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New insights about barium biomineralization in *Spirogyra*

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Recognizable for its helical chloroplast's arrangement, *Spirogyra* is a multicellular green alga which has been widely used as a model organism to study the algal system. Reproduction, mitosis and organelle transport, have been investigated thanks to particular transparency of *Spirogyra* cells, making it an ideal microscopical object [1]. Yet, a rather incredible discovery was quickly forgotten. In 1957, Kreger identified barite microcrystals in *Spirogyra* cells by X-ray diffraction and suggested that the particles moving in Brownian motion, visible under an optical microscope, could match the barite signals as detected by the XRD [2]. Thirty years later, Grolig describes these particles as "small vesicles of high refraction"..." most of the time showed rapid Brownian motion..." and which "rarely moved on the tracks with the other particles and then only for short distances" [3].

Although barite biomineralization is well known for its fellow unicellular green algae, *Closterium* [4] and *Micrasterias* [5], its nucleation mechanism and function remain largely unknown. Using a laser tweezer Raman microspectroscopy *in vivo*, we succeeded in proving the original hypothesis of Kreger that the mobile particles in the cells observed under optical microscope are in fact the barite crystallites. Barite microcrystals are not fixed within the cells but are diffusing, and this character is common to the genus *Spirogyra*. By tracking the diffusive motion of barite crystallites, we further investigated the details of the physical and chemical properties of cytoplasm. This new information obtained *in vivo* could be a key step toward understanding the nucleation process of barite in *Spirogyra* and finding the answer to the fundamental question of how these crystals form within *Spirogyra* at the first place.

[1] Johansen (1940), McGraw-Hill, New York and London.

[2] Kreger & Boeré (1969), *Acta Botanica Neerlandica* 18, 143-151.

[3] Grolig (1990), *Protoplasma* 155, 29-42.

[4] Brook, Fotheringham, Bradly & Jenkins (1980), *British Phycological Journal* 15, 261-264.

[5] Meindl (1984), *Phyton* 24, 273-276.