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Atypical Carbonic Anhydrase in the CO₂ concentration mechanism of the diatom *Thalassiosira pseudonana*

Diatoms are members of a divergent branch of micro-algae with a complex evolutionary history. They possess complex CO₂ concentration mechanisms (CCM) that are highly efficient to transport inorganic carbon into their 4-membranes chloroplast. We have identified and structurally characterise a Carbonic Anhydrase (CA) of a new class (ι -CA), that has an important role in the CCM of the diatom *Thalassiosira pseudonana*, and that is localised in the chloroplast boundary.

Since our initial publication, other ι -CAs have been identified from prokaryotes, cyanobacteria and micro-algae. They possess unusual properties for CA:

- They are not metal-dependent, or have unusual metal co-factor (such as Mn for *T. pseudonana* ι -CA).
- They have unusual domain repetition (four domains repetition for *T. pseudonana* ι -CA).
- They have unusual structural organisation with complex arrangement (drone-like structure for *T. pseudonana* ι -CA).

We propose a 6 months internship on the study of *T. pseudonana* ι -CA. The student will pursue our enzymatic characterisation of the enzyme with activity assay (CO₂ \leftrightarrow HCO₃⁻ reversible conversions and esterase activity) on different constructions of the proteins (already available) with and without metal co-factor. Besides, the effect of the metal ion on some physiological properties (growth rates, photosynthetic parameters in relation to ι -CA expression) of *T. pseudonana* will be studied. In parallel, photosynthetic efficiency under a range of growth conditions (high or low [CO₂], high or low light) will be determined.

References:

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