1SAP-01 UV-B photoreception by plant UVR8
John Christie (University of Glasgow)

The plant photoreceptor UV RESISTANCE LOCUS 8 (UVR8) triggers regulatory changes in gene expression that underpin photoresponses to UV-B. UVR8 is a 7-bladed b-propeller homodimer that monomerises in response to UV-B. Structural analyses, combined with mutagenesis and far-UV circular dichroism spectroscopy reveal that UVR8 forms a tryptophan-dominated dimer interface linked by a complex salt-bridge network. Salt-bridging arginines flank the excitonically coupled cross-dimer tryptophan “pyramid”. Photoreception disrupts these salt bridges to initiate signalling through CONSTITUTIVELY PHOTOMORPHOGENIC 1 (COP1). These analyses establish how UVR8 functions as a photoreceptor without a prosthetic chromophore to promote plant survival in sunlight.

1SAP-02 植物におけるCPD光回復酵素とUVB抵抗性
Jun Hidema (Grad. Sch. Life Sci. Tohoku Univ.)

UVB-induced cyclobutane pyrimidine dimers (CPDs) are one of principal cause of UVB-induced growth inhibition in plants grown under supplementary UVB radiation. The CPDs are mainly repaired by CPD photolyase, which absorbs blue/UV light as an energy source to monomerize dimers. CPD photolyase belongs to DNA photolyase/blue light receptor family, and is widely distributed among species, ranging from bacteria to plants and mammals. CPD photolyase, which is encoded by a single-copy gene in the nuclear genome, translocates to chloroplasts, mitochondria, and nuclei and repairs CPDs, and is subjected to “triple targeting” in rice cells. These results indicate that plant may have evolved a CPD photolyase to protect cells from the harmful effects of UVB radiation.

1SAP-03 植物の青色光受容体phototropinの全長でのシグナリング機構
Koji Okajima (Osaka Pref. Univ.)

Phototropin (phot) is a blue light (BL) sensor in plants and is involved in phototropism, chloroplast movement, stomata opening, etc. phot has two LOV (LOV1 and LOV2) as light perceiving domain and kinase as an output. Upon BL, kinase is activated through structural changes in LOV2 that is led by the formation of the adduct between FMN and Cys residue. We prepared full-length phot in green algae Chlamydomonas. Purified phot showed a photocycle and kinase activity in a light dependent manner. Small Angle X-ray Scattering indicated that conformational changes in full-length phot were induced by BL irradiation. The transduction mechanism will be discussed.

1SAP-04 植物における青色光に依存した気孔開口
Ken-ichiro Shimazaki, Atsushi Takemiya (Dept. of Biol., Kyushu Univ.)

We have demonstrated that phototropins initiate the blue light signaling and activate the plasma membrane H+-ATPase that drives stomatal opening. We also have indicated that type 1 protein phosphatase mediates the signaling between phototropins and the H+-ATPase. To identify other signaling components in this pathway, we developed a method for screening Arabidopsis plants impaired in blue light-dependent stomatal opening by infrared thermography. Using this method, we obtained a mutant that exhibited the complete loss of blue light-dependent stomatal opening. We identified the responsible gene as a novel protein kinase and named it as blue light signaling 1 (BLUS1) in Arabidopsis. We will report the functional role of BLUS1 in blue light-dependent stomatal opening.

1SAP-05 フォトトロピンで誘導される葉緑体と核の運動機構
Masamitsu Wada (Kyushu University)

Chloroplasts and nuclei show their specific intracellular distribution patterns depending on light conditions. Under weak blue or white light chloroplasts gather at the light irradiated area, but they escape from strong blue or white light. The former accumulation response is mediated by blue light receptor phototropin1 (phot1) and phot2, but the latter avoidance response is mediated specifically by phot2. Chloroplasts use the newly found actin structure, chloroplast actin filaments (cp-actin filaments) for the movement. In this symposium, I will discuss how chloroplasts move with the cp-actin filaments. The mechanism of nuclear avoidance movement that is mediated by phot2 will also be discussed.

1SAP-06 フィトクロマ A のモジュラー構造
Akira Nagatani1, Yoshito Oka1,2, Yuya Ono1, Yukiko Yoshikawa1, Keio Kokaji1, Nobuyoshi Mochizuki1 (Grad. Sch. Sci., Kyoto Univ., 2Plant Sci. Center, RIKEN)

Phytochrome is a red(R)/far-red(FR)-light photoreceptor that regulates various aspects of plant development. Phytochrome A (phyA), which mediates atypical responses to continuous FR and a very low ammount of R, represents a highly specialized form of phytochromes. In this study, 16 chimeric phytochromes between phyA and phyB, a representative of canonical phytochromes, were constructed and expressed in transgenic Arabidopsis to identify domains that confer specific properties such as nuclear accumulation under FR, R-induced degradation and sensitization to R. Consequently, distinct structural modules were shown to be responsible for each of these properties. Hence, phyA is modularly structured to act as a highly-sensitive photoreceptor in seed plants.