

**GERMANY/HONG KONG JOINT RESEARCH SCHEME**  
**THE PROJECT REPORT**  
*(for Project Completion)*

**Project Number: G\_HK018/10**

**Title**

Functional Analysis of the Plant Vacuolar Sorting Machinery  
 植物液泡分選機制的功能研究

**Particulars**

	Hong Kong team				German team	
Name of Project Co-ordinator (with title)	Prof. JIANG Liwen				Dr. PIMPL Peter	
Name of Co-Investigator (if any)						
Institution or Institutional affiliation	<input type="checkbox"/>	CityU	<input type="checkbox"/>	HKU	<input checked="" type="checkbox"/>	University of Tübingen
	<input checked="" type="checkbox"/>	CUHK	<input type="checkbox"/>	HKUST	<input type="checkbox"/>	
	<input type="checkbox"/>	HKBU	<input type="checkbox"/>	LU	<input type="checkbox"/>	
	<input type="checkbox"/>	HKIED	<input type="checkbox"/>	PolyU	<input type="checkbox"/>	
Other project team members (if any)	Miss WANG Xiangfeng Miss ZHUANG Xiaohong				Mr. KÜNZL Fabian	

**Funding Period**

	1 <sup>st</sup> year	2 <sup>nd</sup> year (if applicable)
Start Date	January 1, 2011	January 1, 2012
Completion Date	December 31, 2011	December 31, 2012

**Objective(s) as per original application**

1. To analyze the interaction of the VSR- and RMR-family members with ligands carrying different VSDs *in vivo*
2. To identify endogenous ligands of the individual VSR- and RMR-family members
3. To characterize the transport routes of the VSR and RMR proteins

**Details of Report** [Please attach relevant document(s)]

**i) Outline of proposed research and results obtained**

We proposed to study the plant vacuolar sorting machinery by analysing the interaction of the VSR- and RMR-family members with ligands *in vivo* and identifying endogenous VSR- and RMR-ligands. We have thus far achieved the followings:

- We have firstly generated two pH sensors to measure the pH of endomembrane organelles *in vivo*;
- We showed that SCAMP1 reaches the PM via an endoplasmic reticulum (ER)–Golgi–TGN–PM pathway;
- We demonstrated that (i) the cytosolic N-terminus of SCAMP1 contains an ER export signal; (ii) the transmembrane domain 2 (TMD2) and TMD3 of SCAMP1 are essential for Golgi export; (iii) SCAMP1 TMD1 is essential for TGN-to-PM targeting; (iv) the predicted topology of SCAMP1 and its various mutants remain identical as demonstrated by protease protection assay;
- We found that retromer components, sorting nexin 1 (SNX1), SNX2a and the vacuolar sorting protein VPS29p, were localized to the trans-Golgi network (TGN), which is considered to represent the early endosome of plants;
- We showed the inhibition of retromer function and RNAi knockdown of all sorting nexins led to accumulation of the VSR BP80 at the TGN;
- We have published two high-impact papers that are related to plant vacuolar sorting machinery in plant cells.

**ii) Significance of research results**

- We have generated an organelle-specific pH map for organelles of the Arabidopsis endomembrane system for the first time;
- We demonstrated that both the cytosolic N-terminus and TMD sequences of SCAMP1 play integral roles in mediating its transport to the PM via an ER-Golgi-TGN pathway.

**iii) Research output**

1. Shen J, Zeng YL, Zhuang X, Sun L, Yao X, Pimpl P and \*Jiang L. (2013) Organelle pH in the Arabidopsis Endomembrane System. *Molecular Plant* (in press) doi: 10.1093/mp/sst079
2. Scheuring D, Künzl F, Viotti C, San WYM, Jiang L, Schellmann S, Robinson DG and \*Pimpl P (2012) Ubiquitin initiates sorting of Golgi and plasma membrane proteins into the vacuolar degradation pathway. *BMC Plant Biology* 12: 164.

**iv) Potential for or impact on further research collaboration**

With the support of Germany/Hong Kong Joint Research Scheme over the past years, we have built a very strong and productive collaboration between our two groups at CUHK and University of Tübingen. We will certainly continue such collaboration and work together on plant vacuolar sorting machinery in the coming years. We have submitted a new application to this Germany/Hong Kong Joint Research Scheme again in the round of 2013/14.