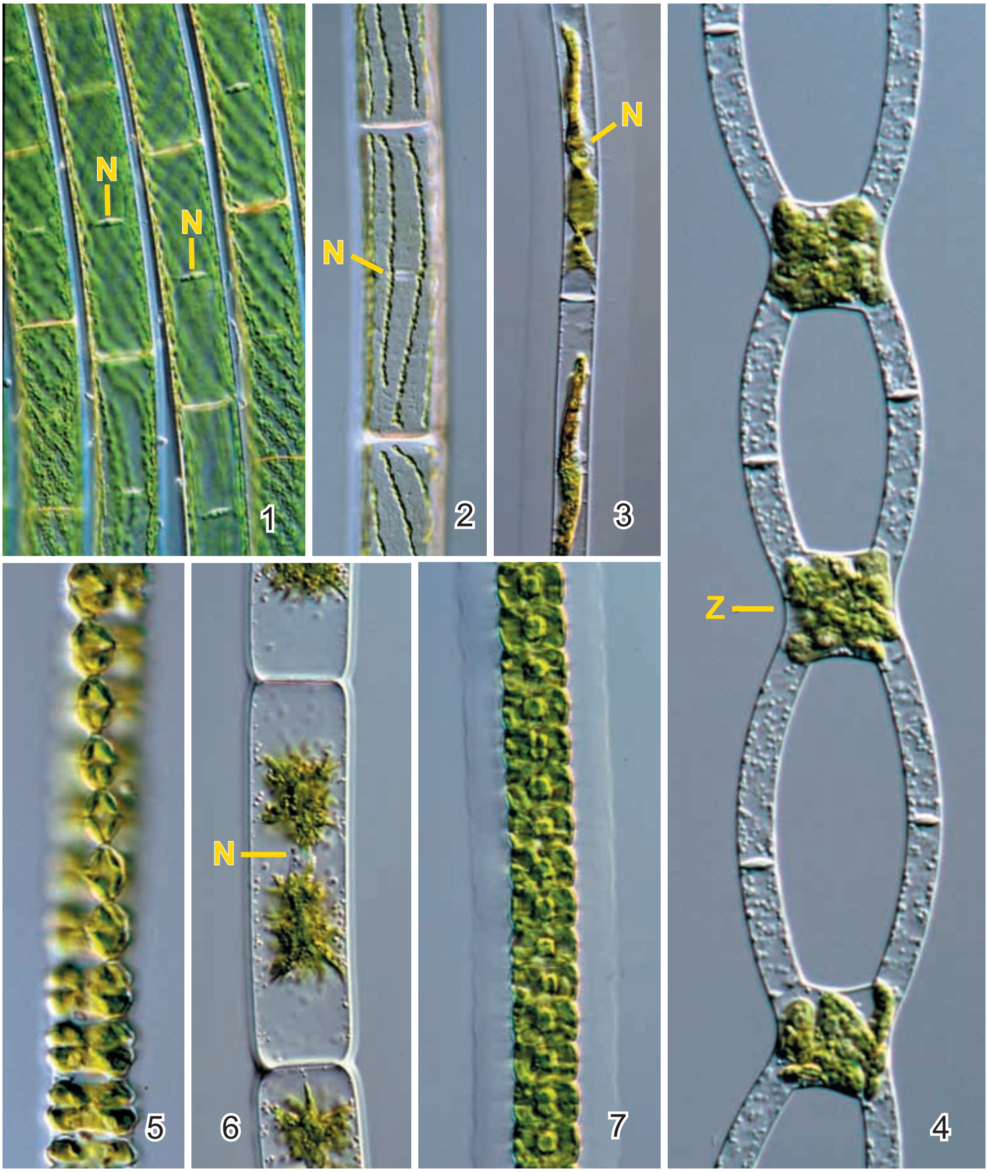
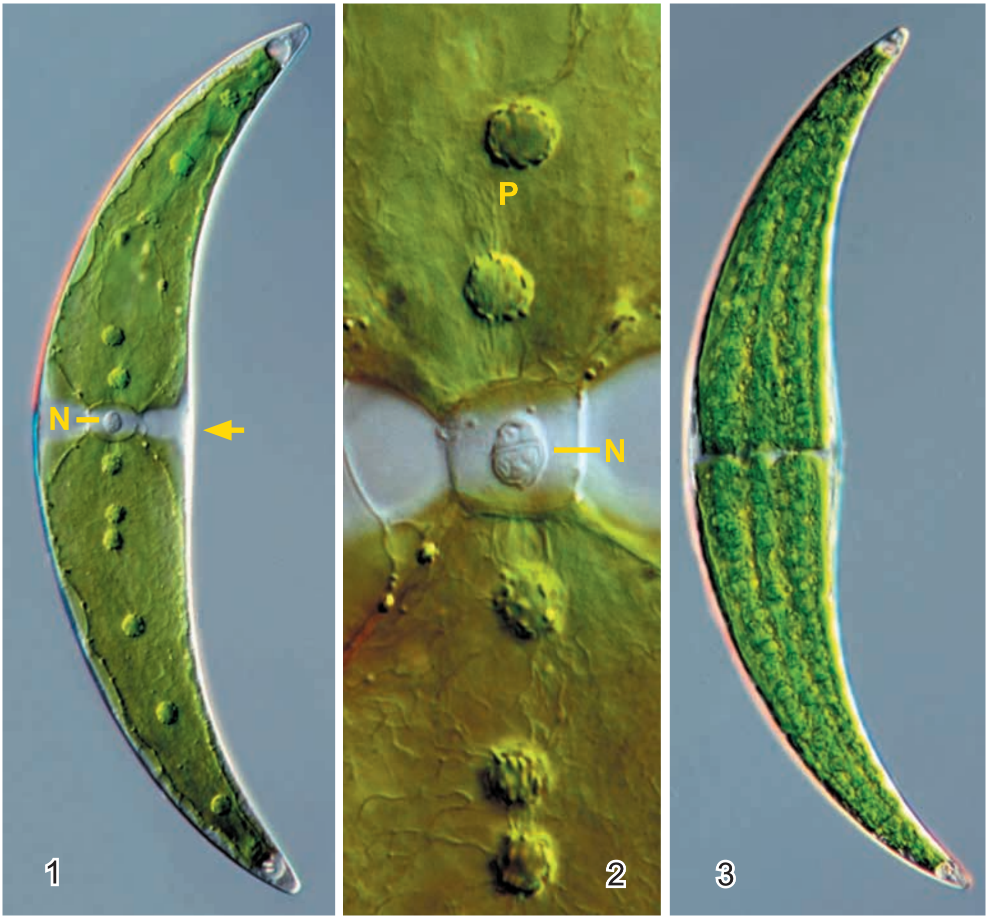


Fig. 1 – 7: Chlorophytes. The desmids comprise many filamentous genera and species. **1, 2:** *Spirogyra* spp. (width 30–40 µm) can often be found in floating mud and are easily recognized by the spiral chloroplasts. **3, 4:** *Mougeotia* spec. (width 30 µm) has a plate-like chloroplast and can often be found in the process of conjugation (4), a form of sexual reproduction. The product is a diploid, cube-shaped zygospore (4). All desmids can conjugate. **5:** *Desmidium swartzii* (width 25 µm) forms helical filaments. **6:** *Zygnema* spec. (width 35 – 40 µm) shows two star-like chloroplasts per cell. **7:** *Hyalotheca dissilens* (width 25 µm) is covered with a thick layer of protective mucus. N – nucleus, Z – zygospore.



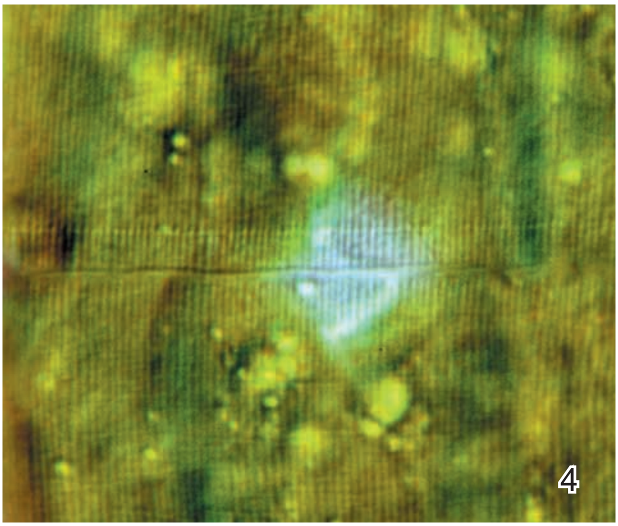


Fig. 1 – 4: Chlorophytes. *Closterium* is crescentic and not constricted in the centre. The cell wall is often ornamented with pores or lines. **1, 2:** The inner margin of *Closterium moniliferum* (320 µm) is slightly inflated in mid-body (1, arrow). The 4 - 10 pyrenoids (P) per semicell are aligned. The nucleus (N) is centrally located in a globular blister (2). **3, 4:** *Closterium ehrenbergii* var. *malinvernianum* (430 µm) looks very similar to *C. moniliferum*, but has a finely striated surface and scattered pyrenoids. N – nucleus, P – pyrenoid.

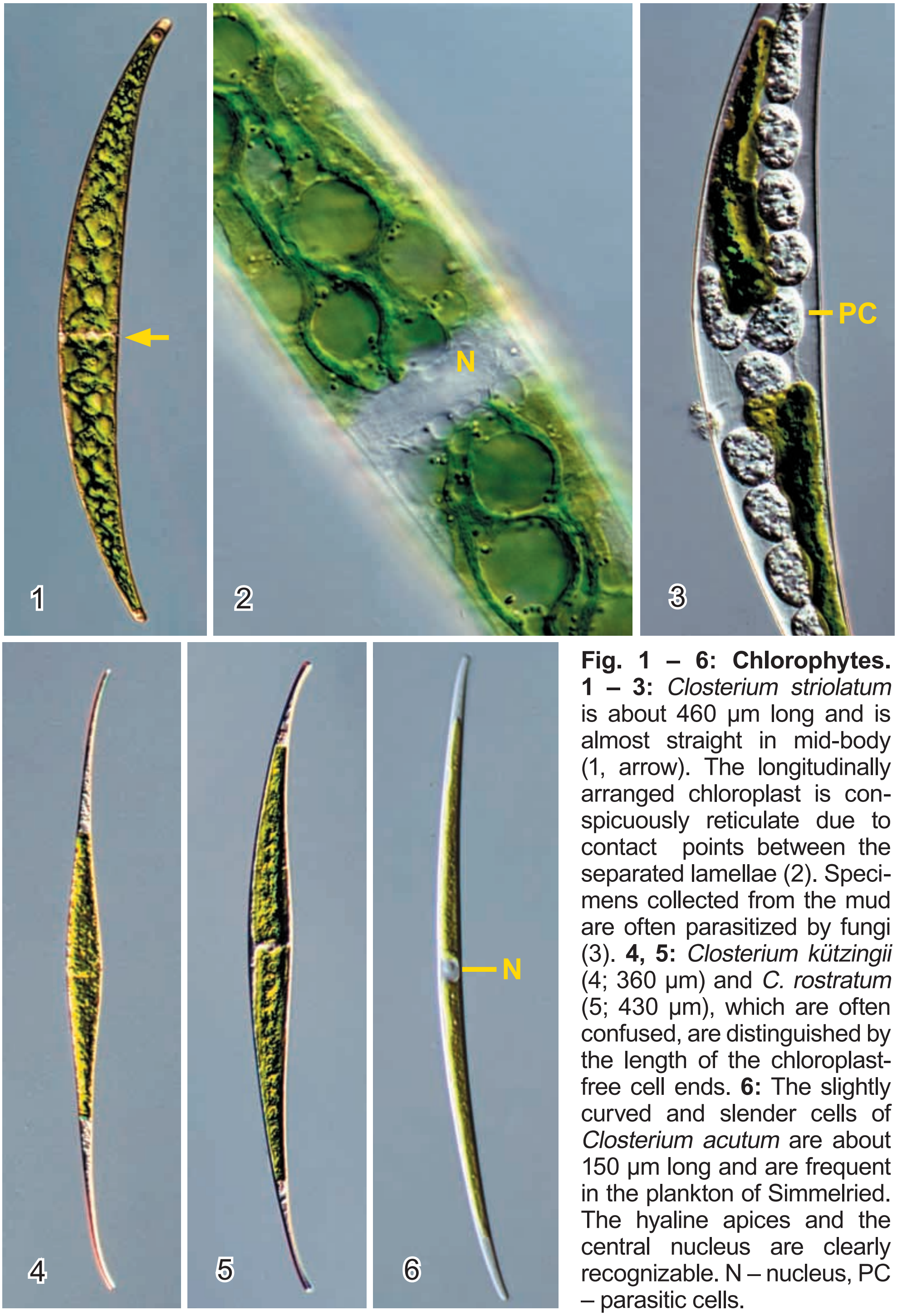


Fig. 1 – 6: Chlorophytes. 1 – 3: *Closterium striolatum* is about 460 µm long and is almost straight in mid-body (1, arrow). The longitudinally arranged chloroplast is conspicuously reticulate due to contact points between the separated lamellae (2). Specimens collected from the mud are often parasitized by fungi (3). **4, 5:** *Closterium kützingii* (4; 360 µm) and *C. rostratum* (5; 430 µm), which are often confused, are distinguished by the length of the chloroplast-free cell ends. **6:** The slightly curved and slender cells of *Closterium acutum* are about 150 µm long and are frequent in the plankton of Simmelried. The hyaline apices and the central nucleus are clearly recognizable. N – nucleus, PC – parasitic cells.

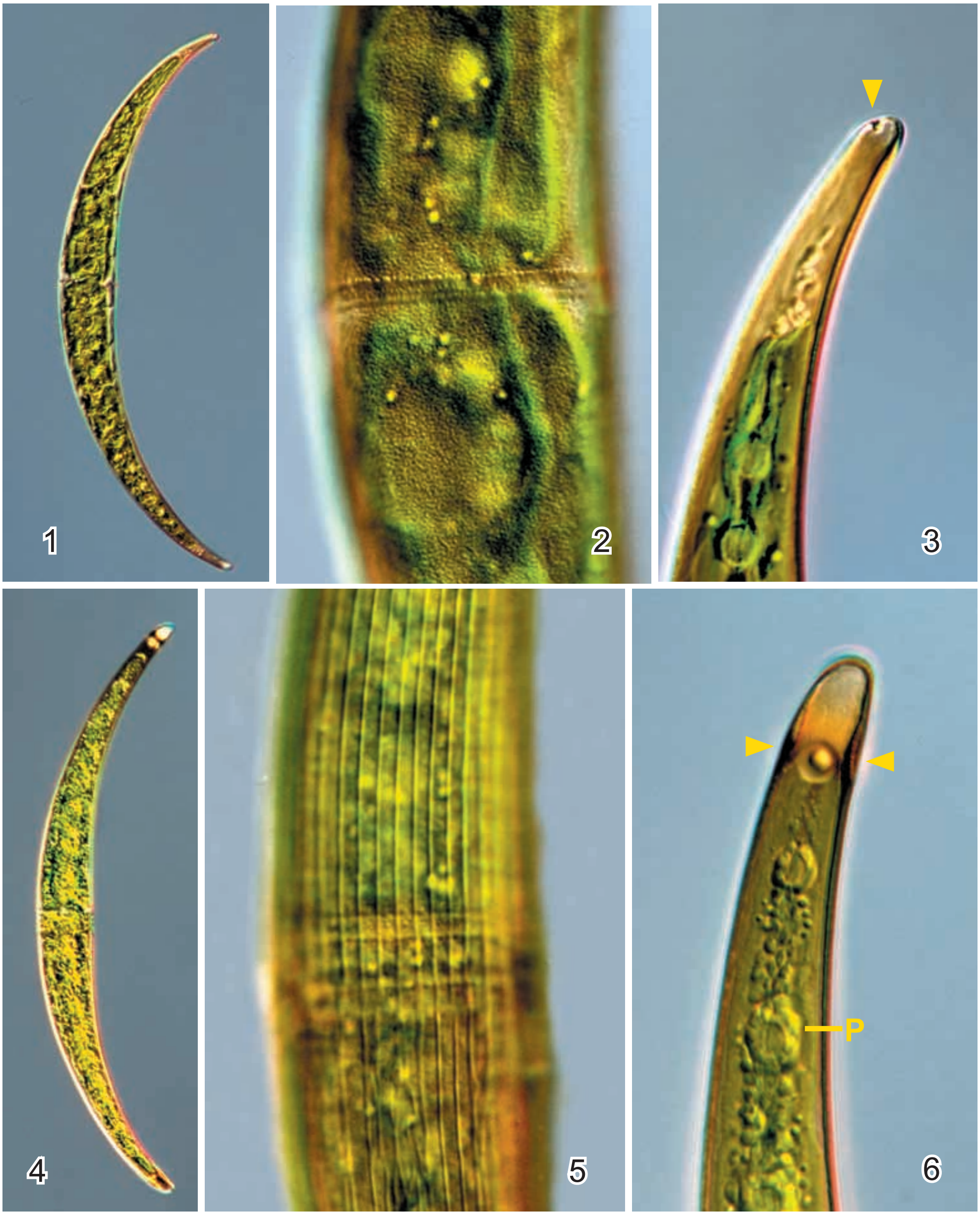
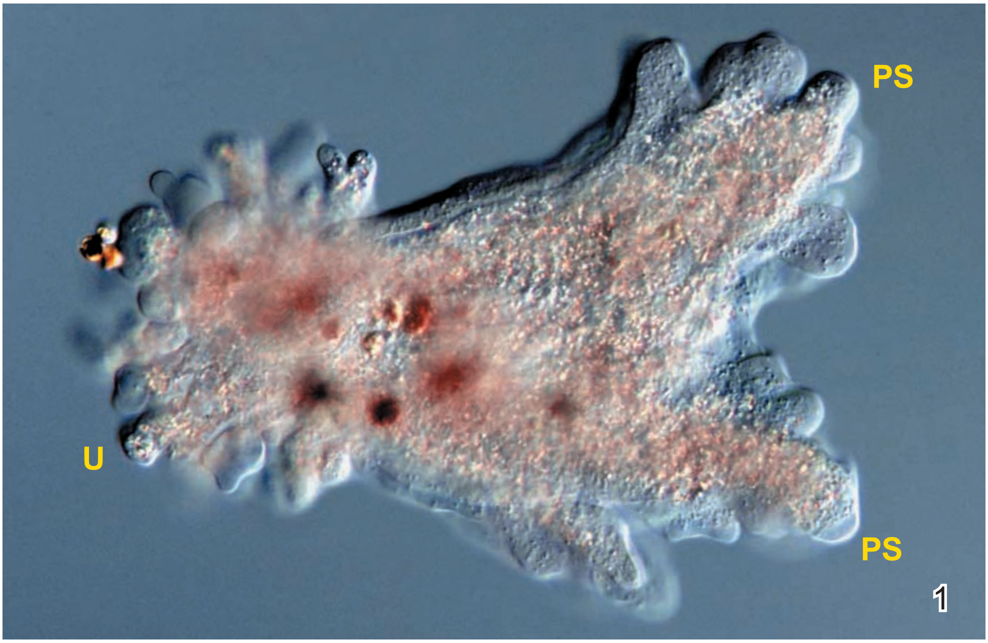


Fig. 1 – 6: Chlorophytes. 1 – 3: *Closterium dianae* is about 300 µm long and is one of the most common desmids in Simmelried. The slender cells are crescentic and lack any inflation of the inner margin (1). The surface is often finely grained (2). The apices show a conspicuous pore (3, arrowhead). **4 – 6:** *Closterium nematodes* (330 µm) has a similar size as *C. dianae,* but is less curved (4). The mid has distinct ridges across the width of the cell (5). Below the apices, is a thickened, dark ring (6, arrowheads). P – pyrenoid.

Fig. 1 – 6: Chlorophytes. 1 – 3: The up to 1 mm long cells of *Closterium turgidum* var. *borgei* appear as green needles to the naked eye. The longitudinal striae of the cell wall are fine but distinct (2). In the middle of the cell, brown bands may appear in dividing specimens (2, arrowheads). The thickened apices are typical for this species (3, arrow). **4:** The only 60 µm long *Closterium incurvum* is almost semicircular, and each semicell has only one pyrenoid. The vesicle in the end contains a single gypsum crystal (4, arrowheads). **5 – 6:** *Closterium cornu* is about 210 µm long and a very slender species often found in the plankton. The middle of the cell is straight, while the hyaline ends are slightly curved. The apices are blunt and lack vesicles (6). N – nucleus, P – pyrenoids.



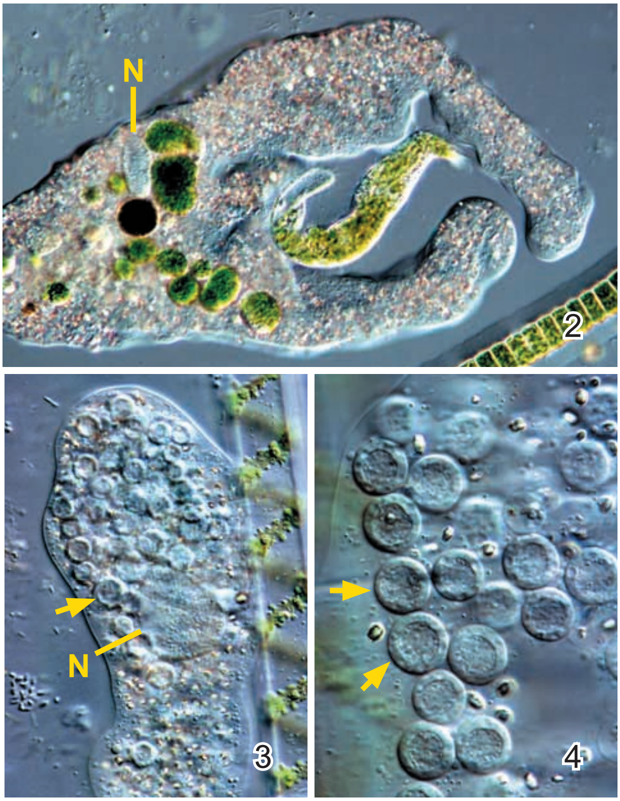
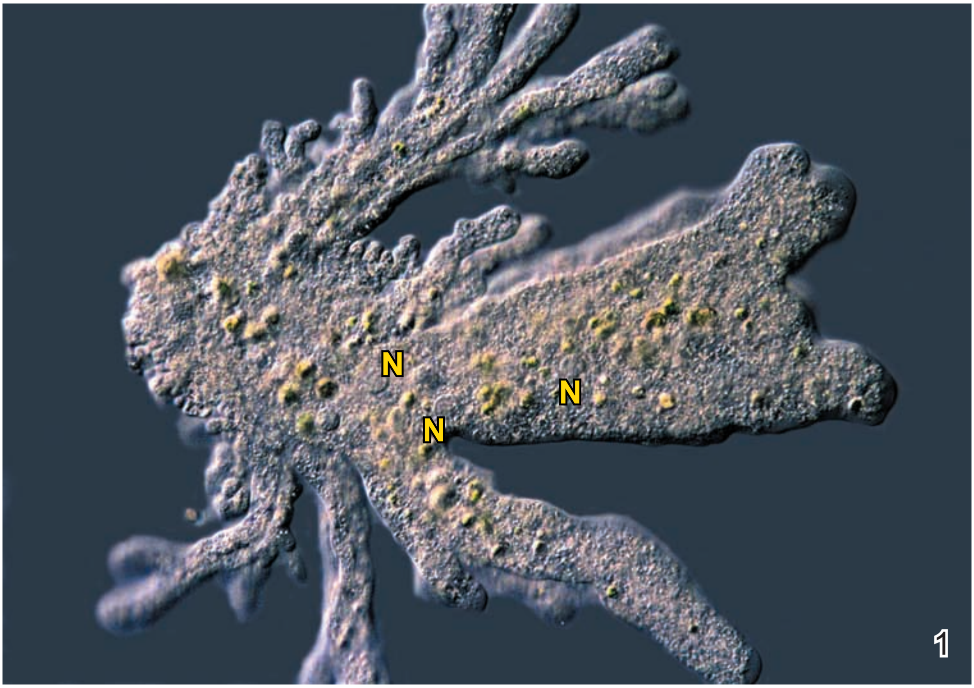


Fig. 1 – 4: Amoebae. The amoebae are moving by extension of lobose (finger-like) or filose (thread-like) pseudopodia ("feet"). Members that lack test are called naked amoebae. The Simmelried is a habitat with a high variety of naked amoebae, only some of which can be shown in this booklet. **1:** The mud is inhabited by the "classic" *Amoeba proteus* (200–750 µm). This large amoeba has broad, rounded pseudopodia (PS) and a large single nucleus. **2:** This specimen of *Amoeba proteus* just captured a ciliate, *Pseudoblepharisma tenue* var. *chlorelligera,* with two large pseudopodia. **3, 4:** Some specimens of *A. proteus* were attacked by an endoparasite, filling the amoeba with hundreds of globular cells 8–10 µm across (3, 4; arrows). N – nucleus, PS – pseudopodia, U – uroid ("tail").



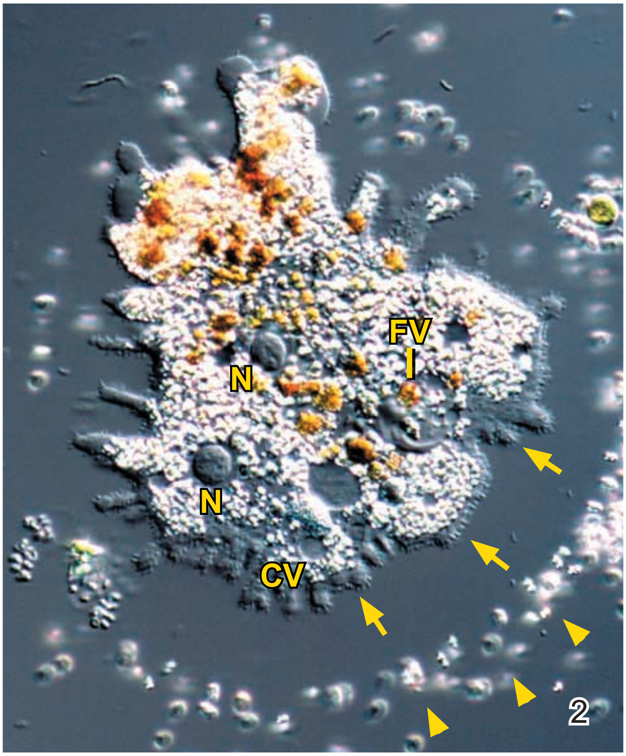
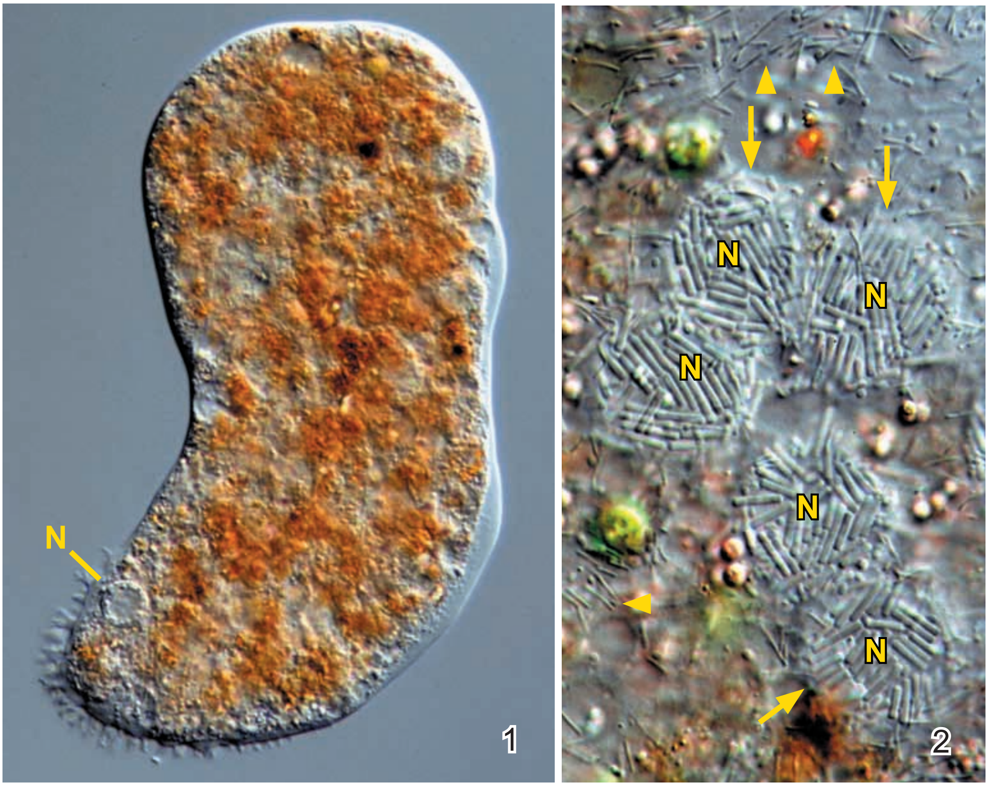


Fig. 1 – 2: Amoebae. 1: *Chaos carolinense* is a polypodial, up to 2 mm (!) long amoeba and very similar to *Amoeba proteus*, except of the many nuclei (N). This species is very rare in Simmelried. **2:** The pseudopodia of *Dinamoeba mirabilis* (~ 200 µm) are covered with bacterium-like rods or scales (arrows). It is unclear whether these rods are a specific character of this species (Page 1988), but they occur in all specimens from the Simmelried. *Dinamoeba mirabilis* is usually covered by a 20–30 µm thick mucuos layer, recognizable by the attached bacteria (arrowheads). The two nuclei (N) and one of several contractile vacuoles (CV) are recognizable within the cell. FV – food vacuoles, N – nucleus.



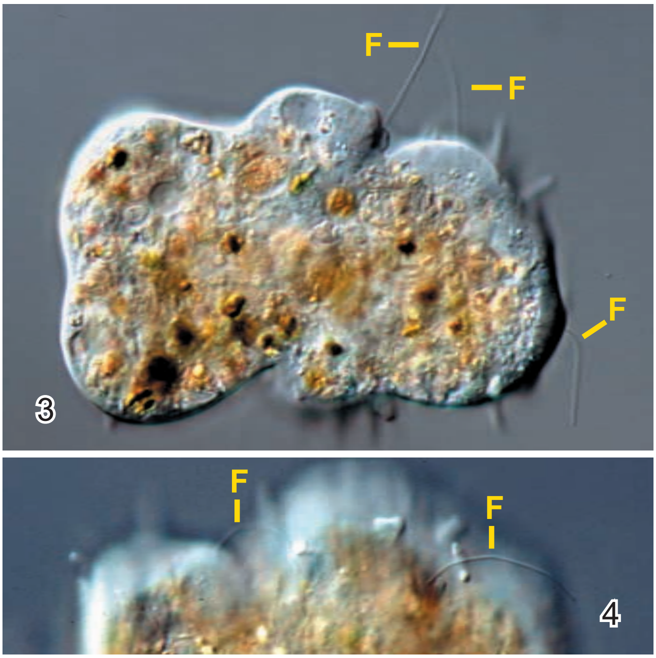
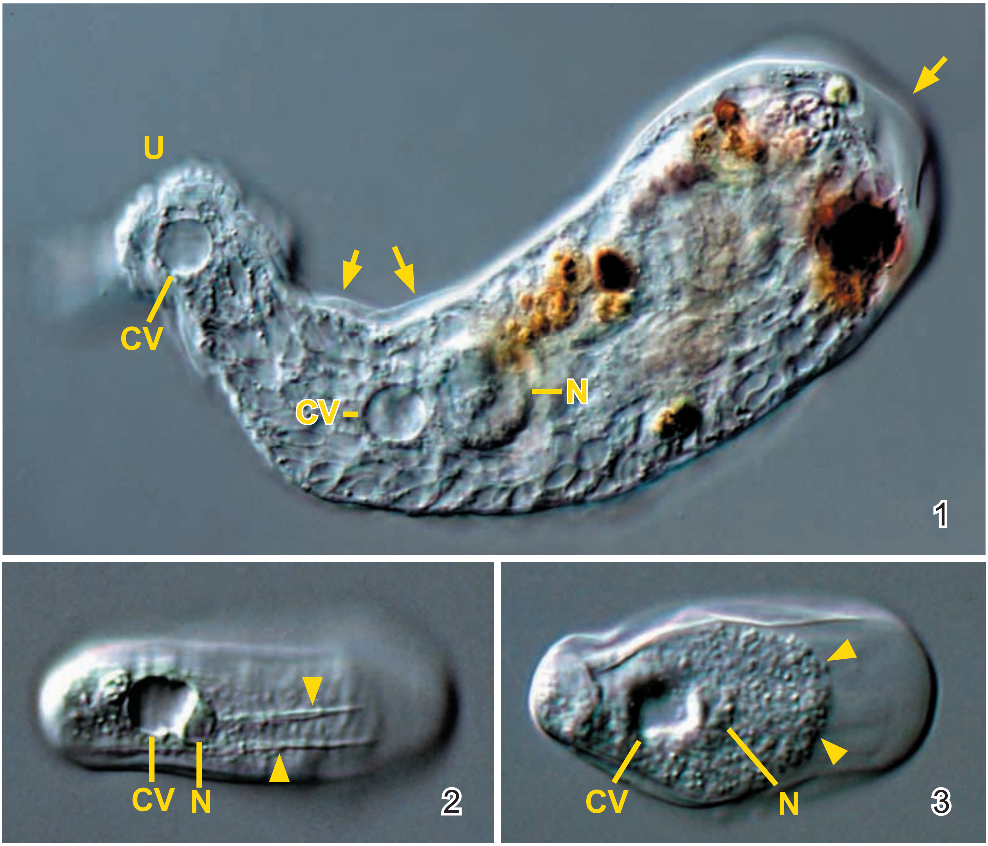


Fig. 1 – 4: Amoebae. Naked amoebae representing a single pseudopodium are called monopodial and occur in a so-called *limax* form. **1 – 4:** *Pelomyxa palustris* is up to 2 mm (!) long and lives in the mud of Simmelried. The cell is studded with nuclei, symbiotic bacteria (2, arrowheads), ingested mud, and mineral grains. All nuclei are about 6 µm across and covered with a monolayer of rod-shaped, symbiotic bacteria (2, arrows). The species lacks Golgibodies and mitochondria, but can form non-motile flagella up to 30 µm long (3, 4). F – flgaella, N – nuclei.



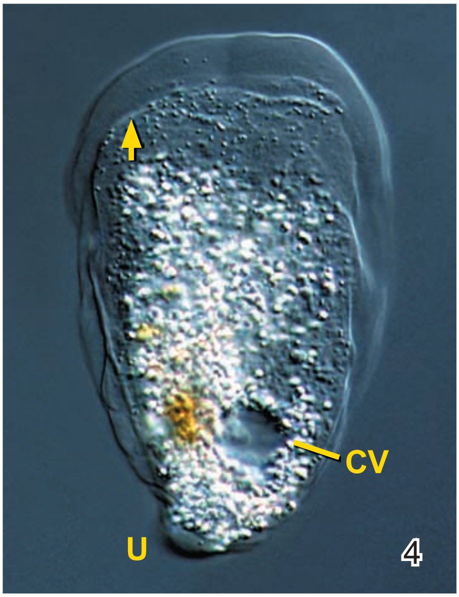
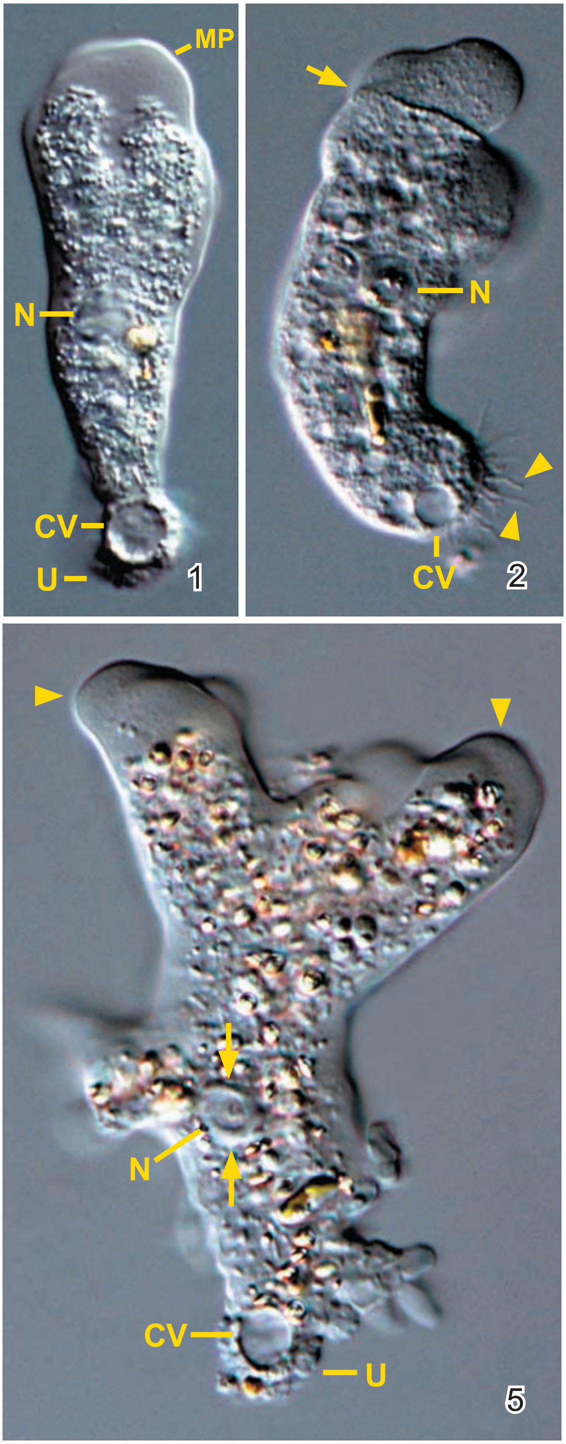


Fig. 1 – 4: Amoebae. *Thecamoeba* spp. are monopodial amoebae with a prominent hyaline front when moving. Frequently, the surface has longitudinal folds. The plasm is viscous and refractive. **1:** *Thecamoeba proteoides* (60–280 µm) forms thin, hyaline caps anteriorly and in mid-body (arrows). The plasm is highly vacuolated and appears frothy. **2, 3:** *Thecamoeba striata* (30–80 µm) can be easily recognized by the longitudinal folds on the dorsal side of the moving cell (2, arrowheads). The anterior third of the cell is hyaline ectoplasm and sharply separated from the endoplasm (3, arrowheads). **4:** The plasm cap of *Thecamoeba sphaeronucleolus* (80–130 µm) is crescentic, and the endoplasm is often filled with scattered granules (arrow). A conspicuous, knobby uroid (U) is usually visible at posterior end. CV – contractile vacuole, N – nucleus, U – uroid.



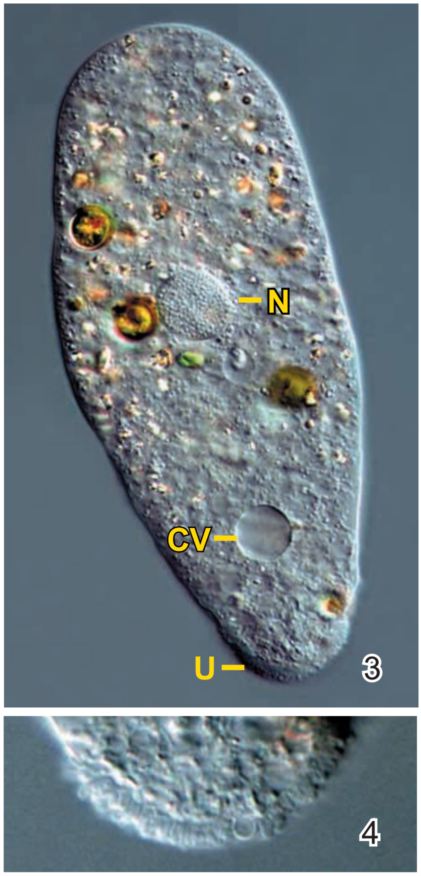


Fig. 1 – 5: Amoebae. 1: Gliding *Saccamoeba limax*, which are 40–100 µm long, have a hyaline cap and a bulb-like uroid (U). **2:** Many filaments (arrowheads) extend from the uroid of *Saccamoeba clava*, which is 80–100 µm long. When moving, the eruptive plasm forms a temporary demarcation (arrow). **3, 4:** *Trichamoeba villosa* is 250–500 µm long and is a "*limax*" amoeba. Locomotion is a continuous flow, and the uroid is a villous bulb (4). **5:** *Polychaos fasciculatum* is polypodial and 100–140 µm long. The pseudopods have clear caps (arrowheads). The species can be recognized by two crescentic bodies in the nucleus (arrows). CV – contractile vacuole, MP – monopodium, N – nucleus, U – uroid.

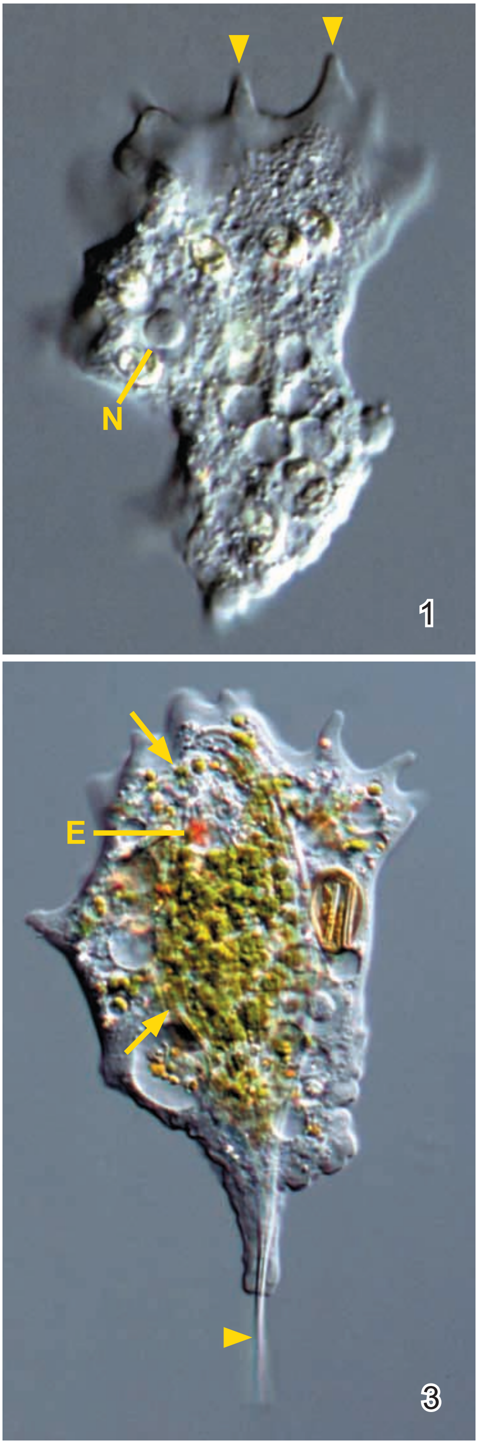


Fig. 1 – 3: Amoebae. Amoebae of the genus *Mayorella* produce V-shaped or mamillate frontal pseudopodia. **1 – 3:** *Mayorella penardi* (70–100 µm) from life (1) and in the scanning electron microscope (2). It is one of the most common members of the genus in Simmelried and has mamillate pseudopodia (1, 2; arrowheads). The nucleus is near cell centre (1). Usually, *M. penardi* feeds on bacteria and flagellates, but it is able to ingest also large algae like *Phacus lismorensis* (3, arrows). Within the ingested cell the red eyespot is visible. Because the amoeba is not able to cover the whole ingested cell, the posterior spine of *P. lismorensis* projects from the body proper (3, arrowhead). E – eyespot, N – nucleus.

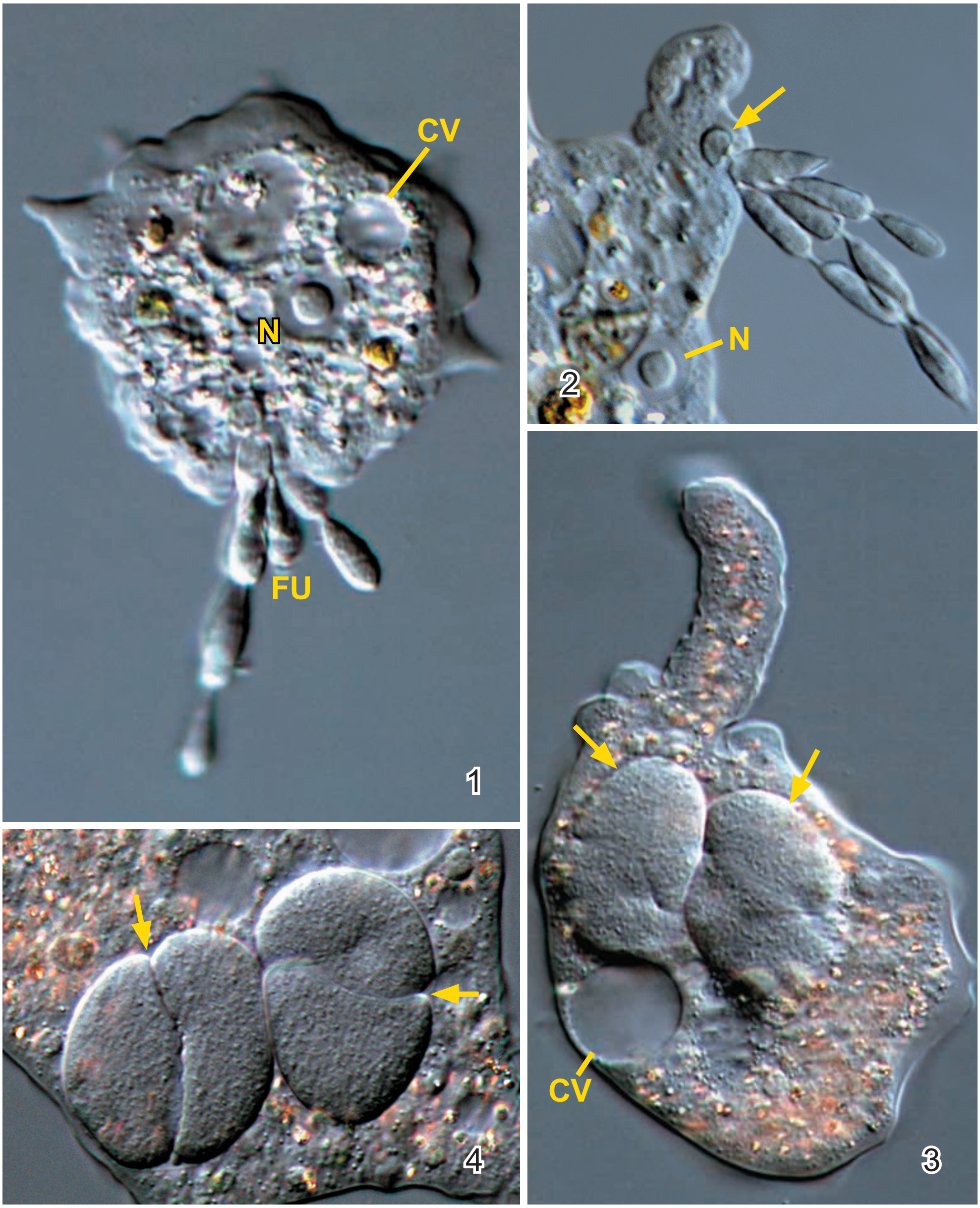


Fig. 1 – 4: Amoebae. *Mayorella penardi* is 70–100 µm long and is often affected by parasites. **1, 2:** Frequently, *M. penardi* is parasitized by *Amoebophilus simplex*, a fungus which extends from the posterior body end. Though it seems to be an ectoparasite, the "anchor-cell" (haustorium) is inside of the amoeba (2, arrow). **3, 4:** In a 210 µm long specimen of *Mayorella* spec., two large, immobile structures could be observed (~ 60 x 40 µm, arrows). They appear similar to nuclei, but have distinct notches (4, arrows). Likely, this is another sort of parasite. CV – contractile vacuole, FU – fungus, N – nucleus.

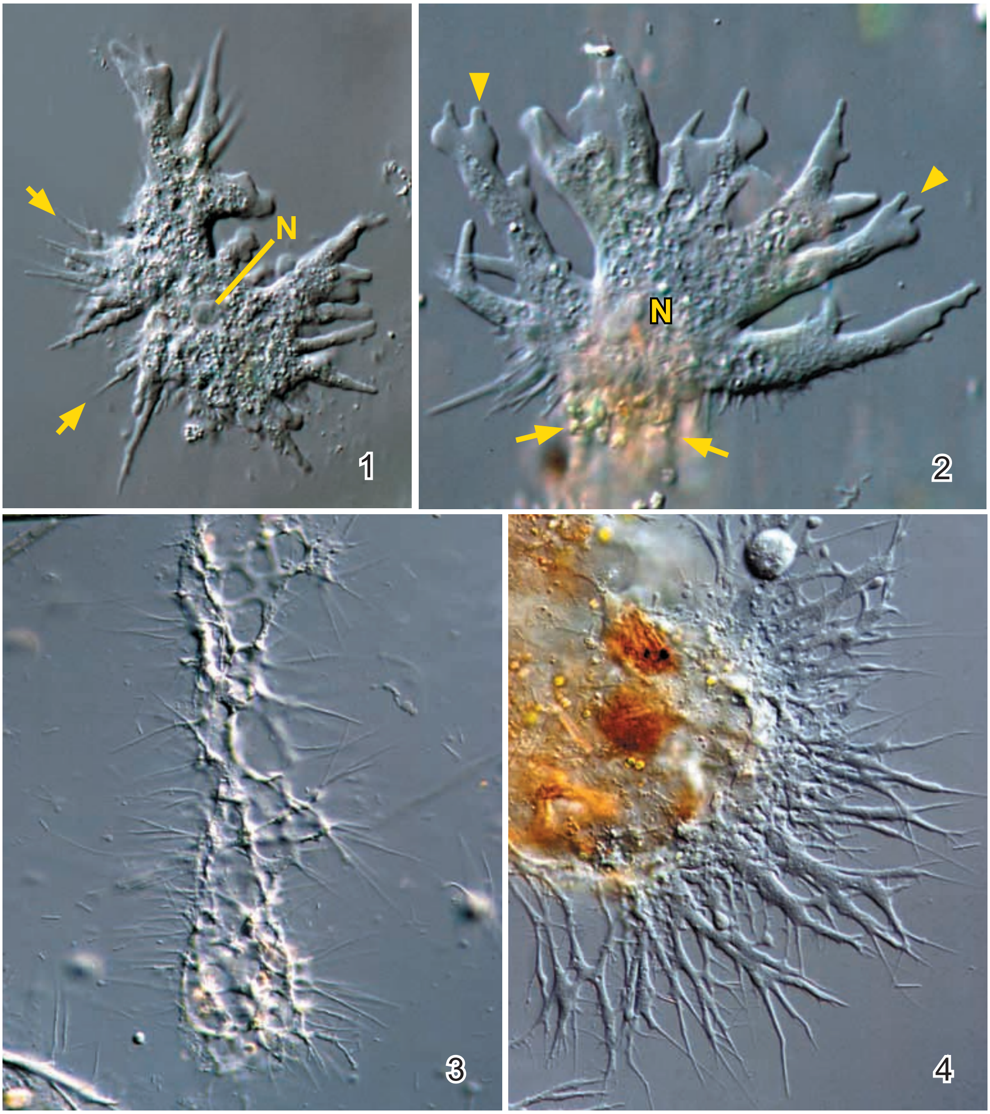
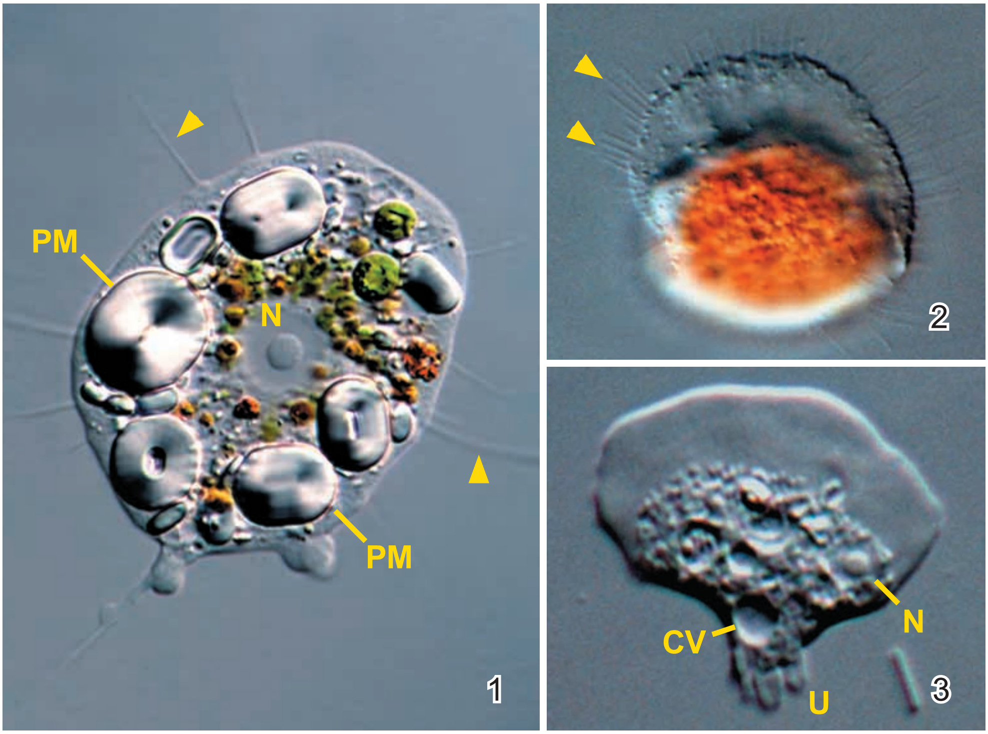


Fig. 1 – 4: Amoebae. *Leptomyxa* spp. are widely distributed reticulate and polypodial amoebae in the mud of Simmelried. The genus can be separated from *Rhizamoeba* by the lack of *limax*-formed stages in the life cycle. Two of the three described species of *Leptomyxa* occur in Simmelried. **1, 2:** *Leptomyxa fragilis* (100 –500 µm) has an irregularly formed nucleus (N) and numerous filose-like pseudopodia, arising from the posterior end (1, arrows). The anteriorly extending pseudopodia are branched to finger-like structures (2; arrowheads). Frequently, the posterior end of the amoeba is covered with particles (2; arrows). **3, 4:** *Leptomyxa reticulata* (40 µm–3 mm) forms three-dimensional structures of anastomosing pseudopodia (3). The multinucleate (> 100 nuclei) plasmodium can spread to highly anastomosing, flat pseudopodia (4). N – nucleus.



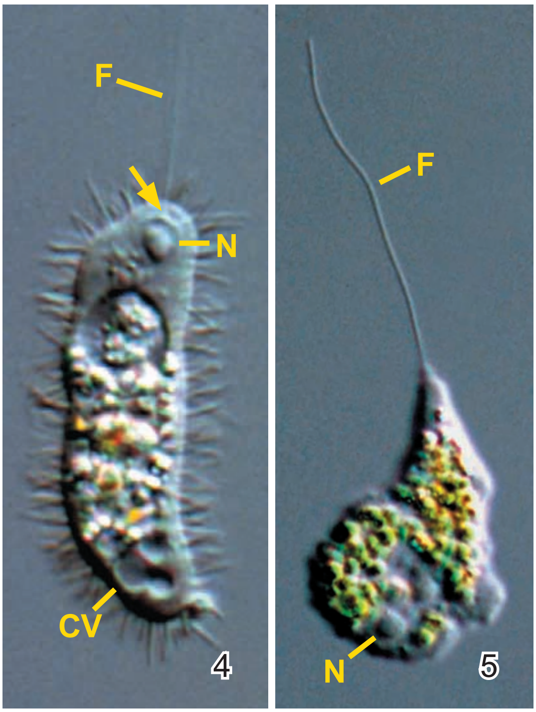


Fig. 1 – 5: Amoebae. 1: This specimen of *Nuclearia* spec. (50 µm) is filled with paramylon grains from an ingested *Euglena*. Note the filopodia (arrowheads) and the central nucleus. **2:** *Hyalodiscus rubicundus* (15–90 µm) is gliding on a broad radiating pseudopodium, with delicate filopodia extending from the margin (arrows). **3:** The hyaloplasmatic cap of *Vanella simplex* (40–50 µm) is almost semicircular. The posterior end shows a finger-like uroid (U). **4, 5:** Some naked amoebae from Simmelried have a flagellum. The flagellum of *Mastigameoba setosa* (4; 70–100 µm) originates from the nucleus (arrow). The amoeba is covered with 4–6 µm long filaments. *Mastigella* spec. (5; 40–50 µm) can be distinguished from *Mastigamoeba* by the flagellum which is not connected to the nucleus. CV – contractile vacuole, F – flagellum, N – nucleus, PM – paramylon, U – uroid.

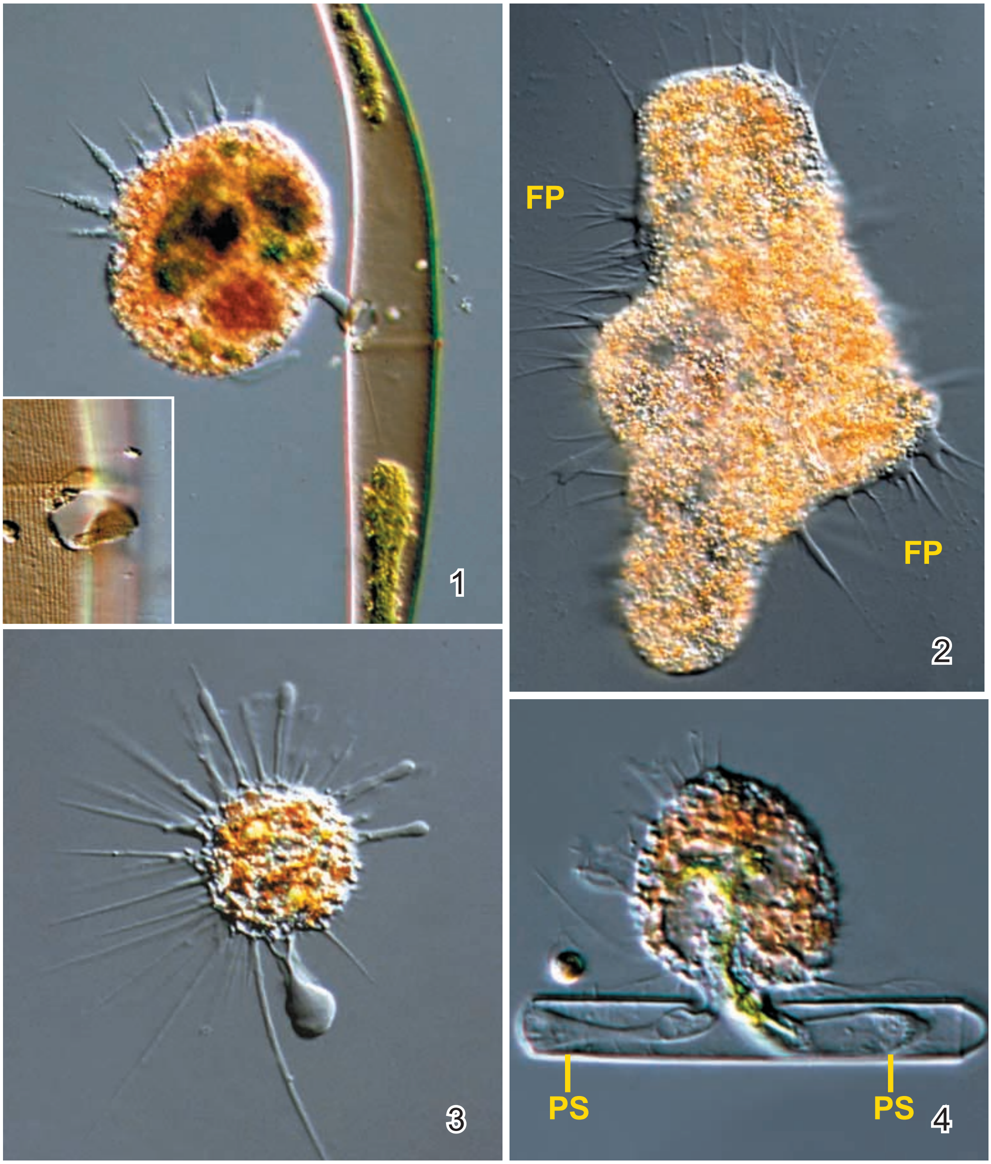


Fig. 1 – 4: Amoebae. *Vampyrella* was named for the ability to penetrate the cell wall of algae and feeding on the contents. The cell wall is pierced by an enzymatic process resulting in a circular hole (1, inset). Some of the described species are specialized on certain genera of algae. The cytoplasm of *Vampyrella* is often orange or reddish from carotine granules. **1, 2:** *Vampyrella closterii* (50–200 µm) attacks only *Closterium* spp. After ingesting of the chloroplast, the amoeba rounds up and forms a cyst (1). **2:** A spread specimen with arising filopodia. **3, 4:** When gliding, *Vampyrella lateritia* is globular and has claviform or filiform pseudopodia. It feeds on *Mougeotia.* FP – filopodia, PS – pseudopodia.

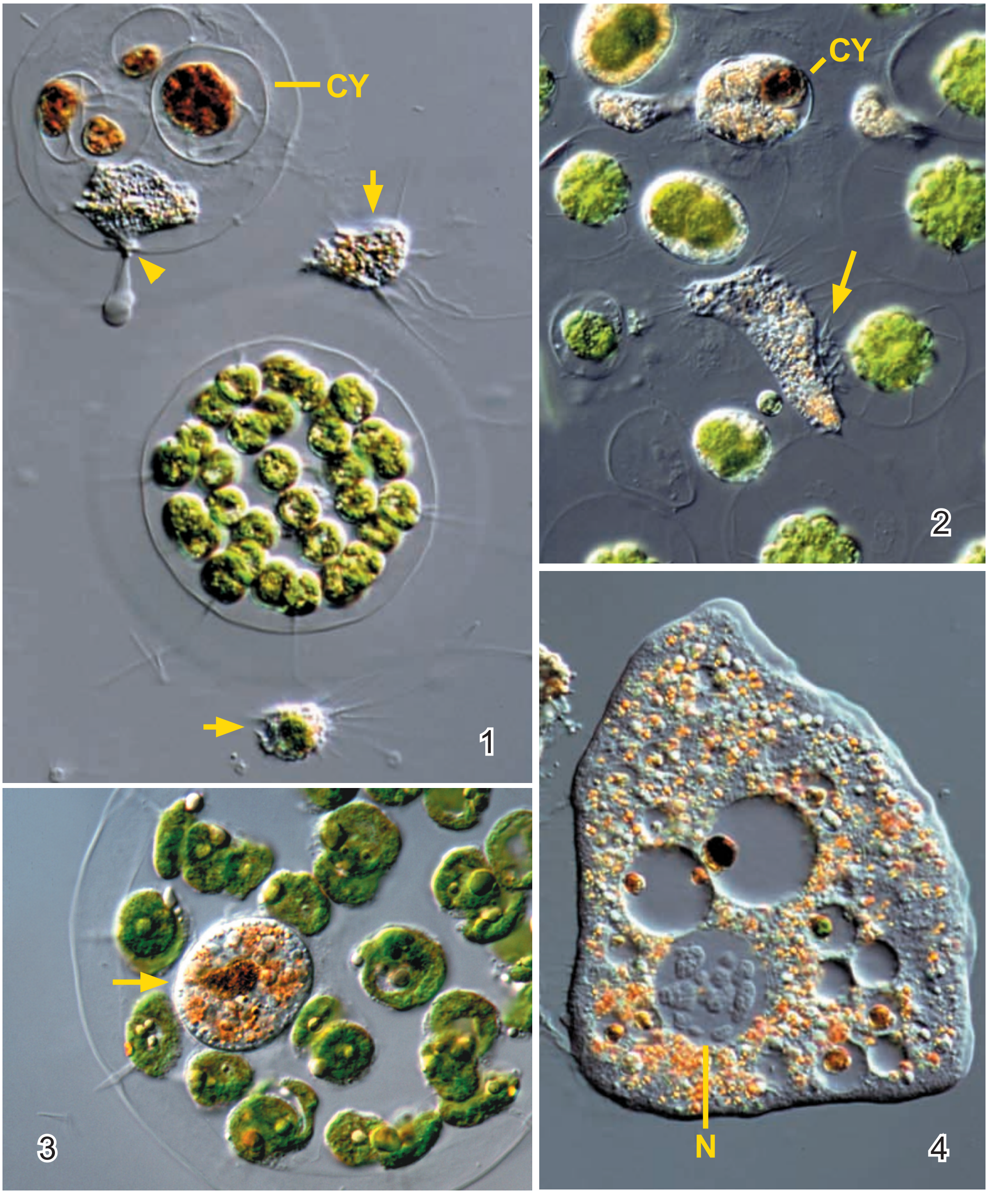


Fig. 1 – 4: Amoebae. A likely undescribed species of *Vampyrella* is specialized to feed on *Eudorina elegans*. After attaching to the gelatinous coat of *E. elegans* (1, arrow), *Vampyrella* (30–40 µm) penetrates the coat and ingests the algae (2, arrow). After feeding, the amoeba rounds up building a refractive cyst about 20 µm across. The colour of the ingested algae turn brownish (3, arrow) and after 1 - 2 days the cyst releases up to three new *Vampyrella*, which leave the dead *Eudorina* colony (1, arrowhead). When squashed, the nucleus and the orange digestion remnants become distinct (4). CY – cyst, N – nucleus.

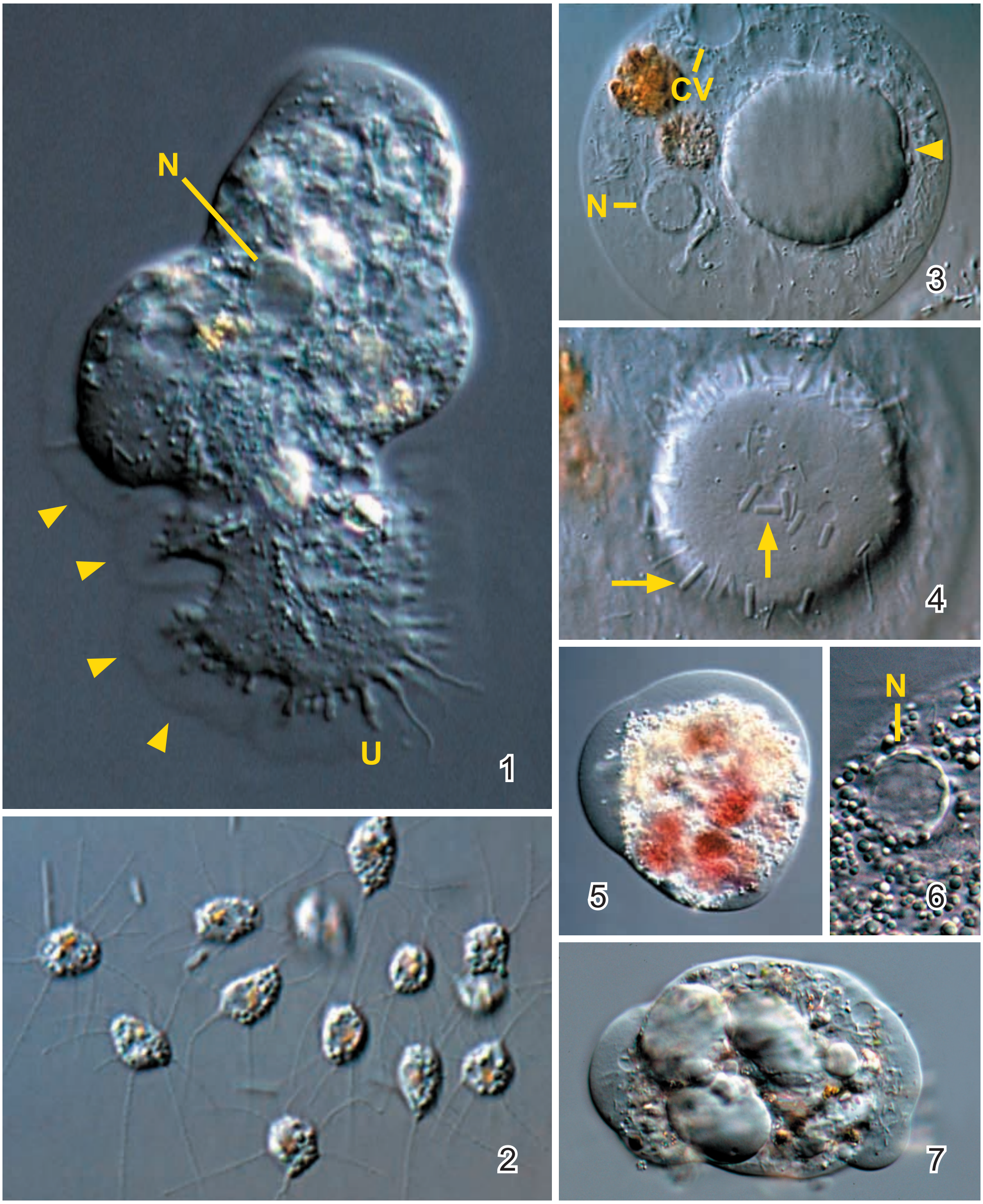
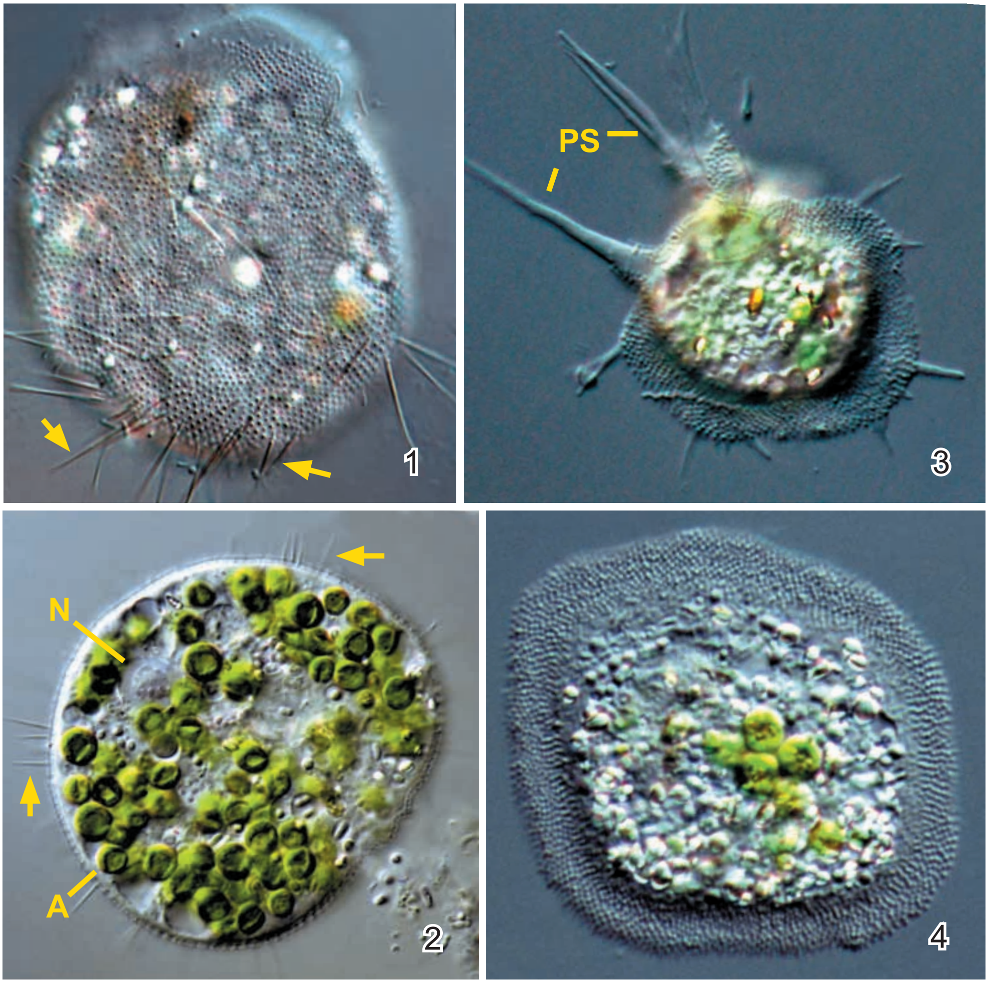


Fig. 1 – 7: Amoebae. Some unidentified, likely undescribed amoebae from Simmelried. **1:** A 100–150 µm long amoeba with a hyaline fringe (arrowheads) and a filose uroid (U). **2:** A colony of filose amoebae only 4 µm across. The focus is on the granular filopodia. **3, 4:** This hyaline amoeba is 35 µm across and contains a large, refractive body (3, arrowhead) covered with bacteria (4, arrows). **5 – 7:** Likely, these are members of the *Pelomyxa*-group with a length of 80–100 µm. The cytoplasm is studded with ingested rhodobacteria (5) or refractive grains (7). CV – contractile vacuole, N – nucleus, U – uroid.



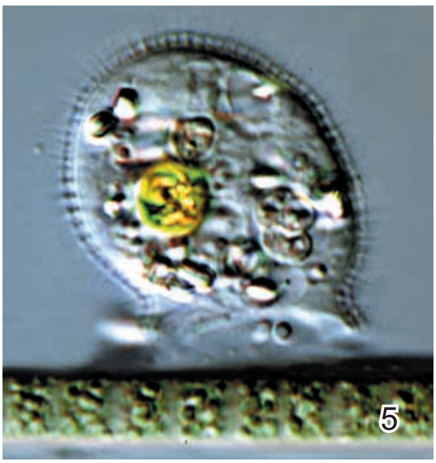


Fig. 1 – 5: Amoebae. *Cochliopodium* can be considered as a "missing link" between naked and testate amoebae. The cells are covered with fine scales or granules building a flexible test. **1 – 2:** Many radiating spines (arrows) extend from the granulated test of *C. vestitum*, which is 15–20 µm across. Some specimens contain symbiotic algae (2). **3 – 5:** *Cochliopodium bilimbosum* is 20–30 µm across and is similar to *C. vestitum*, but lacks spines. Slender pseudopodia with rounded ends protrude from under the test when the amoeba is walking on, for instance, filamentous cyanobacteria and algae (5). The dorsal view (4) shows the reticular structure of the test. A – symbiotic algae, N – nucleus, PS – pseudopodia.

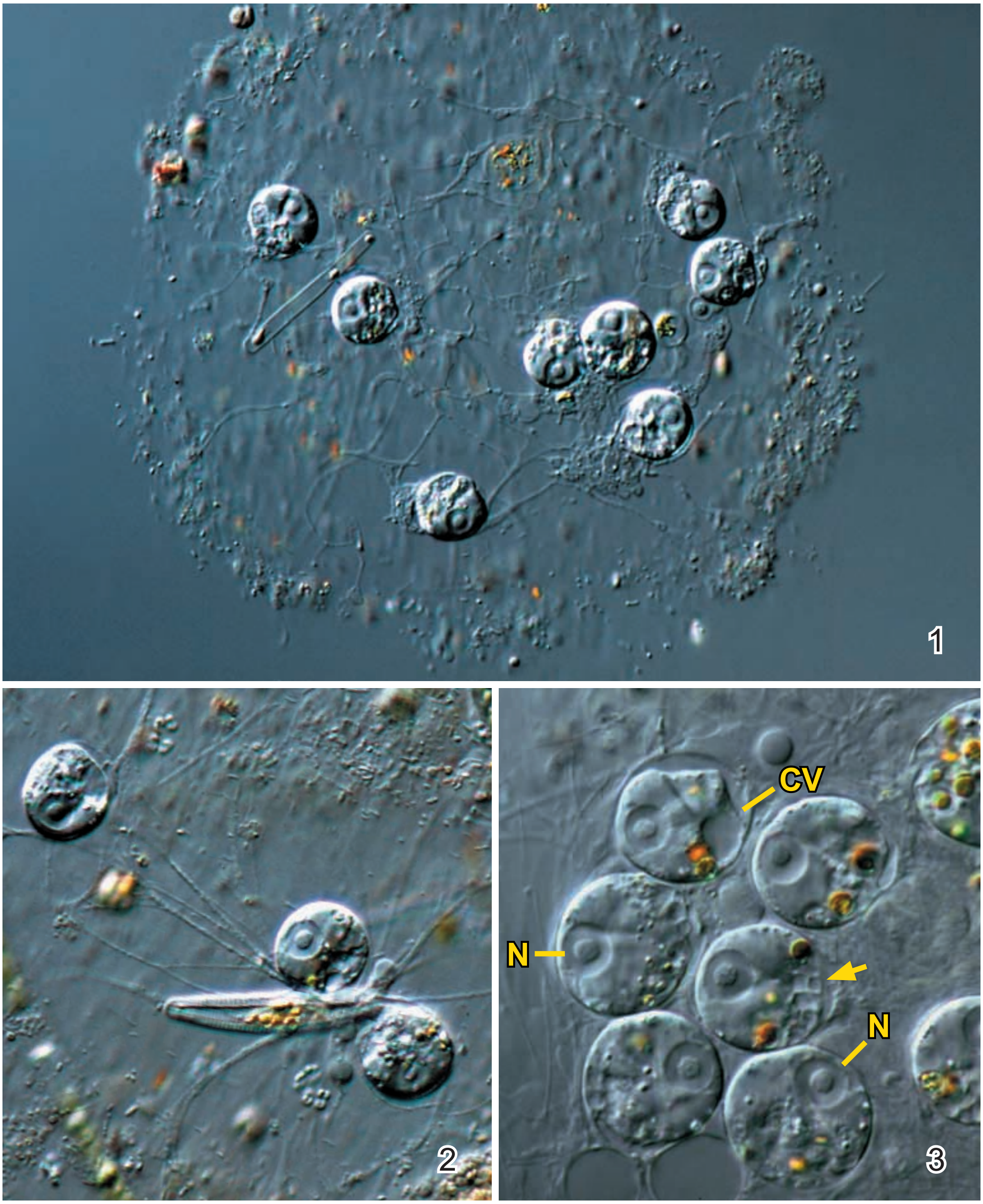


Fig. 1 – 3: Amoebae. 1: *Lecythium hyalinum* is one of the rare amoebae forming groups of 2–20 individuals. They live in a mucous envelope with a diameter of 50–250 µm and feed on algae and bacteria. The long, filose pseudopodia often form a reticulate pattern (1). **2:** Two *L. hyalinum* specimens feeding on the diatom *Navicula*. **3:** The Simmelried population of *L. hyalinum* has a colourless, globular test 16–21 µm across. The cytoplasm is divided in a hyaline area around the nucleus and a vacuolated area near the aperture of the test (arrow). CV – contractile vacuole, N – nucleus.

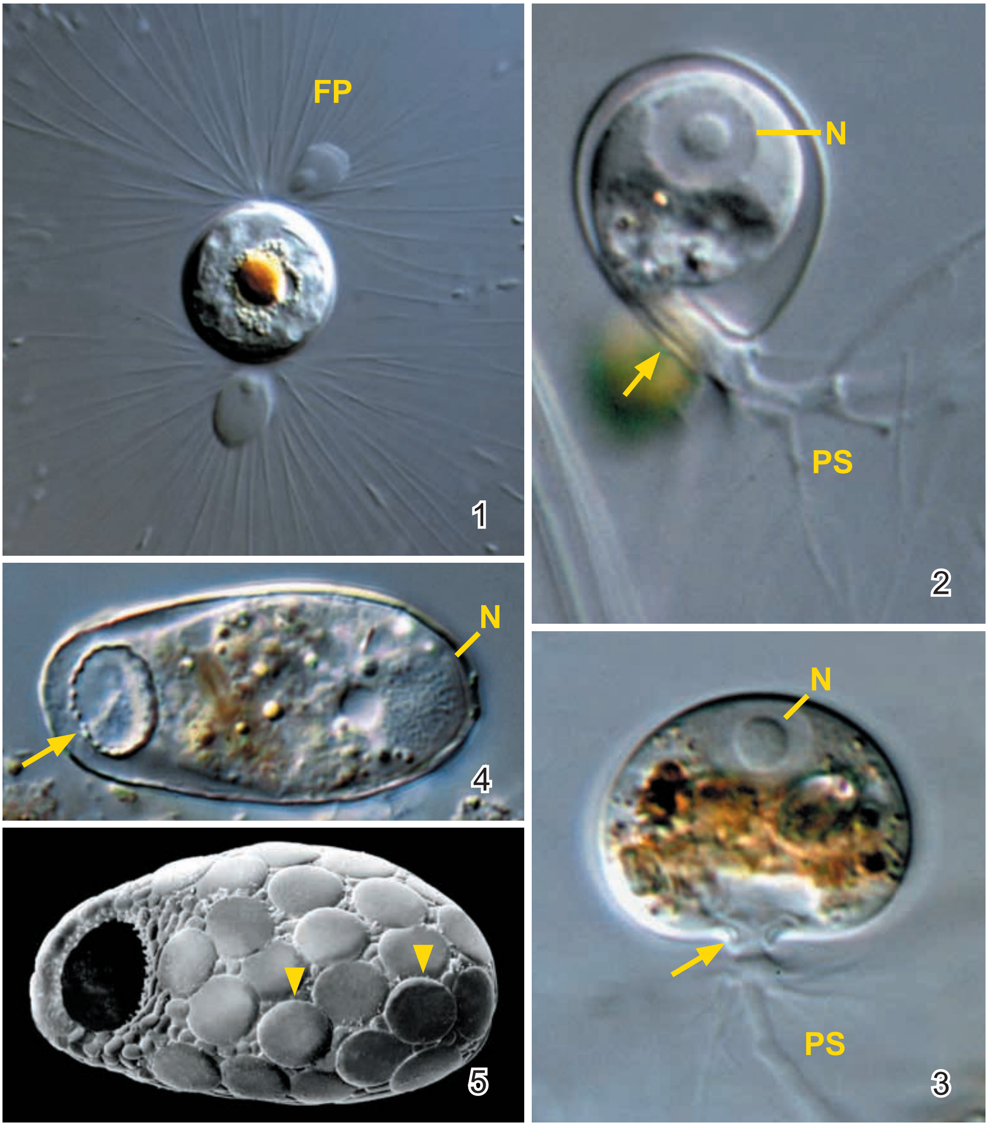


Fig. 1 – 5: Amoebae. 1: *Diplophrys archeri* is 8–10 µm across and is a filose amoeba with a globular, hyaline test. Tufts of filopodia emerge from two opposite test openings. The cytoplasm contains a large orange or reddish oil droplet. **2:** *Microgromia socialis* is 16–20 µm long and has a rigid test with a short neck (arrow), from which anastomosing pseudopodia arise. The cytoplasm is divided into a granular anterior half and a smooth posterior which contains the conspicuous nucleus. **3:** *Rhogostoma schleusseri* (15–20 µm) has a slit-like, infolded pseudostome (arrow) and non-anastomosing pseudopodia. **4, 5:** The pouch-shaped test of *Trinema complanatum* (35 µm) has an elliptical pseudostome (4, arrow) and is composed of many minute and some large scales 4–5 µm across (5, arrowheads). FP – filopodia, N – nucleus with distinct nucleolus in centre, PS – pseudopodia.

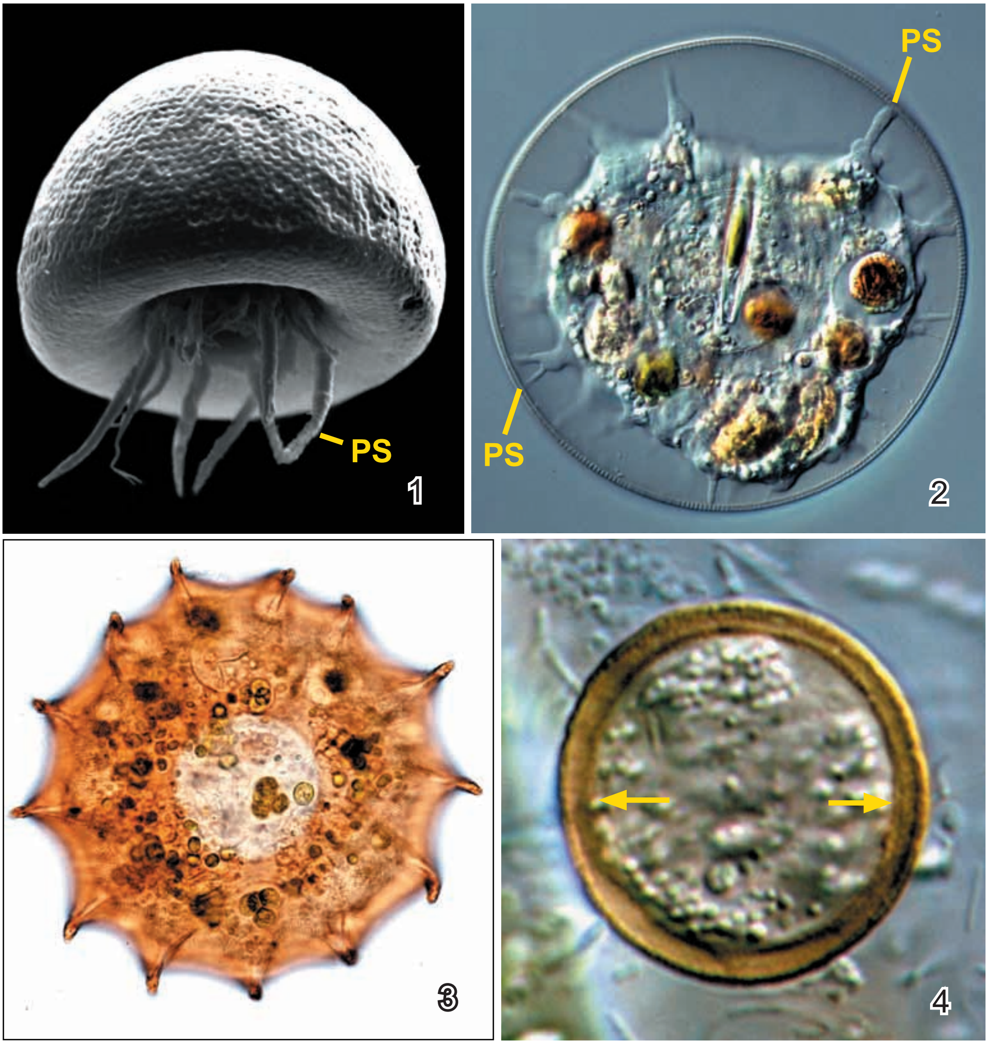
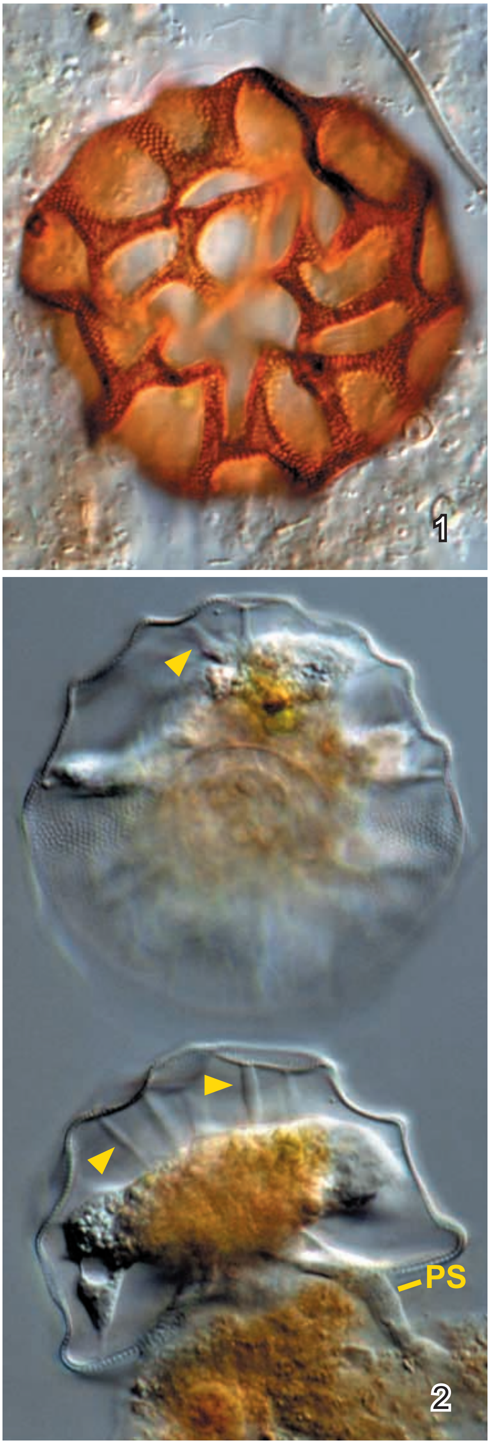


Fig. 1 – 4: Amoebae. Species of the genus *Arcella* have a circular, hyaline test composed of a chitinoid, hexagonally faceted material. The pseudostome is invaginated and centrally located. The colourless test of young specimens becomes brownish by iron or manganese deposits in old tests. The amoebae are mostly binucleate and have several contractile vacuoles. **1:** *Arcella* sp. in the scanning electron microscope, showing the faceted test structure and the invaginated pseudostome from which the pseudopodia extend. **2:** *Arcella vulgaris* is 100–150 µm across and has a bowl-shaped test. The specimen is attached to the test inside by many small pseudopodia. **3:** The test of *Arcella dentata* is 125–185 µm across and is nicely crenulated by 8–14 spines. The spines curve dorsally providing the test with a crown-like appearance in lateral view. **4:** *Pyxidicula operculata* is 15–20 µm across and is easily confused with *Arcella*, but the pseudostome (arrows) is nearly as wide as the test. N – nucleus, PS – pseudopodia.



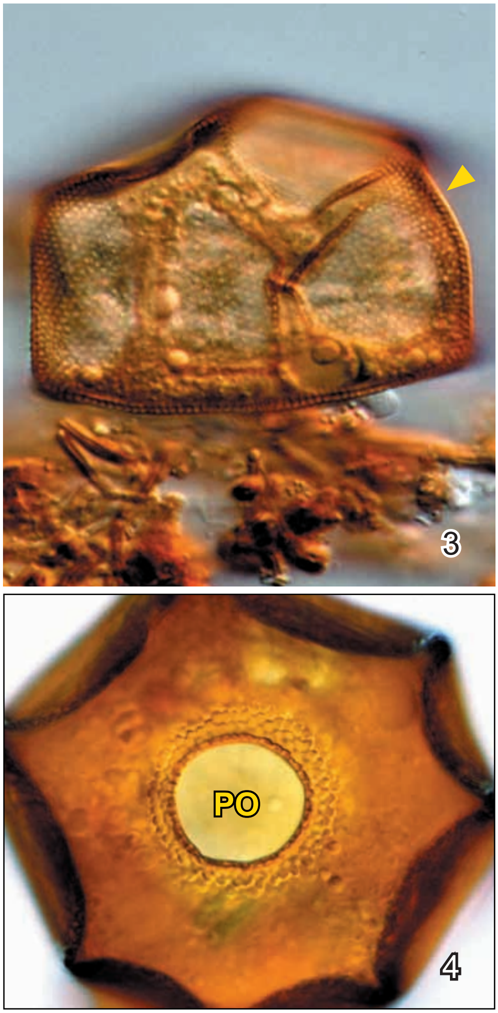
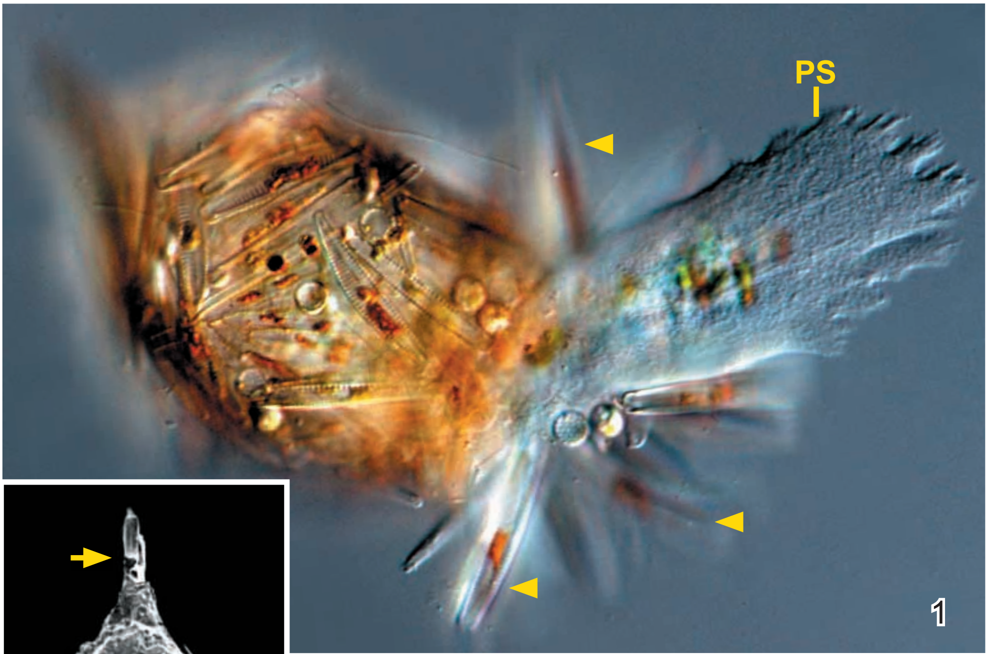


Fig. 1 – 4: Amoebae. 1, 2: *Arcella gibbosa* is 70–130 µm across and has a hemispherical test (2) with numerous irregular depressions well recognizable in dorsal view (1). Young specimens (2) are colourless, while old tests are brown due to ferric deposits (1). Arrowheads mark filopodia anchoring the cell to the test. **3, 4:** The test of *Arcella conica* is about 80 µm across and has large facets with distinct ridges (3). The ventral view shows the circular pseudostome. Note the finely faceted wall (3, arrowhead). PO – pseudostome, PS – pseudopodia.



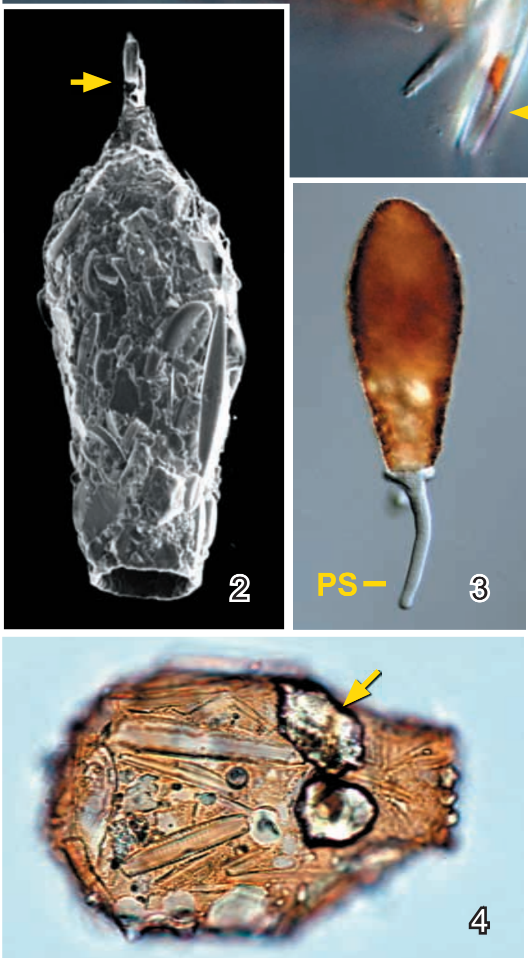


Fig. 1–4: Amoebae. The chitinoid test of *Difflugia* is circular in cross-section and mainly composed of xenosomes, that is, sand grains, diatom frustules, and/or organic debris from the enviroment. Often, the test has spines. **1:** The test of *Difflugia bacillifera* is composed mainly of diatom frustules, some of which are arranged around the pseudostome (arrowheads). This specimen is gliding with a broad pseudopodium on the microscope slide. **2:** *Difflugia acuminata* in the scanning electron microscope. The base of the vase-shaped test tapers to a short spine (arrow). The test is 200–400 µm long and is composed mainly of quartz grains and diatom frustules. **3:** *Difflugia pyriformis* is 350–420 µm long and is similar to *D. acuminata,* but has a rounded test base. **4:** The pyriform, 65–115 µm long test of *Difflugia rubescens* is yellowish to brownish and composed of diatom frustules and large quartz grains (arrow). PS – pseudopodia.

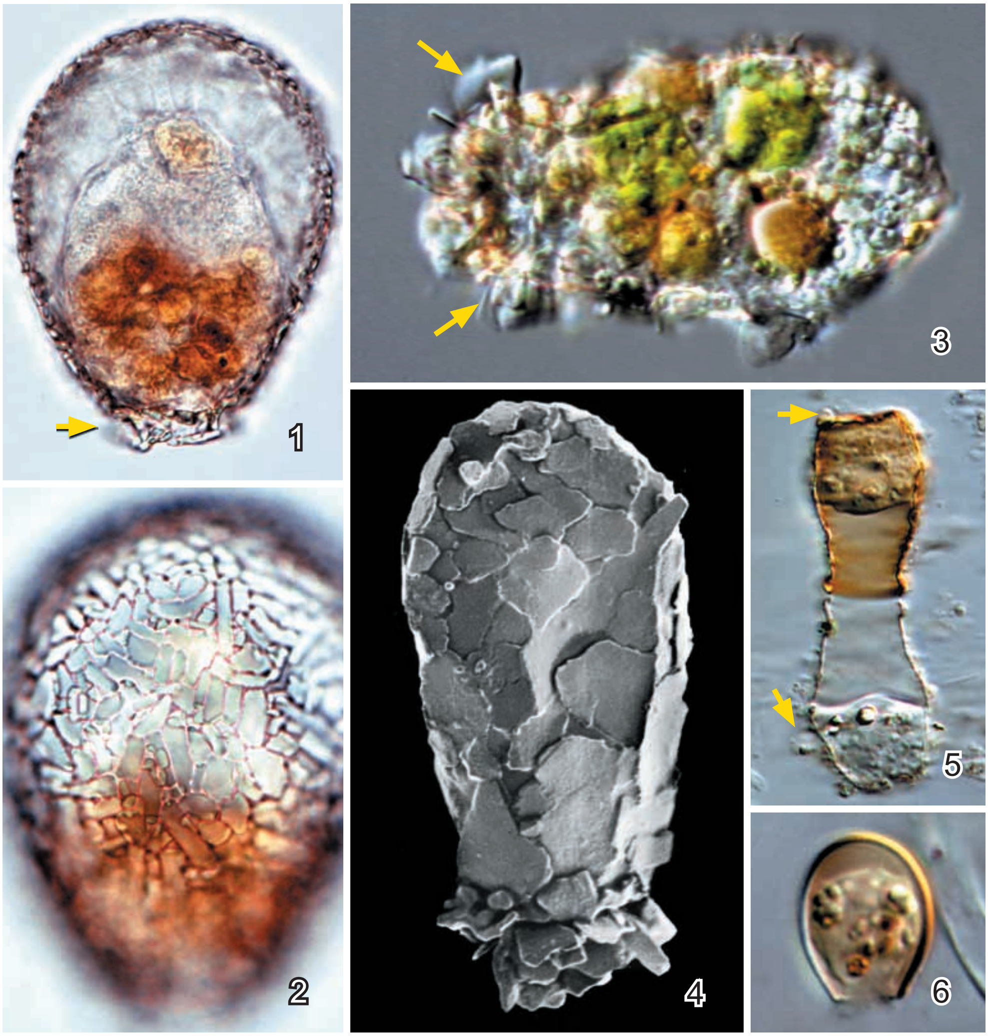


Fig. 1 – 6: Amoebae. Some testate amoebae look like *Difflugia* but are assigned to other genera, depending on characteristics of the test. **1, 2:** The pseudostome of the genus *Cucurbitella* has a collar separated from the test by a ring-shaped depression (1, arrow). The sole species of the genus is *C. mespiliformis,* which is 125–190 µm long and has the test composed of clear quartz grains embedded in a chitinoid matrix (2). **3, 4:** If the pseudostome is surrounded by xenosomes and the pseudopodia are filose, the species is a member of *Pseudodifflugia*. In case of *P. fascicularis* (3), the pseudostome is surrounded by comparatively large quartz grains (arrows), similar as in *Difflugia lucida* (4). **5, 6:** Small testate amoebae, similar to *Difflugia*, but with a smooth membraneous test, are classified into *Cryptodifflugia. Cryptodifflugia sacculus* is 20–30 µm long and has an irregularly flask-shaped test with some attached xenosomes (5, arrows), while *C. oviformis* has a 15–20 µm long regular test (6). *Cryptodifflugia sacculus* has just divided (5).

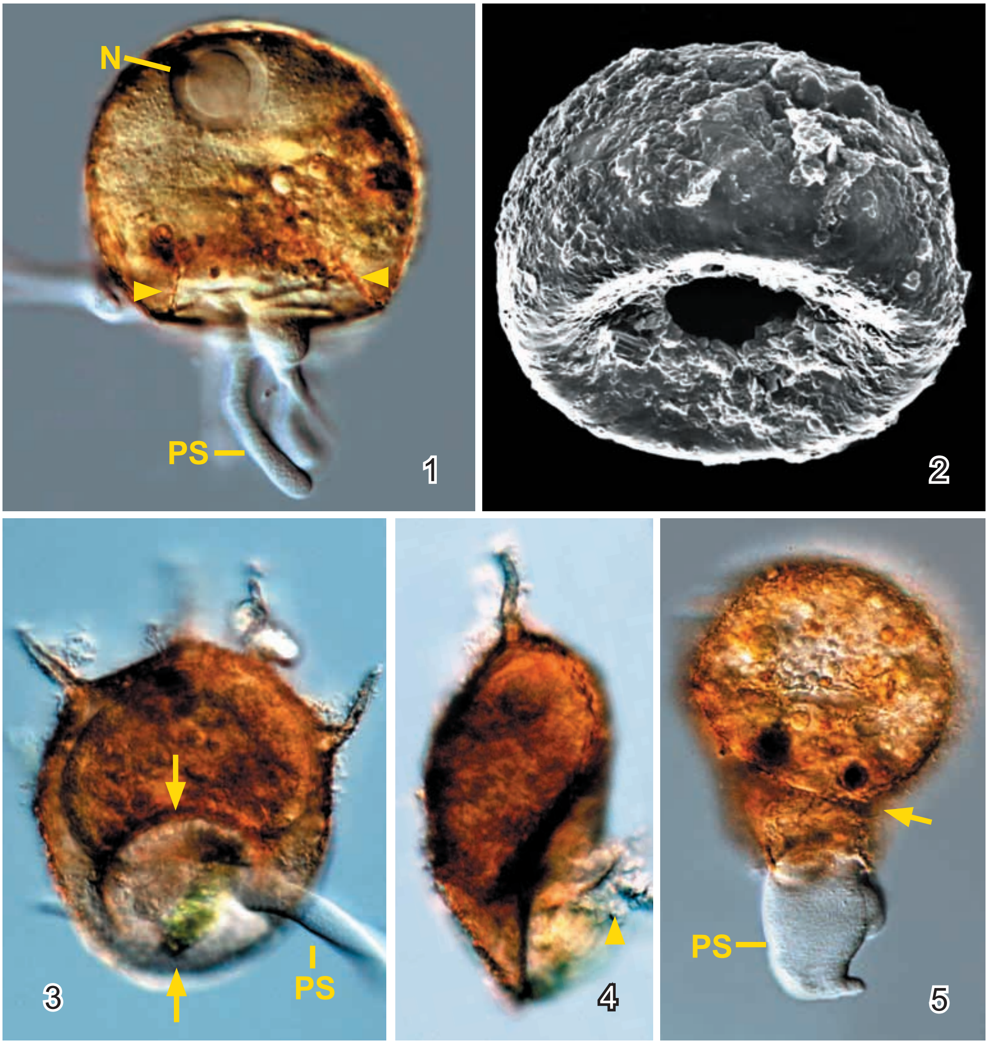


Fig. 1 – 5: Amoebae. 1, 2: *Cyclopyxis kahlii* is about 80–85 µm across and has a hemispherical test. The light microscopical lateral view (1) shows the lobose pseudopodia extending from the centric, slightly invaginated pseudostome (1, arrowheads). The scanning electron microscope reveals the rough surface of the test and the invaginated pseudostome. **3, 4:** *Centropyxis* can be distinguished from *Arcella* and *Cyclopyxis* by the eccentric pseudostome. Frequently, the tests have spines and are composed of organic particles and sand grains embedded in a chitinous matrix. *Centropyxis aculeata* is 120–150 µm long and has a strongly eccentric pseudostome (3, arrows). The lateral view (4) shows a posteriorly located spine and food particles (arrowhead) projecting from the test entrance. **5:** The test of *Pontigulasia spiralis* is 100–160 µm long and similar to that of *Difflugia*, but has a constriction to form a neck (arrow) which is separated by a diaphragm from the posterior, inflated portion of the test. N – nucleus, PS – pseudopodia.

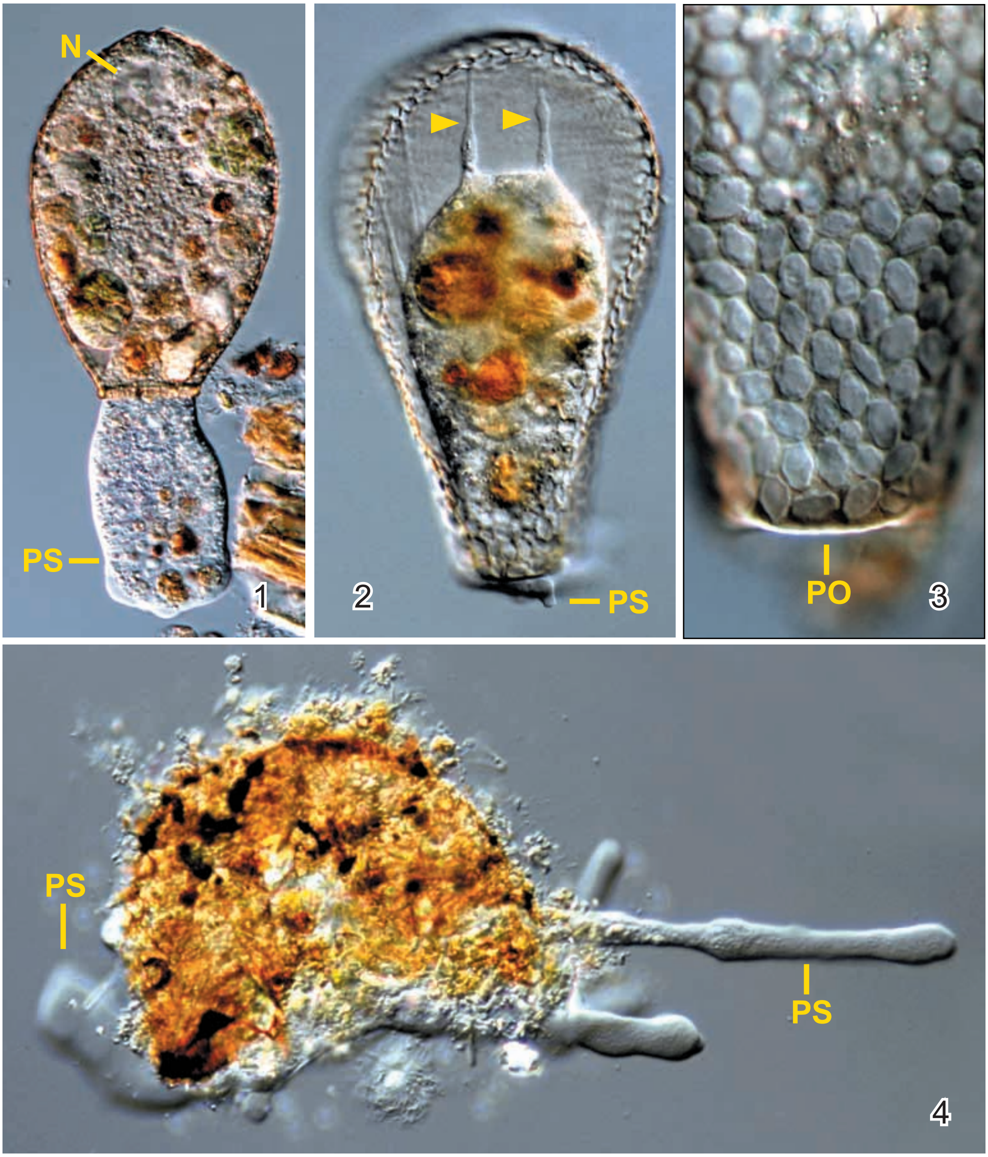


Fig. 1 – 4: Amoebae. 1 – 3: The test of *Nebela* is flattened and usually built from test scales of engulfed other testate amoebae. The pseudostome is elliptical or slit-like. **1:** *Nebela parvula*, which is 80–120 µm long, has an ellipsoidal test and forms a broad, conspicuous pseudopodium (PS). **2, 3:** The test of *Nebela tubulosa* is 190–220 µm long and the amoeba is attached to the test by many minute pseudopodia (2, arrowheads). The pseudostome lacks a lip, and the test is composed of ellipticall, siliceous scales (3). **4:** *Phryganella nidulus* is 165–220 µm in size and has a hemispherical test covered with large amounts of xenosomes and debris. The slender pseudopodia (PS) extend in all directions. N – nucleus, PO – pseudostome, PS – pseudopodia.

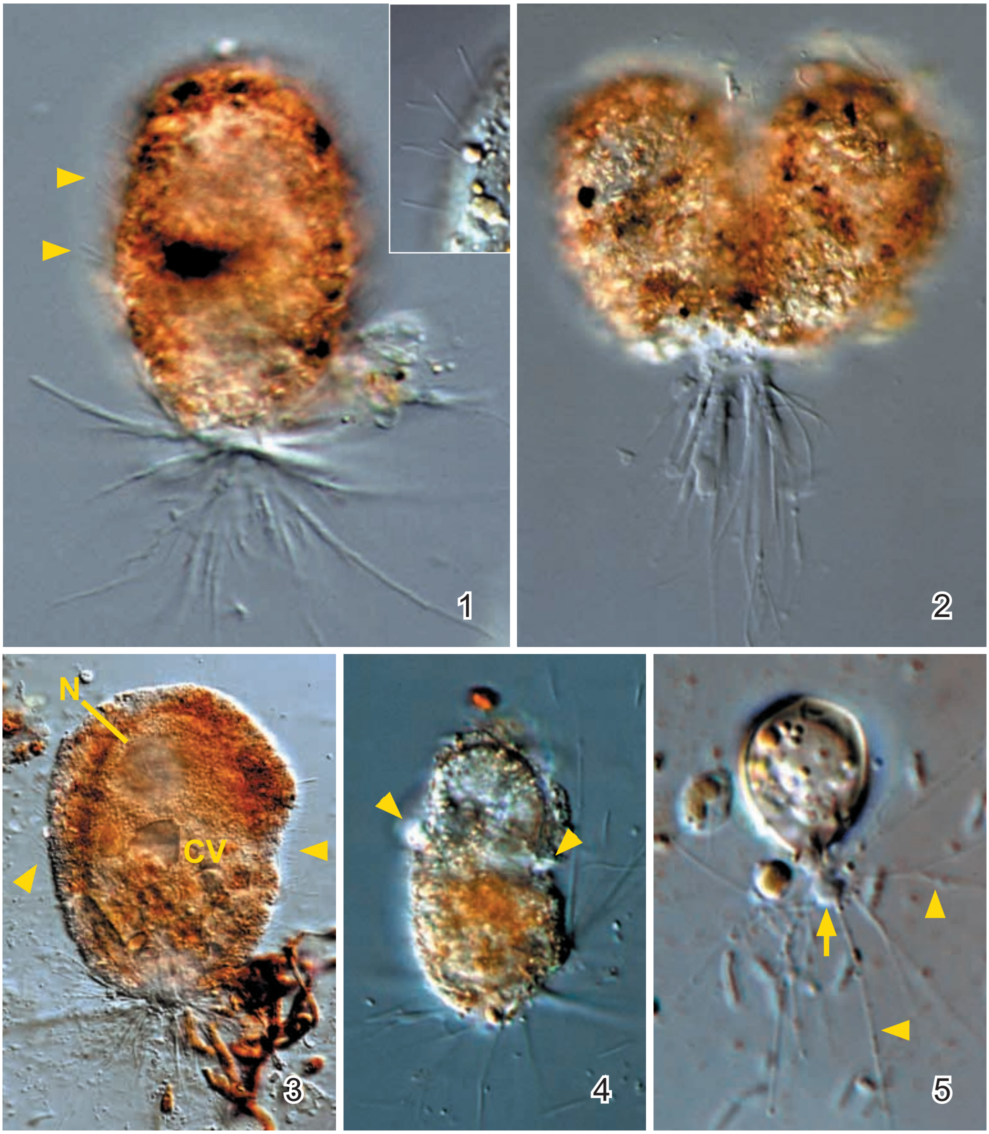


Fig. 1 – 5: Amoebae. 1, 2: *Diaphoropodon mobile* is 60–120 µm long and a common testate amoeba in the mud of Simmelried. The brownish test is ovoid and covered with fine xenosomes and hair-like spines (1, arrowheads and inset). Sometimes two laterally attached (dividing? conjugating?) specimens can be observed (2). **3:** This 135 µm long *Diaphoropodon* is probably a new species because the test is not made of irregular xenosomes but of minute granules. Arrowheads mark hair-like spines. **4:** *Plagiophrys parvipunctata* is 45–56 µm long and has an ellipsoidal test, which is uneven by attached quartz grains (arrowheads). The anterior half of the cell is studded with brownish food inclusions. **5:** *Apogromia mucicola* has a smooth, transparent test with a length of 8–15 µm. The finely granular filopodia (arrowheads) arise from a bulbous base (arrow). CV – contractile vacuole, N – nucleus.

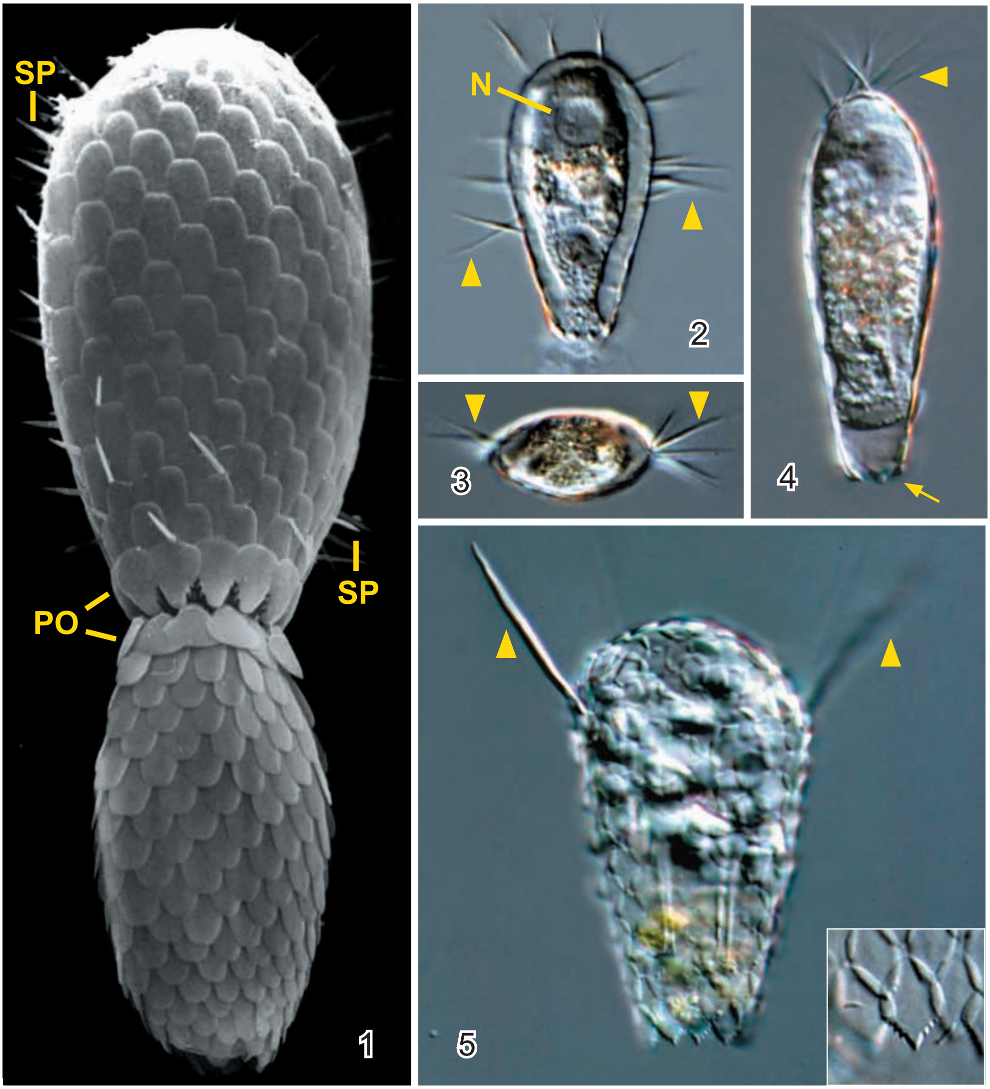


Fig. 1 – 5: Amoebae. The tests of *Euglypha* are ovoid and composed of tile-like arranged siliceous scales. In transverse section, the test can be circular or elliptical. Most species have spines and denticulated scales around the pseudostome. **1:** Division of *Euglypha ciliata* (40–100 µm) in the scanning electron microscope. Note the pseudostome scales which are larger than the scales and are finely dentate. **2, 3:** *Euglypha compressa* (70–130 µm) in lateral (2) and apical (3) view. The spines are arranged on the edge of the flattened test (2, 3, arrowheads). **4:** *Euglypha cristata* is 35–70 µm long and has a tuft of spines on the posterior end (arrowhead). The scales, which surround the pseudostome, are finely dentate (arrow). **5:** *Euglypha crenulata* is 65–140 µm long and has long spines near the posterior end of the test (arrowheads). The species can be distinguished from several congeners by the finely dentate pseudostome scales (inset). N – nucleus, PO – pseudostome, SP – spines.

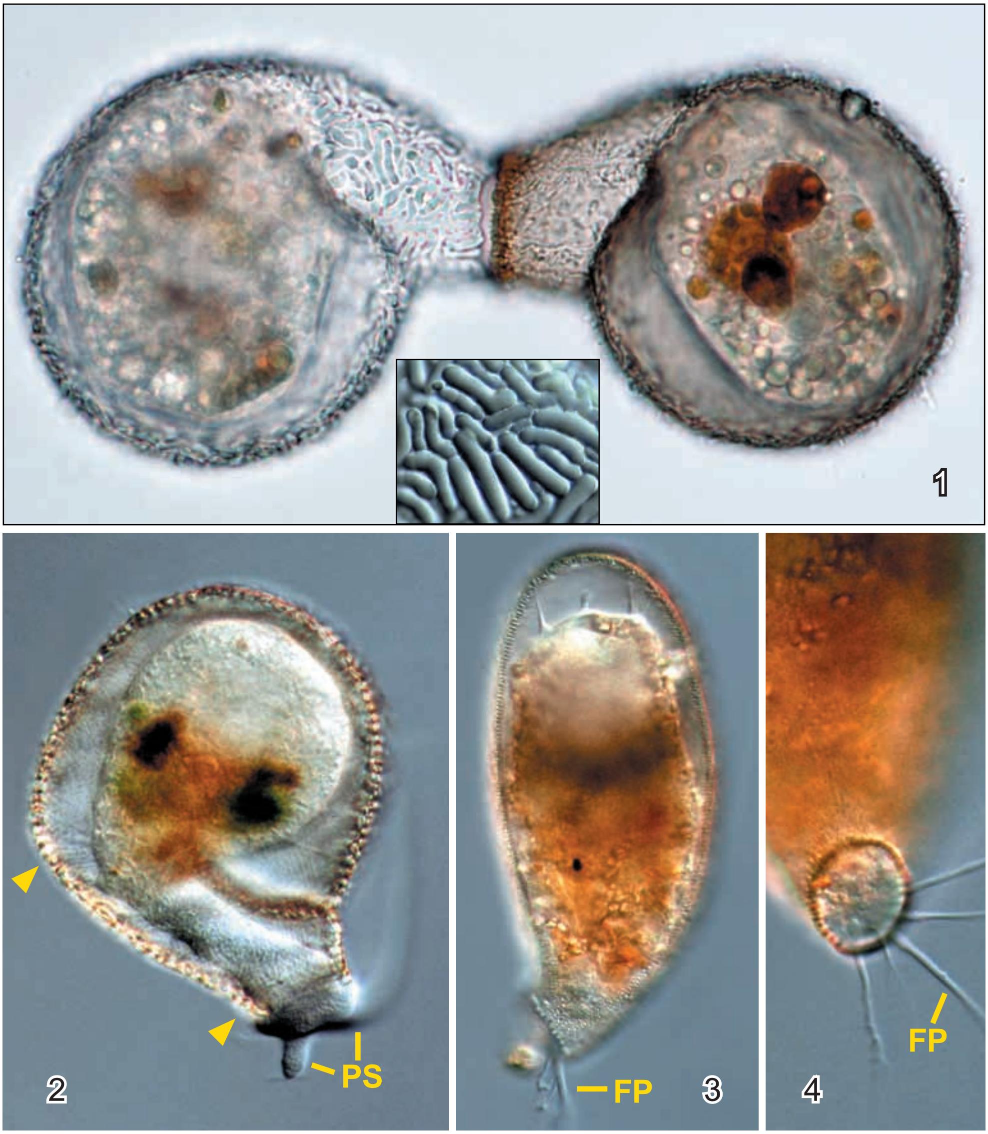


Fig. 1 – 4: Amoebae. *Lesquereusia* are lobose amoebae building spiral tests composed of siliceous, curved rods (1, inset). The rods are formed endogenously and are embedded in an organic matrix. **1:** *Lesquereusia spiralis* is about 95–190 µm long and has an ovoid test with a short neck. When dividing, the daughters are connected via the pseudostome. The parent cell is brownish by iron and manganese deposites. **2:** *Lesquereusia epistomum* is about 100 µm long and has a long neck (arrowheads) abruptly turning into the inflated posterior. **3, 4:** The retort-shaped test of *Cyphodera ampulla* is 60–140 µm long and is composed of minute scales in a chitinoid matrix. The filopodia extend through the circular pseudostome (4). FP – filopodia, PS – pseudopodia.

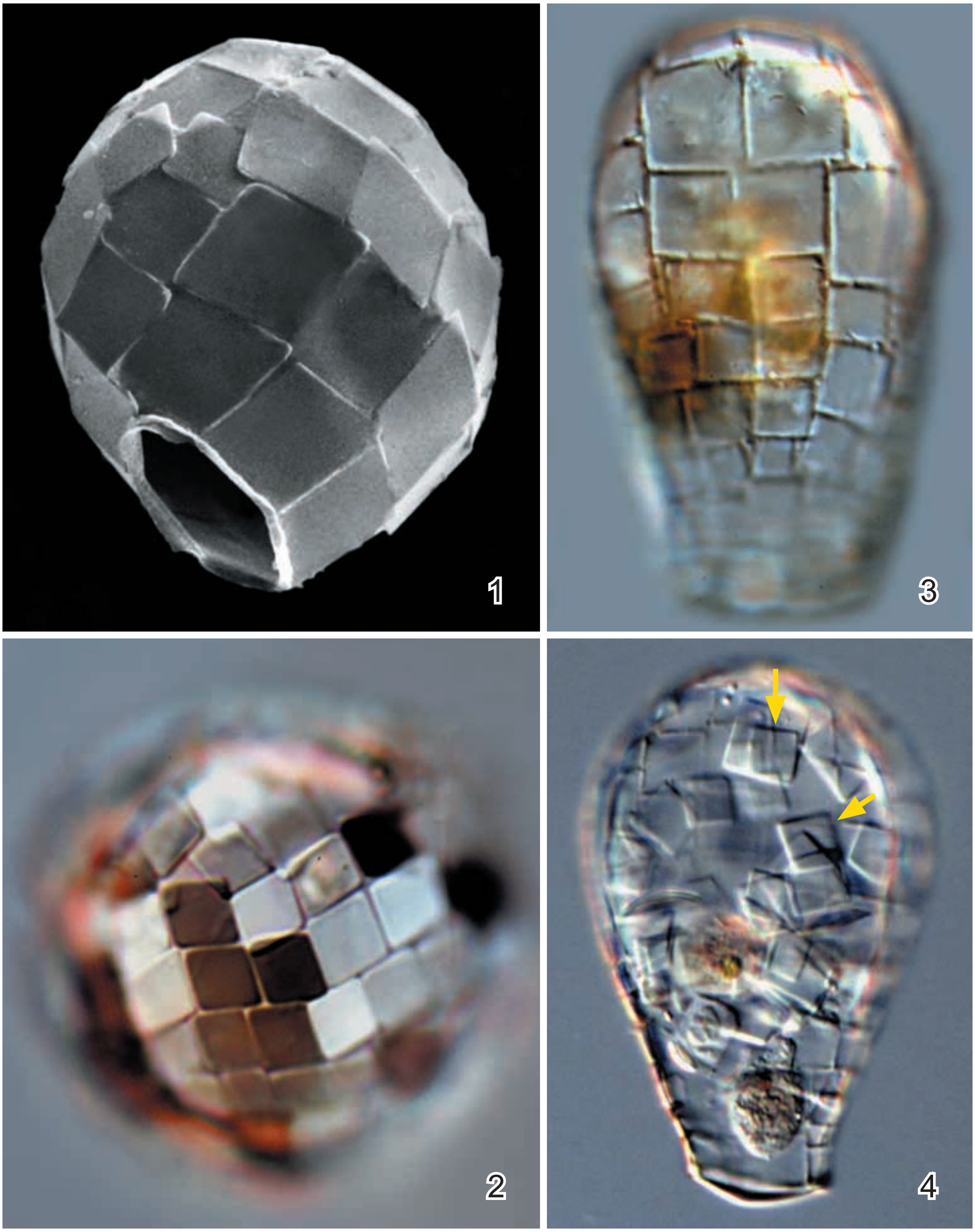
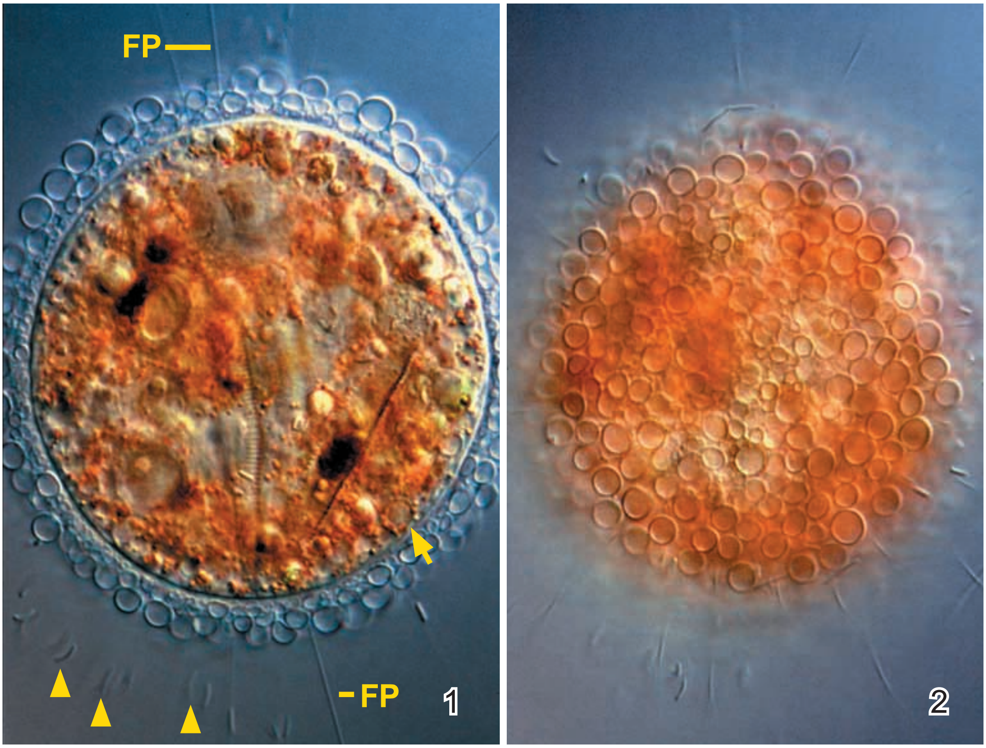


Fig. 1 – 4: Amoebae. 1, 2: The 30–40 µm long test of *Paraquadrula* spec. in the scanning electron microscope (1) and the light microscope (2). The test is made of calcit platelets 5–6 µm across. In the polarized light of the interference contrast, the scales appear in different shades of grey. **3, 4:** *Quadrulella symmetrica* is about 100 µm long and occurs in the mud of Simmelried. The square platelets of the test have a size of 8–10 µm and are made of silicium. Some specimens contain platelets, likely used for the daughter when dividing (4, arrows).



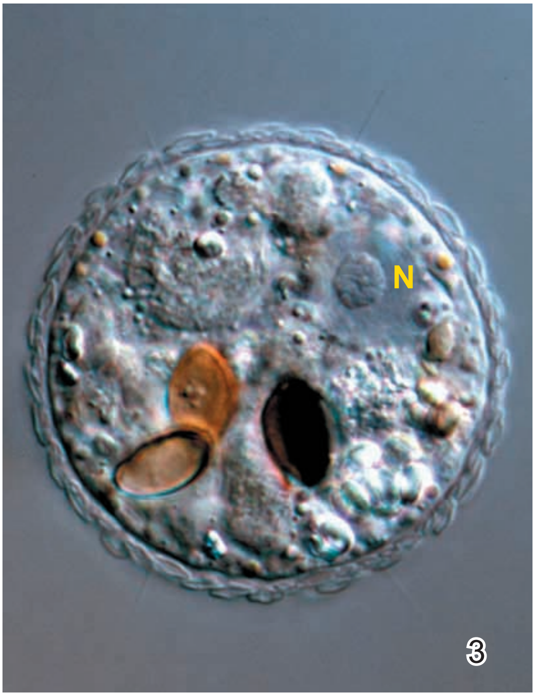
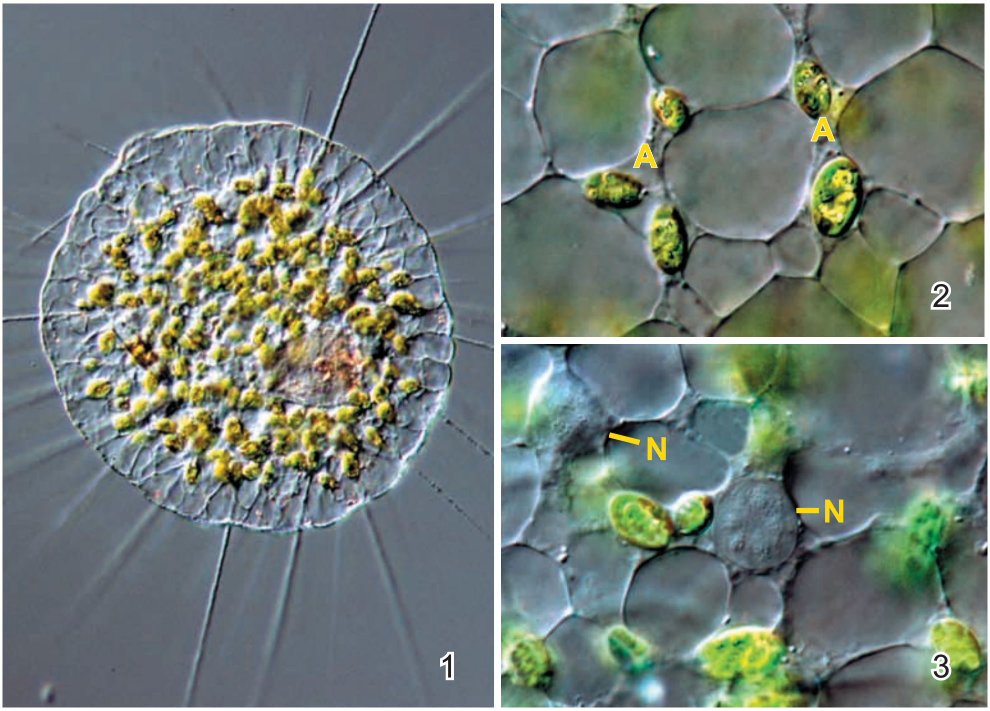


Fig. 1 – 3: Amoebae. 1, 2: *Pompholyxophrys punicea* is about 56 µm across and is a heliozoan-like amoeba covered with concentric layers of siliceous, globular scales. The thick, mucuos coat becomes recognizable by attached bacteria (arrowheads). Rod-like filopodia pass through all layers. The cytoplasm is reddish to orange by ingested algae and diatoms. Within the cytoplasm developing scales can be observed (1, arrow). The scales of the outer sphere are usually about 4 µm across. **3:** *Pompholyxophrys ovuligera*, which is about 30 µm across, is a further member of the genus in Simmelried, but it is much rarer than *P. punicea*. The scales of this species are ovoid or discoid. The colourless cytoplasm contains brownish remnants of fungal spores. FP – filopodia, N – nucleus.



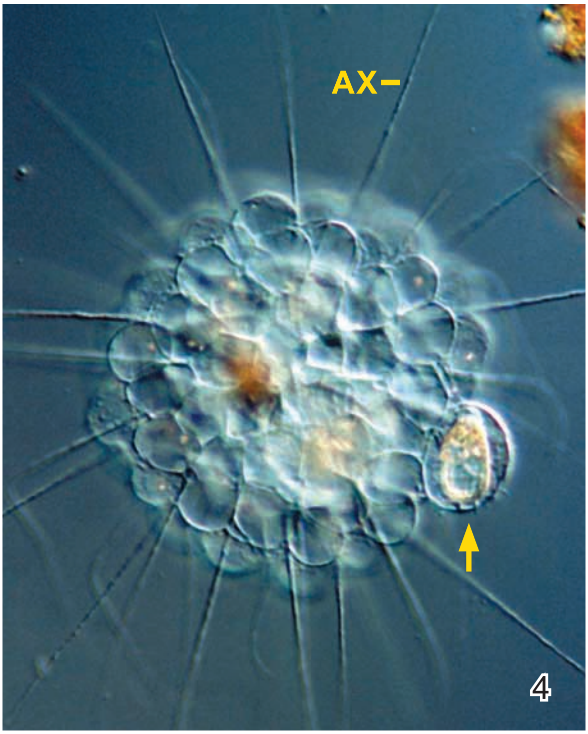


Fig. 1 – 4: Heliozoa. Species of the genus *Actinosphaerium* are strongly vacuolated and have a multilayered organisation. Two species of *Actinosphaerium* are common in Simmelried. **1 – 3:** The green *Actinosphaerium eichhornii* var. *viridis* is about 240 µm across and contains many symbiotic algae, viz., *Chlamydomonas actinosphaerii*. They are in the cytoplasm-filled contact points of the vacuoles (2). The nuclei are scattered between the symbiotic algae near the centre of the cell (3, N). **4:** *Actinosphaerium eichhornii* lacks symbiotic algae and is thus colourless. The specimen shown is about 180 µm across and has just captured a ciliate (*Coleps*, arrow). The straight axopodia are covered by a film of cytoplasm giving them a granular appearance. A – symbiotic algae, AX – axopodia, N – nuclei.

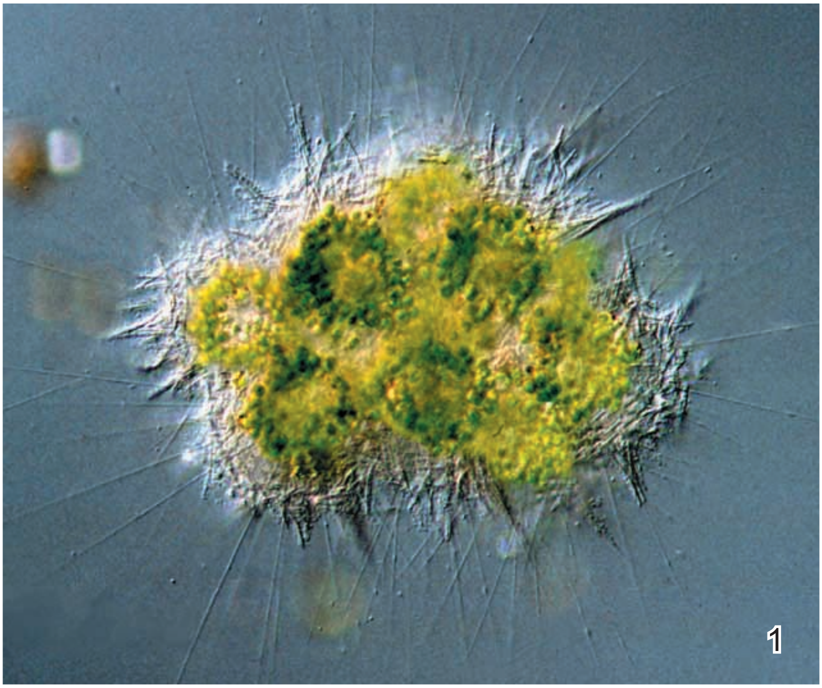


Fig. 1 – 3: Heliozoa. Members of the genus *Raphidiophrys* are covered by elliptical or fusiform scales. Two colonial species occur in the Simmelried. **1:** The colonies of *Raphidiophrys viridis* consist of 5–15 individuals each 30–90 µm across. The green colour is caused by large amounts of symbiotic algae. The long, fusiform scales extend almost to the ends of the axopodia and form compact, conical structures. **2, 3:** *Raphidiophrys elegans* forms colonies with individuals 20–70 µm in diameter. The cells are connected by plasmatic bridges. The colour comes from greenish prey remnants (flagellates, algae, ciliates). The elliptical scales extend along the proximal third of the axopodia, forming a loose meshwork (S). S – scales.

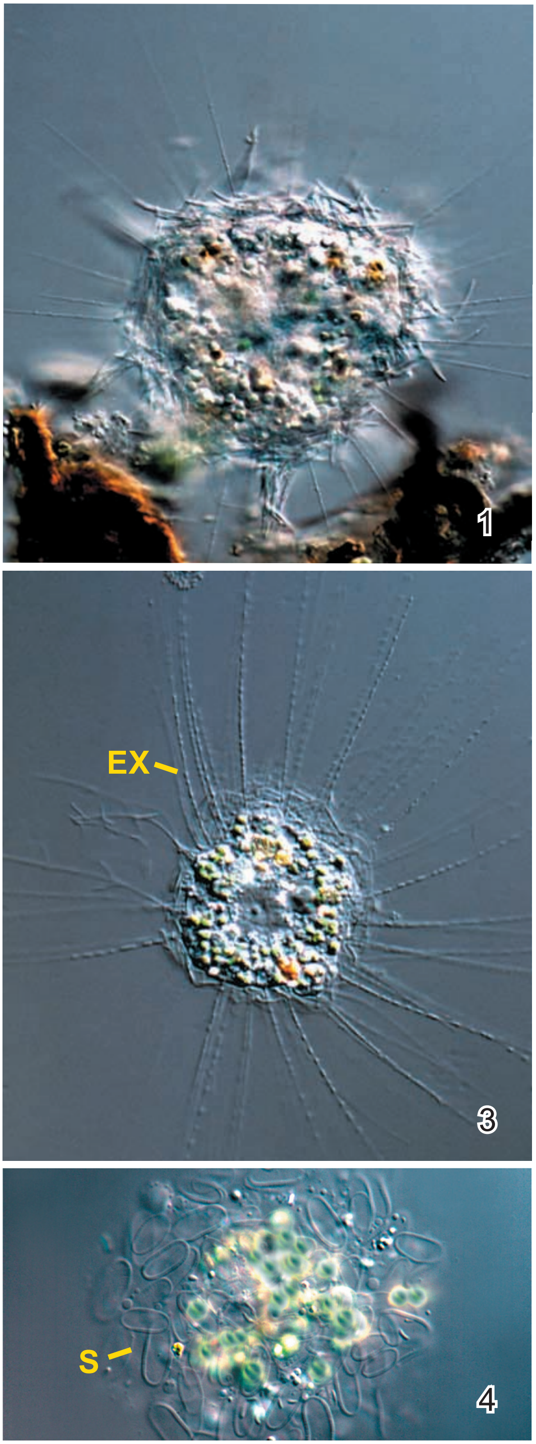
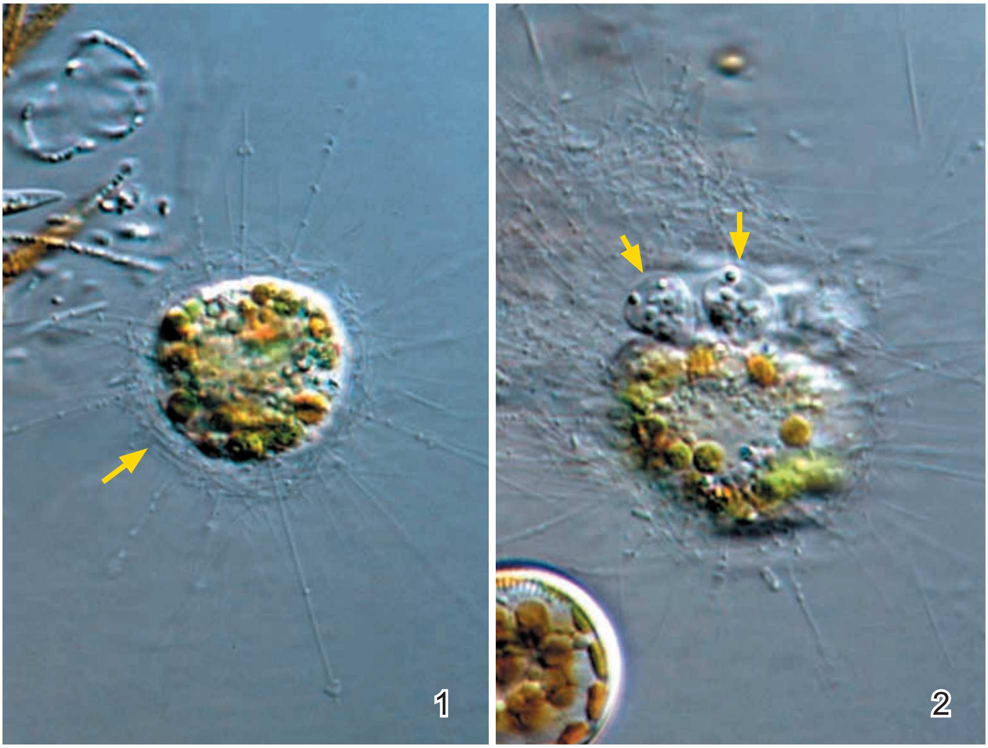


Fig. 1 – 4: Heliozoa. 1, 2: *Raphidiophrys pallida* is about 85 µm across and is thus one of the largest members of the genus. Usually, it is attached to mud flocs or floating plants. The body has a coat of 20–30 µm long, acicular siliceous scales, which are slightly curved and embedded in a mucus layer (2). The body is studded with food inclusions, which obscure the excentrically located nucleus and the contractile vacuoles. **3, 4:** *Raphidiophrys intermedia* is about 50 µm across and covered with a thin layer of elliptical, 8–10 µm long scales (4). The granular appearance of the axopodia, which are free from scales, is caused by minute extrusomes (3), which are involved in prey capture and mucus secretion. In the centre of the cell is the centroplast, that is, an organizing centre for the microtubules supporting the axopodia (3). EX – extrusomes, S – scales.



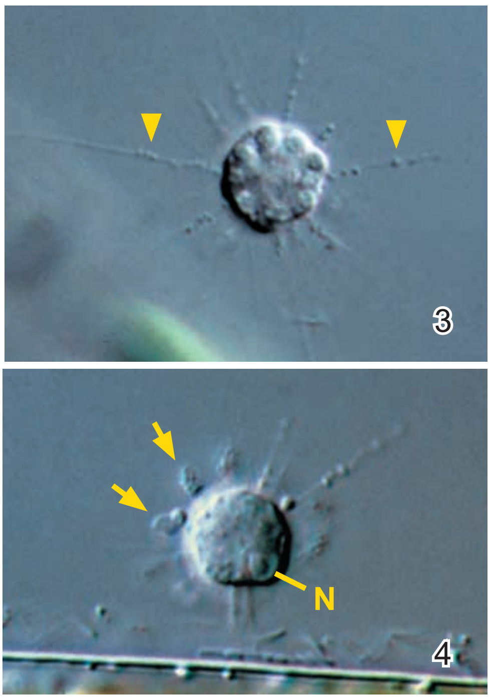


Fig. 1 – 4: Heliozoa. 1, 2: *Raphidiophrys coerulea* is about 20 µm across and thus a very small member of the genus. Often it is found in groups on the mud surface. Penard named the species according to its greyblue colour in the bright field microscope. The body is covered with hyaline scales (1 arrow). A third of the population was attacked by an ectoparasite located between cell body and scale layer (2, arrows). The parasites could be distinguished from prey because they were not ingested by *R. coerulea*. The pyriform ectoparasite is 5–6 µm long and equipped with two contractile vacuoles and a nucleus. Possibly, it is a flagellate of the genus *Spiromonas.* **3, 4:** *Oxnerella* is only 10 µm across and lacks spicules and scales. The retractable axiopods bear extrusomes (3, arrowheads). When collapsed by disturbance, extrusome clusters are formed(4, arrows). N – nucleus.

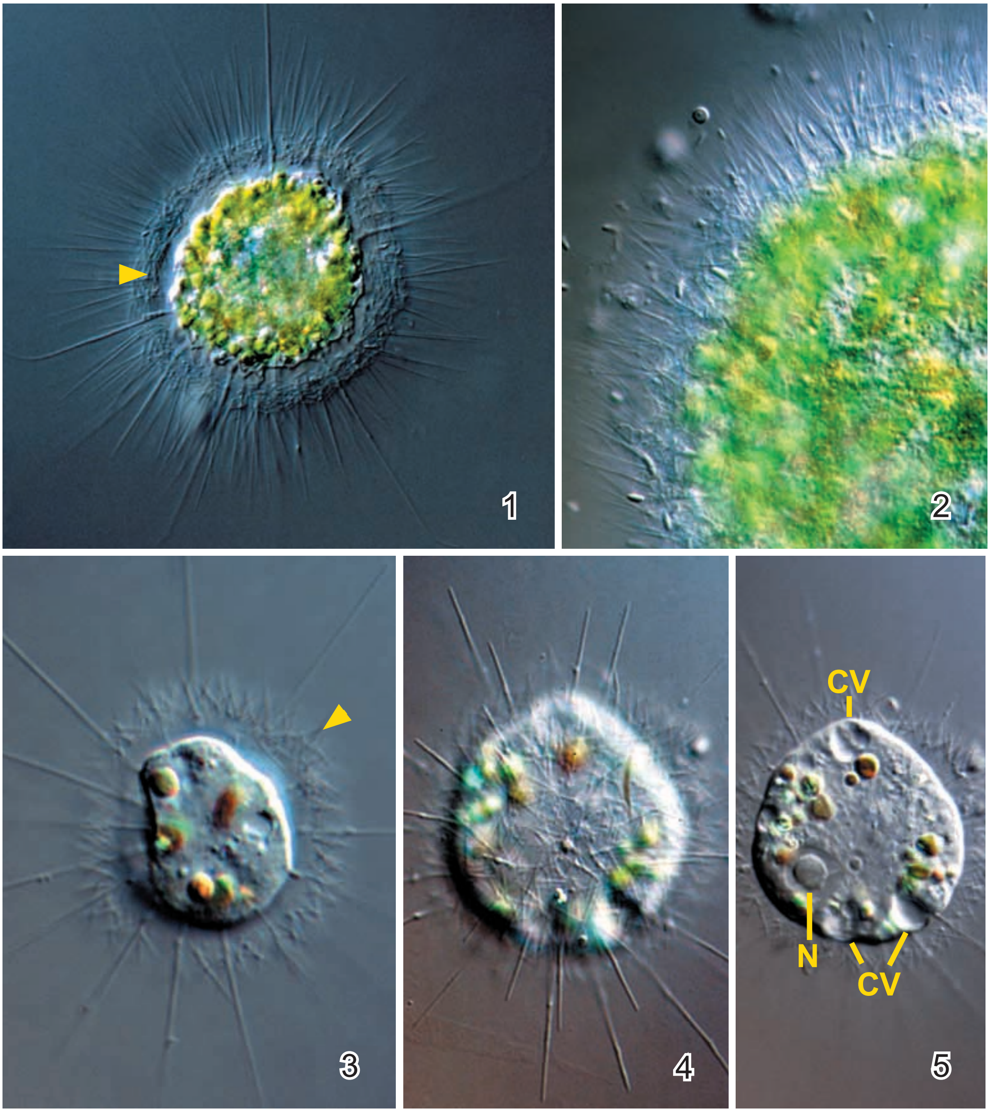
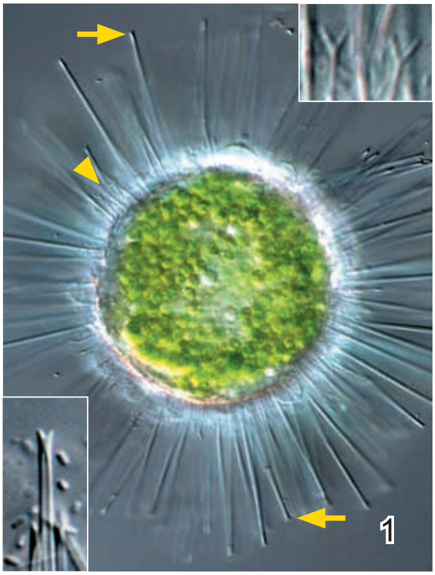
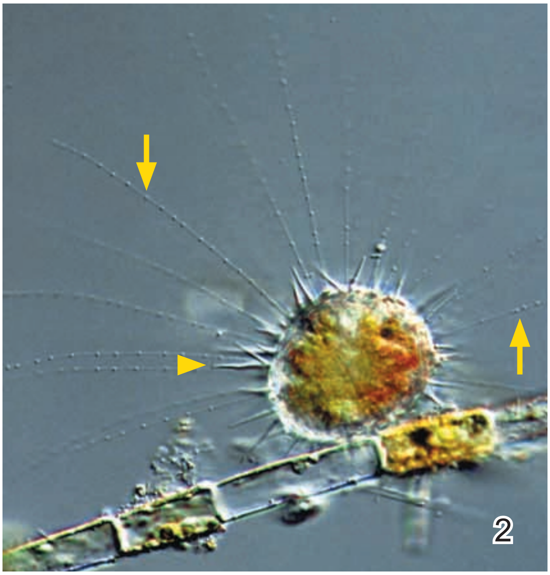


Fig. 1 – 5: Heliozoa. Species of the genus *Heterophrys* are covered with a distinct layer of mucus. Many needle-like, organic spicules are radiating through this layer. **1, 2:** *Heterophrys myriopoda* (55 µm across) is a rare species in Simmelried and can be identified by the gap between the gelatinous coat and the body (1, arrowhead). The green colour is caused by symbiotic algae. At high magnification, the radiating scales become visible (2). **3 – 5:** *Heterophrys fockei* is only 15 µm across and irregulary formed. It is covered with a delicate, 3–4 µm thick mucuos layer not separated from the body by a gap, as in *H. myriopoda* (1). Spicules are visible on the edge of the coat (3, arrowhead). **4:** Focus on the spicules of a squashed specimen. **5:** Focus into the cell of the same specimen. CV – contractile vacuoles, N – nucleus.





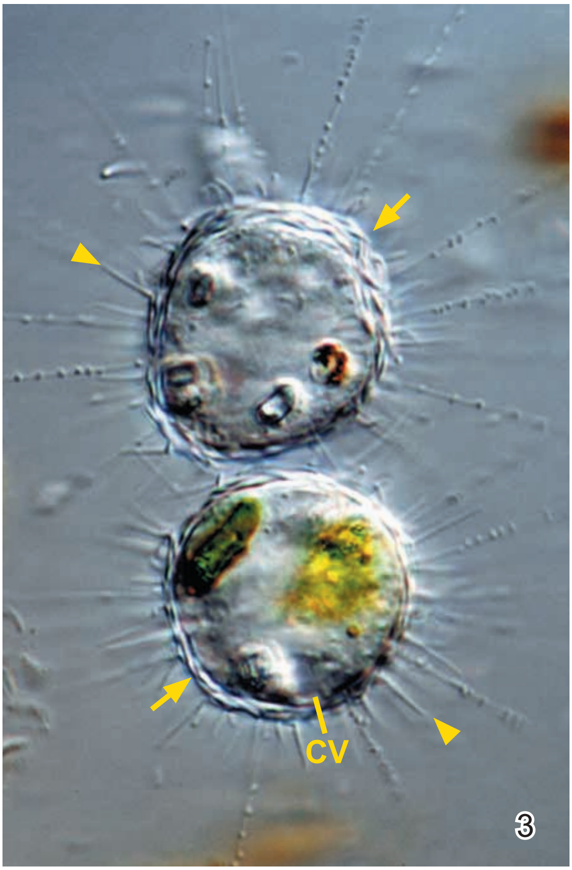


Fig. 1 – 3: Heliozoa. Species of the genus *Acanthocystis* have two kinds of siliceous spicules or scales. A layer of tangentially arranged scales is penetrated by radiating spines with acute or bifurcated ends. The base of the spines is often nail-headed and attached to the body surface. **1:** *Acanthocystis turfacea* is about 80 µm across and contains symbiotic algae. The radiating spines are forked (arrows and lower inset). Between the long, forked spines is a layer of short spines with V-like ends (arrowheads and upper inset). **2:** The radiating spines of *Acanthocystis aculeata* (80 µm across) are slightly curved and about one third of the body diameter in length (arrowhead). The granular appearance of the axopodia is caused by minute extrusomes (arrows). **3:** *Acanthocystis erinaceus* is similar to *A. aculeata*, but can be distinguished by the smaller size (about 20 µm across) and the delicate, slightly curved spines (arrowheads). The tangential scale layer is clearly recognizable in these specimens (arrows). CV – contractile vacuole.

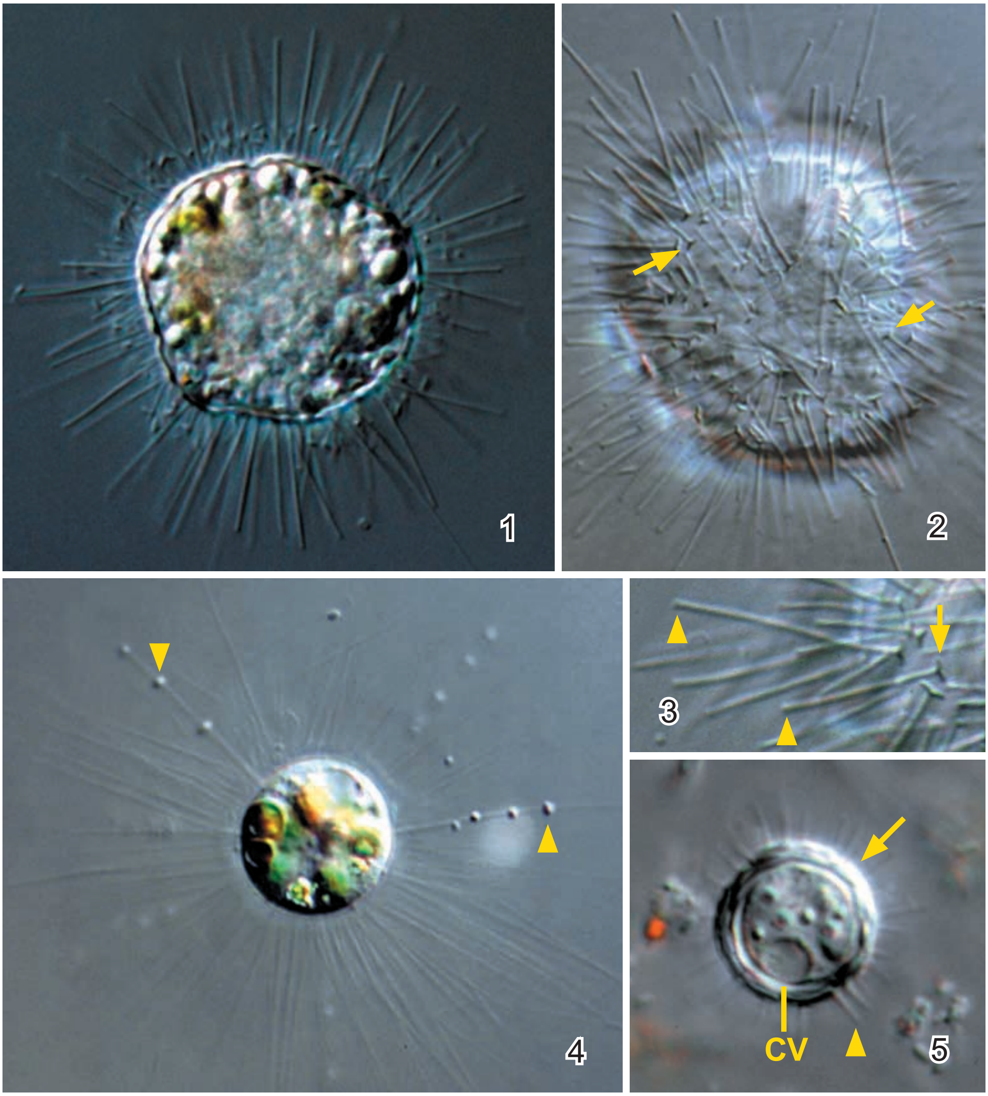


Fig. 1 – 5: Heliozoa. 1 – 3: *Acanthocystis penardi* is about 50 µm across and looks similar to *A. turfacea* (shown on forgoing plate), but the radiating spines are not forked (3, arrowheads) and symbiotic algae are lacking. Instead, the cell is often filled with starch-like, refractive bodies (1). The nail-headed end of the spines is attached to the cell surface (2, 3, arrows). **4:** *Acanthocystis myriospina* is only 12 µm across, but has many delicate spicules. They are nearly as long as the granular axopodia (arrowheads). The body is covered with a delicate layer of tangential scales difficult to recognize. **5:** *Acanthocystis perpusilla*, which occurs on the mud surface, is only 10 µm across and thus the smallest species of the genus. The cell is covered with a thick layer of tangential scales (arrow). The radiating spines are 2–4 µm long (arrowhead). CV – contractile vacuole.

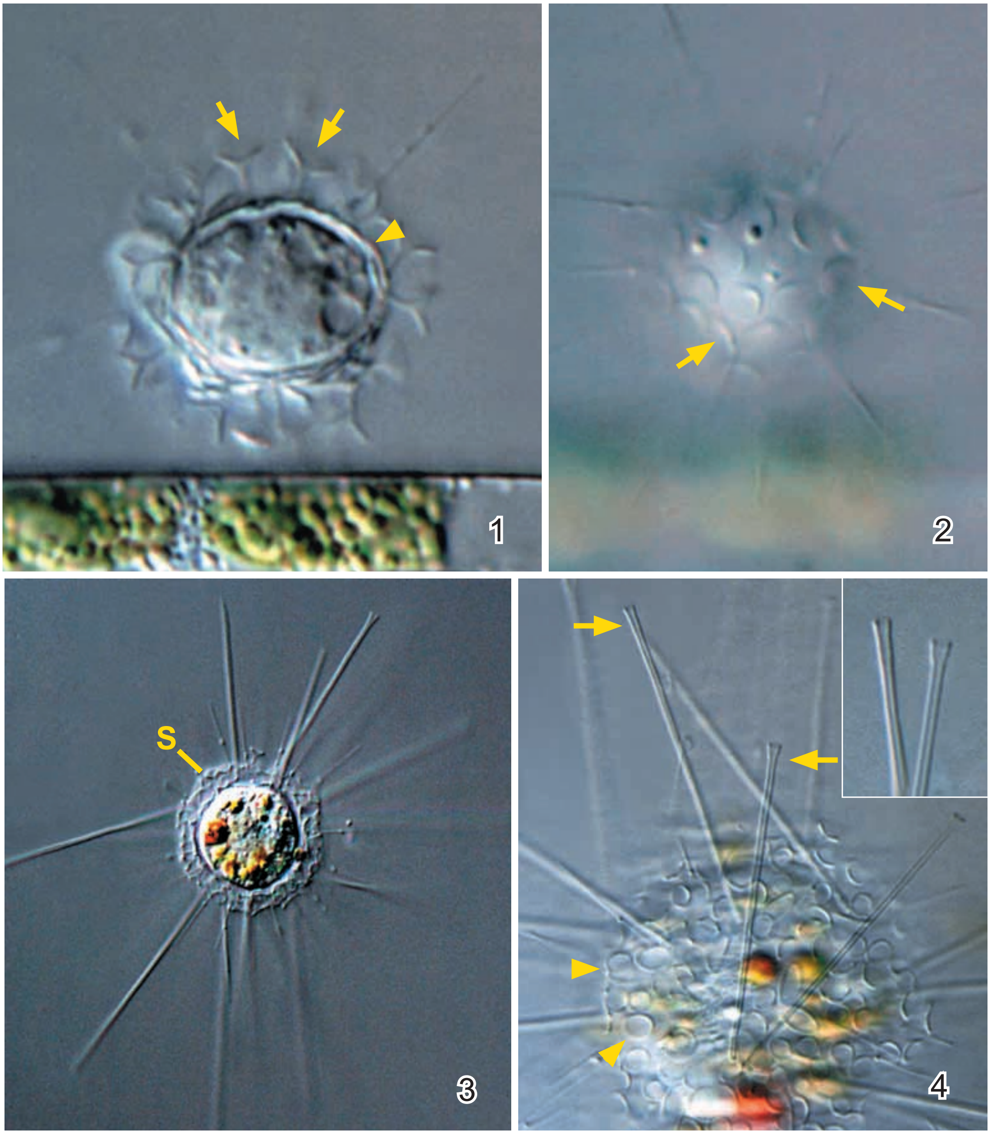


Fig. 1 – 4: Heliozoa. *Raphidiocystis* can be distinguished from other heliozoans by the trumpet-shaped spines. The tangential scales form a compact layer close to the cell surface. Two species of the genus are common in Simmelried. **1, 2:** The spines of *R. glutinosa*, which is only about 10 µm across, are broadly funnel-shaped and extend from a sharply contoured layer of tangential scales (1, arrowhead). In lateral view, the spines appear forked (1, arrows), while the apical view reveals the circular aperture, that is, the conical shape of the scales (2, arrows). **3, 4:** The long spines of *R. tubifera* are trumpet-shaped at the distal end (4, arrows and inset). The lenght of the spines can vary within a population. The thick tangential layer (3, S) consists of 6–8 µm long, elliptical scales (4, arrowheads). S – scales.