SPICULES

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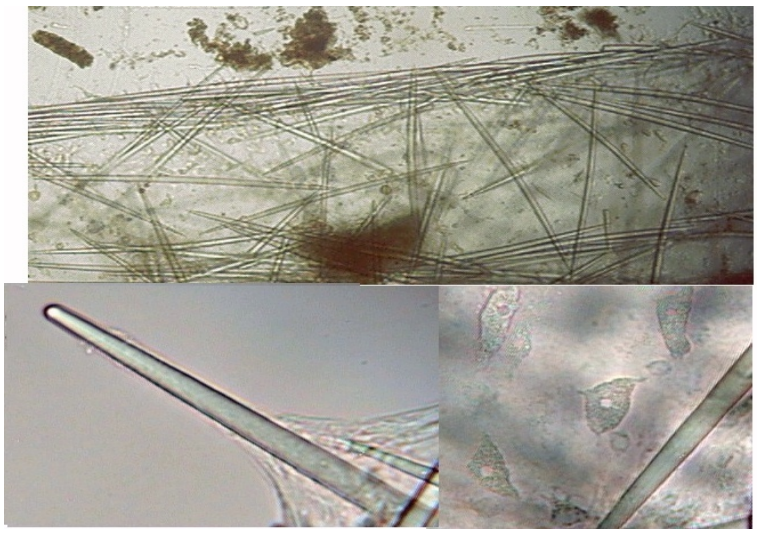
Why are we interested in these microscopic elements? Because they are found in various organisms! Definition of spicules or sclerites: they designate the extracellular mineral secretions present in the tissues of certain groups of invertebrates. They can be made up of calcite, silica, chitin, or even sclerotized proteins.
Their purpose is to serve as support tissue, a sort of skeleton, for the soft tissues constituting the body.

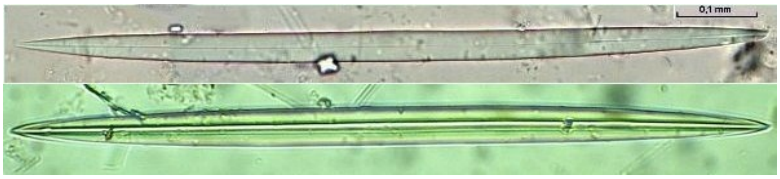
They are found in large quantities in sponges: for example this specimen living at shallow depths (less than a meter) size: 10 cm. Maybe *Aplysina cavernicola*

And this is what its spicules look like, very numerous and it is quite difficult to separate them from the soft tissues of the sponge in which they are embedded

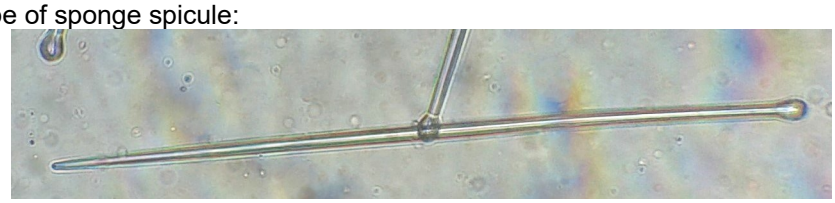
Here is an image of the sponge tissues at x 2,5 we see the spicules and in the image at the bottom left how the soft tissues adhere to them, to the right picture: amoebocyte cells:



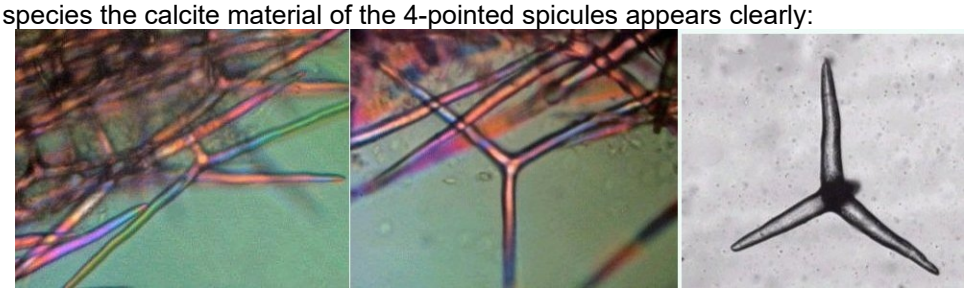
But what is surprising (see the photo below) is that we find the same spicules in diatomite or diatomaceous earth, a sedimentary rock at least 50,000 years old, composed mainly of diatoms.



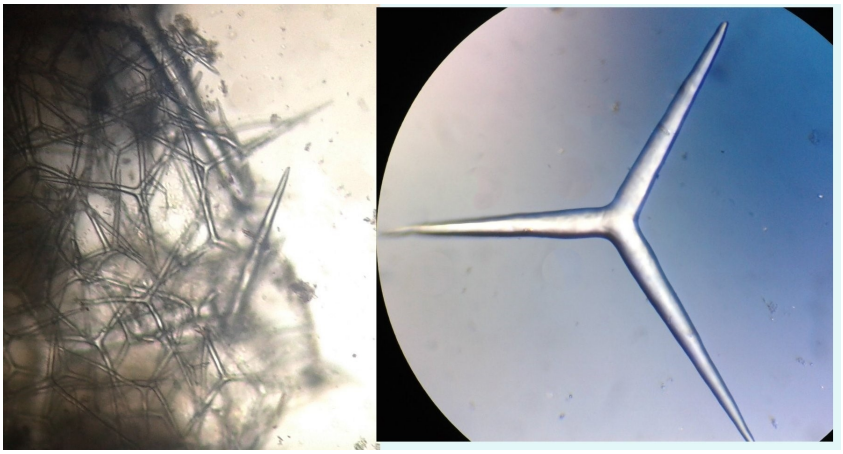
Another type of sponge spicule:



The spicules above are made of silica (we see this because they do not polarize the light); for other species the calcite material of the 4-pointed spicules appears clearly:

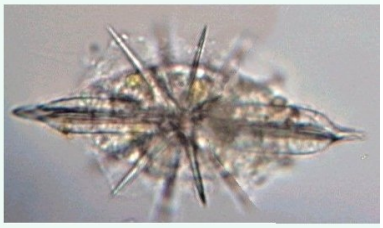


The tripod form (triactin) is better visible here: on the right image in polarized light. The forms with 4 branches are called tretractins.



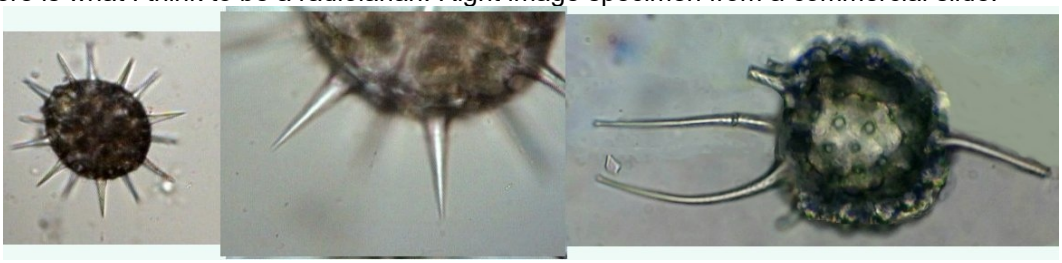
Among the calcareous spicules we can see them in the podia (tubes feets) of the sea urchin: image at X 15 after dissolution of the soft tissues:

In *Acantharia* (one of the three groups of Actinopods with Radiolarians and Heliozoans) the spicules are composed of another material : strontium sulfate (SrSO4) for example below in *Amphilonche elongata* and on the right *Amphibelone:*

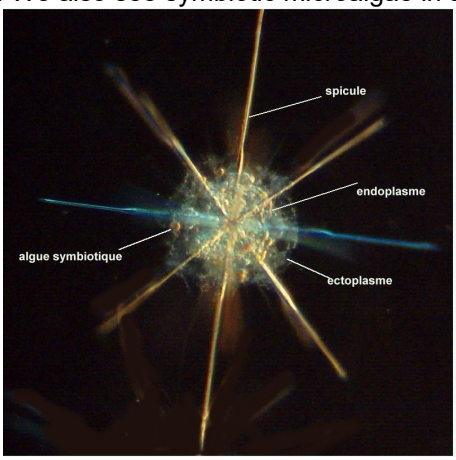


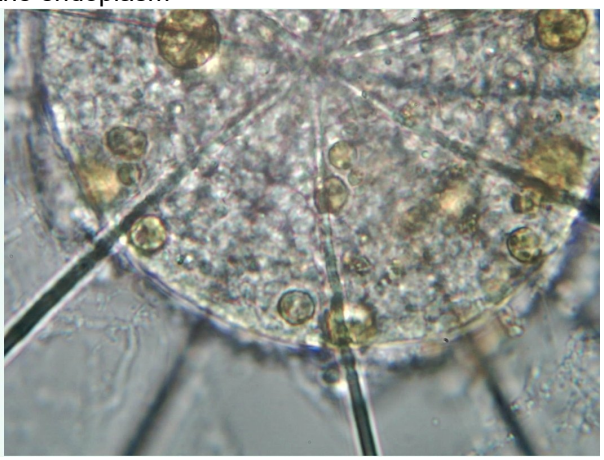
We may wonder why these organisms use strontium, which is less abundant in nature than calcium or silica. But the strontium atom has a structure of its electron shells close to that of calcium which can explain the substitution.

Here is what I think to be a radiolarian: Right image specimen from a commercial slide:

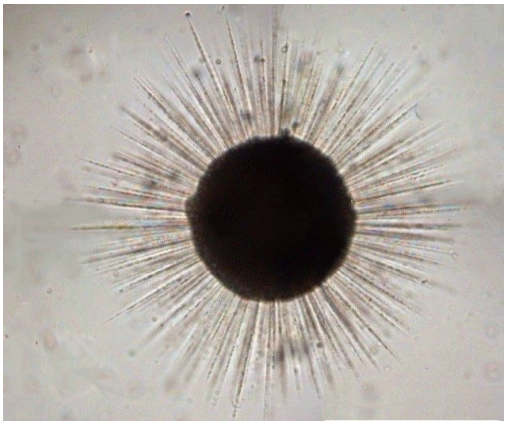


Acanthozoans have radiating spicules from the center of the cell as seen in the image on the right. We also see symbiotic microalgae in the endoplasm



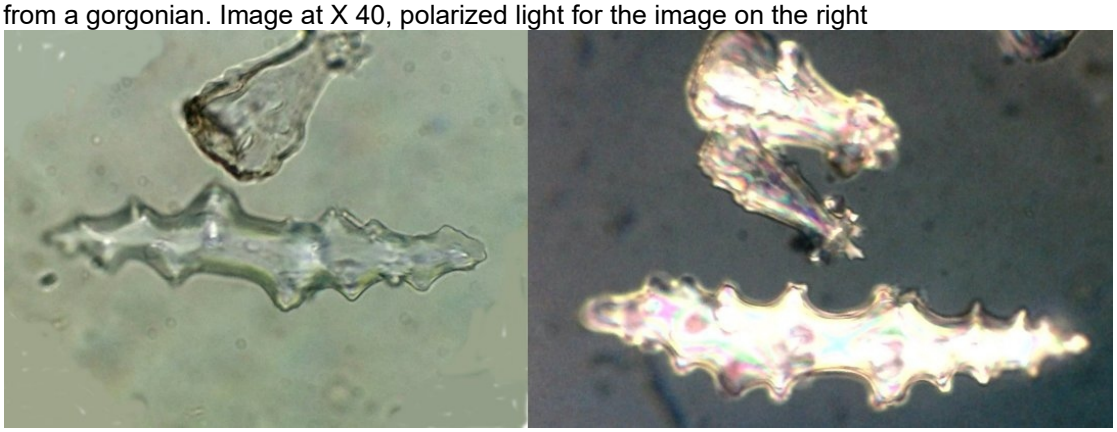


The other group of Heliozoa has very fine siliceous spicules between the axopods and near the surface of smaller spicules ending in a bifid tip not visible here



In sea cucumbers (holothuridae) the spicules are of the calcareous type and disseminated in the epidermis: here are some of them (taken from a commercial preparation) and corresponding to a Trepang: dried sea cucumber (pink sea cucumber) consumed in Asian countries: image in x 40 – Right in polarized light:

In the same box of commercial preparations (from the 60s) these calcareous spicules coming from a gorgonian. Image at X 40, polarized light for the image on the right



One of the most intriguing questions is to understand how these organisms manage to synthesize silica (almost glass) in a purely chemical process. The spicules are secreted by scleroblasts, apparently from a protein filament that contains microcrystals: see this recent study:
https://www.psi.ch/fr/media/actualites-recherche/la-structure-des-proteines-produisant-du-verre-dans-certaines-eponges-a

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