

# Tjitske Starkenburg

Center for Interdisciplinary Exploration and Research in Astrophysics (CIERA)  
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## Academic biography

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### Postdoctoral Fellow

Center for Interdisciplinary Exploration and Research in Astrophysics  
Independent postdoctoral fellowship

**Northwestern University**  
2019–current

### Flatiron Research Fellow

Center for Computational Astrophysics  
Independent postdoctoral fellowship

**Flatiron Institute**  
2016–2019

### PhD Astronomy

June 24 2016, *The impact of dark satellites on dwarf galaxies in a  $\Lambda$ CDM universe*  
Advisor: Prof. Dr. A. Helmi

**University of Groningen**  
2011–2016

### MSc Astronomy, Cum Laude ~ top 5–10%

Master thesis: *On dwarf galaxies and dark satellites*  
Advisor: Prof. Dr. A. Helmi

**University of Groningen**  
2009–2011

### BSc Astronomy & BSc Mathematics

Bachelor thesis: *Classifying galaxies with mathematical morphology*  
Advisors: Prof. Dr. S.C. Trager (astronomy), Dr. M.H.F. Wilkinson (computer science) & Prof. Dr. G. Vegter (mathematics)

**University of Groningen**  
2005–2009

## Research Interest

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My research will answer fundamental questions on the evolution of galaxies, by combining **galactic dynamics** and **extragalactic astronomy** to understand galaxies, their stellar halos, and surviving and disrupted satellites with the goal to **unravel how observed properties connect to galaxy formation history**. My research covers analyzing the **full galaxy population**, including **anomalous galaxies**, in large-scale and zoom cosmological models and observational samples, the **development of theoretical models**, and **improving techniques to build synthetic observations**. I make use of **statistical and machine learning approaches** to connect observational data to theoretical constraints, and study how these tools can support gains in physical understanding. Combining information from dynamics, kinematics, morphology, tidal features, and stellar populations, I work toward an understanding of how galaxies evolve under influence of the non-linear combination of all internal and external physical processes.

## Prizes and grants

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### Kavli Institute for Theoretical Physics Program Winter 2023

*Building a Physical Understanding of Galaxy Evolution with Data-driven Astronomy*

Initiated and led a proposal for a 10-week KITP program, granted during a particularly competitive year for astronomy

**KITP**  
2021

### Multiple travel grants

**Leids Kerkhoven-Bosscha Fund**  
2011–2016

### National Academic Award

*for the Kapteyn Institute Team on The infrared universe*

- National award for the best science outreach project with national scope: €100 000 to implement the proposed project
- I was an active member of the team and contributed to the winning presentation

**Netherlands Organization for Scientific Research**  
2008

### "Betabeurs" Scholerschip

Scholarship for top students in Mathematics, cohorts starting 2004 and 2005  
Amount: €1500

**Dutch Ministry for Science and Education**  
2007

### Prize in Mathematics

*2<sup>nd</sup> Prize for presenting my own research project*

Out of a selection of > 100 high school students from 14 different countries

**International Conference for Young Scientists**  
2005

## Publication List

### First and Second author publications

\* indicates works by students I co-supervised

Hahn, C.H., **Starkenburg, T.K.**, and the IQ-(Isolated and Quiescent) collaboratory, *IQ Collaboratory III: The Empirical Dust Attenuation Framework – Taking Hydrodynamical Simulations with a Grain of Dust*, 2021, ApJ submitted, arXiv: 2106.09741

Rey, M.P., **Starkenburg, T.K.**, *How cosmological merger histories shape the diversity of stellar haloes*, 2021, MNRAS, submitted, arXiv: 2106.09729

\*Dickey, C.M., **Starkenburg, T.K.**, Geha, M., and the IQ-(Isolated and Quiescent) collaboratory, *IQ-Collaboratory II: The Quiescent Fraction of Isolated, Low Mass Galaxies Across Simulations and Observations*, 2021, ApJ, 915, 53

\*Kopenhafer, C., **Starkenburg, T.K.**, Tonnesen, S., and Tuttle, S., *The breakBRD Breakdown: Using IllustrisTNG to Track the Quenching of an Observationally-Motivated Sample of Centrally Star-Forming Galaxies*, 2020, ApJ, 903, 143

\*Duckworth, C.J., **Starkenburg, T.K.**, Genel, S., Davis, T., Habouzit, M., Kraljic, K., Tojeiro, R., *Decoupling the rotation of stars and gas – II: the link between black hole activity and IFU kinematics in IllustrisTNG*, 2020, MNRAS, 495, 4542

Pearson, S., **Starkenburg, T.K.**, Johnston, K.V.J., Williams, B.F., Ibata, R.A., and Khan, R., *Detecting Thin Stellar Streams in External Galaxies: Resolved Stars & Integrated Light*, 2019, ApJ, 883, 87

**Starkenburg, T.K.**, Sales, L.V., Genel, S., Manzano-King, C., Canalizo G., and Hernquist, L., *On the Origin of Star-Gas Counterrotation in Low-mass Galaxies*, 2019, ApJ, 878, 143

**Starkenburg, T.K.**, Tonnesen, S., and Kopenhafer, C., *What Is Inside Matters: Simulated Green Valley Galaxies Have Centrally Concentrated Star Formation*, 2019, ApJL, 874, L17

Hahn, C.H., **Starkenburg, T.K.**, and the IQ-(Isolated and Quiescent) collaboratory, *IQ-Collaboratory 1.1: the Star-Forming Sequence of Simulated Central Galaxies*, 2019, ApJ, 872, 160

**Starkenburg, T.K.**, Helmi, A. and Sales, L.V., *Dark influences III. Structural characterization of minor mergers of dwarf galaxies with dark satellites*, 2016, Astronomy & Astrophysics, 595, A56

**Starkenburg, T.K.**, Helmi, A. and Sales, L.V., *Dark Influences II: gas and star formation in minor mergers of dwarf galaxies with dark satellites*, 2016, Astronomy & Astrophysics, 587, A24

**Starkenburg, T.K.** and Helmi, A., 2015, *Dark Influences: imprints of dark satellites on dwarf galaxies*, 2015, Astronomy & Astrophysics, 575, A59

### Co-Authored publications

Kilpatrick, C.D., Fong W-F, Blanchard, P.K., et al. including **Starkenburg, T.K.**, *Deep Hubble Space Telescope Observations of GW170817: Complete Light Curves and the Properties of the Galaxy Merger of NGC 4993*, 2021, ApJ submitted, arXiv: 2109.06211

Kado-Fong, E., Sanderson, R.E., Greene, J.E., et al. including **Starkenburg, T.K.**, *The In-situ Origins of Dwarf Stellar Outskirts in FIRE-2*, 2021, ApJ submitted, arXiv: 2109.05034

Pearson, S., Clark, S.E., Demirjian, A.J., et al. including **Starkenburg, T.K.**, *The Hough Stream Spotter: A new Method for Detecting Linear Structure in Resolved Stars and Application to the Stellar Halo of M31*, 2021, ApJ submitted, arXiv: 2107.00017

Flores Velázquez, J.A., Gurvich, A.B., Faucher-Giguère, C-A, Bullock, J.S., **Starkenburg, T.K.**, et al., *The time-scales probed by star formation rate indicators for realistic, bursty star formation histories from the FIRE simulations*, 2021, MNRAS, 501, 4812

Iyer, K.G., Tacchella, S., Genel, S., et al. including **Starkenburg, T.K.**, *The diversity and variability of star formation histories in models of galaxy evolution*, 2020, MNRAS, 498, 430

Pandya, V., Somerville R.S., Anglés-Alcázar, D., et al. including **Starkenburg, T.K.**, *First results from SMAUG: The need for preventative stellar feedback and improved baryon cycling in semi-analytic models of galaxy formation*, 2020, ApJ, 905, 4

Koppelman, H.H., Helmi, A., Massari, D., Price-Whelan, A.M., and **Starkenburg, T.K.**, *Multiple retrograde substructures in the Galactic halo: A shattered view of Galactic history*, 2019, A&A, 631, L9

Arabsalmani, M., Roychowdhury, S., **Starkenburg, T.K.**, et al., *The host galaxy of GRB 980425 / SN1998bw is interacting*

with a satellite galaxy, 2019, MNRAS, 485, 5411

Helmi, A., Sales, L.V., Starkenburg, E., **Starkenburg, T.K.**, Vera-Ciro, C.A., De Lucia, G., Li, Y.-S., *Dark Satellites and the Morphology of Dwarf Galaxies*, 2012, Astrophysical Journal, 758L, 5

## Leadership experience

<b>Lead Coordinator Kavli Institute for Theoretical Physics Program Winter 2023</b>	<b>KITP</b>
Organizing and leading a 10-week KITP program: <a href="http://www.kitp.ucsb.edu/activities/galevo23">www.kitp.ucsb.edu/activities/galevo23</a> the program will be partially remote and 4-weeks in-person at KITP leading to unique challenges in the organization	2021-2023
<b>PI of the Isolated and Quiescent galaxies (IQ) Collaboratory<sup>1</sup></b>	<b>IQ-collaboratory</b>
collaboration of ~30 astronomers, with currently 3 active multi-paper projects comparing simulated and observed galaxy populations to learn about quenching processes	2017-current
<b>Co-leader of the synthetic observations working group</b>	<b>SMAUG<sup>2</sup></b>
Simulating Multiscale Astrophysics to Understand Galaxies (SMAUG) Collaboration ~40 experts from 7 institutions in the USA and Europe	2017-current
<b>Organizing the Tristate Postdoc Retreat 2018</b>	<b>Flatiron Institute</b>
2-day career oriented workshop for all astronomy postdocs within the wider New York area Independently thought out and planned the program, including workshops on both academic and non-academic careers, Decadal Survey brainstorm sessions, panel discussions, and lightning talks	2018
<b>Co-organizing astro-ph meetings at the Center for Computational Astrophysics</b>	<b>Flatiron Institute</b>
	2018
<b>Chair, Organizing Committee Study Trip</b>	<b>Student association for Physics and Mathematics</b>
Organizing a three-week study trip ○ visiting Universities, Institutes, and Companies in Brazil and Argentina ○ for 25 students and 2 staff members of the University of Groningen; Total budget: €70,000	2008–2009
<b>Vice-Chair, Faculty Council, Faculty of Mathematics and Natural Sciences</b>	<b>University of Groningen</b>
The Council is the official representative advisory body to the Executive Board of the Faculty	2007

## Teaching and mentoring experience and training

<b>Member of the CIERA Bridge Program and Mentoring Task Force</b>	<b>CIERA</b>
Leading the development of a Mentoring Survey for all of CIERA and the report on the survey results Also attended multiple mentoring trainings to keep learning myself.	2020-current
<b>CIRTL Research Mentor Training</b>	<b>CIRTL</b>
11-week Evidence-based Course on Research Mentoring Including discussions and exercises that address key concerns and challenges identified by experienced research mentors	2021
<b>Mentoring an undergraduate student for the CIERA REU program</b>	<b>CIERA</b>
Primary advisor, co-mentoring with Prof. Claude-André Faucher-Giguère and Dr. Sarah Wellons also co-advised another REU student.	2021
<b>Lecturing at the CCA Dynamics Summer School 2021</b>	<b>Flatiron Institute</b>
pre-recorded 15min lectures on the galaxy as an equilibrium system and a collection of orbits One of 5 lecturers for the school.	2021
<b>Mentoring graduate students in the CCA Dynamics Summer School 2021</b>	<b>Flatiron Institute</b>
Primary advisor/co-advisor on multiple 5-week projects All projects I was involved in are continuing, and are expected to lead to publications.	2021
<b>CIRTL online course <i>Advancing Learning through Evidence-Based STEM Teaching</i></b>	<b>CIRTL</b>
Also participated a Learning Community connected to the course. Course includes developing well-defined, measurable, achievable and student-centered learning goals and objectives, and designing instructional practices and materials that align with those	2021
<b>Subject-specific tutor for Northwestern Prison Education Program (NPEP)</b>	<b>Northwestern University</b>
Tutoring for 2 classes during 2 quarters: Introductory Physics and Introductory Astronomy	2021

<sup>1</sup><http://iqcollaboratory.github.io>

<sup>2</sup><https://www.simonsfoundation.org/flatiron/center-for-computational-astrophysics/galaxy-formation/smaug/>

<b>CIRTL online course <i>An Introduction to Evidence-Based Undergraduate STEM Teaching</i></b>	<b>CIRTL</b>
Also participated a Learning Community connected to the course	2020
Course included developing learning goals and objectives, assessments, and teaching plans	
<b>Interactive virtual workshop for High School students doing Summer Research Projects</b>	<b>CIERA</b>
One-time workshop on Galaxy Mergers where students made their own movies of merger simulations	2020-2021
Workshop jupyterLab notebook and necessary data available on github	
<b>Mentoring graduate student in the Kavli Summer School 2018</b>	<b>Flatiron Institute</b>
6-week project on outside-in quenching galaxies; Co-mentor with Dr. Stephanie Tonnesen (CCA)	2018
The project led to two published refereed papers: Starkenburg et al. 2019 and Kopenhafer et al. 2020	
<b>Math tutoring for Public School children with <i>The Reading Team Math Program</i></b>	<b>New York</b>
Teaching math to kindergarten and 1st grade students and developing materials that are fun and educational	2017
led by Prof. Dr. Hui from Columbia University <a href="https://sites.google.com/view/readingteammath">https://sites.google.com/view/readingteammath</a>	
<b>Mentoring CUNY undergrad Summer student</b>	<b>Flatiron Institute</b>
Project on black holes in dwarf galaxy mergers; Co-mentor with Prof. Dr. Jillian Bellovary (CUNY)	2017
The student has presented results at SACNAS and AAS meetings (Mercedes-Feliz, Starkenburg & Bellovary in prep.)	
<b>Teaching Assistant</b>	<b>University of Groningen</b>
For multiple courses on Introductory Astronomy and Observational Astronomy	2010–2013
Including teaching exercise classes, grading homework, and mentoring and teaching students during observation runs at the Isaac Newton Telescope (INT), La Palma, and the Blaauw Observatory, University of Groningen	
<b>Mentoring high school students in research projects</b>	<b>University of Groningen</b>
Including developing and teaching various outreach activities, masterclasses, and workshops	2006–2011

## Scientific experience

### Selected Talks at Conferences

- *Spergelfest: Celebrating the 60th birthday of David Spergel and the 5-year Anniversary of CCA, Princeton-CCA*, October 2021
- *European Astronomical Society Meeting: The main sequence of star-forming galaxies*, virtual, July 2021
- *European Astronomical Society Meeting: The outer reaches of galaxies: structure, kinematics, and accretion history*, virtual, June 2021
- *American Astronomical Society Division on Dynamical Astronomy Meeting*, virtual, May 2021
- *Multi-Object Spectroscopy for Statistical Measures of Galaxy Evolution*, virtual, STScI, May 2021
- *Linking the Galactic and the Extragalactic*, virtual, ASTRO-3D, December 2020
- *The Epoch of Galaxy Quenching*, virtual, KICC, September 2020
- *Quenching and Transformation Throughout Cosmic Time*, Aspen Center for Physics, February 2020
- *In the Balance: Stasis and Disequilibrium in the Milky Way*, KITP Santa Barbara, April 2019, **Invited talk**
- *The life and death of star-forming galaxies*, ICRAR, Perth, Australia, March 2019, Contributed talk
- *The Near, The Far, and The In-between: Synergy between low and high redshift galaxy evolution studies in the era of JWST and EUCLID*, Noordwijk, the Netherlands, July 2018
- *The Physics of Galaxy Scaling Relations and the Nature of Dark Matter*, Kingston, Canada, July 2018
- *KIAA Forum on Gas in Galaxies: star formation and quenching*, Beijing, China, June 2018
- *The Physics of quenching massive galaxies at high redshift*, Leiden, the Netherlands, November 2017
- *The role of gas in galaxy dynamics*, Malta, October 2017
- *Gaia sprint NYC workshop*, New York, USA, October 2016 and June 2018
- *Dark matter on smallest scales*, Leiden, the Netherlands, April 2016
- *13th Potsdam Thinkshop: Near field cosmology*, Obergurgl, Austria, March 2016
- *European Week of Astronomy and Space Science: The journey of dwarf galaxies*, Tenerife, Spain, June 2015
- *The life and death of satellite galaxies*, Leiden, the Netherlands, April 2015
- *11th Potsdam Thinkshop: Satellite galaxies and dwarfs in the Local Group*, Potsdam, Germany, August 2014

## Selected Seminar Talks.....

- Universities Space Research Association SOFIA team, **Invited Seminar**, March 2021
- Michigan State University astrophysics group, **Invited Seminar**, December 2020
- American Museum of Natural History Seminar, May 2019
- Canadian Institute for Theoretical Astrophysics, **Invited Seminar**, May 2019
- Institute for Theory and Computation, Center for Astrophysics, Harvard, **Invited Seminar**, March 2019
- Princeton University Galread: galaxy evolution paper discussion Seminar, December 2018
- Space Telescope Science Institute Galaxy Journal Club, November 2018
- Columbia University Thursday Seminar, April 2018
- New York University Astrophysics Seminar, September 2017
- Yale University lunch Seminar, February 2017
- Rutgers University lunch Seminar, February 2017
- University of California Riverside Astronomy Seminar, January 2017
- ESO lunch seminar, May 2016
- MPA Cosmology Seminar, May 2016

## Referee responsibilities.....

- Referee for MNRAS; AAS journals; A&A
- Proposal reviewer for NASA Postdoctoral Program; two National Science Foundations
- Reviewing applications for CCA Dynamics Summer School 2020 and 2021; REU programs at CCA and CIERA

## Outreach experience

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**Invited lecture at Amateur Astronomers Inc.**

**Cranford, New Jersey**  
November 2019

**Talk to a scientist at Kids Week 2017 at the Intrepid museum**

**New York**  
February 2017

**Astronomy on Tap talk and panel discussion**  
short, interactive outreach talks at a pub

**New York**  
November 2016

**Invited lectures for amateur astronomers, high school students, specific groups and general public**  
*Including a video interview for ScienceLinx, the University of Groningen science outreach center*

2011–2016

**Lecturer and volunteer at the Blaauw Observatory Open Nights**  
*Presenting public lectures, quizzes, and experiments for young audiences, assisting the organization*

**Groningen**  
2008–2016

**Interview in *Zenit*, the magazine for astronomy enthusiasts in the Netherlands**

September 2015

**Evening for Science and Society**

*Meeting that fosters interaction between leading figures in science, industry, politics, and culture*  
Accompanying Amina Helmi, who was invited accompanied by a young scientist of her choice

**The Hague**  
October 2015

**Invited Talk at the National Conference for Physics Teachers**

**Noordwijk**  
December 2013

**National outreach activities on the *Infrared Universe***

*After winning the National Academic Award for best science outreach project with the Kapteyn Institute team*

2009