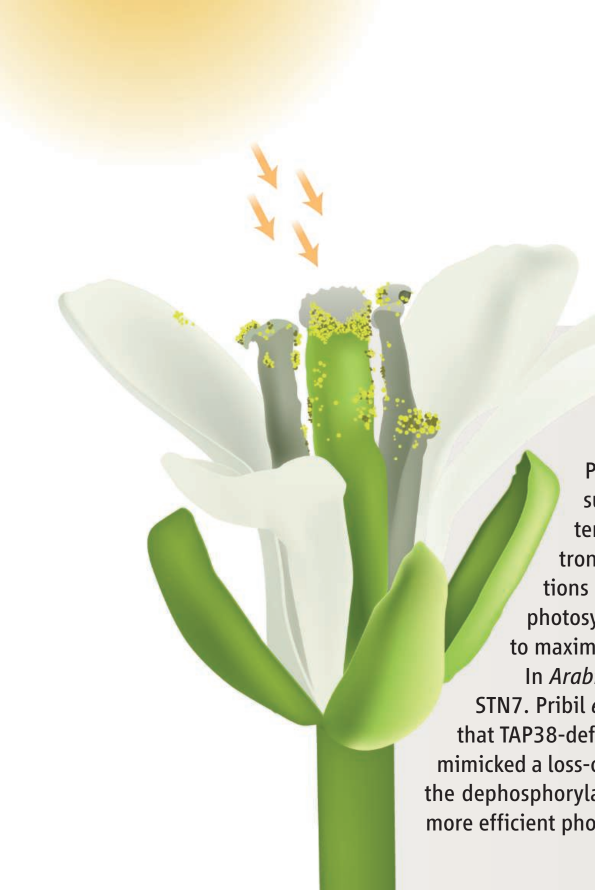

PLANT SCIENCE

Regulating Supply and Demand

Photosynthesis, the means by which green plants use sunlight to convert CO_2 into sugars, depends on the harvesting of photons and their delivery to two photosystem complexes (I and II). When light intensity or spectral composition varies, electron flow through the photosystems can be modulated in what is known as transitions of state. The association of light-harvesting protein complexes (LHCs) with the photosystems is regulated by phosphorylation and dephosphorylation of the LHC so as to maximize photosynthetic efficiency.

In *Arabidopsis,* the protein kinase responsible for phosphorylation of this complex is STN7. Pribil *et al.* have characterized the thylakoid-associated phosphatase TAP38 and show that TAP38-deficient plants accumulated phosphorylated LHCs, whereas TAP38 overexpression mimicked a loss-of-function mutation in the kinase STN7. These data suggest that TAP38 controls the dephosphorylation of the LHC and offer a means by which it might be possible to engineer more efficient photosynthetic systems. — LMZ

PLoS Biol. **8**, e1000288 (2010).

CHEMISTRY

Peering into Collapsing Bubbles

A liquid excited by ultrasonic pressure waves emits a short burst of light caused by the implosion of either single bubbles or clouds of bubbles. Spectroscopy of this sonoluminescence has shown that temperatures of several thousand kelvin may be associated with bubble collapse, but it has not been clear how homogeneous the temperature profile within a cloud of bubbles is. To address this question, Xu *et al.* have measured the spectroscopic temperature in bubble clouds formed in aqueous phosphoric acid, using molecular emissions from both OH and PO radicals. The results show that there are two different bubble populations in the cloud. One population, associated with OH emission, collapses symmetrically and has a temperature of around 9500 K; the other, associated with PO emission, comes from colder bubbles (~4000 K) that collapse nonsymmetrically. These properties of collapsing bubbles will affect the course of the local chemistry. — JFU

Angew. Chem. Int. Ed. **49**, 1079 (2010).

CELL BIOLOGY

Selective Consumption

Cellular self-digestion, or macroautophagy, occurs when the cell degrades its internal components. This helps to avoid the accumulation of potentially toxic protein aggregates, which leads to neurodegenerative diseases, and it serves to recycle nutrients during starvation. A membrane-bound organelle—the autophagosome—sequesters the intracellular material to be degraded, and it subsequently fuses with lysosomes, which provide hydrolytic enzymes.

Lee *et al.* have identifed a differential requirement for the histone deacetylase HDAC6 in starvation-dependent versus -independent macroautophagy. HDAC6 binds F-actin and microtubules and was previously found to play a role in clearing misfolded proteins from the cell. The authors found that HDAC6 promotes fusion between autophagosomes and lysosomes by recruiting a network of F-actin. Both HDAC6 and F-actin were required for proper protein clearance, and HDAC6-deficient mice and *Drosophila* exhibited increased protein aggregation in neurons, as well as symptoms of neurodegeneration. However, neither HDAC6 nor F-actin was required for the fusion of autophagosomes and lysosomes during starvation, indicating that protein and organelle degradation is selective, targeting only damaged or potentially toxic substrates. — HP

Degeneration of photoreceptor neurons in *Drosophila*.

EMBO J. **29**, 10.1038/emboj.2009.405 (2010).

CHEMISTRY

Whence Homochirality?

Just as left and right hands cannot be superimposed in space, so the carbon centers in biologically derived amino acids and sugars are locked in a single specific orientation, or chiral sense, distinct from its mirror image. An enduring question is how this circumstance came about. This month, a collection of nine papers organized by Pizzarello and Lahav explores this question from a variety of angles. Among the contributions, Green and Jain review several theories put forward over the past half-century; they emphasize that chiral selectivity is a natural consequence of the evolution of enzymes toward maximum catalytic efficiency, and they further suggest that life may have begun on both sides of the mirror, so to speak, with organisms of the presently unfavored symmetry tripped up by an early random event. Many current studies focus instead on the possibility that the preponderance of building blocks on Earth were homochiral from the outset, their configurations set by a process of asymmetric amplification from a small initial excess of one chiral sense in a precursor pool. Kawasaki *et al.* investigate the propensity of a chiral organic crystal to seed this sort of amplification. Taken together, the full series of papers conveys the diversity of approaches directed toward solving this deep natural mystery. — JSY

Orig. Life Evol. Bios. **40** 1; 111; 65 (2010).

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