# **HELMER** HERMAN KOPPELMAN

## CONTACT


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## RESEARCH INTERESTS

I am interested in studying all dynamical and physical processes that govern the structure and evolution of the Milky Way, and in extension, the formation of galaxies and the universe as we know it. I combine theory with simulations and data to come up with new theories or to test existing ones. Generally speaking, I have a broad interest and an affinity for **statistics**, **data science**, and **machine learning**.

## EDUCATION

**BSc Astronomy**
*University of Groningen*
**2011 - 2014**

**MSc Astronomy** **cum laude**
*University of Groningen*
**2014 - 2016**

**PhD Astronomy**
*University of Groningen*
**2016 - (expected September 2020)**

## LANGUAGES

**Dutch** native
**English** fluent

## SKILLS

### Programming

Python, Fortran, LaTeX, parallel computing, big data, classification algorithms, neural networks

### Software & algorithms

vaex, numpy, matplotlib, scipy, jupyter, pandas, AGAMA, f2py, HDBSCAN, ipyvolume, Sklearn, GADGET-2, ROCKSTAR

### Survey data

Gaia, RAVE, LAMOST, APOGEE, Galah, SDSS, Pan-STARRS

### Data visualisation

3D-animations, high-res illustrations for papers/ magazines

### Scientific writing

### Scientific presentation

## EXPERIENCE

### PhD Candidate **2016-2020**

**(supervisor: Prof.dr. Amina Helmi)**
*University of Groningen / Kapteyn Astronomical Institute*

**The formation history of the Milky Way with Gaia**

The main theme of my PhD research is to study the formation history of the Milky Way. I test theories by identifying and analysing substructure in the stellar halo. Besides research, I teach and assist with the supervision of BSc/ MSc students.

### Founding board study association **2016-2017**

*Sirius A - study association astronomy*

Towards the end of my studies, I founded a study association for astronomy, together with four other students. The association strives to help students with their studies and to increase social bonding between students (and the institute staff). As the most experienced member of the board, my main contribution was to set up a good organisational and financial framework to start a healthy association.

- **Skills acquired: managing, raising funds, negotiating.**

### Chair & Secretary **2011-2013**

*G.S.B.V. Tweeslag - Student beach volleyball club*

Beach volleyball was one of my passions during my studies. As secretary (2011-2012) and chair (2012-2013) of the club, I had a leading role in the organisation of all sports- and social-related events of the club. During this time I helped in organising many events of up to 300 participants.

- **Skills acquired: public relations and branding of the club, managing, finding compromises.**

## EXTRACURRICULAR ACTIVITIES **2011-2019**

### Coaching/Teaching

Creating practise exams (2013-2016).
Supervision of a BSc student (2019), that led to a paper.
**Teaching assistant:**
'Intro to Programming' (2017, 2019),
'Dynamics of Galaxies' (2018).

### Teamwork

Many committees for the faculty, study association, and sports club:
Sports tournaments,
Galas and other social events,
Symposium (1-day),
Faculty introduction camp,
Program committee of astronomy (2011-2013).

### Leadership

Chair of a sports club (2012-2013).
Chair Kapteyn Institute first year PhD committee (2016-2017).

### Outreach **2016-2019**

Live interviews on local radio,
Magazine interviews,
Reporter for "astro news",
Talk as part of a planetarium show,
Creating illustrations and animations for (inter)national press releases,
Popular scientific lectures for amateur astronomers on Gaia and the Galaxy (2 times, 2h).

### Professional service

Referee for MNRAS, A&A

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Groningen, NLD

## Reference 2

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Leiden, The Netherlands

## Reference 3

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Bologna, Italy


## Talks / conferences / visits:

**KITP Santa Barbara:** 3-week stay, '*Dynamical Models for Stars and Gas in Galaxies in the Gaia Era*' April-2019
**Harvard**: lunch talk, 2-day visit April-2019
**Yale**: lunch talk, 1-day visit April-2019
**CCA**: lunch talk, 2-day visit April-2019
**Shanghai**: contributed talk. '*The life and times of the Milky Way*' Nov-2018
**Heidelberg**: contributed talk '*Survival of Dense Star Clusters in the MW*' Nov-2018
**Potsdam**: poster *IAUS 334 'Rediscovering our Galaxy'* July-2017
**Nice**: poster *IAUS 330 'Astrometry and Astrophysics in the Gaia Sky'* April-2017

## Refereed publications

**citations**

**[1]** Helmi, Babusiaux, **Koppelman**, et al. 2018, **Nature,** DOI: 10.1038/s41586-018-0625-x **131**
*Contribution: I analysed the simulation and took care of the dynamical analysis (Fig. 1 & 3)*

**[2]** **Koppelman** et al. 2018, APJ-L, DOI: 10.3847/2041-8213/aac882 **38**

**[3]** Starkenburg et al. 2018, MNRAS, DOI:0.1093/mnras/sty2276 **18**
*Contribution: I observed stellar spectra for three consecutive nights on the WHT on La Palma (4m telescope)*

**[4]** Massari, **Koppelman**, and Helmi 2019, A&A, DOI: 10.1051/0004-6361/201936135 **10**
*Contribution: I did the dynamical analysis in this work and assisted in grouping the globular clusters.*

**[5]** **Koppelman** et al. 2019, A&A, DOI: 10.1051/0004-6361/201834769 **7**

**[6]** Helmi & **Koppelman** 2016, APJ-L, DOI: 10.3847/2041-8205/828/1/L10 **5**
*Contribution: During my MSc thesis, I modelled dark matter - stream interactions, the results of my thesis led to a paper.*

**[7]** 't Mannetje, Banpurkar, **Koppelman** et al. 2013, Langmuir, DOI: 10.1021/la4015724 **20**
*Contribution: I was a lab assistant in the group of 'Physics of Complex Fluids' at the University of Twente.*

**[8]** **Koppelman** et al. 2019, A&A, DOI: 10.1051/0004-6361/201936738

Citations according to ADS, checked in October 2019 **total: 229**
See also: Google Scholar (Helmer Koppelman)

## Non-refereed publications (submitted / in prep.)

**[9]** **Koppelman et al. 2018** Scratching the surface with TGAS and RAVE: disk moving groups in the Solar neighbourhood
**Summary**: *I modified ROCKSTAR (a FOF subhalo finder) to find groups of stars with small velocity dispersions in the TGAS sample of Gaia DR1. The result of this study is that 10% of the (disc) stars in the Milky Way are found in kinematically cold groups.*

**[10]** **Koppelman et al. in prep** A massive mess: The evolution of merger debris in a live Milky Way-like host
**Summary**: *(close to submission) I analyse a simulation the resembles the Gaia-Enceladus merger event.*

**[11]** **Koppelman & Helmi in prep** The Reduced Proper Motion selected halo: methods and description of the catalog
**Summary**: *I identify halo stars with a combination of photometry and proper motions. A few million halo stars are selected and analysed.*

**[12]** **Koppelman & Helmi in prep** Determination of the escape velocity
**Summary**: *Using a sample of halo stars with only proper motion information (see paper [11]) I determine the escape velocity for the Milky Way as a function of galactocentric distance.*

**[13]** **Hagen, Koppelman, Helmi in prep** Structure in Orbital Frequencies space
**Summary**: *We study the orbital frequencies for a set of halo stars from Gaia DR2 with full phase-space information. I aided with the orbit integration, analytic calculation of the frequencies and interpretation of the structures in frequencies space.*

**[14]** **Koppelman & Helmi in prep** Time evolution of gaps in streams in axisymmetric Stäckel potentials
**Summary**: *I have extended a model to describe the time evolution of gaps in streams to work in axisymmetric Stäckel potentials. Both the size and central density of the gap are modelled successfully.*