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From mechanical anisotropy of plant cell wall to growth anisotropy: an experimental study.

The emergence of such complex shapes, as leaves and flowers, results from the integration at the organ level of inhomogeneous anisotropic growth at the cell level. Though flowers are the most beautifull examples of vegetal organs, recent attempts to go from one scale to the other have led to poorly robust models. Focusing on much simpler organisms, the internodes of corticated *Characeae,* gigantic cylindrical algal cells (2 cm) surrounded by smaller cells, this experimental training aims to understand how local anisotropic growth determines global growth on firmer experimental basis, more tractable for theoretical analysis.

Unlike animal cells, the vegetal cell is surounded by a rigid shell made of cell-wall. For *Characeae*, the anisotropic growth promoting cylindrical shape is due to the presence of rigid microfibrils wounded orthogonaly to the cell axis. The training will further test how mechanical anisotropy and growth anisotropy are linked through kinematical growth studies of different uncorticated (single-cell) (Figure A) and corticated (multicellular) *Characeae* (Figure B). Small beads will be put at the surface of the cell to monitor the growth. Tracking techniques will be necessary to infer both the elongation and the rotation involved in growth. The rheology of the cell wall will be tested through changes in temperature of the surrounding liquid and light stretching. If some times remains at the end of the training, light modeling tools could be used to confront experiments to predictions.

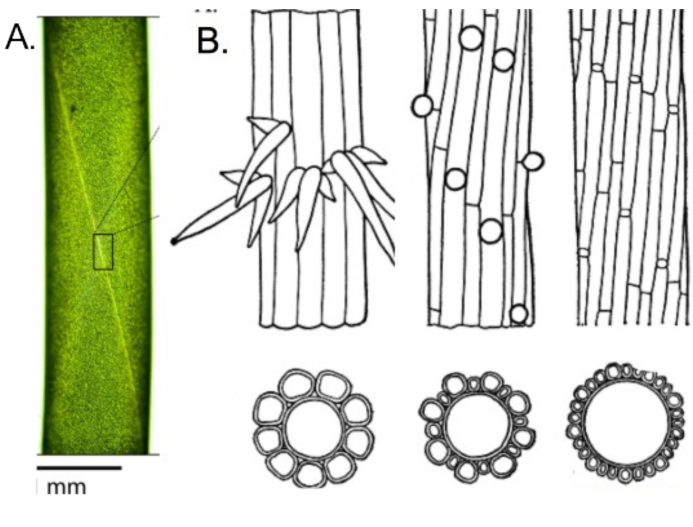

Figure. A. An internode of *C.corralina*. B. *Characeae* with cortications: *C. canenscens, C. contraria, C. fragilis.*
Up. Lateral view: The cortications inclination is varying from species tospecies.
Down. Transversal view: A big central internode surrounded by smaller cortications.