

# [Editorial: advances in plastid biology and its applications](https://assignbuster.com/editorial-advances-in-plastid-biology-and-its-applications-application-essay-samples/)

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The Editorial on the Research Topic   
Advances in Plastid Biology and Its Applications

Plastids originated from endosymbiosis around 1. 5 billion years ago. They have been extensively studied to understand photosynthesis and other metabolic functions and to express foreign proteins, and knowledge about plastids has greatly increased. However, there are many aspects of plastid biology that remain unclear, and there have been difficulties in fully developing plastid transformation as an effective vehicle to express proteins. This research topic was launched to advance the knowledge of plastid biology, review recent progress, and address some of the challenges.

Tight coordination between plastid and nuclear genomes is essential for development and homeostasis in plant tissues. Bobik and Burch-Smith provide a detailed overview of this process including retrograde signaling between plastids and other organelles, plastid signaling in response to biotic and abiotic stress and the effect on the cell wall and intercellular symplasmic transport. By viewing chloroplast signaling in the context of the whole plant, they highlight the impact of chloroplast engineering on intracellular communication to avoid unintended consequences on growth and development.

An example of this concern is the alteration of carotenoid content of plants for the production of high value products. There is growing evidence that carotenoid cleavage products (apocarotenoids) can play an important role in modulating stress responses and impact upon plastid biogenesis; progress in identifying the signals and genes responsible is reviewed by Tian .

Chloroplast development from pro-plastids in angiosperms is dependent on light signaling pathways. Hills et al. demonstrated that classic plastid signaling also exists in gymnosperms but found that pine chloroplast biogenesis is light-independent. They investigated how light dependence might have evolved, and propose that suppression of photosynthetic gene responses to plastid signals in the dark occurred through recruitment of repressors of photomorphogenesis.

Organisms have evolved different mechanisms to cope with environmental stresses. The accumulation of osmoprotectants helps stabilize the active conformation of proteins and keeps cellular structures including membranes intact. D-arabitol accumulation in yeast provides protection against drought and salt stress. Khan et al. transferred the D-arabitol-mediated pathway into plants to test whether they could be made tolerant to drought and salinity. Overexpression of yeast arabitol dehydrogenase (ArDH)—an enzyme that reduces D-ribulose to D-arabitol—in tobacco chloroplasts conferred tolerance to NaCl up to 400 mM and 6% polyethylene glycol (PEG). This finding could have implications for developing stress-resilient crops to enhance yield.