

Dr. Nathan Deg

Department of Physics, Engineering Physics, and Astronomy
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[github profile](#)

Degrees and Positions

- **Queen's University** Kingston, ON
Canadian Data Intensive Astrophysics Platform Software Developer 2024-present
- **Queen's University** Kingston, ON
Canadian Institute for Radio Astronomy Data Analysis Software Developer 2019-2024
- **University of Cape Town** Cape Town, SA
SARChI Postdoctoral Fellow 2015 – 2019
- **Queen's University** Kingston, ON
Ph.D. Astrophysics 2010 – 2014
 - Advisor: Lawrence Widrow
 - Thesis: The Methodology of Modelling the Milky Way with Stellar Streams
- **Queen's University** Kingston, ON
M.Sc. Astrophysics 2007 – 2010
 - Advisor: Lawrence Widrow
 - Thesis: Dynamic Made-To-Measure: A Method of Making Dynamically Self-Consistent Triaxial Halos
- **Saint Mary's University** Halifax, N.S.
B.Sc. Astrophysics 2003 – 2007
 - Advisor: Aleksandrs Aleksajevs
 - Thesis: Calculating Asymmetries In Electron-Proton Scattering

Scientific/Professional Memberships

- Square Kilometer Array (SKA) HI Science Working Group Member
 - The SKA HI Science Working Group focuses using HI emission and absorption to study the history of gas in our Universe using the SKA and SKA pathfinders.
- Representative of the HI SWG on the SKA Regional Center Steering Committee (SRCSC) Working Group 6
 - The SRCSC is focused on developing and coordinated the various Regional Centers being built to facilitate SKA science.
- WALLABY team member, builder, and chair of TWG 7.1
 - WALLABY is one of the key surveys on the Australian SKA Pathfinder. It is an untargetted HI survey covering most of the southern sky. WALLABY builders are a category of WALLABY members who are building the core data products for the team. WALLABY Technical Working Group (TWG) 7.1 is aimed at coordinating and building the public archives for WALLABY data across multiple data centers.

- CASCA (Canadian Astrophysics Society - Société Canadienne D'Astronomie) Member
– CASCA is the professional organization for Canadian Astronomy.

Publications

57. Perron-Cormier et al., Bayesian Galaxy Asymmetry, submitted to ApJ
56. Deg et al., [The Bright Future of the Dark and Dim Universe](#), chapter in Advancing Astrophysics with the SKA II, accepted
55. Ramatsoku et al., [Resolved HI and Environmental Dynamics](#), chapter in Advancing Astrophysics with the SKA II, accepted
54. Lelli et al., Testing dark matter models and modified gravity theories with spatially resolved HI observations, chapter in Advancing Astrophysics with the SKA II, accepted
53. Lais et al., [The Low- \$\alpha\$ Splash Population in the Milky Way](#), submitted to ApJ
52. Dudley et al., [WALLABY Pilot Survey: A gas-rich diffuse dwarf on the baryonic Tully Fisher relation](#), submitted to ApJ
51. Garver et al., [Modeling the recent interactions between the Magellanic Clouds and Milky Way](#), MNRAS, 2026
50. Guimarães Silva et al., [WALLABY pilot survey: Blinded by the light – discovery of a fourth member in the ESO 179-013 system](#), submitted to ApJ
49. Fiteni et al., [Kinematic diagnostics for non-axisymmetry in the Milky Way's nuclear stellar disc](#), A&A, 709, A40, 2026
48. Amarante et al., [GASTRO library II: Exploring Chemical Bimodalities in Disk Galaxies with GSE-like Mergers and Massive Star-forming Clumps](#), ApJ, 1004, 242, 2026
47. Zhu et al., [Baryonic Masses and Properties of Gaseous Satellite Galaxies](#), submitted to ApJ
46. Lee, S., et al., [WALLABY pilot survey: HI depletion times within the stellar discs of nearby galaxies](#), MNRAS, 548, stag660, 2026
45. Yu et al., [Insights into the Physical Nature of Polar-ring Galaxies from H I Observations](#), ApJ, 999, 199, 2026
44. Villard et al., [Advanced Data Products for radio observatories](#), A&C, 54, 101003, 2026
43. Roxburgh et al., [The Distribution of Atomic Hydrogen in the Host Galaxies of FRBs](#), PASA, 42, e164, 2025
42. O'Beirne et al., [WALLABY: an untargeted search for H I-bearing ultra-diffuse galaxies uncovers the first known ultra-diffuse galaxy pair](#), MNRAS, 544, 1799, 2025
41. Deg et al., [WALLABY Pilot Survey: Characterizing Low Rotation Kinematically Modelled Galaxies](#), ApJ, 994, 232, 2025
40. Staveley-Smith et al., [WALLABY pilot survey: the extensive interaction of NGC 4532 and DDO 137 with the Virgo cluster](#), MNRAS, 543, 1, 2025

39. Deg et al., [Simulating the Milky Way bar and bulge with an initially Sérsic disc](#), MNRAS, 542, 464, 2025
38. O’Beirne et al., [WALLABY Pilot Survey: Properties of HI-selected Dark Sources and Low Surface Brightness Galaxies](#), PASA, 42, e087, 2025
37. Namumba et al., [Investigating the HI Distribution and Kinematics of ESO444-G084 and \[KKS2000\]23: New Insights from the MHONGOOSE Survey](#), A&A, 699, A372, 2025
36. Hank et al., [HI asymmetries in spatially resolved SIMBA galaxies](#), MNRAS, 540, 3047, 2025
35. Lee, S., et al., [WALLABY pilot survey: Spatially resolved gas scaling relations within the stellar discs of nearby galaxies](#), PASA, 42, e046, 2025
34. Huang et al., [WALLABY Pilot Survey: Star Formation Enhancement and Suppression for Gas-rich Galaxy Pairs](#), ApJ, 980, 157, 2025
33. Perron-Cormier et al., [WALLABY Pilot Survey & ASymba: Comparing HI Detection Asymmetries to the SIMBA Simulation](#), AJ, 169, 114, 2025
32. Holwerda et al., [WALLABY Pilot Survey: kNN identification of perturbed galaxies through HI morphometrics](#), PASA, 42, e028, 2025
31. Wang et al., [WALLABY Pilot Survey: HI source-finding with a machine learning framework](#), PASA, 42, e033, 2025
30. Deg et al., [WALLABY Pilot Survey: Resolved HI Scaling Relations](#), ApJ, 976, 159, 2024
29. Murugesan et al., [WALLABY Pilot Survey: Public data release of ~1800 HI sources and high-resolution cut-outs from Pilot Survey Phase 2](#), PASA, 41, e088, 2024
28. Mould et al., [WALLABY Pilot Survey Phase 2: the Tully-Fisher relation in the NGC 4808, Vela and NGC 5044 fields](#), MNRAS, 533, 925, 2024
27. O’Beirne et al., [WALLABY Pilot Survey: An ‘Almost’ Dark Cloud near the Hydra Cluster](#), MNRAS, 528, 4010, 2023
26. English et al., [CosmosCanvas: Useful color maps for different astrophysical properties](#), Astrophysics Source Code Library, ascl:2401.005, 2024
25. Deg, N., et al., [WALLABY Pilot Survey: the Potential Polar Ring Galaxies NGC 4632 and NGC 6156](#), MNRAS, 525, 4663, 2023
24. Beraldo e Silva, L., et al., [Orbital support and evolution of flat profiles of bars \(shoulders\)](#), ApJ, 955, 38, 2023
23. Deg, N., Perron-Cormier, M., Spekkens, K., Glowacki, M., Blyth, S.-L., Hank, N., [Measuring Galaxy Asymmetries in 3D](#), MNRAS, 523, 4340, 2023
22. Reynolds, T., et al., [WALLABY Pilot Survey: The diversity of HI structural parameters in nearby galaxies](#), PASA, 40, e032, 2023
21. Lin, X., et al., [FAST-ASKAP Synergy: Quantifying Coexistent Tidal and Ram-Pressure Strippings in the NGC 4636 Group](#), ApJ, 956, 148, 2023
20. Holwerda, B., et al., [WALLABY Pilot Survey: HydraCluster Galaxies UV and HI morphometrics](#), MNRAS, 521, 1502, 2023

19. Glowacki, M., et al., [WALLABY Pilot Survey: HI in the Host Galaxy of a Fast Radio Burst](#), ApJ, 949, 1, 2023
18. Courtois, H., et al., [WALLABY Pre-Pilot and Pilot Survey: the Tully Fisher Relation in Eridanus, Hydra, Norma and NGC4636 fields](#), MNRAS, 519, 4589, 2023
17. Kim, S.-J., et al., [WALLABY Pilot Survey: HI gas kinematics of galaxy pairs in cluster environment](#), MNRAS, 519, 318, 2023
16. Deg, N., et al., [WALLABY Pilot Survey: Public release of HI kinematic models for more than 100 galaxies from phase 1 of ASKAP pilot observations](#), PASA, 39, E059, 2022
15. Westmeier, T., et al., [WALLABY Pilot Survey: Public release of H I data for almost 600 galaxies from phase 1 of ASKAP pilot observations](#), PASA, 39, E058, 2022
14. Glowacki, M., Deg, N., Blyth, S. L., Hank, N., Davé, R., Elson, E., Spekkens, K., [ASymba: HI Global Profile Asymmetries in the SIMBA simulation](#), MNRAS, 517, 1282, 2022
13. Amarante, J., Debattista, V. P., Beraldo e Silva, L., Laporte, C. F. P., Deg, N. [GASTRO library I: the simulated chemodynamical properties of several GSE-like stellar halos](#), ApJ, 937, 12, 2022
12. Lee, B., et al., [ALMA/ACA CO Survey of the IC 1459 and NGC 4636 Groups: Environmental Effects on the Molecular Gas of Group Galaxies](#), ApJ, 262, 1, 2022
11. Anderson, S., Debattista, V. P., Erwin, P., Liddicott, D. J., Deg, N., Beraldo e Silva, L., [The secular growth of bars revealed by flat \(peak + shoulders\) density profiles](#), MNRAS, 513, 1642, 2022
10. Reynolds, T., et al., [WALLABY pilot survey: H I gas disc truncation and star formation of galaxies falling into the Hydra I cluster](#), MNRAS, 510, 1716, 2022
9. Reynolds, T., et al., [WALLABY pilot survey: first look at the Hydra I cluster and ram pressure stripping of ESO 501-G075.](#), MNRAS, 505, 1891, 2021
8. Deg, N., Blyth, S. L., Hank, N., Kruger, S., Carignan, C., [Systematically asymmetric: a comparison of H I profile asymmetries in real and simulated galaxies](#). MNRAS, 495, 1984, 2020
7. Namumba, B., Carignan, C., Foster, T., Deg, N., [HI observations of IC10 using the DRAO Telescope.](#), MNRAS, 490, 3365, 2019
6. Deg, N., Widrow, L., M., Carignan, C., Randriamampandry, T. H., [GalactICS with Gas](#), MNRAS, 486, 5391 2019
5. Randriamampandry, T. H., Deg, N., Carignan, C., Widrow, L., M.. [Simulating non-axisymmetric flows in disc galaxies](#). A&A, 618, A106, 2018
4. Randriamampandry, T. H., Deg, N., Carignan, C., Combes, F., Spekkens, K. [Exploring the GalMer database: bar properties and non-circular motions](#). A&A, 594, A86, 2016
3. Randriamampandry, T. H., Combes, F., Carignan, C., Deg, N. [Estimating non-circular motions in barred galaxies using numerical N-body simulations](#). MNRAS, 454, 3743, 2015
2. Deg, N., Widrow, L., M., [Incorporating Streams into Milky Way Models](#). MNRAS, 439, 2678, 2014
1. Deg, N., Widrow, L., M., [The Sagittarius Stream and halo triaxiality](#). MNRAS, 428, 912, 2013

Observing Proposals

- **The deepest, highest resolution HI observations of a diffuse dwarf** 2026
MeerKAT *Priority B1 - 25 hrs*

Invited Talks

- **Kinematic Modelling Tutorial** 2026
PHISCC 2026 (Beijing)
- **CanDIAPL and Computing** 2025
Saint Mary's University Computational Methods (Halifax)
- **Understanding Galaxy Evolution and Environment with Gas:
The diversity of Science with WALLABY** 2025
GEESE-ON (Waterloo)
- **Gassy Galaxies and How They Move:
WALLABY, HI, and the Local Universe** 2024
Queen's Astronomy Seminar (Kingston)
- **GalactICS with Gas** 2019
Queen's Astronomy Seminar (Kingston)

Conference Presentations

- **Kinematics, Structural Parameters and Scaling Relations:
WALLABY, 3KIDNAS, and more** 2026
PHISCC (Beijing)
- **The Milky Way Without a Bulge:
Building a Plausible Box/Peanut Bulge from Bulgeless Initial Conditions** 2026
Galactic Bars, Bulges and Disks (Lipari)
- **Strength in numbers:
the population of gas-rich disk galaxies uncovered by WALLABY** 2025
PHISCC (Cagliari)
- **WALLABY Data Access** 2025
PHISCC (Cagliari)
- **3D Asymmetries** 2025
PHISCC (Cagliari)
- **The 3KIDNAS Kinematic Pipeline** 2025
PHISCC (Cagliari)
- **The Bright Future of the Dim Universe with the SKA:
Probing the Low Mass End of the Velocity Function** 2025
SKA: A New Era in Astrophysics (Görlitz)
- **Gas, Galaxies, and Rotation: The Resolved Disks of WALLABY** 2025
SKA Science Meeting (Halifax)

- **Lessons From Coordinated Releases:
WALLABY Data Release Products Across Multiple Archives**
Advanced Data Products (Garching) 2024
- **HI Kinematics of the Southern Sky:
The WALLABY Models of PDR1 and Beyond**
CASCA (Penticton) 2023
- **HI Kinematics of the Southern Sky:
The WALLABY Models of PDR1 and Beyond**
PHISCC (Cape Town) 2023
- **3D Morphometrics and Kinematic Modelling for the WALLABY Survey**
SKA Science Meeting (Online) 2021
- **Profile Asymmetries**
Double Peak Emission Line Galaxies (Online) 2021
- **Asymmetries as a Tool for Quantifying Velocity Profiles**
AAS 2020 (Online) 2020
- **Systematically Asymmetric**
PHSICC 2019 (Perth) 2019
- **GalactICS with Gas**
SARAO Bursary Conference 2018 (Port Elizabeth) 2018
- **GalactICS with Gas**
SKA South Africa Bursary Conference 2017 (Cape Town) 2017
- **GalactICS with Gas: Making Equilibrium Galaxies with Gas**
SKA South Africa Bursary Conference 2016 (Cape Town) 2016
- **Streams Out of Clouds: The Particle Cloud method of modelling stellar streams**
South Africa Institute of Physics Annual Conference 2016 (UCT) 2016
- **Stream Modelling: A Quick Comparison**
Stellar Streams Ringberg 2015 (Ringberg Castle) 2015
- **Stellar Streams: Modelling & Methodology**
South Africa Institute of Physics Annual Conference 2015 (Port Elizabeth) 2015
- **Combining Stellar Streams with other Observational Constraints**
Gaia Challenge Workshop (U. of Surrey) 2013
- **The Milky Way and the Sagittarius Stream**
Santa Fe Cosmology Workshop (Santa Fe) 2012
- **Calculating Asymmetries in Electron-Proton Scattering**
Winter Nuclear and Particle Physics Conference (Banff) 2007
- **Calculating Asymmetries in Electron-Proton Scattering**
Canadian Undergraduate Physics Conference (University of New Brunswick) 2006

Conference Posters

- **The Bright Future of the Dark and Dim Universe with the SKA**
CASCA (Montreal) 2026
- **Modelling WALLABY's: Challenges of, and Solutions for,
Automated Kinematic Modelling of Galaxies in Large Surveys**
IAU (Cape Town) 2024

- **3D Asymmetries and their application to Simulations and Survey**
IAU (Cape Town) 2024
- **HI Polar Rings in the SKA Era:**
The potential polar rings of NGC 4632 and NGC 6156
IAU (Cape Town) 2024
- **The Kinematic Scaling Relations of the WALLABY Pilot Galaxies**
IAU (Cape Town) 2024
- **Motions of the Southern Sky: The WALLABY PDR1 Kinematic Modelling**
NewEyes on the Universe: SKA & ngVLA (Vancouver) 2023
- **WALLABY Pilot Survey Kinematic Models**
CASCA 2021 (Online) 2021
- **Asymmetries as a Tool for Quantifying Velocity Profiles**
CASCA 2020 (Online) 2020
- **GalactICS with Gas**
The Role of Gas in Galaxy Dynamics (Valetta, Malta) 2017
- **Stellar Streams and the Milky Way**
SKA South Africa Bursary Conference 2015 (Stellenbosch) 2015
- **The Sagittarius Stream, Statistics, and the Shape of the Dark Halo**
Statistical Challenges in Modern Astronomy (Penn State) 2011
- **The Sagittarius Stream, Statistics, and the Shape of the Dark Halo**
CASCA 2011 (U. Western Ontario) 2011
- **Modelling The Milky Way: A Cautionary Tale**
CASCA 2010 (Saint Mary's University) 2010
- **Modelling The Milky Way: A Cautionary Tale**
CITA 25 (U. Toronto) 2010
- **Made To Measure made Simple and Self-Consistent**
Unveiling The Mass (Queen's University) 2009

Supervision

- **Mathieu Perron-Cormier** 2023-
 - Queen's University
 - Ph. D student
 - Comparing simulations to observations.
 - Co-supervisor with Prof. Kristine Spekkens
- **Carolyn McKenna** 2026-
 - Queen's University
 - Honours Student
 - Simulating Ultra-thin Galaxies
 - Co-supervisor with Prof. Kristine Spekkens
- **Noah Baldin** 2025-2026
 - Queen's University
 - Honours Student

- Galaxy Pairs in SIMBA
 - Co-supervisor with Prof. Kristine Spekkens
- **Maya Nackan** 2025-2025
 - Queen’s University
 - Honours Student
 - Detecting Galaxy Pairs in WALLABY.
 - Co-supervisor with Prof. Kristine Spekkens
- **Emma Godbout** 2025-2025
 - Queen’s University
 - Summer Student
 - Clustering and Structure in WALLABY.
 - Co-supervisor with Prof. Kristine Spekkens
- **Luca Comitis** 2025-2025
 - Queen’s University
 - Summer Student
 - Generating Mock HI Images from IllustrisTNG.
 - Co-supervisor with Prof. Kristine Spekkens
- **Grant Hurley** 2024-2025
 - Queen’s University
 - Undergraduate
 - Modelling DINGO galaxies
 - Co-supervisor with Prof. Kristine Spekkens
- **Rebecca Dudley** 2023-2024
 - Queen’s University
 - Undergraduate student
 - Characterizing the low velocity galaxies in the WALLABY pilot data releases.
 - Co-supervisor with Prof. Kristine Spekkens
- **Mathieu Perron-Cormier** 2021-2023
 - Queen’s University
 - Masters student
 - Investigating 3D asymmetries.
 - Co-supervisor with Prof. Kristine Spekkens
- **Rebecca Halloran** 2020-2023
 - Queen’s University
 - Masters student
 - Investigating kinematically modelled WALLABY galaxies.
 - Co-supervisor with Prof. Kristine Spekkens
- **Reanna Pellaske** 2021-2023
 - Queen’s University
 - Masters student
 - Investigating polar ring galaxies.
 - Co-supervisor with Prof. Kristine Spekkens

- **Nadine Hank** 2017-2020
 - University of Cape Town
 - Masters student
 - Investigating galaxy asymmetries in 1D and 2D using simulations and observations.
 - Co-supervisor with Prof. Sarah Blyth
- **Simon Krüger** 2017-2017
 - University of Cape Town
 - Honours student
 - Investigating asymmetries in interacting galaxies with simulations.
 - Co-supervisor with Prof. Claude Carignan and Prof. Sarah Blyth
- **Toky Randriamampandry** 2015-2017
 - University of Cape Town
 - Ph.D student
 - Studying non-circular motions induced by galactic bars.
 - Co-supervisor with Prof. Claude Carignan

Teaching Experience

- **Masters of Data Science in Astronomy** UCT
Guest Lecturer 2017-
 - Developed and delivered lectures on Bayesian statistics and N-body simulations.
- **Computational Astrophysics** UCT
Lecturer 2018-2019
 - One of three instructors for the Masters course in computational astrophysics.
 - Developed material, delivered lectures, wrote assignments. Working with the other lecturers, developed a final project to fairly cover all course material.
- **Galactic and Extragalactic Astronomy** UCT
Guest Lecturer 2018
 - Taught a large portion of the main 3rd year astronomy course.
- **Physics For Life Sciences (Phys117)** Queen's University
(Senior) T.A. 2007-2014
 - Run multiple 1.5 hour tutorial sections for students
 - Marked one long answer question on winter and spring exams.
 - Guided first year lab sections

References

- **Prof. Kristine Spekkens** kristine.spekkens@queensu.ca
Queen's University Kingston, Ont., Canada
- **Prof. Claude Carignan** claude.carignan@gmail.com
University of Cape Town, retired Cape Town, South Africa
- **Prof. Sarah Blyth** sarblyth@gmail.com
University of Cape Town Cape Town, South Africa