

Fine structure of tubes in Maldanidae (Annelida)

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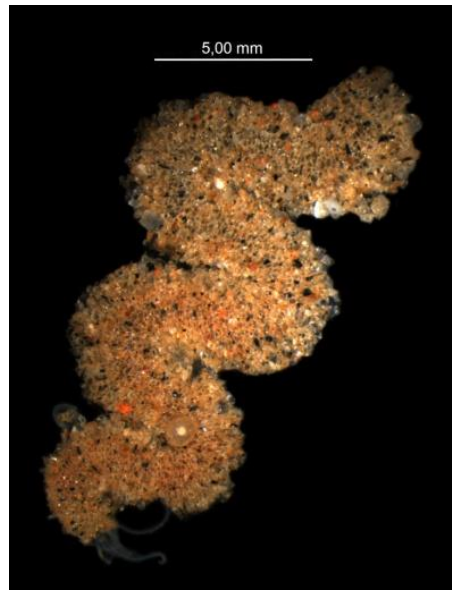
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Agglutinated tubes in different families of Polychaeta



Galathowenia oculata, **Oweniidae**



Pista flexuosa, **Terebellidae**



Terebellides stroemi, **Terebellidae**



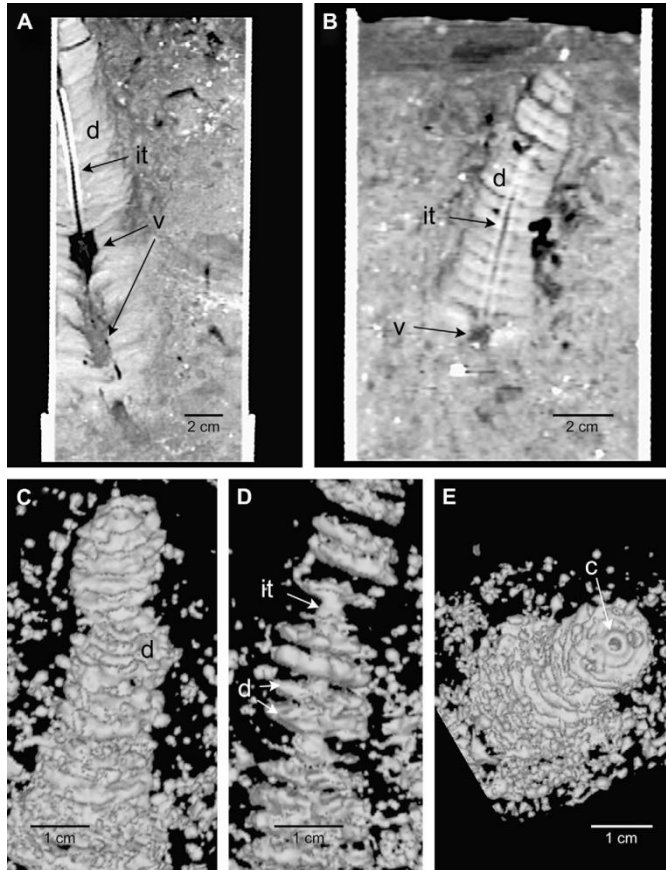
Pectinaria koreni, **Pectinariidae**



Euchone analis, **Sabellidae**

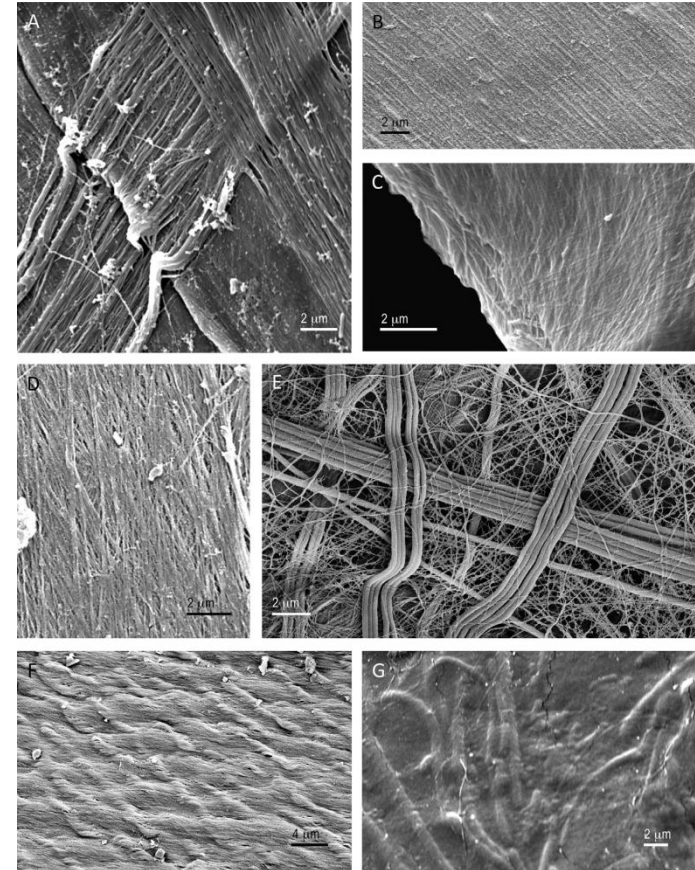
Earlier studies

Dufour et al., 2008



CT scan reconstructions of *Maldane sarsi* tubes:
 A. 2D view of a tube within a sediment core, showing series of disks
 B. 2D view of a tube
 C. 3D reconstruction of a tube
 D. 3D reconstruction of a tube, showing parts of the inner tube between disks
 E. 3D reconstruction of a tube, viewed from the sediment surface

Merz, 2015

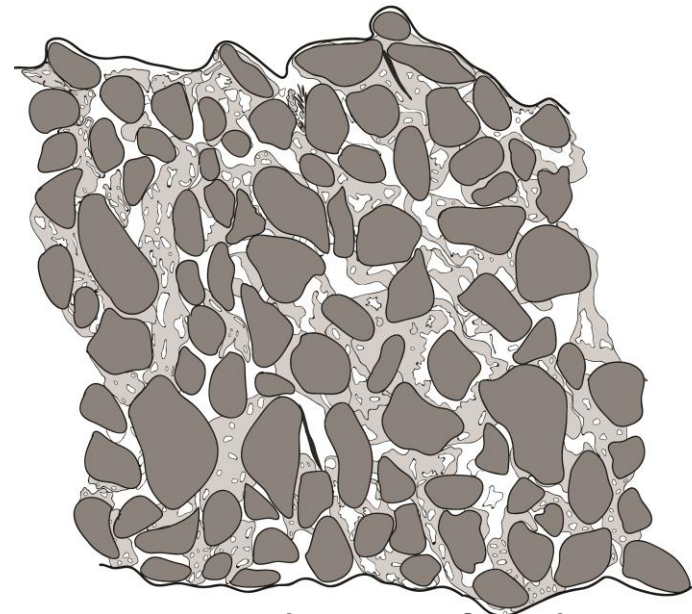


SEM photos of the tubes inner lining:
 A. siboglinid *Oasisia* sp
 B. sabellid *Eudistylia vancouveri*
 C. maldanid *Clymenella torquata*
 D. terebellid *Pista brevibranchiata*
 E. nereidid *Platynereis bicanaliculata*
 F. onuphid *Diopatra ornata*
 G. alvinellid *Alvinella pompejana*

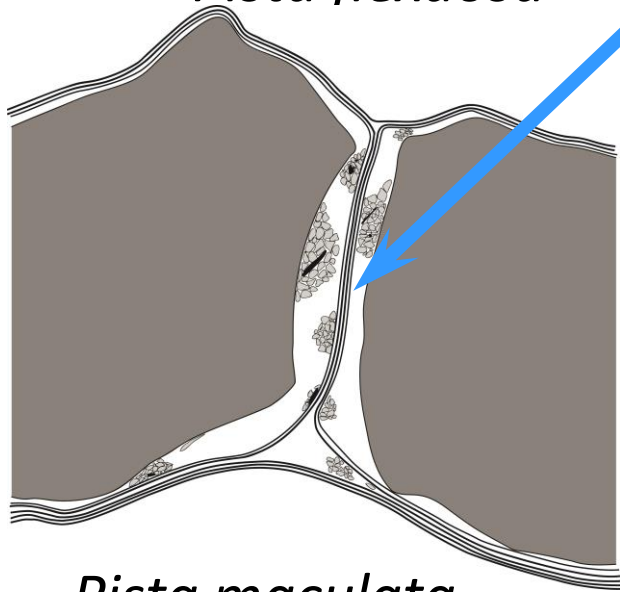
Tubes of Terebellidae and Pectinariidae



Pista flexuosa



Amphitrite figulus

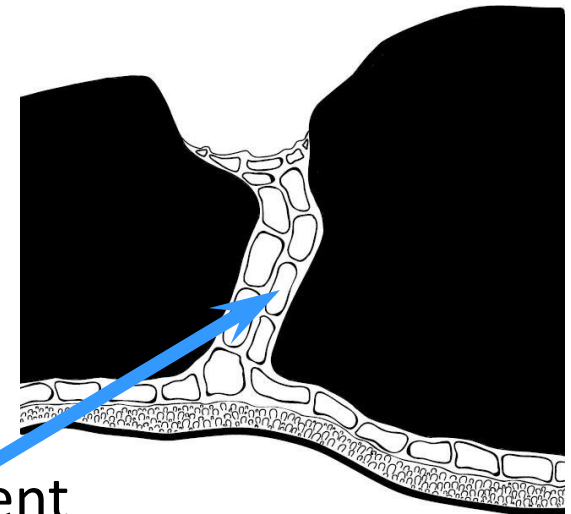


Pista maculata

Organic films

Shcherbakova,
Tzetlin, 2016

Foam cement



Pectinaria koreni

Maldanidae tubes

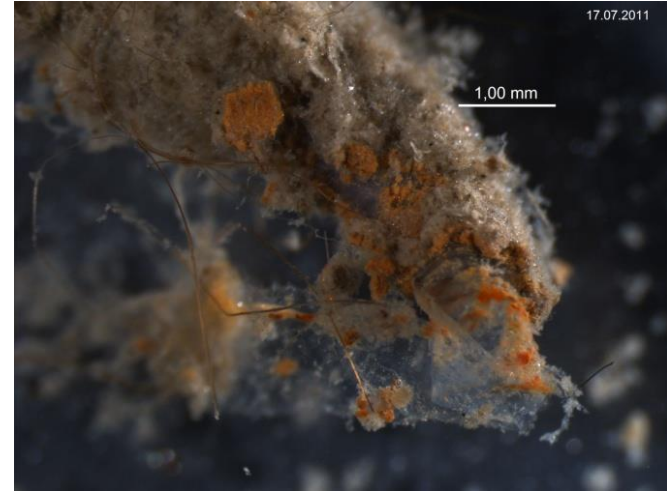
Different genera of Maldanidae construct different tubes

The tube structure is correlated with the lifestyle

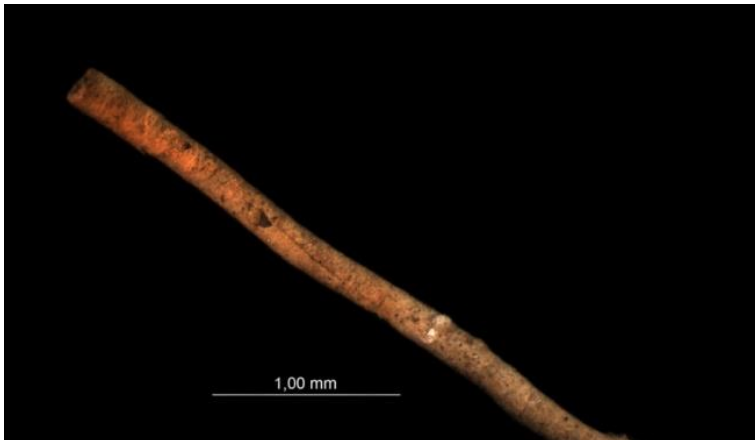
Could these tubes be used for family identification?



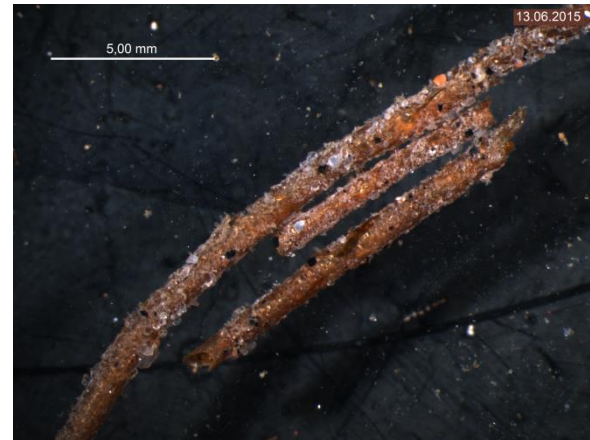
Nicomache lumbricalis



Maldane sarsi



Praxillella praetermissa



Rhodine gracilior

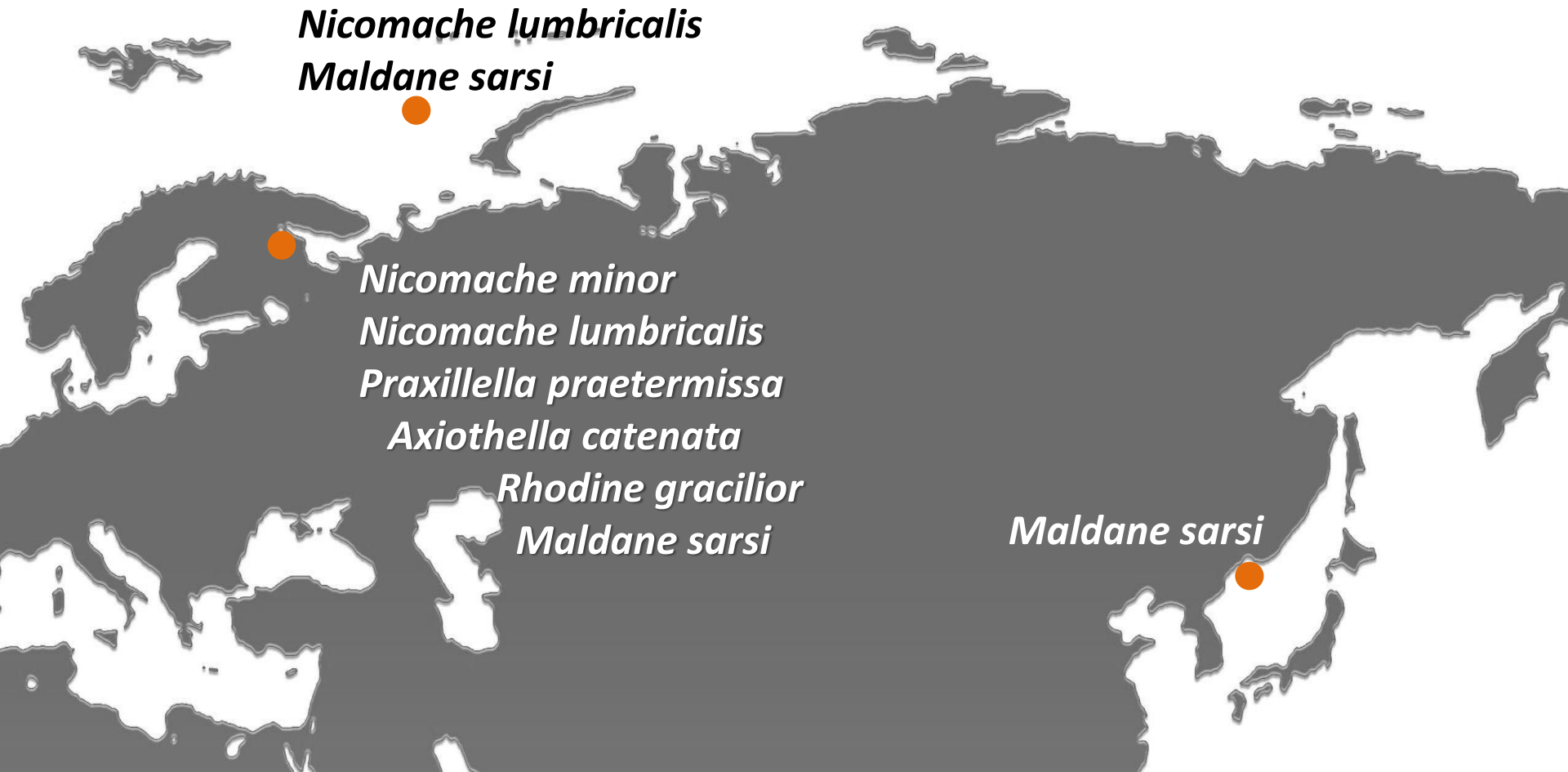


*Axiothella
catenata*



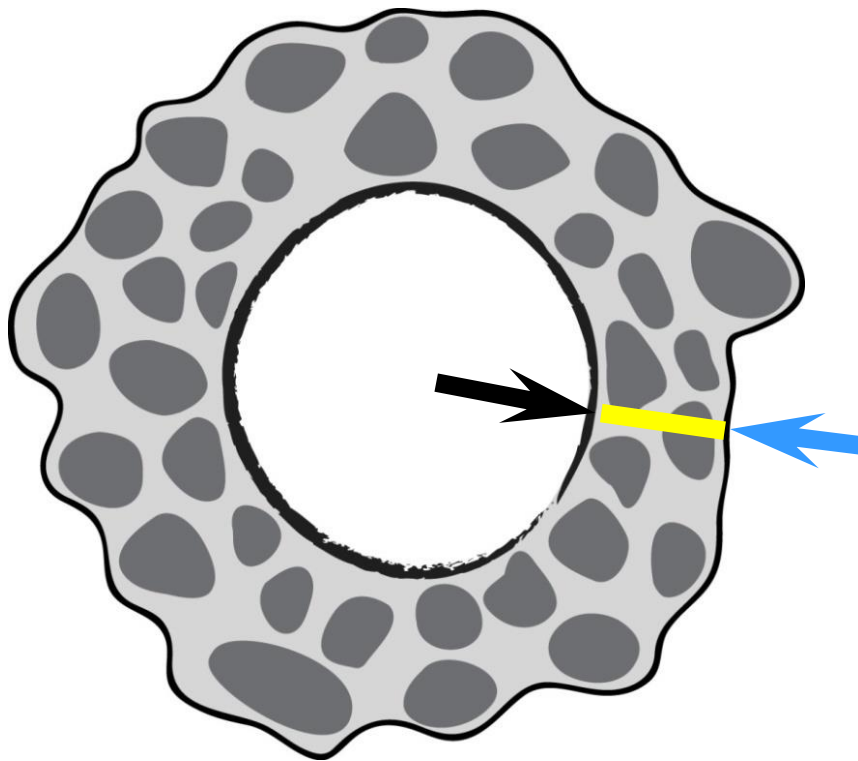
*Nicomache
minor*

Material was collected in 2011-2015 in the White Sea, Barents Sea, Sea of Japan



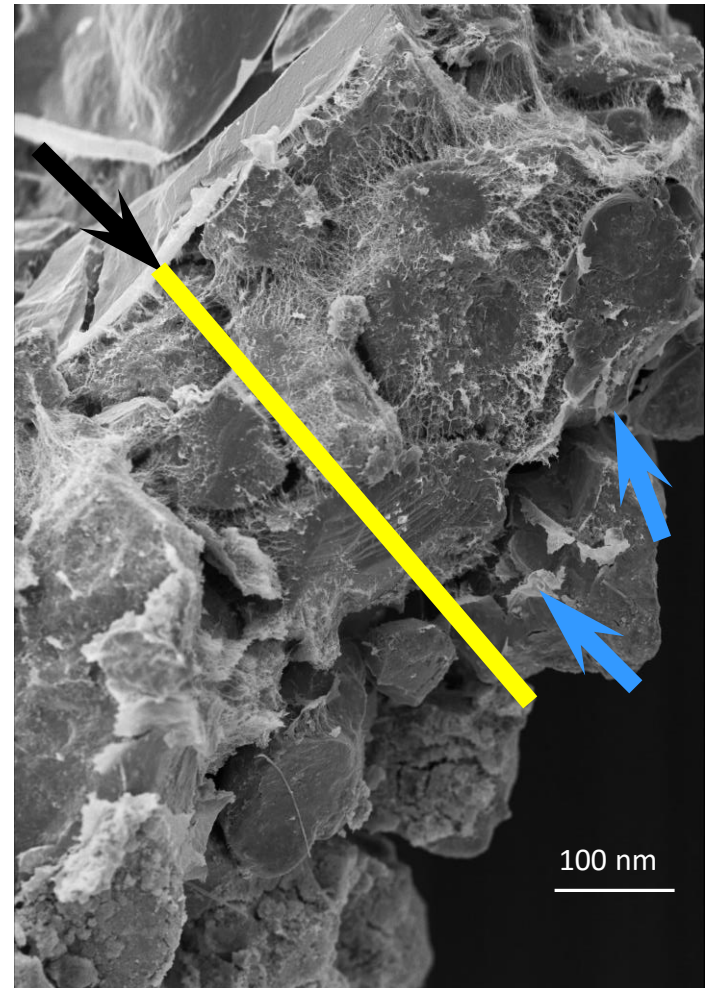
Plan of tube construction

- Inner cylinder ←
- Agglutinated part —
- Outer layer (absent in *P. praetermissa* and *R. gracilior*) ←



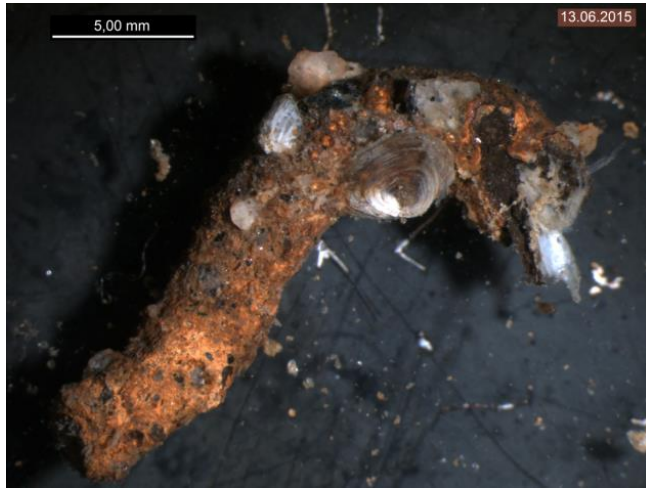
Schematic cross-section of maldanid tube

SEM photo of *Nicomache lumbricalis* tube wall fragment

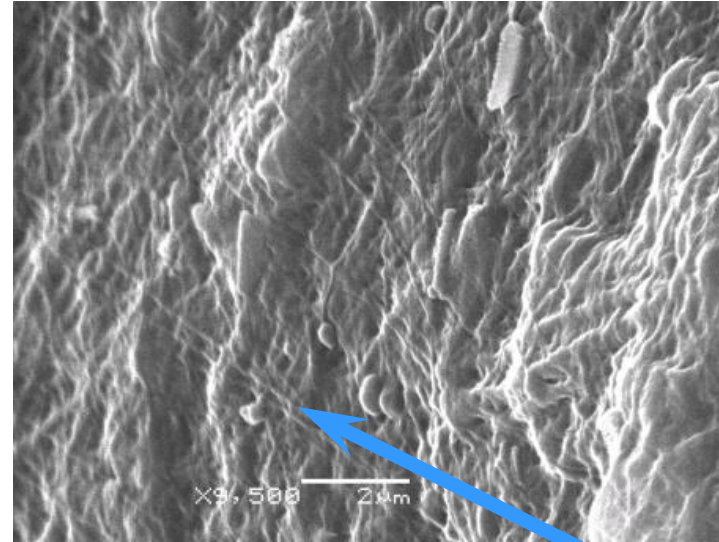


Nichomache tubes

N. lumbricalis



Inner cylinder of N. lumbricalis tube



N. minor



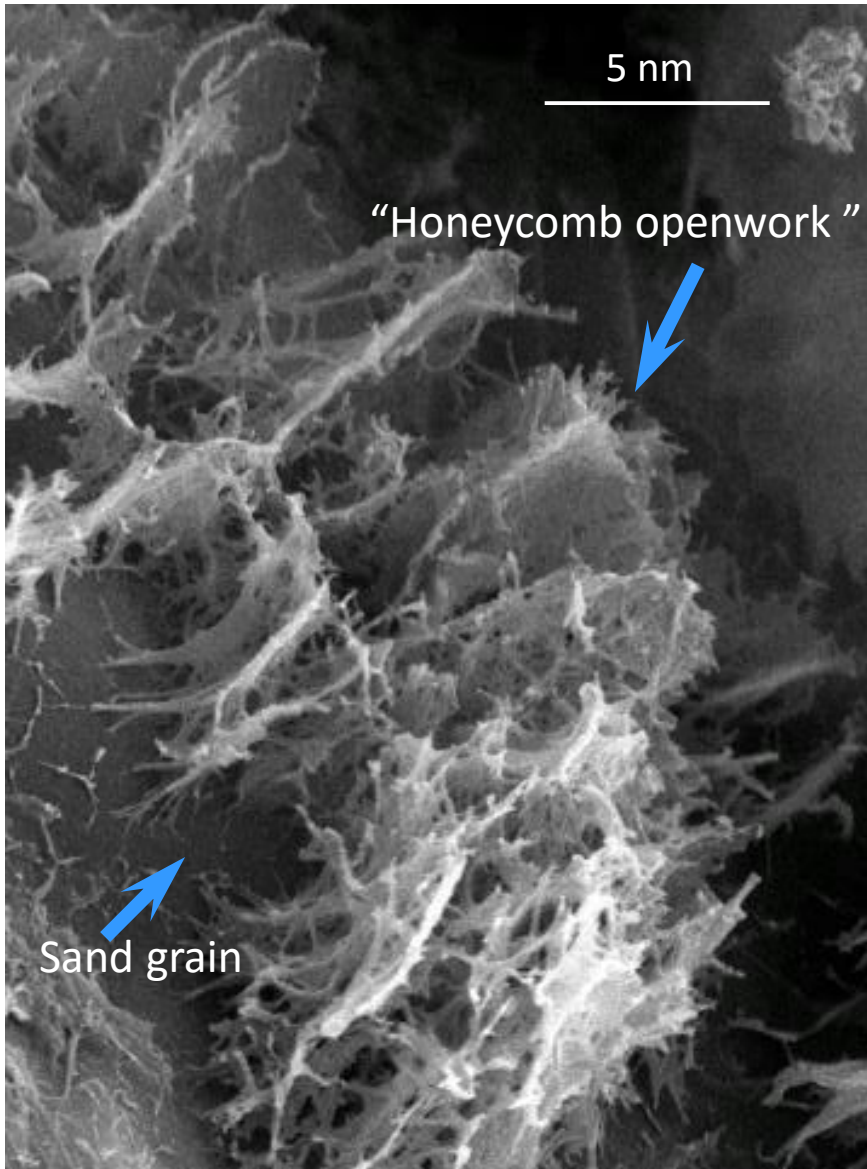
Tube, attached
to stone

Organic fibers, composing
inner cylinder

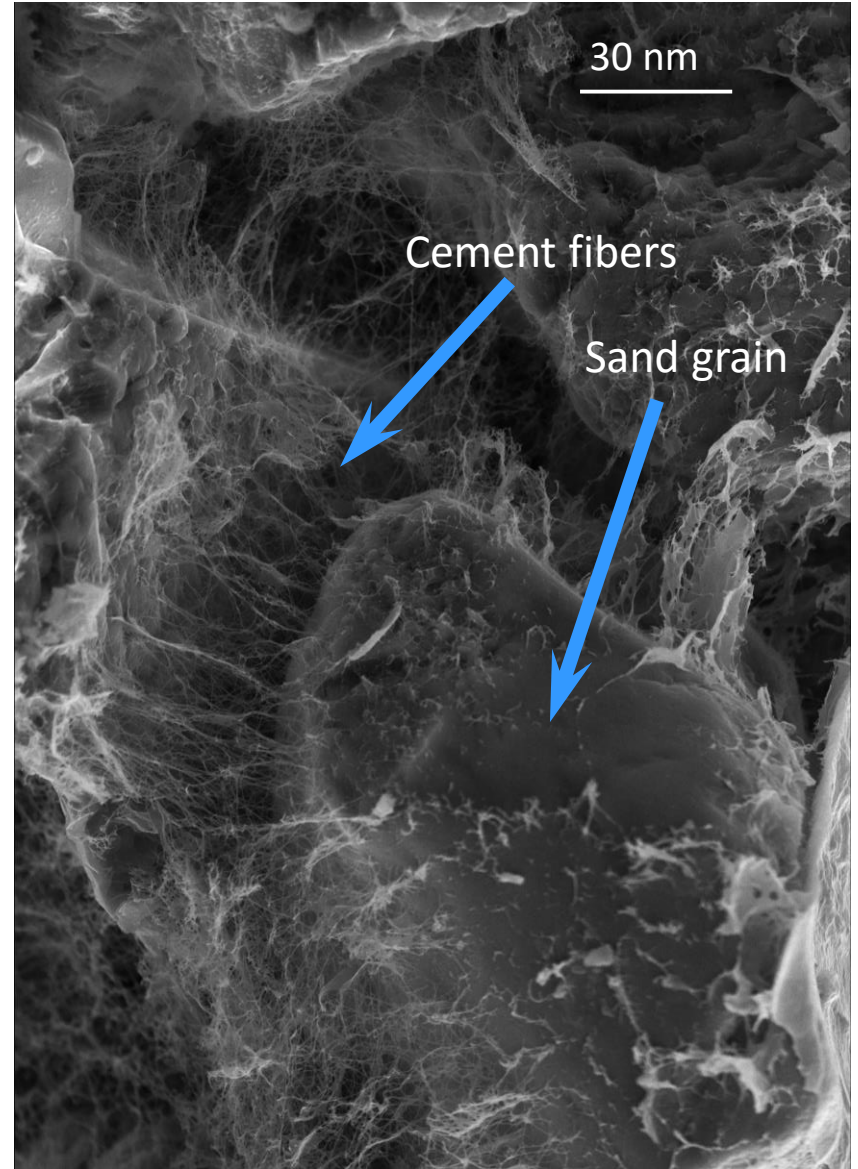
- **Live on the stones emergent from mud and attach to them their tubes**
- **Tubes are irregularly bent, hard, brittle**
- **Large agglutinated particles**

Agglutinated part of Nicomache tubes

N. lumbricalis

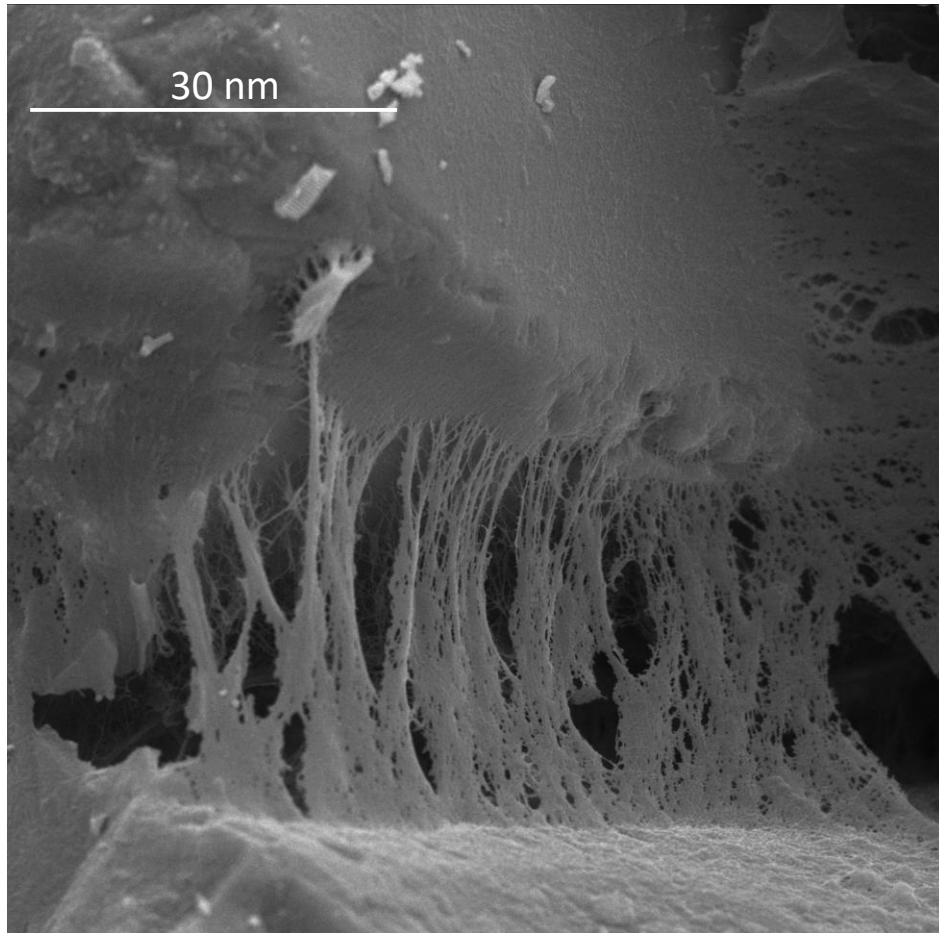


N. minor

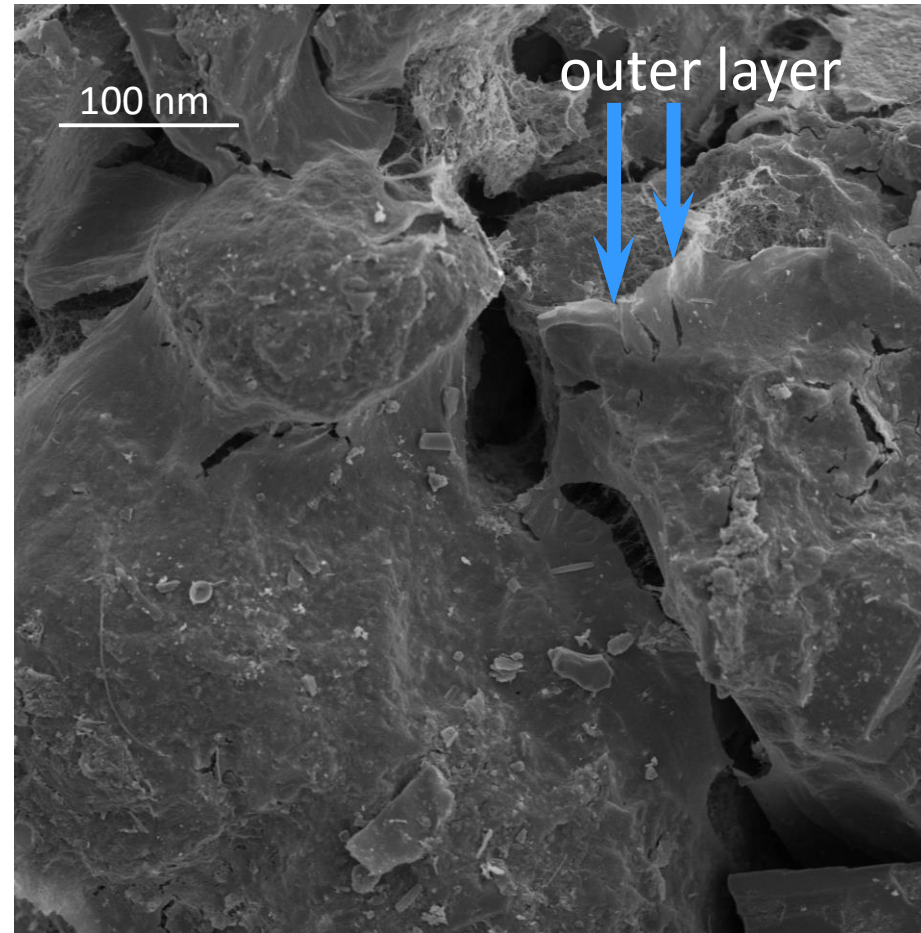


Outer layer of Nicomache tubes

N. minor

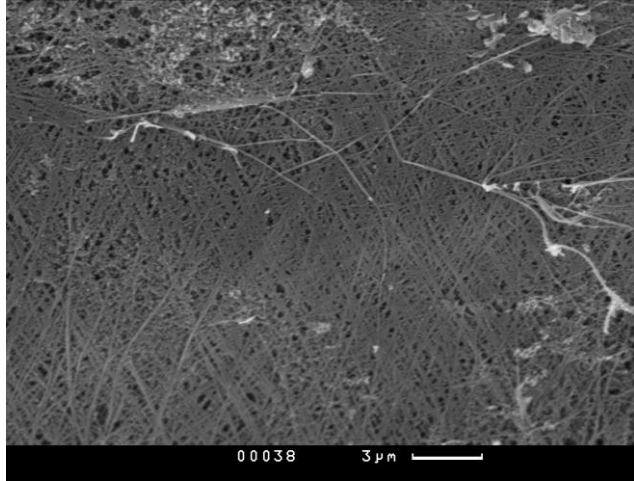


N. lumbricalis



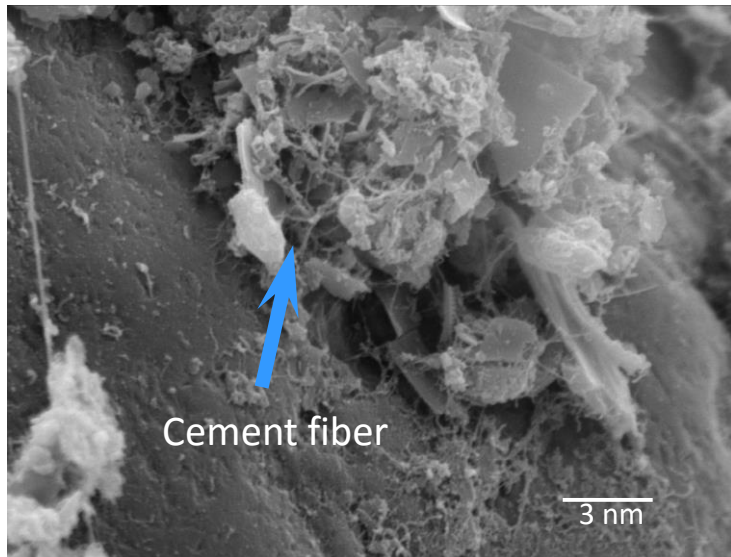
Outer layer is formed by fibers

Praxillella praetermissa and *Axiiothella catenata* tubes

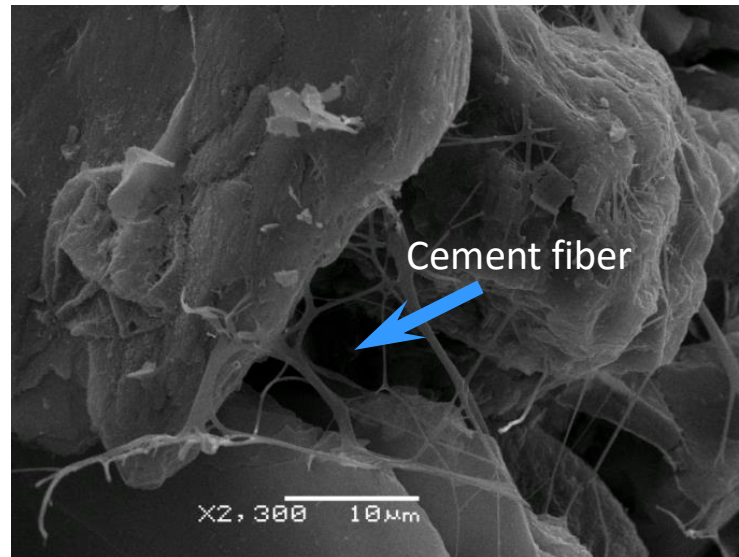


P. praetermissa inner cylinder

- Live on mud flats and build long, straight tubes in the sediment. Tubes are brittle
- Agglutinated particles smaller, than in *Nicomache*, and the tube is not so strong
- Outer layer of *A. catenata* similar to *Nicomache*
- In *P. praetermissa* the outer layer is not found



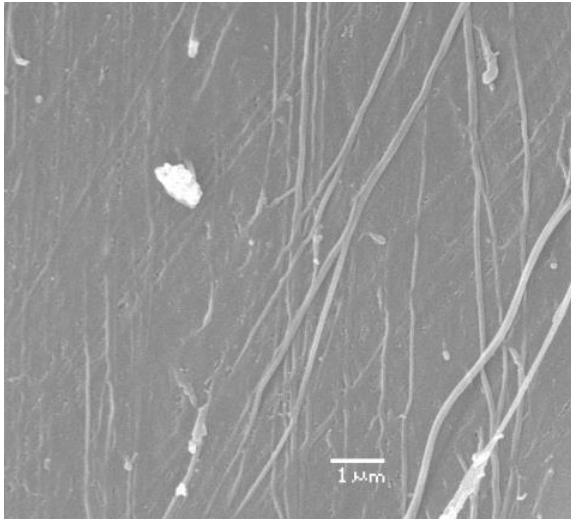
A. catenata cement



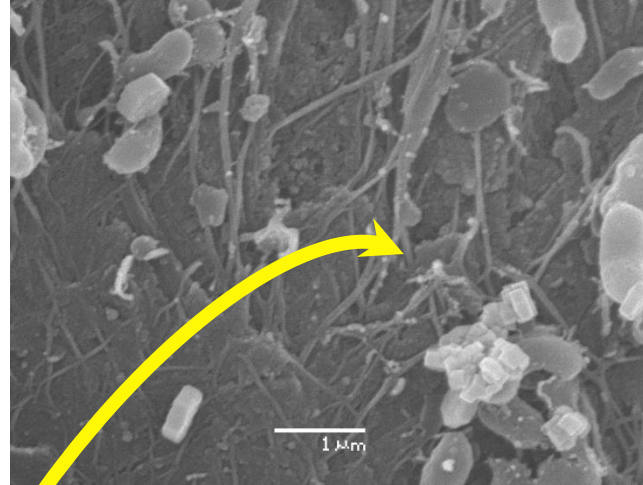
P. Praetermissa cement



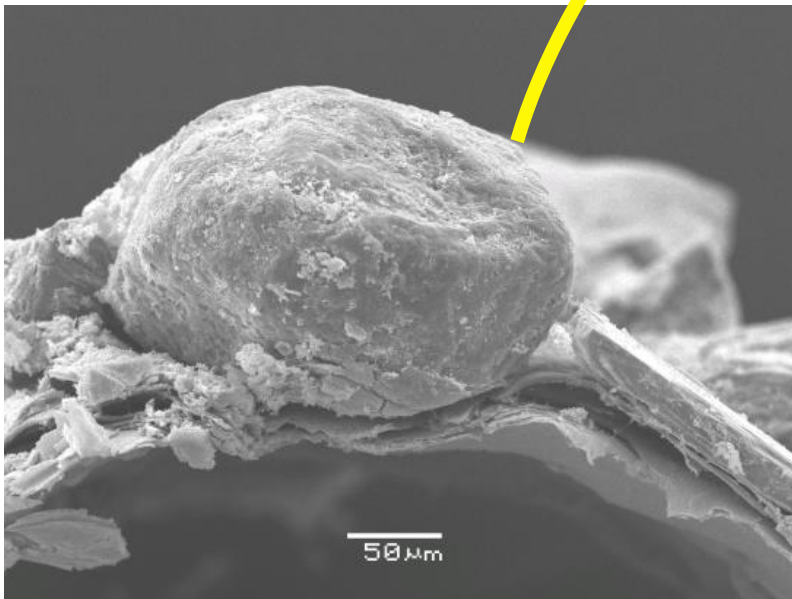
Rhodine gracilior tube



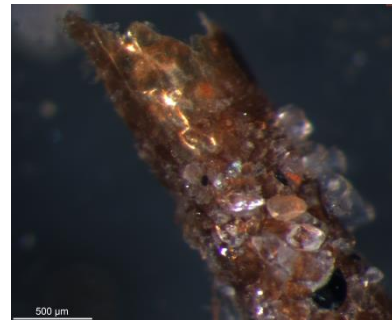
Inner cylinder



If a grain of sand falls off



SEM photo of tube wall fragment



- Lives on mud flats and builds long, straight tubes in the sediment
- Inner cylinder very thick, with numerous layers of fibers
- Tube is elastic and leather-like
- Outer organic layer is not found

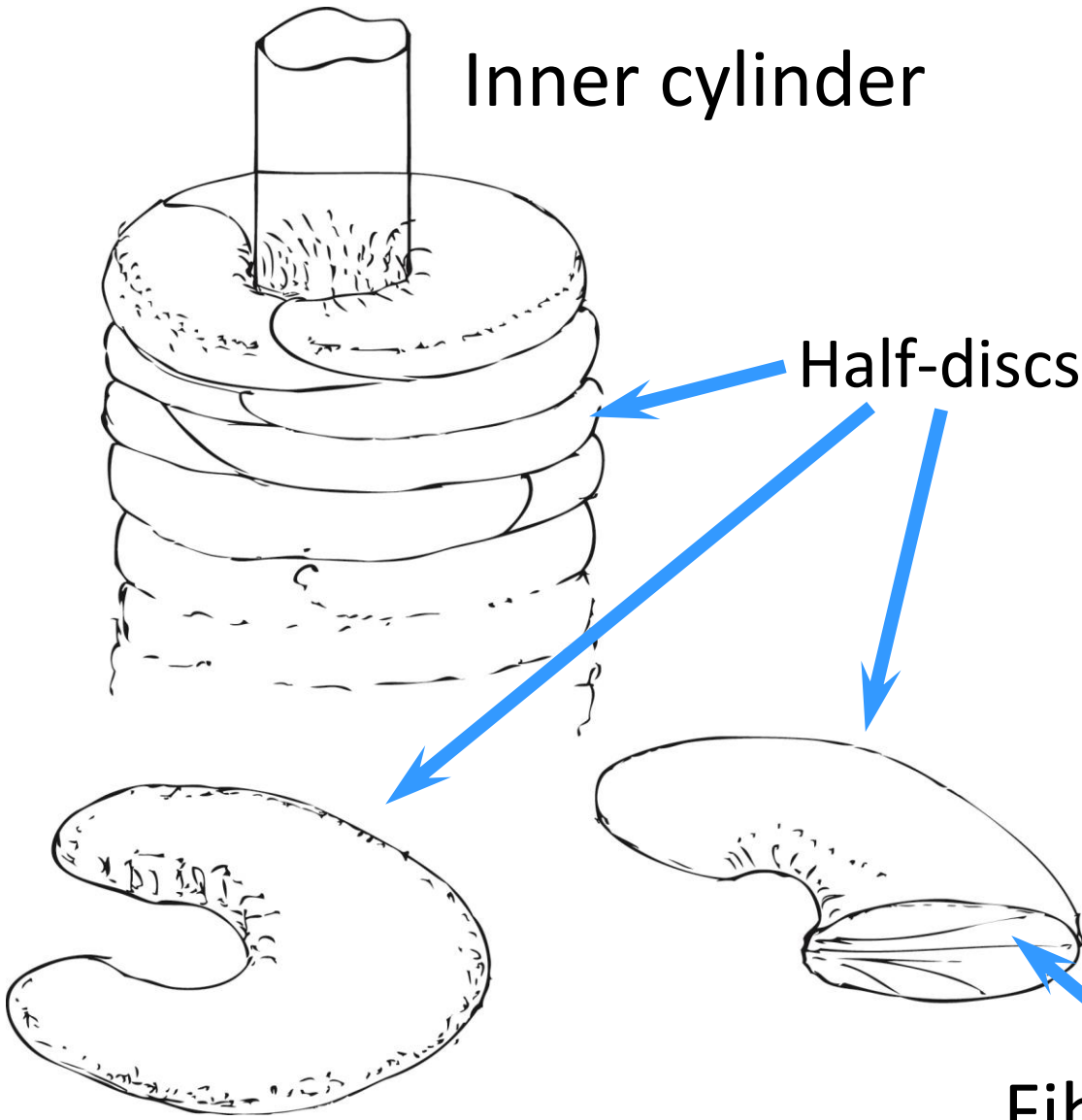
Maldane sarsi tube

- Lives on mud flats
- Tubes are soft, silty
- Inner cylinder with regularly arranged fibers of variable thickness
- Agglutinated part consists of half-discs
- Inside discs there are small particles mixed with flaky cement and radiating fibers covered with a fabric of organic fibers

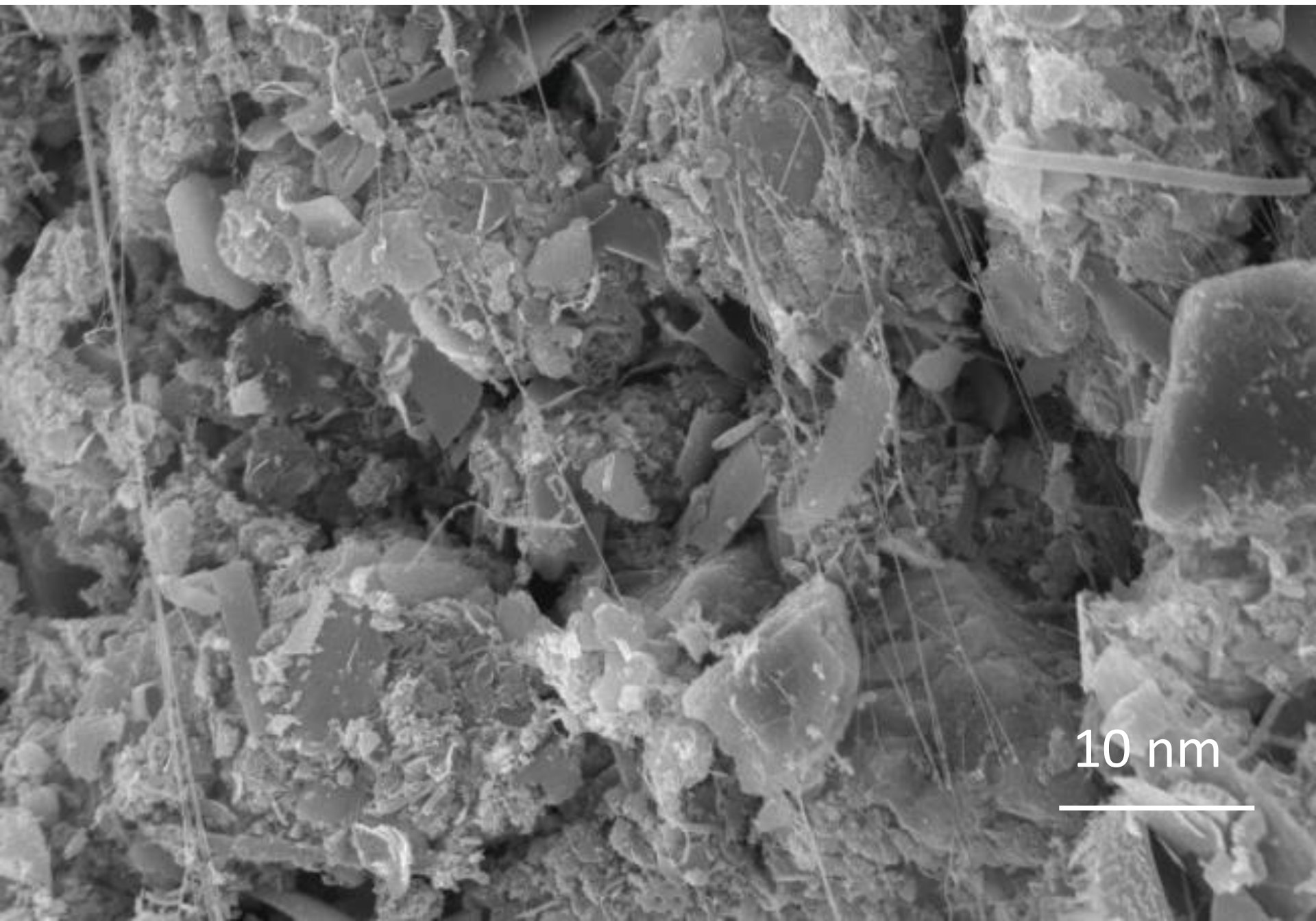
Inner cylinder

Half-discs

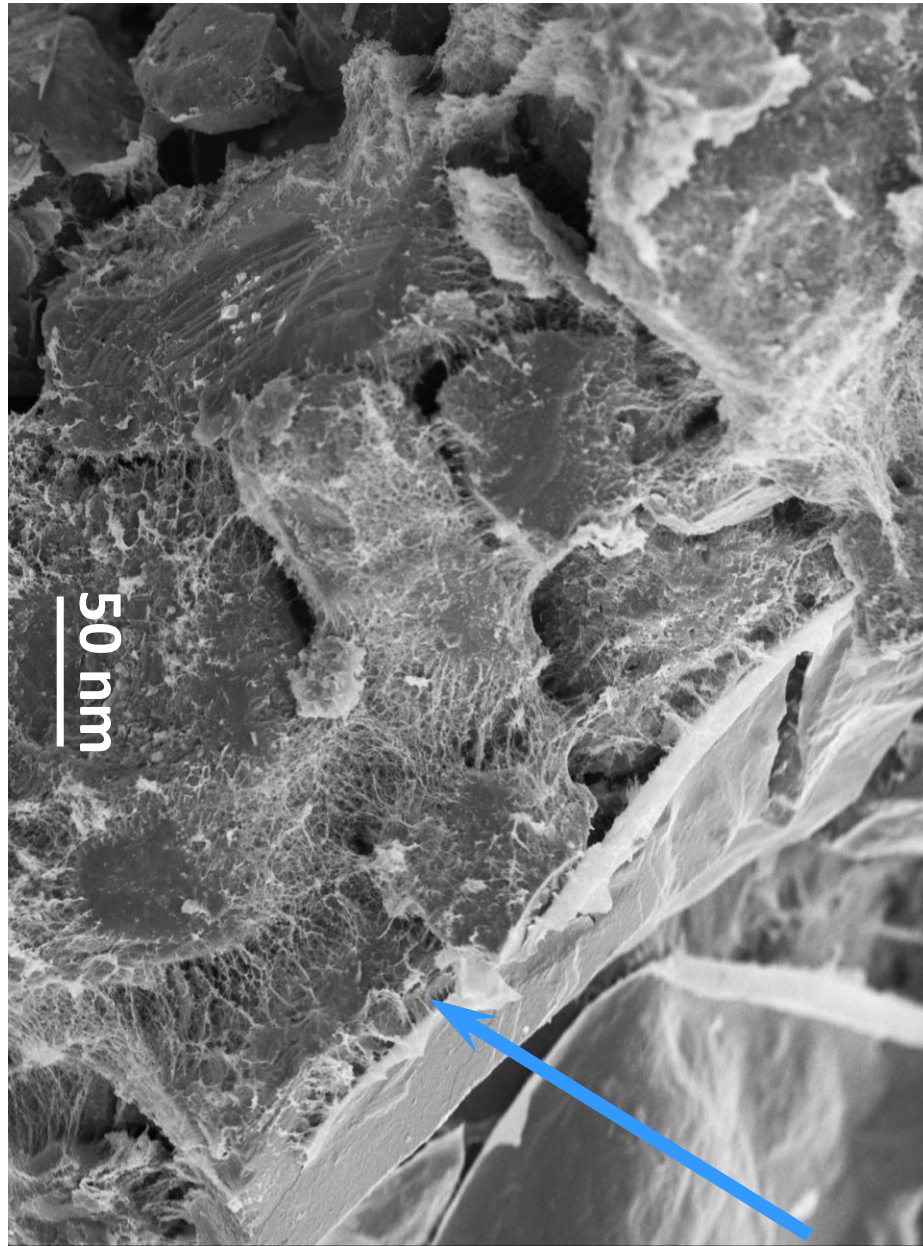
Fibers inside half-discs



Maldane sarsi tube



Variability of Maldanid tubes

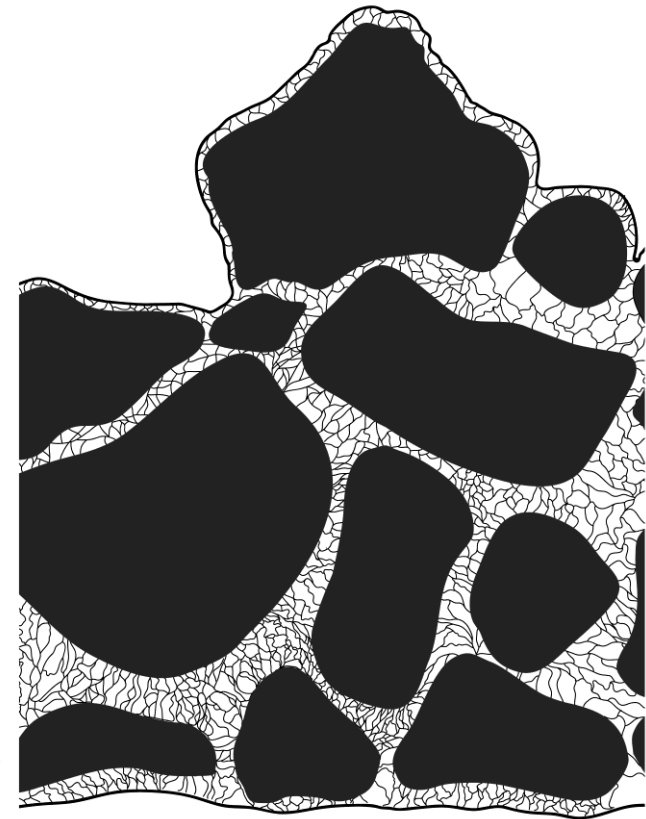


Nicomache minor **Inner cylinder**

Rhodine gracilior

Conclusion

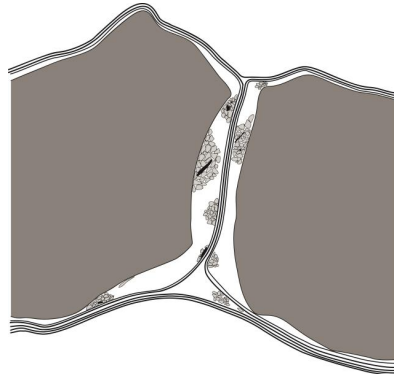
Maldanidae tubes have a specific character: agglutinated layer consisting of filaments fastening the inner cylinder and agglutinated particles



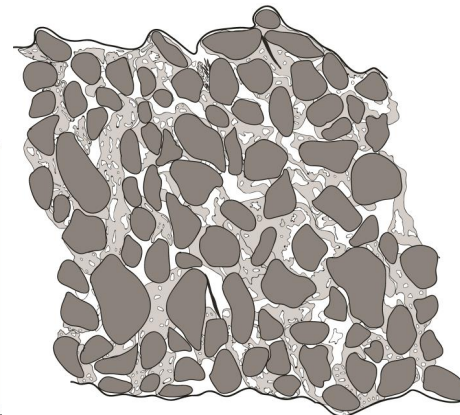
Nicomache minor



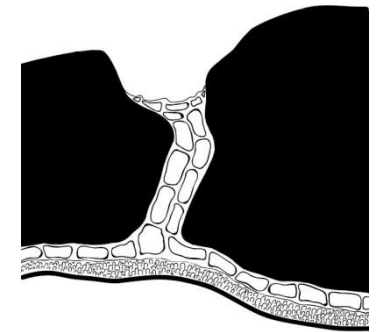
Pista maculata




Pista flexuosa



Amphitrite figulus



Pectinaria koreni

A microscopic view of a textured surface, possibly a mineral or biological specimen, showing a complex, granular structure with various shades of brown, tan, and black. The surface is highly detailed, with many small, irregular particles and fibers. The lighting is bright, creating a shimmering effect on the surface. The text "Thank you for your attention!" is overlaid in the center in a bold, white, sans-serif font.

Thank you for your attention!

Acknowledgements

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