RGC Reference CUHK2/CRF/11G

please insert ref. above

The Research Grants Council of Hong Kong Collaborative Research Fund Group Research Projects Completion Report

(for completed projects only)

Part A: The Project and Investigator(s)

1. Project Title

EXPO (Exocyst-positive Organelle): Dynamics, Biogenesis and Function in Plants

2. Investigator(s) and Academic Department/Units Involved (please highlight approved changes in the composition of the project team and quote the date when RGC granted approval of such changes)

			Average number of hours per week spent on this project in the current
Research Team	Name/Post	Unit/Department/Institution	reporting period
Project	Jiang, Liwen	School of Life Sciences	14
Coordinator	Professor	СИНК	
Co-Principal	Wong, Kam-bo	School of Life Sciences	4
investigator(s)	Professor	CUHK	
	Varia Via mina	School of Life Sciences	4
	Kwan, Kin-ming Associate Professor	School of Life Sciences CUHK	4
	Zhang, Jianhua	School of Life Sciences	4
	Professor	CUHK	Т
	Chan, Raymond Hon-fu Professor	Department of Mathematics CUHK	4
	Yao, Xiaoqiang Professor	School of Biomedical Sciences CUHK	4
	Xia, Jun Associate Professor	Division of Life Science	4
		HKUST Division of Life Science	4
	Li, Ning Professor	HKUST	4
	Xia, Yiji Professor	Department of Biology HKBU	4

CRF 8G (Revised Sep 15)

	Chye, Mee Len Professor	School of Biological Sciences HKU	4
Collaborators/ Others			

3. Project Duration

	Original	Revised	Date of RGC Approval (must be quoted)
Project Start Date	15-Jun-2012		
Project Completion Date	14-Jun-2015		
Duration (in month)	36 months		
Deadline for Submission of Completion Report	14-Jun-2016		

Part B: The Final Report

5. **Project Objectives**

- 5.1 Objectives as per original application
 - 1. To study EXPO dynamics and EXPO-PM fusion in transgenic living cells;
 - 2. To identify and study EXPO cargo and membrane proteins via EXPO isolation and proteomic analysis;
 - 3. To study membrane origins and biogenesis of EXPO;
 - 4. To identify and study the nature of E2-interacting protein complex and its roles in EXPO-mediated secretion; and
 - 5. To study the possible functions of EXPO in Arabidopsis plants.
- 5.2 Revised objectives

Date of approval from the RGC: <u>N/A</u>

Reasons for the change: N/A

1. 2. 3.

6. Research Outcome

6.1 Major findings and research outcome *(maximum 1 page; please make reference to Part C where necessary)*

- 1) We have demonstrated that EXPO and autophagosomes are distinct from one another in normally growing cells. However, EXPO as well as autophagosomes fuse with the vacuole and overlap with each other to a significant degree after autophagic induction. This novel finding opens up a new research direction on the crosstalk between EXPO and the autophagic pathway in plants in future research.
- 2) With the combination of transient expression, confocal microscopy and immunogold transmission electron microscopy (TEM) techniques, we have demonstrated that a number of exocyst subunits are recruited to EXPO by AtExo70E2 as well as AtExo70E2 is also capable of inducing EXPO formation in an animal cell line. These results point to a specific and crucial role for AtExo70E2 in EXPO formation. Our study thus provides the evidence for a plant-specific exocyst complex in EXPO-mediated protein secretion in plants.
- 3) Using live cell imaging of transgenic cells/plants, we have demonstrated that EXPO are highly dynamics organelles and their mobility is actin-dependent in plant cells. Using subcelluar fractionation and immuno-purification, we have also isolated enriched EXPO fractions for proteomic analysis with cargo identification and further characterization. We are now in the process of preparing two manuscripts which focus on the proteomic analysis and dynamic study of EXPO respectively.

We have also carried out related research in organelle dynamics and biogenesis:

- 4) We have demonstrated and illustrated the underlying mechanism of a unique plant pair of COPII machinery (AtSar1a and AtSec23a) function in ER export in eukaryotes.
- 5) We have demonstrated the multiple functions of a plant unique FYVE domain containing protein FREE1 (FYVE domain protein required for endosomal sorting 1) in regulating a) plant growth and development; b) MVB biogenesis and vacuolar sorting of membrane proteins; c) vacuolar protein transport and autophagic degradation; and d) cross talk with the autophagic pathway via interacting with the autophagosome regulator SH3P2.

Taken together, we have achieved all the original goals of this project with excellent publications in international journals including PNAS, Current Biology, Plant Cell, Plant Journal, Plant Physiology, Molecular Plant, Journal of Experimental Botany and Trends in Plant Science.

In addition, with partially support from this project, we have also trained several very good postgraduate students with excellent research outputs as demonstrated by publications of their thesis work in international journals. and two of them are successfully selected by national professional program "One Thousand Youth Talent Plan" to become faculties in Mainland China in 2016.

- 6.2 Potential for further development of the research and the proposed course of action *(maximum half a page)*
 - Different organelles in a cell contain different lipids compositions and protein constitutes, which maintain the organelle integrity and functional specificity. Thus the findings and publications about the dynamics, biogenesis and function of EXPO, as well as the related protein trafficking pathways from this project will serve as the basic foundation and new directions for future study of protein trafficking and organelle biogenesis in plant cells.
 - 2) Based on our findings, we will further develop our future research program into understanding the underlying mechanisms of the protein secretion pathway especially for unconventional protein secretion (UPS) pathway among different organisms including plant, mammal and yeast in the future.
 - 3) This new research of EXPO and its potential usefulness in understanding the function of UPS in plants can be further enhanced and promoted via international collaboration with leaders in both yeast and animal fields.
 - 4) The function analysis of Exo70E2 and EXPO will be helpful to understand the physiological functions of different exocyst subunits especially different Exo70s in plants under different stress conditions in future studies.
- 6.3 Research collaboration achieved (please give details on the achievement and its relevant impact)

This CRF project has also promoted national and international collaboration with excellent outputs, such as University of Heidelberg, Chinese Academy of Sciences, University of Tubingen, University of California Riverside, and University of California at Berkeley.

Collaborator	Joint Publication
Robinson DG	• Unconventional Protein Secretion. <i>Trends in Plant Science</i> 17:
(University of	606-615.
Heidelberg)	• Exo70E2 is essential for exocyst subunit recruitment and for
	EXPO formation in both plants and animals. <i>Molecular Biology of</i>
	<i>the Cell</i> . 25(3): 412-426.
	• Retention mechanisms for ER and Golgi membrane proteins.
	Trends in Plant Science 19(8): 508-515.
	• Unconventional Protein Secretion (UPS) pathways in plants.
	Current Opinion in Cell Biology 29: 107-115.

Lin Hong Yuan	 Exocyst-Positive Organelles and Autophagosomes Are Distinct Organelles in Plants. <i>Plant Physiology</i> 169(3):1917-32. Unconventional protein secretion in plants: a critical assessment. <i>Protoplasma</i> 253(1): 31-43. The novel quantitative trait locus <i>GL3.1</i> controls rice grain size
Lin Hong-Xuan (Chinese Academy of Sciences)	 The novel quantitative trait locus <i>GL3.1</i> controls rice grain size and yield by regulating <i>Cyclin-T1;3. Cell Research</i> 22: 1666-1680. A two-locus interaction causes interspecific hybrid weakness in rice. <i>Nature Communications</i> 5: 3357.
Pimpl Peter (University of Tuebingen)	• Organelle pH in the Arabidopsis Endomembrane System. Molecular Plant 6: 1419-1437
Chen Xuemei (University of	• MicroRNAs inhibit the translation of target mRNAs on the endoplasmic reticulum in <i>Arabidopsis</i> . <i>Cell</i> 153: 562-574.
California Riverside)	• Fast-suppressor screening for new components in protein trafficking, organelle biogenesis and silencing pathway in Arabidopsis thaliana using DEX-inducible FREE1-RNAi plants. <i>The Journal of Genetics and Genomics</i> 42(6):319-330.
Nakano Akihiko (University of Tokyo)	 ARA7(Q69L) expression in transgenic Arabidopsis cells induces the formation of enlarged multivesicular bodies. <i>Journal of</i> <i>Experimental Botany</i> 64: 2817-2829. Activation of the Rab7 GTPase by the MON1-CCZ1 complex is essential for PVC-to-vacuole trafficking and plant growth in <i>Arabidopsis. Plant Cell</i> 13(26): 2080-97.
Rojo Enrique (Consejo Superior de Investigaciones Científicas, Spain)	 An in vivo expression system for the identification of native cargo proteins of vacuolar sorting receptors in Arabidopsis culture cells. <i>The Plant Journal</i> 75: 1003-1017. N-linked glycosylation of AtVSR1 is important for vacuolar protein sorting in Arabidopsis. <i>The Plant Journal</i> 80: 977-992.
Cheung Alice Y (University of Massachusetts)	• Apical F-Actin Regulated Exocytic Targeting of NtPPME1 is Essential for Pollen Tube Cell Wall Construction and Rigidity. <i>The Plant Journal</i> 76(3): 367-379.
Schekman Randy W (University of California at Berkeley)	• Unique COPII component AtSar1a/AtSec23a pair is required for the distinct function of protein ER export in <i>Arabidopsis thaliana</i> . <i>Proceedings of the National Academy of Sciences of the United States of America</i> 12(46):14360-5.

7. The Layman's Summary

(describe <u>in layman's language</u> the nature, significance and value of the research project, in no more than 200 words)

This RGC-funded CRF project aims to study the different biological aspects of a newly identified organelle termed EXPO (Exocyst-positive Organelle), including its dynamics, biogenesis and function in plants, using a combination of cellular, biochemical and molecular approaches. Results derived from this study have provided new insights about the molecular machinery in regulating unconventional protein secretion in plants, with potential functional implications in plant defense and stress responses in future studies.

Part C: Research Output

8. Peer-reviewed journal publication(s) arising <u>directly</u> from this research project

(Please attach a copy of the publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.)

The	Latest Status	of Publica	tions	Author(s)	Title and	Submitted	Attached	Acknowled	Accessible
Year of publication	Year of Acceptance (For paper accepted but not yet published)	Under Review	Under Preparation (optional)	(denote the corresponding author with an asterisk*)	Journal/Book (with the volume, pages and other necessary publishing details specified)	to RGC (indicate the year ending of the relevant progress report)	to this report (Yes or No)	ged the support of RGC (Yes or No)	from the institutional repository (Yes or No)
2012				Ding Y, Wang J, Wang JQ, Stierhof YD, Robinson DG, and *Jiang L	nal Protein Secretion.	2013	direct.co m/science	No This publication is originated from this CRF grant but the acknowled gement was regrettably overlooked	No
2012				Qi P, Lin Y, Song X, Shen J, Huang W Shan J, Zhu M, Jiang L, Gao J and *Lin H.	The novel quantitative trait locus <i>GL3.1</i> controls rice grain size and yield by regulating <i>Cyclin-T1;3.</i> <i>Cell</i> <i>Research</i> 22: 1666-1680.	2013	Yes http://ww w.nature. com/cr/jo urnal/vao p/ncurren t/full/cr20 12151a.ht ml		No
2013				Shen J, Zeng YL, Zhuang X, Sun L, Yao X, Pimpl P and *Jiang L.	Organelle pH in the	2013	Yes http://ww w.cell.co m/molecu lar-plant/f ulltext/S1 674-2052 (14)6021 7-3	Yes	No
2013				Xu W, Jia L, Shi W, Baluška F, Kronzucker H, Liang J and	Tomato 14-3-3 Protein TFT4 Modulates	2013	Yes http://ww w.plantph ysiol.org/ content/e	Yes	No

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			*Zhang J.	Proton Efflux, Basipetal Auxin Transport and PKS5-J3 Pathway in Root Growth Response to		arly/2013 /10/17/pp .113.2247 58.1		
2013			Coo M. Maa	Alkaline Stress. <i>Plant</i> <i>Physiology</i> doi: 10.1104/pp.1 13.224758	2012	Vas	Vog vogd	No
			Cao M, Mao Z, Kam C, Xiao N, Cao X, Shen C, Cheng KKY, Xu A, Lee KM, Jiang L and *Xia J	PICK1 and ICA69 Control Insulin Granule Trafficking and Their Deficiencies Lead to Impaired Glucose Tolerance. <i>PLOS</i> <i>Biology</i> 11(4): e1001541		w.plosbio logy.org/ article/inf o%3Adoi %2F10.1 371%2Fj ournal.pb io.100154 1	HKUST10/ CRF/11G, which is the code given for CUHK2/C RF/11G at HKUST	
2013			Li S, Liu L, Zhuang X, Yu Y, Liu X, Pan Z, Raikhel N, Jiang L and *Chen X.	translation of target mRNAs on the endoplasmic reticulum in <i>Arabidopsis</i> . <i>Cell</i> 153: 562-574.		Yes http://ww w.cell.co m/abstrac t/S0092-8 674(13)0 0404-2	Yes	No
2013				Successful transport to the vacuole of heterologous ly expressed mung bean 8S globulin occurs in seed but not in vegetative tissues. <i>Journal of</i> <i>Experimenta</i> <i>l Botany</i> 64:		Yes http://jxb. oxfordjou rnals.org/ content/6 4/6/1587. full	Yes	No

				1587-1601.				
				1007 1001.				
2013			Jia T, Gao C,		2013	Yes	Yes	No
) expression		http://jxb.		
			J, Ding Y, Cai			oxfordjou		
			Y, Ueda T, Nakano A and	Arabidopsis		rnals.org/ content/6		
				the		4/10/2817		
				formation of		.full		
				enlarged				
				multivesicul				
				ar bodies.				
				Journal of Experimenta				
				<i>l Botany</i> 64:				
				2817-2829.				
2013			Shen J, Suen	An in vivo	2013	Yes	Yes	No
				expression		http://onli		
				system for		nelibrary.		
				the identificatio		<u>wiley.co</u> m/doi/10.		
				n of cargo		<u>1111/tpj.</u>		
				proteins of		12257/ful		
				vacuolar		1		
				sorting				
				receptors in				
				Arabidopsis culture cells.				
				The Plant				
				Journal 75:				
				1003-1017.				
2013			Wang H,	Apical	2013	Yes	Yes	No
			Zhuang XH,	F-actin-regul		http://onli		
				ated exocytic		nelibrary. wiley.co		
				targeting of		$\frac{\text{whey.co}}{\text{m/doi/10}}$.		
				NtPPME1 is		<u>1111/tpj.</u>		
				essential for		12300/ab		
				construction		stract		
				and rigidity				
				of the pollen tube cell				
				wall.				
				The Plant				
				Journal				
				76(3):				
2013				367-379. A	2013	Yes	Yes	No
2013			Zhuang, X., Wang, H.,	A BAR-Doma	2013	Y es http://ww	105	INU
			Lam, S.K.,	in Protein		w.plantce		
			Gao, C.,	SH3P2,		ll.org/con		
			Wang, X.,	Which		tent/25/11		
			Cai, Y. &	Binds to		/4596.full		
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			Formation				
			in				
			Arabidopsis				
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			Cell 25:				
			4596-4615.				
2013		Ding, Y.,		2013	Yes	Yes	No
			essential for		http://ww		
		J.H.C., Chan,	exocyst		w.molbio		
		V.H.L.,	subunit		lcell.org/c		
		Wang, X.,	recruitment		ontent/25/		
		Cai, Y., Tan,	and for		3/412.full		
		X., Bao, Y.,	EXPO				
		Xia, J.,	formation in				
		Robinson,	both plants				
		D.G., and	and animals.				
		*Jiang, L.	Molecular				
		5 ming, D.	Biology of				
			the Cell.				
			25(3):				
			412-426.				
2012		Vana 7. Cara			V	NI-	No
2013		Yang Z, Guo	Stable		Yes	No	INO
		G, Zhang M,	Isotope		http://ww		
		Liu CY, Hu	Metabolic		w.mcponl		
		Q, Lam H,	Labeling-		ine.org/co		
		Cheng H, Xue			ntent/12/1		
		Y, Li J and	Quantitative		<u>2/3559.lo</u>		
		*Li N.	Phosphoprot		<u>ng</u>		
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			Analysis of				
			Arabidopsis				
			Mutants				
			Reveals				
			Ethylene-				
			regulated				
			Time-				
			dependent				
			Phosphoprot				
			eins and				
			Putative				
			Substrates				
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			Triple				
			Response 1				
			Kinase.				
			Molecular				
			& Cellular				
			Proteomics.				
			12:				
			3559-3582.				
			5559-5562.				
2014		 *Chan R,	А	2013	Yes	Yes	No
		Yang HF and	Two-stage		http://ww		
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		Zeng TY.	image				
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			Journal of			
			Imaging			
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2014		 Chan C. Chan	A 4 1	V	V	No
2014		Chen C, Chen	A two-locus	Yes	Yes	INO
		H, Lin YS,	interaction	http://ww		
		Shen JB, Shan	causes	w.nature.		
		JX, Qi P, Shi	interspecific	com/nco		
		M, Zhu MZ,	hybrid	mms/201		
		Huang XH,	weakness in	4/140221/		
		Feng Q, Han	rice. Nature			
				$\frac{ncomms4}{257/fm11/m}$		
		B, Jiang L,	Communica	<u>357/full/n</u>		
		Gao JP and	tions 5:	comms43		
		*Lin HX.	3357.	<u>57.html</u>		
2014		Zhuang XH	Autophagos	Yes	Yes	No
		and *Jiang L	ome	https://w		
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			SH3P2.	urnals/aut		
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2014		Cui Y, Zhao	Activation	Yes	Yes	No
2014		 Cui Y, Zhao Q, Gao C,	Activation of the Rab7		Yes	No
2014		 Q, Gao C,	of the Rab7	Yes http://ww	Yes	No
2014		Q, Gao C, Ding Y, Zeng	of the Rab7 GTPase by	Yes http://ww w.plantce	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T,	of the Rab7 GTPase by the	Yes http://ww w.plantce ll.org/con	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC	Yes http://ww w.plantce ll.org/con tent/early/	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T,	of the Rab7 GTPase by the MON1-CC Z1 complex	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114.	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114.	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i>	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i> . <i>Plant Cell</i>	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo	Yes	No
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i> . <i>Plant Cell</i> 13(26):	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo	Yes	No
		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and *Jiang L	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i> . <i>Plant Cell</i> 13(26): 2080-97.	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo ng		
2014		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and *Jiang L Shen J, Fu J,	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i> . <i>Plant Cell</i> 13(26):	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo ng Yes	Yes	No
		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and *Jiang L	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i> . <i>Plant Cell</i> 13(26): 2080-97.	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo ng		
		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and *Jiang L Shen J, Fu J, Ma J, Wang	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i> . <i>Plant Cell</i> 13(26): 2080-97. Isolation, Culture, and	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo ng Yes (PDF		
		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and *Jiang L Shen J, Fu J, Ma J, Wang X, Gao C,	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i> . <i>Plant Cell</i> 13(26): 2080-97. Isolation, Culture, and Transient	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo ng Yes		
		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and *Jiang L Shen J, Fu J, Ma J, Wang X, Gao C, Zhuang C,	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i> . <i>Plant Cell</i> 13(26): 2080-97. Isolation, Culture, and Transformat	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo ng Yes (PDF		
		Q, Gao C, Ding Y, Zeng YL, Ueda T, Nakano A and *Jiang L Shen J, Fu J, Ma J, Wang X, Gao C, Zhuang C, Wan J and	of the Rab7 GTPase by the MON1-CC Z1 complex is essential for PVC-to-vac uole trafficking and plant growth in <i>Arabidopsis</i> . <i>Plant Cell</i> 13(26): 2080-97. Isolation, Culture, and Transformat ion of Plant	Yes http://ww w.plantce ll.org/con tent/early/ 2014/05/1 3/tpc.114. 123141.lo ng Yes (PDF		
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2015		He Y, Zhao Q, Zeng Y, Shen		Yes http://ww w.pnas.or g/content/ 112/6/188 6.long	Yes	No
2015		Zhao Q, Gao C, Lee P, Liu L, Li S, Hu T, Shen J, Pan S, Ye H, Chen Y, Cao W, Cui Y, Zeng P, Yu S, Gao Y, Cheng L, Mo B, Liu X, Xiao S, Zhao Y, Zhong S, Chen X and *Jiang L	Fast-suppres sor	Yes http://ww w.science direct.co m/science /article/pi i/S16738 52715000 752	Yes	No

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				26(23):4280- 93.			
2015			B, Lai CM, Lam SK, Wang X, Cui Y, Gao C, Luo M, Wong KB, Schekman R, and *Jiang L		Yes http://ww w.pnas.or g/content/ 112/46/14 360.long	Yes	No
2015			*Robinson DG, Ding Y and Jiang L	Unconventio nal protein secretion in plants: a critical assessment. <i>Protoplasma</i> 253(1): 31-43.	Yes http://link .springer. com/articl e/10.1007 %2Fs007 09-015-0 887-1	Yes	No
2016	2016		Shen J, Gao C, Zhao Q, Lin Y, Wang X, Zhuang X and *Jiang L	AtBRO1 functions in ESCRT-I complex to regulate multivesicul ar body protein sorting. <i>Molecular</i> <i>Plant</i> (in press) doi: 10.1016/j.m olp.2016.02. 005.	Yes http://ww w.science direct.co m/science /article/pi i/S16742 05216000 381	Yes	No
2016	2016		Zhuang X, Wang J and *Jiang L	Biogenesis of Plant Prevacuolar Multivesicul ar Bodies. <i>Molecular</i> <i>Plant</i> (in press) doi:	Yes http://ww w.cell.co m/molecu lar-plant/ abstract/S 1674-205 2(16)000	Yes	No

			10.1016/j.m	<u>30-7</u>	
			10.1016/j.m olp.2016.01.		
			011.		

9. Recognized international conference(s) in which paper(s) related to this research project was/were delivered (*Please attach a copy of each conference abstract*)

M	onth/Year/ Place	Title	Conference Name	Submitted to RGC (indicate the year ending of the relevant progress report)	Attached to this report (Yes or No)	Acknowledged the support of RGC (Yes or No)	Accessible from the institutional repository (Yes or No)
1.	08/2012/ Hong Kong	SURE-Based Motion Blur Estimation	International Conference on Signal Processing, Communications and Computing	2013	Yes	No	No
2.	08/2012/ USA	SURE-based blind Gaussian deconvolution	(ICSPCC'12) IEEE Statistical Signal Processing Workshop (SSP)	2013	Yes	No	No
3.	09/2012/ USA	SURE-LET image deconvolution using multiple Wiener filters		2013	Yes	No	No
4.	10/2012/ Korea	Molecular Characterization of EXPO-Mediated Plant Exocytosis	10th International Congress on Plant Molecular Biology	2013	Yes	Yes	No
5.	10/2012/ Korea	The Golgi-Localized Arabidopsis Endomembrane Protein 12 (EMP12) Contains both ER Export and Golgi Retention Signals at its C-terminus	10th International Congress on Plant Molecular Biology	2013	Yes	Yes	No
6.	10/2012/ Korea	Identification and characterization of Arabidopsis VSR cargo	10th International Congress on Plant Molecular Biology	2013	Yes	Yes	No
7.	10/2012/ China	Molecular Mechanism of Exocytosis-Mediated Cell Wall Construction in Growing Pollen Tubes	The 2012 Pollen Biology	2013	Yes	Yes	No
8.	10/2012/ China	The Roles of Phosphoinositide Kinases in Vesiclular Trafficking of Growing Pollen Tubes	The 2012 Pollen Biology International	2013	Yes	Yes	No

		D1	2012	XZ -	XZ	Na
	Golgi Retention	Plant Cell and	2013	Yes	Yes	No
China	Mechanisms of	Developmental				
	Endomembrane	Biology, Cold				
	Membrane Proteins	Spring Harbor				
	(EMPs) in Eukaryotes	Asia				
10.06/2013/	Functional Study of	Plant Cell and	2013	Yes	Yes	No
China	Endomembrane Proteins	Developmental				
	(EMPs) in Plants	Biology, Cold				
		Spring Harbor				
		Asia				
	Biogenesis and function	Plant Cell and	2013	Yes	Yes	No
China	of COPII vesicles in	Developmental				
	plants	Biology, Cold				
		Spring Harbor				
		Asia				
	Molecular Mechanisms	24th	2013	Yes	Yes	No
Australia	of PVC-Vacuole	International				
	Trafficking in Plant Cells	Conference on				
		Arabidopsis				
		Research				
		(ICAR)				
13.06/2013/	EXPO Function in Plants	24th	2013	Yes	Yes	No
Australia		International				
		Conference on				
		Arabidopsis				
		Research				
		(ICAR)				
14.06/2013/	Biogenesis of EXPO in	24th	2013	Yes	Yes	No
Australia	Plant Cells	International				
		Conference on				
		Arabidopsis				
		Research				
		(ICAR)				
15.06/2013/	Autophagy and	24th	2013	Yes	Yes	No
	Autophagosome in Plants	International				
	1 0	Conference on				
		Arabidopsis				
		Research				
		(ICAR)				
16.06/2013/	A Two-stage Image	CIMI Workshop	2013	Yes	No	No
France	Segmentation Method	on Optimization	-		-	
	using a Convex Variant	and Statistics in				
	of the Mumford-Shah	Image Processing				
	Model and Thresholding					
17.07/2013/	Roles of EXPO cargo	GRC Posttranslat	2013	Yes	No	No
Hong	protein in Arabidopsis	ional Modificatio	-		-	
Kong	growth and development	n Networks				
0						
18.09/2013/	A Two-stage Image	Shanghai	2013	Yes	No	No
China	Segmentation Method	International				
China	using a Convex Variant of					
	the Mumford-Shah Model	Inverse Problems				
	and Thresholding	and Imaging				
		Sciences				

``			[I	1	
19.04/2014/	Golgi Retention	East Asian Cell		Yes	Yes	No
Korea	Mechanisms of	Biology				
	Endomembrane	Workshop 2014				
	Membrane Proteins	Conference				
	(EMPs) in Eukaryotes					
20.04/2014/	11 0	East Asian Cell		Yes	Yes	No
Korea	identification of new	Biology				
	components involved in	Workshop 2014				
	protein trafficking and	Conference				
	organelle biogenesis in					
	Arabidopsis					
21.05/2014/	A BAR-Domain Protein	Keystone		Yes	Yes	No
USA	SH3P2, Which Binds to	Symposia on				
	Phosphatidylinositol	Molecular and				
	3-Phosphate and ATG8,	Cellular Biology				
	Regulates Autophagosome	 Autophagy: 				
	Formation in Arabidopsis	Fundamentals to				
		Disease				
22.05/2014/	In Vitro Reconstitution of	Keystone		Yes	Yes	No
USA	Plant Autophagosome	Symposia on				
	Formation	Molecular and				
		Cellular Biology				
		- Autophagy:				
		Fundamentals to				
		Disease				
23.07/2014/	EXPO (exocyst-positive	3rd International		Yes	Yes	No
China	organelle): isolation,	Conference on				
	proteomic analysis and	Plant Metabolism				
	function in plants			-		
24.07/2014/	A novel PVC-localized	25th International		Yes	Yes	No
Canada	1	Conference on				
	for vacuolar protein	Arabidopsis				
	transport and vacuole	Research (ICAR)				
	biogenesis in Arabidopsis					
25.07/2014/	Roles of AtExo70E2 in	25th International		Yes	Yes	No
Canada	exocyst recruitment,	Conference on				
	EXPO biogenesis and	Arabidopsis				
	function, and plant growth	Research (ICAR)				
	and development			~ ~). T
	Rab7 activation by the	25th International		Yes	Yes	No
Canada	MON1-CCZ1 complex is	Conference on				
	essential for	Arabidopsis				
	PVC-to-vacuole	Research (ICAR)				
	trafficking and plant					
07.04/0015	growth in Arabidopsis			3.7	3.7	NT.
27.04/2015/	Functional Roles of	CSCB The		Yes	Yes	No
China	MON1-CCZ1 Complex in					
	Vacuolar Trafficking	Conference and				
		the 15th				
		Congress of the				
		Chinese Society				
20.04/2015/		for Cell Biology		37	37	Na
28.04/2015/	MISS: Mutant	CSCB The		Yes	Yes	No
China	Identification of SH3P2	Biennial				
	Suppressor	Conference and				
		the 15th				
		Congress of the				
		Chinese Society				
		for Cell Biology				

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29.04/2015/	Fast-suppressor screening	CSCB The	Yes	Yes	No
China	for new components	Biennial			
	involved in protein	Conference and			
	trafficking, organelle	the 15th			
	biogenesis and RNAi	Congress of the			
	pathway in Arabidopsis	Chinese Society			
	thaliana using dominant	for Cell Biology			
	DEXinducible				
	FREE1-RNAi transgenic				
	plants				
30.04/2015/	Tandem Affinity	CSCB The	Yes	Yes	No
China	Purification of the Unit	Biennial			
	Exocyst Complex of	Conference and			
	Recently Discovered Plant	the 15th			
	organelle EXPO	Congress of the			
		Chinese Society			
		for Cell Biology			
31.04/2015/	EXPO and	CSCB The	Yes	Yes	No
China	Autophagosome in	Biennial			
	Arabidopsis thaliana	Conference and			
		the 15th			
		Congress of the			
		Chinese Society			
		for Cell Biology			

10. *Student(s) trained* (please attach a copy of the title page of the thesis)

Name	Degree registered for	Date of registration	Date of thesis submission/
			graduation
Ding, Yu	Ph.D.	2007-08-01	2013-08-31
Zhuang, Xiaohong	Ph.D.	2008-08-01	2013-08-31
Shen, Jinbo	Ph.D.	2009-08-01	2013-08-31
Lau, On-chai Eva	Ph.D.	2009-08-01	2013-07-31
Feng, Xue	Ph.D.	2009-08-01	2013-06-14
WANG Xiangfeng	Ph.D.	2009-08-01	2015-06-10
LUO Fang	Ph.D.	2010-08-01	2014-09-30
CUI Yong	Ph.D.	2011-08-01	2014-09-30
Jia, Tianran	M.Phil.	2010-08-01	2012-08-31
Lam, Chun Kok	M.Phil.	2010-08-01	2012-12-31
Wang, Tianming	M.Phil.	2011-08-01	2013-07-31
Liu, Yingqi	M.Phil.	2012-02-01	2013-06-31
LAI Ching Man	M.Phil	2012-08-01	2015-03-26
WOO Cheuk Hang	M.Phil	2012-08-01	2015-06-10
LIN Youshun	M.Phil	2013-01-01	2014-12-31

11. Other impact (*e.g. award of patents or prizes, collaboration with other research institutions, technology transfer, etc.*)

Project Coordinator

Contact Information: ljiang@cuhk.edu.hk