

## THE METABOLIC LANDSCAPE CONNECTING CHLOROPLAST AND MITOCHONDRIA ENERGETICS IN DIATOMS

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Energy obtained from light harvesting and photosynthetic electron transport is used to drive carbon fixation and other biosynthetic processes required for cellular growth in photoautotrophic organisms. In eukaryotes, these biosynthetic pathways can span multiple compartments and efficient growth requires coordinated delivery of C skeletons and energized biomolecules via primary metabolism. The primary metabolic landscape of diatoms, an ecologically important group of unicellular phototrophic eukaryotes, is highly distinct from that of plants and other algae. Diatoms possess certain metabolic pathways that are anomalous for phototrophs, such as a urea cycle, mitochondrially-targeted glycolysis pathway, and a chloroplast ornithine biosynthetic pathway, but their biological roles are largely unknown. Using phylogenetic, functional genomics, and systems biology approaches, we investigated the origin and significance of these pathways in diatoms. We found that this unique organization is a consequence of their complicated evolutionary history and functions to coordinate cellular energetics between the major energy-generating organelles, the chloroplast and mitochondria.

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