

S002 Discovery of molecules and cell behaviour by live-cell analysis of plant reproduction

Tetsuya Higashiyama

Nagoya University, Nagoya, Japan

Sexual plant reproduction is difficult to study in the living material due to an embedded structure of female reproductive cells. We have been working on pollen tube guidance, double fertilization, and early embryogenesis in the living material by using two model plant species, *Torenia fournieri* and *Arabidopsis thaliana*. Defensing-like peptide LUREs are pollen tube attractants of these species working in a short distance (a few hundred micrometers), which are secreted by two synergid cells on the side of the egg cell (Higashiyama et al., 2001, **Science**; Okuda et al., 2009, **Nature**; Takeuchi and Higashiyama, 2012, **PLoS Biol.**). To understand the molecular mechanism of pollen tube guidance, we have been taking two approaches of live-cell study (for review, Kurihara et al., 2013, **Cell Growth Differ.**). The first approach is to use precisely defined *in vitro* system, including development of various microfluidics devices by our engineering team (e.g., Horade et al., 2012, **Proc. MicroTAS**). Recent *in vitro* studies lead to discovery of novel intercellular signaling molecules involved in competency control of pollen tubes and long-distance attraction (a few millimeters). The second approach is based on *in vivo* imaging. We have shown that pollen tube guidance is intimately related with double fertilization (Hamamura et al., 2011, **Curr. Biol.**; Kasahara et al., 2012, **Curr. Biol.**; Maruyama et al., 2013, **Dev. Cell**). In this symposium, full-scale collaboration between chemistry and biology in our new institute will also be introduced.