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## Shaping massive galaxies: the structural evolution of galaxies across $0 < z < 1$

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# PUBLICATIONS

## Refereed publications

1. *The Mass Scale of High-Redshift Galaxies: Virial Mass Estimates Calibrated with Stellar Dynamical Models from LEGA-C*  
van der Wel, A., van Houdt, J., Bezanson, R., Franx, M., D'Eugenio, F., Straatman, C., Bell, E.F., Muzzin, A., Sobral, D., Maseda, M., **de Graaff, A.**, Holden, B., ApJ in press
2. *The LEGA-C and SAMI Galaxy Surveys: Quiescent Stellar Populations and the Mass-Size Plane across 6 Gyr*  
Barone, T., D'Eugenio, F., Scott, N., Colless, M., Vaughan, S.P., van der Wel, A., Fraser-McKelvie, A., **de Graaff, A.**, van de Sande, J., Wu, P-F., Bezanson, R., Brough, S., Bell, E.F., Croom, S.M., Cortese, L., Driver, S., Gallazzi, A.R., Muzzin, A., Sobral, D., Bland-Hawthorn, J., Bryant, J.J., Goodwin, M., Lawrence, J.S., Lorente, N.P.F., Owers, M.S., 2022, MNRAS, 512, 3828
3. *Observed structural parameters of EAGLE galaxies: reconciling the mass-size relation in simulations with local observations*  
**de Graaff, A.**, Trayford, J., Franx, M., Schaller, M., Schaye, J., van der Wel, A., 2022, MNRAS, 511, 2544
4. *LEGA-C: Analysis of Dynamical Masses from Ionized Gas and Stellar Kinematics at  $z \sim 0.8$*   
Straatman, C., van der Wel, A., van Houdt, J., Bezanson, R., Bell, E.F., van Dokkum, P., D'Eugenio, F., Franx, M., Gallazzi, A., **de Graaff, A.**, Maseda, M.V., Meidt, S., Muzzin, A., Sobral, D., Wu, P-F, ApJ, 928, 126
5. *Ubiquitous OII Emission in Quiescent Galaxies at  $z \sim 0.85$  from the LEGA-C Survey*  
Maseda, M., Van der Wel, A., Franx, M., Bell, E.F., Bezanson, R., Muzzin, A., Sobral, D., D'Eugenio, F., Gallazzi, A., **de Graaff, A.**, Leja, J., Straatman, C., Whitaker, K.E., Williams, C.C., Wu, P-F., 2021, ApJ, 923, 18
6. *Stellar Dynamical Models for 797  $z \sim 0.8$  Galaxies from LEGA-C*  
van Houdt, J., van der Wel, A., Bezanson, R., Franx, M., D'Eugenio, F., Barisic, I., Bell, E.F., Gallazzi, A., **de Graaff, A.**, Maseda, M.V., Pacifici,

- C., van de Sande, J., Sobral, D., Straatman, C., Wu, P-F., 2021, ApJ, 923, 11
7. *The Large Early Galaxy Astrophysics Census (LEGA-C) Data Release 3: 3000 High-Quality Spectra of Ks-selected galaxies at  $z > 0.6$*   
Van der Wel, A., Bezanson, R., D'Eugenio, F., Straatman, C., Franx, M., van Houdt, J., Maseda, M.V., Gallazzi, A., Wu, P-F., Pacifici, C., Barisic, I., Brammer, G.B., Munoz-Mateos, J.C., Vervaeke, S., Zibetti, S., Sobral, D., **de Graaff, A.**, Calhau, J., Kaushal, Y., Muzzin, A., Bell, E.F., van Dokkum, P.G., 2021, ApJS, 256, 44
  8. *The Fundamental Plane in the LEGA-C Survey: Unraveling the M/L Ratio Variations of Massive Star-forming and Quiescent Galaxies at  $z \sim 0.8$*   
**de Graaff, A.**, Bezanson, R., Franx, M., van der Wel, A., Holden, B., van de Sande, J., Bell, E.F., D'Eugenio, F., Maseda, M.V., Muzzin, A., Sobral, D., Straatman, C.M.S.; Wu, P-F., 2021, ApJ, 913, 103
  9. *Tightly Coupled Morpho-kinematic Evolution for Massive Star-forming and Quiescent Galaxies across 7 Gyr of Cosmic Time*  
**de Graaff, A.**, Bezanson, R., Franx, M., van der Wel, A., Bell, E.F., D'Eugenio, F., Holden, B., Maseda, M.V., Muzzin, A., Pacifici, C., van de Sande, J., Sobral, D., Straatman, C.M.S., Wu, P-F., 2020, ApJL, 903, L30
  10. *Probing the missing baryons with the Sunyaev-Zel'dovich effect from filaments*  
**de Graaff, A.**, Cai, Y-C., Heymans, C., Peacock, J.A., 2019, A&A, 624, A48.

## Submitted publications

1. *A common origin for the Fundamental Plane of quiescent and star-forming galaxies in the EAGLE simulations*  
**de Graaff, A.**, Franx, M., Bell, E.F., Bezanson, R., Schaller, M., Schaye, J., van der Wel, A., resubmitted to MNRAS (arXiv e-prints, arXiv:2207.13491)

# CURRICULUM VITAE

I was born in Aberdeen, Scotland, but spent the majority of my childhood in The Hague. In the last two years at my secondary school, the Christelijk Gymnasium Sorghvliet, I also attended the Pre-University College in Leiden, where I participated in a wide variety of lectures and projects. Astronomy caught my interest, and my final-year project supervised by Dr. Ivo Labbé confirmed my choice.

Opting for extra adventure, I pursued an integrated master’s degree in physics and astronomy at the University of Edinburgh. There, I skipped plenty of lectures to instead build a radio telescope with my friends. I was also an active (committee) member of several student organisations: the local running club, Dutch Society and the Young Scientific Researchers Association. I graduated in May 2018 with First Class Honours, and was awarded for being the top student of my cohort.

My first encounter with scientific research was in 2015, during an exchange year at the University of California, Berkeley. With Dr. Ryan Trainor, I studied the sizes of Lyman- $\alpha$  emitters in *Hubble* imaging. The next summer I took part in the LEAPS programme organised by Leiden Observatory and ESA, where I analysed the extended UV emission in nearby galaxies with Dr. Meiert Grootes. Back in Edinburgh, I completed my Senior Honours project with Dr. Yan-Chuan Cai and Prof. Catherine Heymans, which resulted in the detection of some of the elusive warm-hot baryons in the cosmic web that had been labelled as “missing” for decades. The publication, written with the additional help of Prof. John Peacock, sparked a tumultuous response from the press and scientific community. For my MPhys project, I characterised high-redshift Lyman- $\alpha$  emitters and Lyman Break galaxies in large, ground-based imaging surveys with Prof. Ross McLure. Importantly, these mentors taught me the fundamentals of being a scientist: to ask the right questions, trust my own judgement, and communicate with others.

In September 2018 I started my doctoral research as a de Sitter fellow in Leiden, supervised by Prof. Marijn Franx. Given the freedom to pursue my own interests, I studied the structures of galaxies with state-of-the-art observations and simulations. I have worked with a large number and variety of collaborators, most notably the LEGA-C team. Although the pandemic cancelled many of the trips that I had planned and hoped for, I was fortunate to be able to visit Dr. Rachel Bezanson and Prof. Pieter van Dokkum in early 2020. I have also presented my work at many different conferences and team meetings, both in person and virtually.

In October 2022 I will join the Max Planck Institute for Astronomy in Heidelberg as a postdoctoral fellow, and continue my work at the interface of observations and theory. In particular, as a member of the NIRSpec GTO team since 2018, I look forward to exploring the new data from the *James Webb Space Telescope*.



# ACKNOWLEDGEMENTS

The journey towards the completion of this thesis has been quite the challenge. Three chapters of this thesis were written while in self-isolation due to the pandemic, making for a rather lonely PhD experience. Here, I would like to thank all those that have provided support and, most importantly, made these couple of years more fun.

To start, I want to express my gratitude to the support staff at Leiden Observatory, who were always more than happy to provide help with any practicalities needed. A special thank you to Monica and Marjan, who helped organise many of the Friday borrels and other social events. Ruud, thank you for fixing my bricked laptop, this thesis would otherwise likely have been delayed by months.

When it comes to the science, my collaborators have formed a crucial component to this work and my development as an astronomer. Rachel, Arjen, Eric, Francesco and all others of the LEGA-C team: you provided a welcoming and encouraging environment where I could learn and discuss not just the nitty-gritty details of data processing and analysis, but also different philosophies behind the reading and writing of papers. Michael, Bernd, Hans-Walter, thank you for helping me navigate the world of NIRSpec, the complexity of which reaches far beyond the science. Joop, and other simulators in Leiden, you offered a nice and much-needed counterpart to the world of observers. The galaxies journal club in Leiden provided a fun scientific playground, thanks to Leindert, Themiya, Ken, Sarah, and many others. Lastly, Marijn, I might have learnt a thing or two from you these past years, it's been all types of fun.

The department in Leiden is truly something special. It was an honour to serve the almighty Big Dipper together with Martijn (and Mantas). Mantas, you were the worst, best and only officemate – I hope you're proud of your medal. Hidde, you were always up for anything fun, and we still need to complete that hike to the other side of the Grand Canyon. Kirsty, you're my favourite Australian. Thank you for organising the best Halloween parties. Fraser, thank you for always sharing in my dark humour. Marta, I like you (even) more than I do Nala, I promise. Pooneh, our quarantine bubble during the first wave of covid would not have been the same without you. Last but not least, a special thank you to Anniek for enthusiastically showing all of us how to dance the floss.

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Marina, Folkert, I very much enjoyed all our discussions about science, life and beer. To the new/younger folks, thank you for breathing new life into the borrel and the KL puzzles. Josh, you're too nice. Roi, Joey, Nicco, Thijs, Erik, Roland, Margot, Christian, Christiaan, Alfred, Elia, Ivana, Evgenii, Elina, Sil, Jelle, Laura: I probably owe all of you a beer. To Amy, all I can say is: I told you so.

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To counterbalance some of these astronomers, I'm happy to have people in my life that give me a reality check every now and then. Jamie, Lou, I'm very proud of our longstanding friendship, and our ability to share, understand and celebrate both the small things and major milestones in life. Ryan, do you realise it has been 9 years? I can't wait for more trips to Belgium, to chat about life, food and beer. Julie, Ana, despite having taken very different paths in life, somehow we manage to pick up the conversation right where we left off whenever we talk. Thank you for hosting me for several holidays. Friends from Edinburgh, Khush, Ori, Sarah, Ellen, Luciana and Alex, I'm very happy to still be in touch, and get updates on all your various pets.

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Lastly, to my grandma, who studied chemistry in Leiden in the 1940s, but was informed that there was no space for women in the lab. Sadly, you did not get to see me pursue my PhD. Sexism is unfortunately still rife in academia. Nevertheless, may this thesis serve as a testament to the fact that there is a place for women in the sciences, including at the University of Leiden.