

# 2020 Literature report III



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Letter

## **Phosphole-oxide-based Fluorescent Probe for Super-resolution Stimulated Emission Depletion (STED) Live Imaging of the Lysosome Membrane**

Chenguang Wang, Masayasu Taki, Keiji Kajiwara, Junwei Wang, and Shigehiro Yamaguchi

**Reporter: Li Jin**

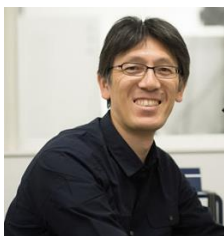
**Date:2020-06-18**

# About the Authors



Prof. Dr. Shigehiro Yamaguchi

Making use of specific effects of **main group elements**, particularly **boron**, **silicon** and **phosphorus**, he has so far produced a range of molecules with both fascinating structures and properties, which can serve numerous purposes

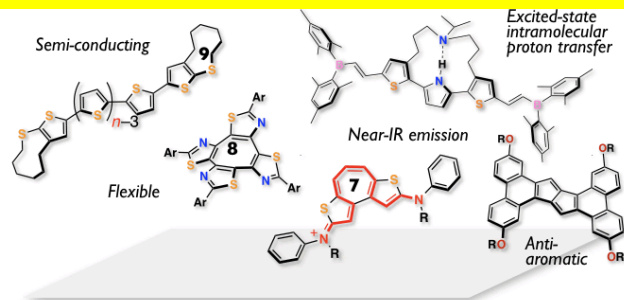


Assoc. Prof. Dr. Masayasu Taki

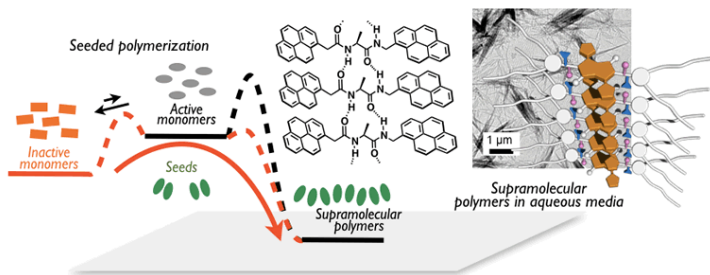
His research interests are in the areas of **chemical biology**, particularly the development of **synthetic chemical tools to visualize specific biomolecules as well as biological phenomena using a fluorescence microscope.**

# About the Authors

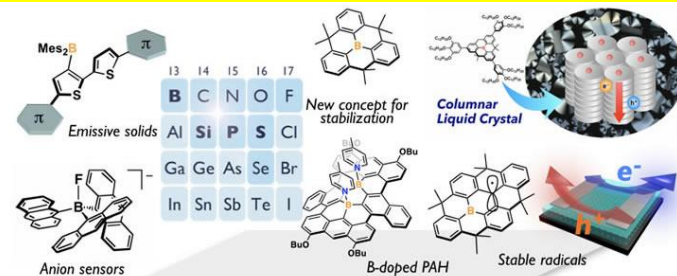
## Designing New Fascinating $\pi$ -Skeletons



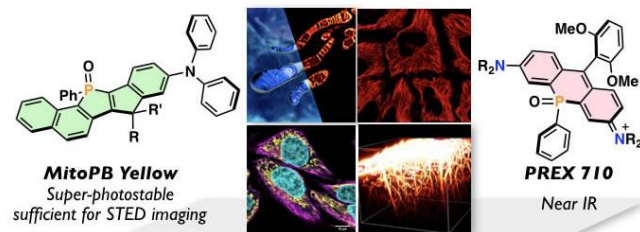
## Pursuing Molecular Functions through Supramolecular Approach



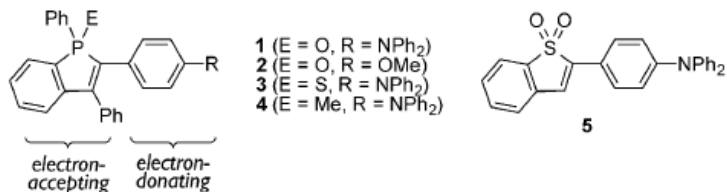
## Making Best Use of Main-Group Elements



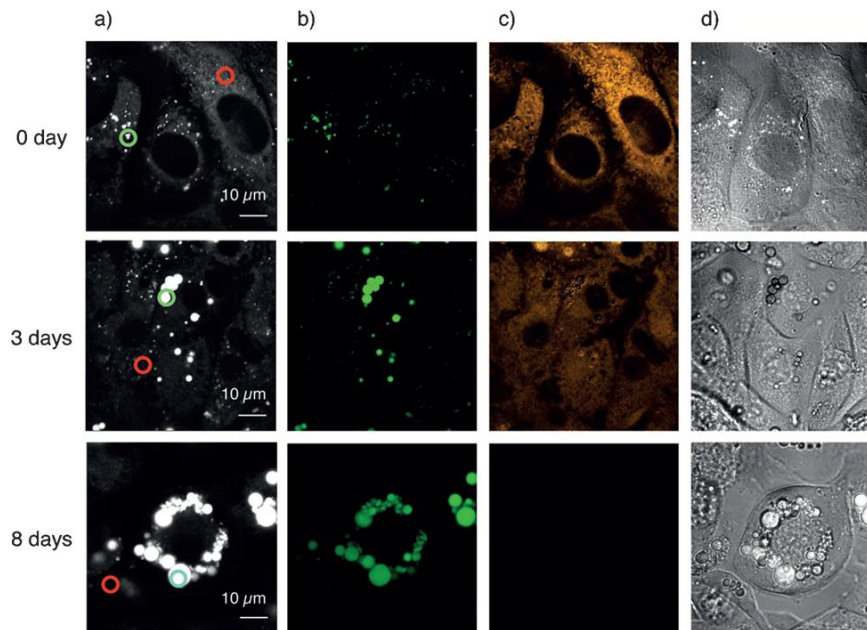
## Tackling Life Science through Innovative Fluorescence Imaging



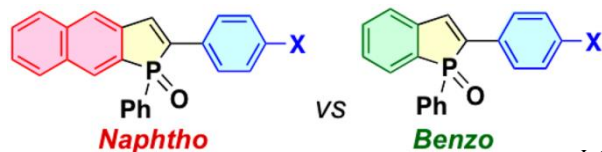
# Environment-Sensitive Fluorescent Probe: A Benzophosphole Oxide with an Electron-Donating Substituent



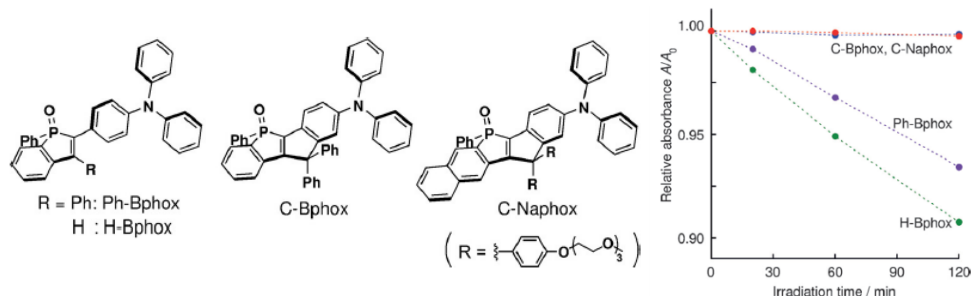
Cmpd	Solvents	$\lambda_{\text{abs}}$ [nm] <sup>[a]</sup>	$\epsilon$ [10 <sup>4</sup> M <sup>-1</sup> cm <sup>-1</sup> ]	$\lambda_{\text{em}}$ [nm]	$\Phi_{\text{F}}^{[b]}$	$\epsilon \times \Phi_{\text{F}}$ [10 <sup>4</sup> M <sup>-1</sup> cm <sup>-1</sup> ]
1	toluene	415	1.87	528	0.94	1.8
	CHCl <sub>3</sub>	420	1.74	553	0.94	1.6
	CH <sub>2</sub> Cl <sub>2</sub>	415	1.73	565	0.90	1.6
	acetone	403	1.73	575	0.84	1.5
	ethanol	417	1.60	593	0.58	0.9
2	DMSO	412	1.66	601	0.64	1.1
	toluene	364	1.03	471	0.74	0.8
3	DMSO	364	0.94	490	0.69	0.7
	toluene	412	1.58	526	0.87	1.4
4	DMSO	411	1.28	608	0.61	0.8
	toluene	448	1.34	672	0.20	0.3
5	DMSO	440	1.23	702	0.02	0.02
	toluene	419	2.56	507	0.92	2.4
	DMSO	418	2.29	628	0.06	0.1



Confocal microphotographs of 3T3L1 preadipocytes (top) and adipocytes after 3 days (middle) and 8 days (bottom) of differentiation.

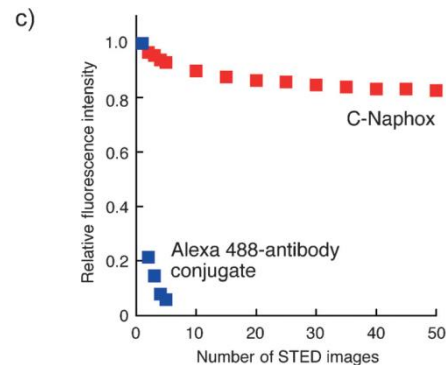
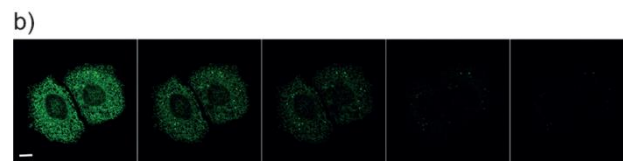
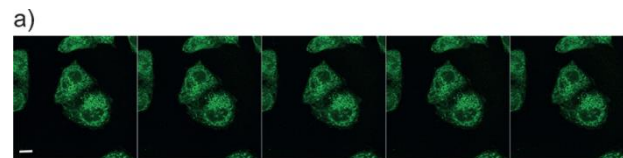


# A Phosphole Oxide Based Fluorescent Dye with Exceptional Resistance to Photobleaching: A Practical Tool for Continuous Imaging in STED Microscopy



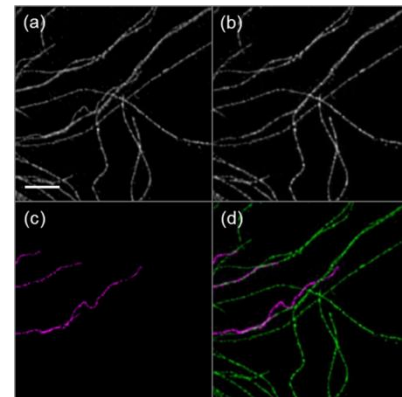
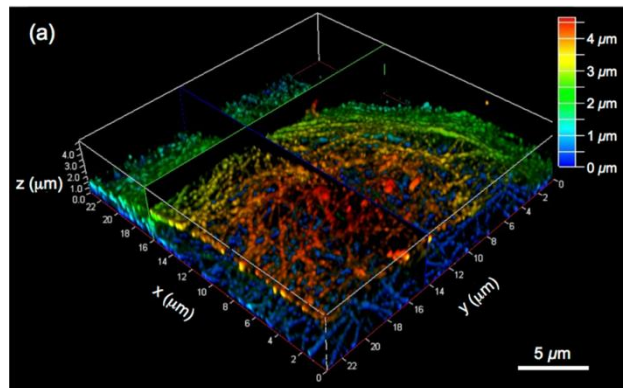
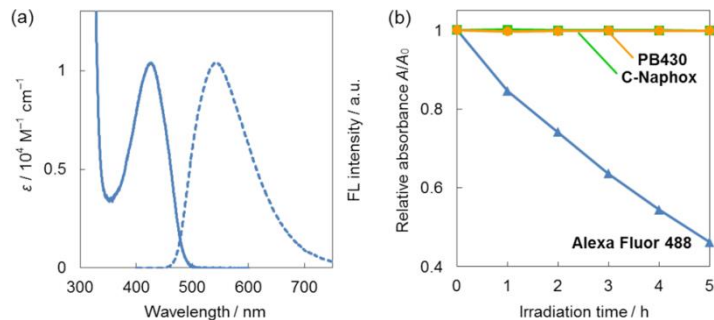
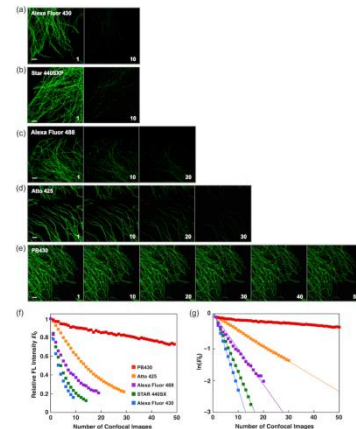
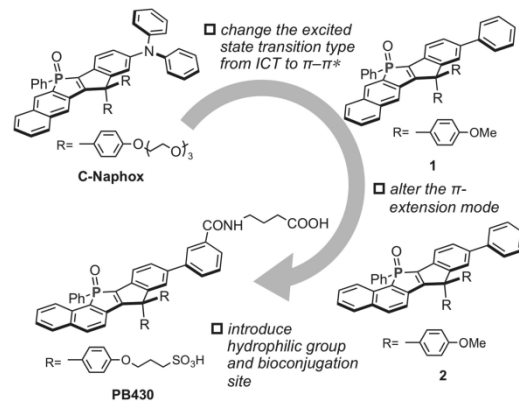
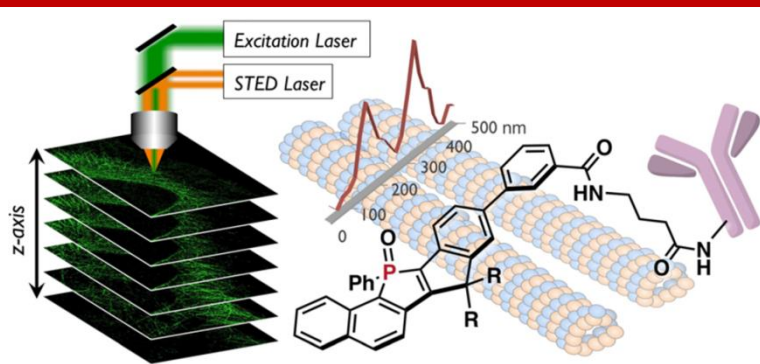
**Table 1:** Photophysical data for benzophosphole-based fluorophores Ph-Bphox, C-Bphox, and C-Naphox in various solvents.

Compound	Solvents	$\lambda_{\text{abs}}$ [nm] <sup>[a]</sup>	$\epsilon$ [10 <sup>4</sup> M <sup>-1</sup> cm <sup>-1</sup> ]	$\lambda_{\text{em}}$ [nm]	$\Phi_F^{[b]}$	$\tau$ [ns]	$k_r$ [10 <sup>8</sup> s <sup>-1</sup> ]	$k_{nr}$ [10 <sup>8</sup> s <sup>-1</sup> ]
Ph-Bphox	toluene	415	1.87	528	0.94	5.2	1.8	0.12
	CH <sub>2</sub> Cl <sub>2</sub>	415	1.73	565	0.90	7.3	1.2	0.14
	MeCN	404	1.59	597	0.61	7.0	0.87	0.56
	MeOH	415	1.53	613	0.22	2.9	0.76	2.7
C-Bphox	toluene	431	1.82	522	0.95	6.3	1.5	0.08
	CH <sub>2</sub> Cl <sub>2</sub>	434	1.69	564	0.92	8.8	1.0	0.09
	MeCN	427	1.70	594	0.81	8.7	0.93	0.22
	MeOH	438	1.60	608	0.40	6.1	0.66	0.98
C-Naphox	toluene	443	2.40	499	0.93	4.3	2.2	0.16
	CH <sub>2</sub> Cl <sub>2</sub>	431	2.48	543	0.93	6.1	1.5	0.11
	MeCN	424	2.45	570	0.88	6.8	1.3	0.18
	MeOH	433	2.32	582	0.71	7.1	1.0	0.41



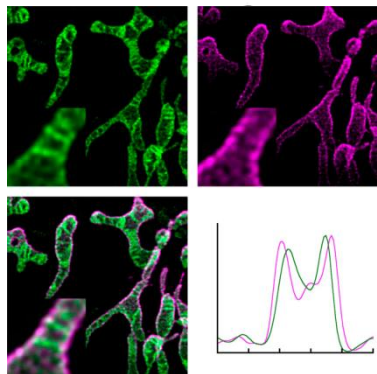
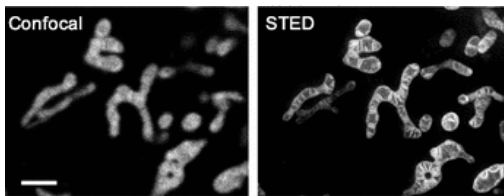
Comparison of the photostabilities of C-Naphox and an Alexa 488-antibody conjugate in **fixed HeLa** cells under **STED** conditions.

# Super-Photostable Phosphole-Based Dye for Multiple-Acquisition Stimulated Emission Depletion Imaging

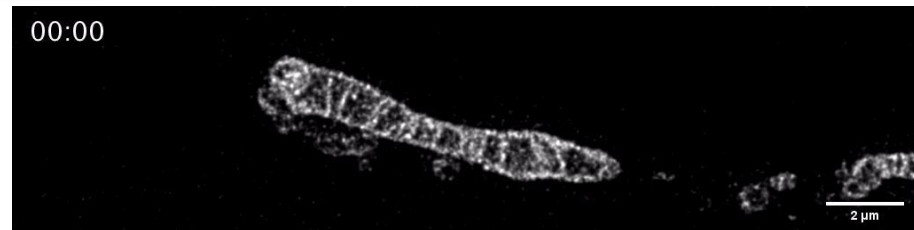
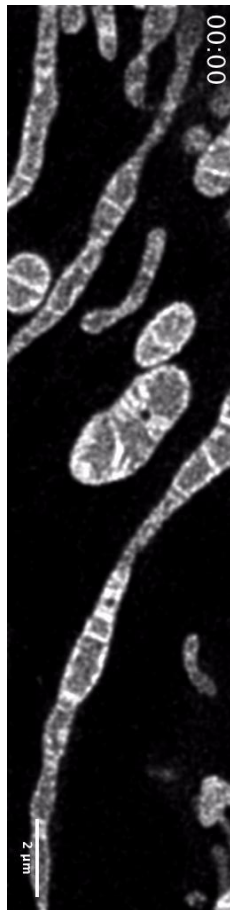




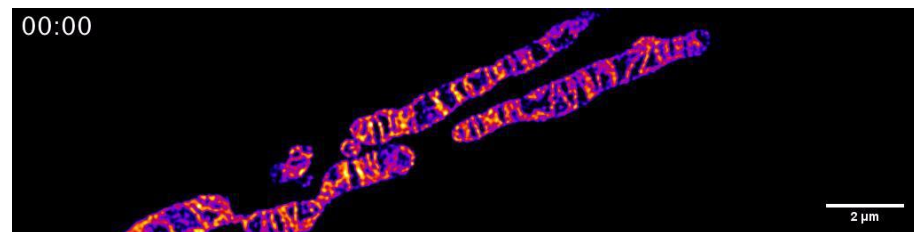
# A photostable fluorescent marker for the superresolution live imaging of the dynamic structure of the mitochondrial cristae



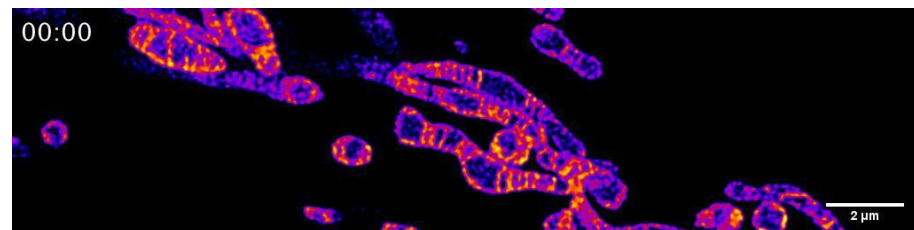
### Time-lapse STED imaging of the rupture of mitochondrial membrane



## Time-lapse STED imaging of mitochondria labeled with probe MitoPB Yellow

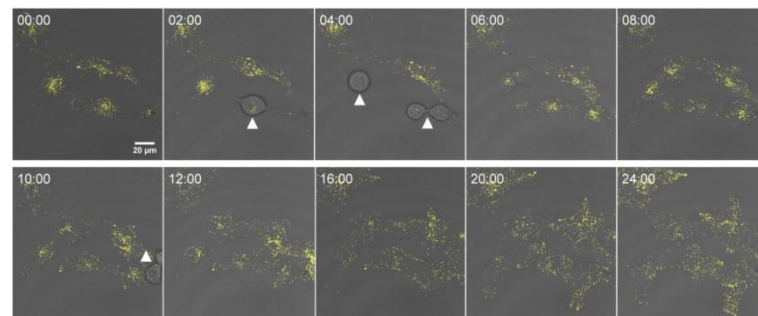
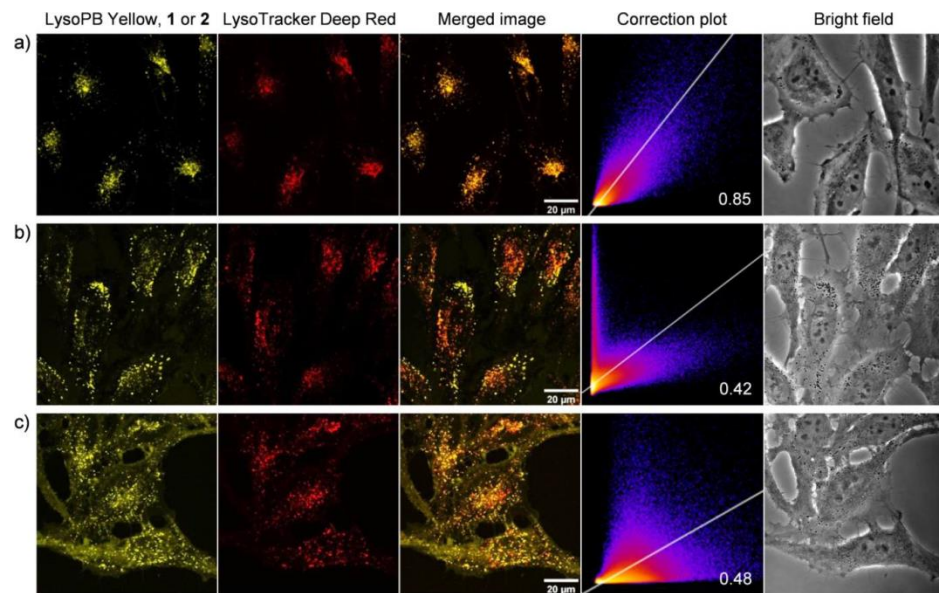
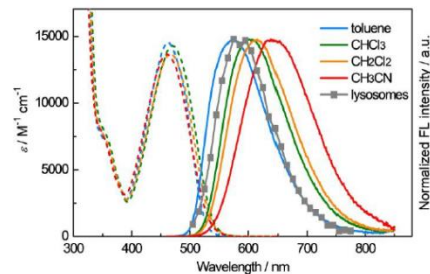
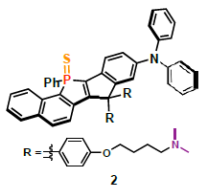
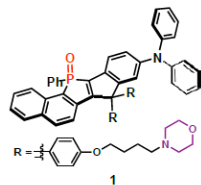
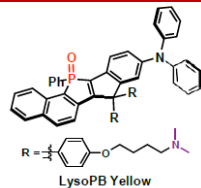
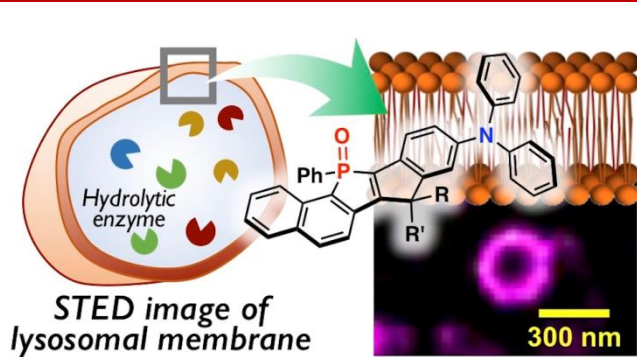


Time-lapse STED imaging of a rapid inter-cristae mergence  
in a single mitochondrion.



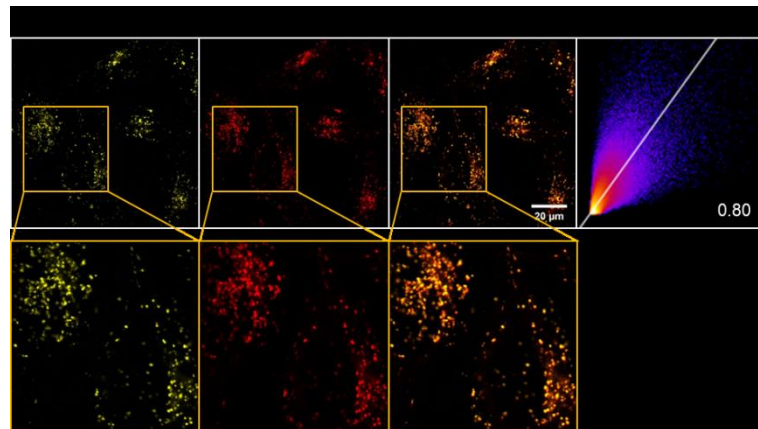
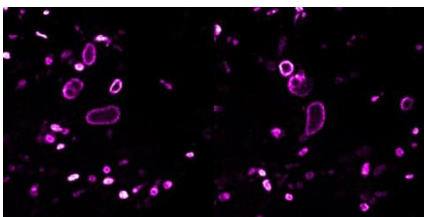
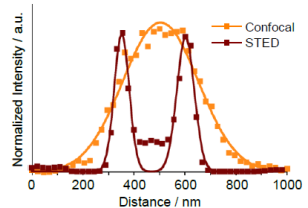
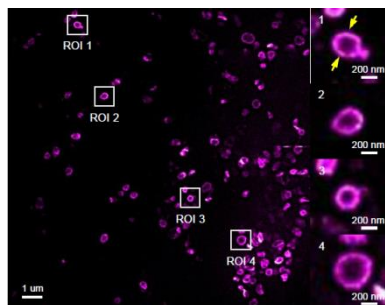
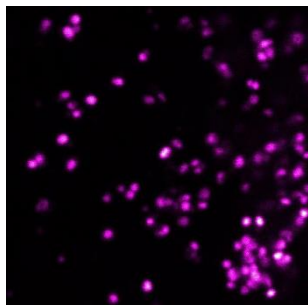
## Time-lapse STED imaging of the inter-mitochondrial fusion

# This work

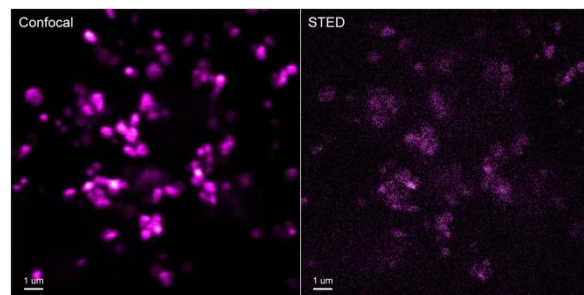
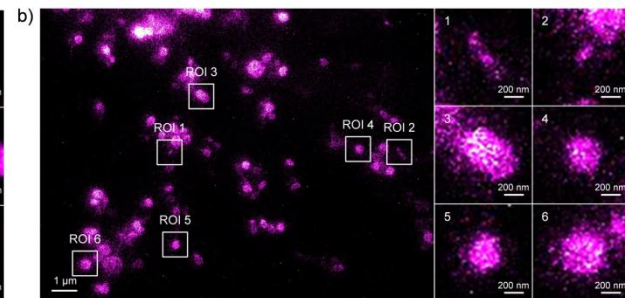
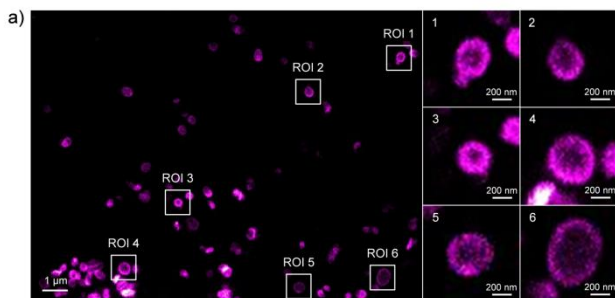




# Properties of LysoPB Yellow



## LysoTracker Green



LysoPB Yellow

LysoTracker Red

**Thanks for your attention!**