Title: Origin of Novelty in Genomes of Phytoplanktonic eukaryotes

Level: Master 1st or 2nd year (4 to 6 months)

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Abstract: Marine picophytoplankton comprise the smallest free-living photosynthetic eukaryotes, with a simple cell organization (one single mitochondrion and one single chloroplast), contained within a cell of 1 µm diameter. These microalgae are at the base of the food chain in coastal areas and the analysis of their genome sequences disclosed a huge genetic diversity and ancient divergence. Within the Ostreococcus genus, at least 4 species have been identified, with a genetic divergence greater than that observed in Mammals. Strikingly, each newly sequenced genome contains several hundreds species-specific genes, likely involved in the ecological niche differences of these species. Here, we propose to investigate the mechanisms that generate these species-specific genes. Several different mechanisms can lead to new genes; gene duplication and divergence, emergence from non-coding sequences, or horizontal gene transfer.

We will take advantage of the genomic data available within the Ostreococcus species complex, the Chlorophyta phylum, and the metagenomic data available from the pan-oceanic TARA-Oceans survey, to quantify the relative importance of different mechanisms on the origin of novelty in these enigmatic microalgae.

Keywords: bioinformatics, orphan genes, duplication, horizontal gene transfer, rewiring, picoeukaryotes

References


