

University of Groningen

## The *hansenula polymorpha* pex23 family: overlooked proteins In organelle formation

Wu, Fei

DOI:  
[10.33612/diss.157801525](https://doi.org/10.33612/diss.157801525)

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2021

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Wu, F. (2021). *The hansenula polymorpha pex23 family: overlooked proteins In organelle formation*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen.  
<https://doi.org/10.33612/diss.157801525>

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

**The *Hansenula*  
*polymorpha* Pex23 Family:**  
Overlooked Proteins In Organelle Formation

**Fei Wu**



university of  
 groningen



The research presented in this thesis was performed in the Molecular Cell Biology Group of the Groningen Biomolecular Science and Biotechnology Institute (GBB) of the University of Groningen, the Netherlands.

This project was supported financially by the China Scholarship Council (CSC), which is a non-profit institution with legal person status affiliated the Chinese Ministry of Education.

**Cover and Layout design:** Publiss – [www.publiss.nl](http://www.publiss.nl)

**Printing:** Ridderprint – [www.ridderprint.nl](http://www.ridderprint.nl)



university of  
 groningen

**The *Hansenula*  
*polymorpha* Pex23 Family:**  
Overlooked Proteins In Organelle Formation

**PhD thesis**

to obtain the degree of PhD at the  
University of Groningen  
on the authority of the  
Rector Magnificus Prof. C. Wijmenga  
and in accordance with  
the decision by the College of Deans.

This thesis will be defended in public on

Friday 19 February 2021 at 14.30 hours

by

**Fei Wu**

born on 17 September 1990  
in Anhui, China

## **Supervisors**

Prof. I.J. van der Klei

Prof. J. Kok

## **Assessment Committee**

Prof. A.J.M. Driessen

Prof. G. van den Bogaart

Prof. M. Schrader

To my family

致我敬爱的父母  
张玲女士、吴兵先生

## Acknowledgements

September 30<sup>th</sup> 2016, I travelled from Shanghai to Groningen to start my PhD project. More than four years have passed, and now it is the time to draw an end for this unforgettable journey. I have experienced ups and downs in the past years, but full of gratitude. Here I would like to sincerely acknowledge to everyone who has helped and supported me during my PhD.

First of all, my heartfelt gratitude goes to my great supervisor Prof. Ida J. van der Klei for accepting me as a PhD student at the Molecular Cell Biology Group. I will never forget the first skype interview we had on February 17<sup>th</sup> 2016, your smile and the tone of your voice made me feel less nervous. I still remember after the interview I told my parents that “I believe I will be happy there” and now it turns out I was correct. Ida, this book would not exist without you! Thank you for all your guidance, encouragement and countless help in the past five years. You are always patient in explaining any research questions, correcting my manuscripts, presentations, oral talks, posters and everything in between. Thank you for being approachable and available, for giving me constructive feedback and teaching me scientific thinking, for believing in me all the time. I hope you get more funding, more nice papers and a fruitful research career. Let’s keep in touch!

I would like to thank my second supervisor Prof. Jan Kok for approving my promotion applications. I would also like to thank the assessment committee members, Prof. Arnold J.M. Driessen, Prof. Geert van den Bogaart and Prof. Michael Schrader for accepting to evaluate and comment on my thesis and also for serving as jury members at my public defence.

My dear Jannet, you are always there whenever I need a favour. I remember the first time I met you in the elevator, while I have no idea you are the person who helped me prepare all documents during my application. I remember the taste of “the black candy” I received from you on Children’s day. Your words “can I help you”, “no worries”, “you can do it” full with magic and can always cheer me up. Thank you so much for what you did for me during these five years and all the best!

Arjen, my dear Shifu, I can always learn something new from our discussions. Thank you for solving many practical issues, checking protocols, ordering stuff and helping me finish projects. Rinse, I am surprised by your bakery, stories about your homemade beer, your cool role in a band and your enthusiasm for microscopy techniques. Thank you for all your help in teaching me EM and data analyzing. Arjen and Rinse, thank you again for all your kindness, I am sure that I would be lost without you!

My dear Renate and Tjaša, thank you for accepting to be my paranymphs. Renate, you are so sweet and always willing to help me! Thank you for taking care of my Dutch summary. I cannot have Heavy easily without your help, your homemade chocolate cake is the most delicious cake I have ever had on my birthday, and the seeds bag warms me in wintertime. One “thank you” is not enough for all that you have done for me. I wish you a lot of happiness and success in your research career. Tjaša, the most positive and energetic girl I have ever met. Thank you for feeding me when I had to stay late in the lab, for listening to my complaints, for encouraging me when I was not in a good mood. You are someone I

can never be, brave and straightforward, please keep them with you! All the best for your researches and life in Groningen!

Huala, my dear shijie, I am lucky to have you as my kind of “big sister”. You are a professional consult, which benefits me a lot when I trapped into confusions. Thank you for helping me overcome many difficult times, being there, and encouraging me. Your cooking skill is amazing! I am looking forward to seeing you soon!

Marc, a warm-hearted, intelligent and humorous guy, you always impress me with your valuable ideas on our work discussion. I believe your broad view of science will help you become a brilliant researcher. Eline, an optimistic and efficient girl, I am happy to see you joining our group to continue with peroxisomal studies. I hope you will have a fruitful PhD life here.

Asmaa, Srishti, Ann, Arman, Justyna, Ritika, Natasha, Richard, Pragya and many other people I forget to mention here (sorry for that), it has been great getting to know everyone of you. Thank you for all your kind help and support.

I would also like to express my gratitude to my Chinese friends in Groningen and other cities in Netherlands, Yingying WU, Wenzhe Guo, Qikai Guo, Qian Chen, Lin Chen, Jin Li, Yan Zhou, Xiaocui Wang, Xiaojuan Zhang, Yehan Tao, Qingqing Yuan, Yongjiao Zhang, Weiteng Guo, Junjie Jiao, Yang Liu, Daili Peng, Liming Dai, Xuan Li, Yu Li and many other people I forget to mention here (sorry for that), thank you for the countless meals, drinks, and travels we enjoyed together. I wish you all the best in your life and see you lovely guys in the future.

Thank you, Groningen, the lovely northern city of Netherlands. I love this city, quiet, beautiful and suitable for studying. See you, Groningen! See you, Zernike! See you, MCB!

Before I move my thanks to my families, I would like to acknowledge the China Scholarship Council.

最后，我要感谢我的亲友们，感谢你们一路以来对我的关怀、理解、鼓励和支持。感谢你们在我不在国内的这几年对家父家母的陪伴和照顾，点点滴滴铭记在心。

万爱千恩百苦，疼我孰知父母？最后的最后，我要特别感谢我的父母。感谢你们这些年的疼爱，感谢你们保护我的天真，感谢你们愿意等我慢慢长大。你们是我的骄傲、是我的榜样、是我前进的动力、更是我的避风港。女儿在这里祝你们平安健康！

致我敬爱的父母

*Fei WU*

*December 2020*





## **Contents**

<i>Chapter 1</i>	Introduction: Peroxisome formation and membrane contact sites in yeast	11
<i>Chapter 2</i>	Pex24 and Pex32 are required to tether peroxisomes to the ER for organelle biogenesis, positioning and segregation in yeast	35
<i>Chapter 3</i>	Structure function analysis of the ER-peroxisome contact site protein Pex32	79
<i>Chapter 4</i>	The absence of <i>Hansenula polymorpha</i> Pex23 and Pex29 affects mitochondrial morphology	111
<i>Chapter 5</i>	Summary and Outlook	127
<i>Samenvatting</i>		134

