'Research Highlights' in *Nature Chemical Biology*
to appear online on June 17 (July 2010 issue)

PHOTOSYNTHESIS
Transcriptional light switch

Proc. Natl. Acad. Sci. USA, published online 24 May 2010, doi: 10.1073/pnas.0911692107

To survive in a fixed location, plants have evolved mechanisms to adapt to varying intensities and wavelengths of light. Alterations in light quality may perturb the balance of electron transport between the two photosystems (PS-I and PS-II), which leads to photosynthetic inefficiency. Plastoquinone (PQ), a mobile redox-active electron shuttle between PS-I and PS-II, is believed to sense these photosynthetic imbalances and initiate a transcriptional program response that resets the stoichiometry of the two photosystems in chloroplast membranes. Shimizu *et al.* now provide evidence in *Arabidopsis thaliana* that the redox state of PQ results in changes in the phosphorylation state of plastid sigma factors (SIGs), which directly regulates transcriptional levels of photosystem genes. The authors showed that phosphorylation of Thr-170 of SIG1—the most abundant sigma factor in Arabidopsis leaves—selectively reduces the transcription of *psaA*, a gene coding a component of PS-I, but barely affect transcription of PS-II genes such as *psbA*. Using small molecule reagents to perturb the redox state of PQ, the authors concluded that in the oxidized state, SIG1 is phosphorylated in the RNA polymerase holoenzyme complex and reduces *psaA* transcription to adjust the balance. Though further work will be needed to identify the kinase that mediates SIG1 phosphorylation and to show how it is regulated by PQ redox state, this study provides a working model for how transcriptional changes are linked to electron transport state sensing in plants. *TLS*