Bibliography


I would have never done it alone.

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**Cristina**, we have made it! While personality-wise in many aspects we might be in the opposite sides of the spectrum, it was (and still is) a great experience working with you. As a rather insecure person myself, I have learned a great deal from your confidence and directness. Your passion for science and your capacity to navigate research projects are inspiring, and I will be delighted if I could be able to reach even a fraction of that capacity myself. I appreciate your support throughout the project. The fact that you believed in me – that sad dead plant at the end of her PhD road and offered me to stay for a bit longer at
Wetsus to join other projects means a lot to me. Thank you for your guidance, kindness, and understanding. You made me grow not only professionally, but also personally.

I would also like to thank the members of the assessment committee, Prof. Gert-Jan Euverink, Prof. Marleen Kamperman and Prof. Wiebe de Vos for reading and approving my thesis. I would also like to thank the committee members, Prof. Gert-Jan Euverink, Prof. Wiebe de Vos, Prof. Marthe Walvoort, Prof. Gang Liu, Prof. Giuseppe Portale, and Prof. Manuel Simões for agreeing to read my thesis and for joining the ceremony.

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In the kick-off meeting for my PhD project, we have preliminarily agreed that I will only be required to visit the BME laboratory for three months in the first half of 2019. However, as I have learnt, research rarely goes according to plan and eventually, I have spent plenty more time travelling between Sneek and Groningen to watch bacteria sticking (or not) to various surfaces of my choice. Despite the longer travelling times, I cherish this experience as it allowed me to meet and work with a variety of great people. I am especially grateful to the technical staff for their kindness, patience, availability, and unlimited willingness to help. You all made my visits at the department very productive, work- and pleasure-wise. Jelly, Willy, Betsy, Marja and Gesinda, thank you so much for your help with smaller and bigger things in the microbiology lab, but also for the talks about everything and anything! Ed, you are one of the most enthusiastic people I know. You always bring a great energy to the room and make people feel welcome. Thank you for all the
computer-related and -unrelated help. **Hans**, thank you for introducing me to multiple techniques and every time providing a great theoretical insight. I was always impressed by your passion, interest, and being so well-spoken. **Willem**, you have taught me everything I know about working with the flow chamber systems and you have guided me through the labyrinth of UMCG more than once. If it was not for you, I would probably still be stuck somewhere hunting the corridors of a faraway department. I appreciated your genuine kindness and composure. **Joop**, your help and expertise were essential to my project, therefore, I thank you for all your (precious) time you gave me, especially, when you made a visit to Wetsus to teach me the secrets of AFM. You are a great person to work with, due to your understanding and patience, but also by being genuinely fun.

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I have been circling around Wetsus since 2014 but doing a PhD in this excellent institute gave me a chance to get the best perspective on its insides. And in its core are the people with expertise and a heart for what they are doing – the staff that helps us achieve our research goals. First of all, I want to thank the microlab team. I feel sorry for the people who are not part of the microlab, as they are missing on an amazing support group that you have built. Thank you for all your help and patience. **Inez**, I really appreciated your calm presence and enormous knowledge on microbiology related topics. Thank you for initiating the Biofilms in DWDS group. It has since evolved but it is now a platform that many of us benefit from. **Bianca**, I have no words for the level of energy you are representing. I have been always impressed to see how much you can do as one person. Thank you for all the help and for being this infinitely positive vibe in the lab. **Agnieszka**, I only wish we could have started working together earlier. Your knowledge on microscopy is impressive and it was so fun to interact with you, as you are a gentle and kind person. **Denise**, thank you for all your help with the tiniest things and always being so kind about it. I respect your ability to choose for the things in life that you love and I wish you will find the perfect balance! **Marta**, what an addition to the team! I love how you can be yourself, full of this explosive young energy, and a completely professional part of the staff at the same time. For me working with you is learning through fun. And last but DEFINETELY not least, **Pieter**. While of course I
thank you for all the help with the microbial community data processing, I am the most grateful for your patience, kindness and understanding. As I can be a chaotic person in chaotic situations, I appreciate your rather stoic approach and support. Your passion for nature is adorable and I enjoy all the conversations we have.

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And let’s not forget about the pillar of Wetsus experimental infrastructure, the technical team. Jan, Ernst, Harm, Jan Jurjen, John, Wim, you guys are amazing and I was never shy about telling you how impressed I am about your ideas and things you create on a daily basis. All the practical skills I have, I owe to you. Especially chunky thank you goes to Jan. I cannot emphasize enough what a massive help and support you have been during my PhD project and beyond. Without you, I would still be standing cluelessly in the middle of the experimental hall, or worse, I would be trying to fix things with a duct tape. Instead, we built a set-up that not only works (as proved in Chapter 5) but also is beautiful. I appreciated (and still do) our conversations, your humor and patience.

I believe that the actual faces of Wetsus also need to be acknowledged, as those are the ones I have seen everyday interchangeably for the past five years. Danique, Anita, Trienke and Jannie, no matter how my morning goes, you make the entering the work place very easy. I cannot thank you enough for your help with arranging things, especially the unfortunate sending of my samples to Texas, which I know, Jannie, gave you a
sleepless night. Extra thanks to you for your support and the ups and downs we shared throughout those insecure few days.

And of course, none of this would be possible if not for the vision and passion of Cees and Johannes. Thank you for creating this excellent research facility. Wetsus raised the bar for a working environment so high, that I am struggling to imagine that I will ever find a place as pleasant and as full of possibilities as here.

Luckily, I am not leaving Wetsus just yet. With that came a new desk at the second floor office with a set of new colleagues. Except for Chris, you are the opposite of a new colleague, as you are one of the people at Wetsus I have known the longest. As completely different people, we went through a bumpy road (from my side). I appreciate that you are only 40% of what I have imagined of you when we first met. I am glad to have you as an officemate now. Roel, Michele, Maarten, Doekle and Michel, thank you for being so welcoming and for the conversations we share.

Now I will try to acknowledge all the people whose interactions with I have cherished (and still do) and with whom I have shared the suffering of being a PhD candidate with. While I am generally not the outside work activities kind of person and we might not have spent a lot of time outside of Wetsus walls, you still added quality to my days and played a smaller or bigger role in my personal growth. As I have no capacity to put it all on paper, please, feel free to find me at Wetsus or send me a message to get your personalized acknowledgment in a spoken format. So, here it goes in no particular order: Shuyana, João, Mariana, Catarina, Barbara, Rita, Qingdian, Thomas, Ragne, Sara, Jolanda, Amanda, Raquel, Sam, Kestral, Rose, Olga B., Sebastian C., Sebastian C., Maarten, Edwin, Emanuel, Ilse, Gosia, Pawel, Slawek, Klaudia, Karolina, Alicia, Rebeca, Hakan, Suyash, Prashanth, Jelmer, Natascha, Nimmy, and Antoine, thank you for being a part of the process. One from this group deserves a special mention in writing. Wokke, thanks for always being supportive and accepting of my boundaries and limitations (and whining). You enriched my life with your presence and the excellent quality memes on suffering and fun. Our WhatsApp chat is a real treasure chest.

I also cannot disregard the impact of the younger generation on my later days at Wetsus. While all the new faces were very confusing at first, you brought a lot of optimism and youthful energy in the later period. So, Pamela, Simona, Talie, Shuoguang, Lester,
Liang-Shin, Lourens, Marija, Rodrigo, Jessica, Sophie, Mirvahid, Elfy, Berke, Yi-zhou, Elorm, Kecen, Mu Lin, Shih-Hsuan, thank you for making me feel young and enthusiastic again.

It brings me to the Office 1.18E which deserves a separate one page-long paragraph. While people claim that their offices are the best, I cannot imagine having a better office than this one. The fate has engineered the components of the Office 1.18E with a perfect precision, as it seems that each of us was born to fit in this small community flawlessly, like puzzles. Being at this office together at that one moment in time, at the final configuration, we have reached our destination. Whatever comes after will be just a disappointment. You have made all of my days and created the safest space. Thank you for that. Antony, I have tried to always stand on your side but you did not make it easy on me… Your strong wish for enemy making prevailed. Nonetheless, it has been a pleasure to know you and I wish you all the best with your business endeavors. Xiaoxia, you started as my favorite competition. I am glad that after all we both ended in biofilm-related projects sitting side by side. I have learnt a lot from you and I have always appreciated your (external) composure. Vania, what a magical creature you are. Is your age a mystery, simply because you have been living through multiple centuries already? You are as sweet, as you are unforgiving and aggressive in the discussions on surprisingly any conversational topic. It has always been a treat to talk with you about darker and brighter subjects and I am impressed by the enormous database that your brain stores. Yicheng, I feel like you are just like me but the opposite. While you, as a newbie, was expected to destroy the balance we have so carefully cultivated, you were actually the final touch that made our office complete. It is only a bummer that you have joined this late. You are so fun, a style icon, and a woman with a cat wish so strong that it attracts the cats from the neighborhood like a magnet. You impress me and I hope we continue to hang out. Nouran, wow. We on the other hand, are the exact opposites but so alike. I have never met a person like you with such different views to mine, with whom I can have such respectful, educating and stimulating discussions. As I already told you, I wish I had your way of expressing your thoughts and your confidence. What I definitely do not wish to have is your capability to recognize hidden context ♥. You are a gem and I appreciate you deeply. Carlo, while I know you prefer to get no acknowledgments, you deserve all of them. You are one of the kindest and most selfless people I have known in my life. As,
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My paranymphs, Yujia and Angel. Thank you for agreeing to be by my side. The reasons I chose you two were beyond just a payback for being a paranymph to you. I feel like each of you represents two conflicting sides of my personality and this is why I connected with each of you so strongly, despite two of you being so different (or are you?). Yujia, I have no words to describe what a beautiful soul you are. There is something about you that is just outside of one’s grasp. The ocean of genuine empathy and kindness you carry has always amazed and impressed me. However, there is also a hidden edge and fierceness to you that once discovered, it brings enormous joy and it is so, so fun. Despite the differences in the intensity of our characters, I believe we think and feel alike. That is why I always felt like I could tell you anything and be supported. I hope to carry a piece of you with me as a reminder about the core values we share. Now, Angel, I enforced my friendship on you and I regret nothing. You are definitely a great friend material, no matter how different we both are (and even if it is only to feed your ego). I always told you I envy your rationality and sober perspective on things, but I benefited from those greatly myself. Whenever I entered a situation that in my head seemed unsolvable, you could
break it down and show me the possible scenarios. I cherished the depth (and a complete lack of it) in the conversations we had, the views we shared, and the controversial topics we poked. I did not cherish Spanish The Simpsons references. But as an overall score, I am grateful for having you in this journey, and staying at Wetsus without you is definitely lacking. Also, one day I will watch *The Man from Earth*.

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List of publications

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In preparation


Sójka O., Van der Mei H. C., Van Rijn P., Gagliano M. C. Biofilm formation on polymeric pipe materials and the anti-adhesive effect of a nanogel-based coating in a simulated drinking water distribution system.
Olga Sójka was born on 14 June 1989 in Wałbrzych, Poland. She completed her bachelor’s degree in Environmental Protection Engineering at Wrocław University of Technology in 2014. The same year, she started the joint master degree of Water Technology in Leeuwarden, the Netherlands, offered by Wageningen University, Groningen University, and University of Twente. She carried out her master thesis research at Wetsus (Leeuwarden) investigating the role of bacteriophages in the spread of antibiotic resistance in wastewater. To fulfil her master degree requirements, she participated in the four months internship at DeSaH (Sneek, the Netherlands) where she helped with optimization of the biological phosphorus removal from greywater at a decentralized wastewater treatment plant. After graduation she worked as a water technologist in companies providing decentralized water and wastewater solutions. However, missing the challenges of scientific research, she returned to Wetsus in 2018 to pursue a PhD degree under the supervision of M. Cristina Gagliano, Patrick van Rijn and Henny C. van der Mei, in a collaboration with the Biomedical Engineering Department at University Medical Center Groningen. For her degree she investigated the influence of polymeric pipe materials and anti-adhesive hydrogel-based coatings on microbial adhesion and biofilm formation in drinking water distribution systems described in this thesis. Currently, she remains at Wetsus as a postdoctoral researcher.
Influence of physical surface properties on biological formation in drinking water distribution systems.