

## Siliceous Particles : Man-made, Volcanic and of Biogenic Origin

### *Abstract*

Amorphous silica particles can have a biogenic as well as a minerogenic origin. Of the biogenic ones, siliceous single-celled algae (diatoms, silicoflagellates, chrysophytes) play an important role in aquatic environments, while, in terrestrial environments, phytoliths, chrysophyte cysts and aerophilous diatoms are common. These silica particles are not man-made but can be concentrated, eroded and transported by human activities (Fig. 1 a-c).

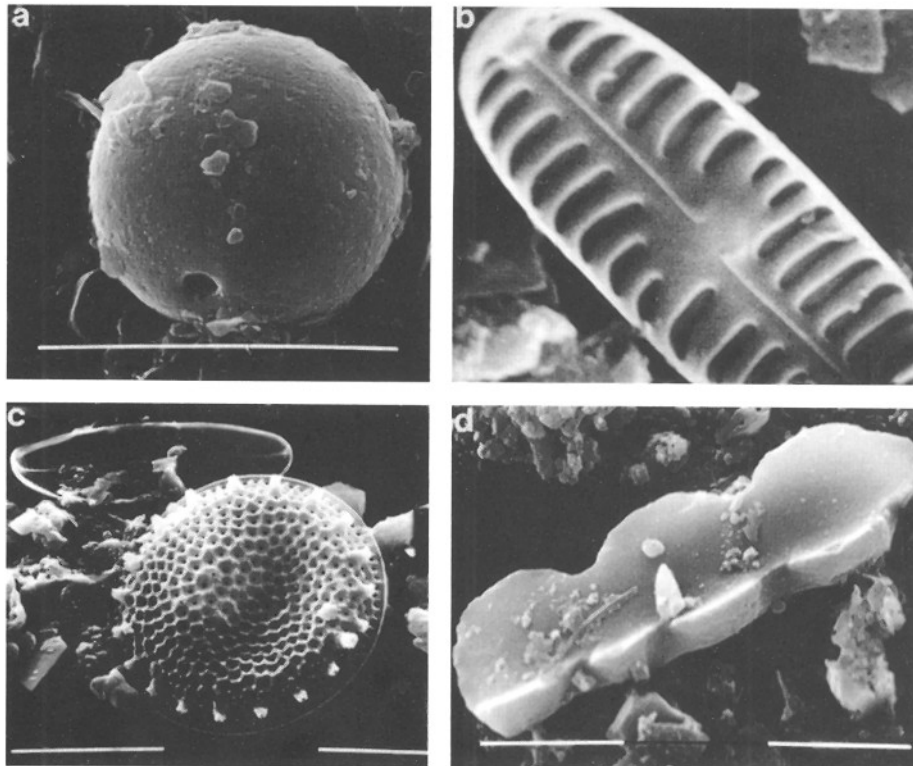
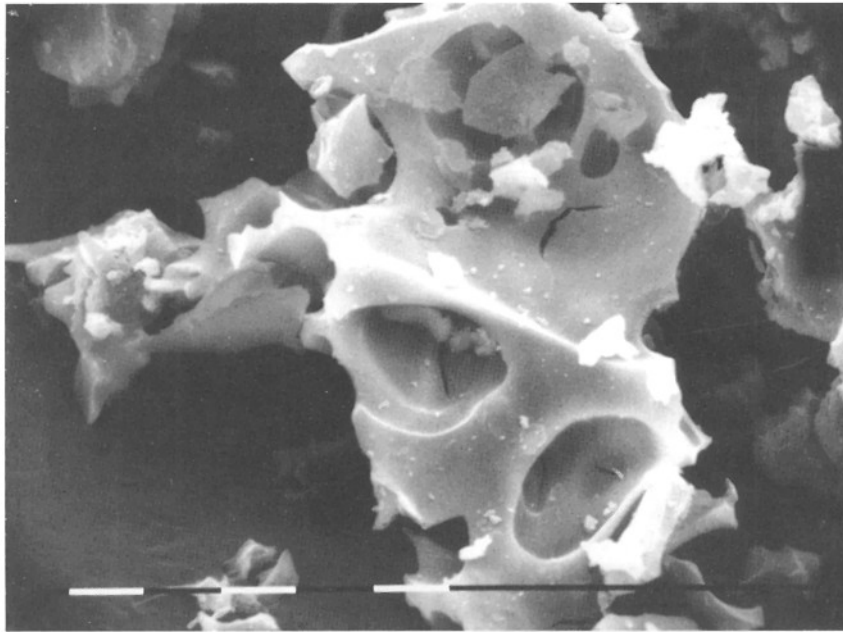


Fig. 1. Siliceous particles of biogenic origin  
a. chrysophyte cyst, common in soil ; b. diatom (*Pinnularia borealis*, aerophilic, living on wet soil) ; c. diatom (*Thalassiosira hyperborea*, coastal brackish water plankton) ; d. phytolith (in grasses and cultivated soil). White bar = 10 micron (1/100 mm).  
SEM micrographs, Department of Quaternary Research, Stockholm University.



*Fig. 2. Volcanic ash particle of minerogenic amorphous silica, deposited after Vesuvius eruption A.D. 79 on Villa Romana in Minori, Italy. White bar = 10 micron (1/100 mm). SEM micrographs, Department of Quaternary Research, Stockholm University.*

The extraction of diatomite causes severe environmental problems in the surroundings of the mines because the material is very easily eroded to silica dust.

The cultivation of cereals concentrates phytolith particles in the soil. When the soil is exposed to ploughing erosion increases and this results in deposition in other environments. The preparation of cereals (harvesting, winnowing and milling) is one way in which prehistoric airborne phytoliths can have been produced (Fig. 1 d).

Minerogenic amorphous silica can be of volcanic origin (volcanic ash, glass, obsidian) or transformed from biogenic silica (by age, pressure, a rise in temperature) to cristoballite and, as an end product – chert (Fig. 2).

During the Stone Age obsidian and chert were important natural resources for tool making. The products of this human activity are microliths – another type of silica particle!

Volcanic ash layers are good stratigraphic markers in sediments, particularly in laminated ones, but can also spell disaster for the environment and man.

Urve MILLER

Department of Quaternary Research  
Stockholm University  
Odengatan 63  
S - 11322 STOCKHOLM, Sweden