Lieke van Son

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Education

PhD in Astrophysics (Joint degree) — *Cambridge, USA – Amsterdam, NL*

Center for Astrophysics | Harvard & Smithsonian – University of Amsterdam — *Jan. 2019 - Awarded May 2023*

Advisors: Prof. S.E. de Mink, UvA/MPA - Garching. and Prof. C. Conroy, CfA - Harvard University

Subject: The massive stellar progenitors of gravitational-wave sources

MSc in Astronomy, specialisation: Cosmology — *Leiden, the Netherlands*

Leiden University — *Feb. 2016 - Awarded Jun. 2018*

Advisors: Prof. J. Schaye and C. Barber Msc., Leiden University

Subject: Overmassive black holes in the C-Eagle Simulation

BSc in Astronomy — *Leiden, the Netherlands*

Leiden University — *Sep.2012 - Awarded Jun. 2015*

Research Experience

Flatiron Research Fellow — *New York, USA*

Center for Computational Astrophysics, Flatiron Institute — *Sept 2023 - Sept 2025*

Cotsen Postdoctoral Fellow in the Society of Fellows — *Princeton, USA*

Princeton University — *Sept 2023 - Sept 2026*

Lyman Spitzer, Jr. Postdoctoral Fellow — *Princeton, USA*

Princeton University — *Sept 2025 - Sept 2027*

Guest researcher and Pre-doctoral Fellow — *New York, USA*

Center for Computational Astrophysics - Simons Foundation — *Sep. 2021 - Oct. 2021*

Advisor: Prof. W. M. Farr, Stoney Brook University, USA

Subject: Understanding observed features in the black hole mass distribution

International research internship — *Rio de Janeiro, Brazil*

Observatório Nacional - Rio de Janeiro — *Mar. 2017 - Jun 2017*

Advisors: Prof. H Röttgering and Dr. R. A. Overzier, Subject: Probing radio galaxies with MG II absorbers

Grants, Awards, and Honors

NASA Hubble Fellowship program (offer declined) — *2023-2026*

3 year fellowship supporting promising postdoctoral scientists to pursue independent research which contributes to NASA Astrophysics $\sim \$225\mathrm{K}$

Barbara Bell Graduate Student Dissertation Fellowship — *spring 2023*

Towards enabling the Faculty of Arts and Sciences to continue to attract, enroll, and support the brightest and most talented graduate students. Paid for spring tuition of Harvard GSAS: $\sim \$7\mathrm{K}$

Flatiron Institute Pre-Doctoral fellowship — *2021-2022*

5 month fellowship including 3 months paid housing in NYC at the Center for Computational Astrophysics. $\sim \$7\mathrm{K}$

Certificate of Distinction In Teaching, Derek Bok Center, Harvard University — *2021*

Rewarded based on graduate student evaluations of teaching.

Special Commendation Derek Bok Center, Harvard University — *2020*

For "special contribution to undergraduate teaching" based on student evaluations for courses taught during the pandemic.

Janneke Fruin-Helb Grant — *2017*

Nominated for most exceptional grant proposal.

Publication Record – Lieke van Son

First- and second-authored publications

-14- Fishbach, Maya & **van Son, Lieke**
"LIGO-Virgo-KAGRA's Oldest Black Holes: Probing star formation at cosmic noon with GWTC-3", arXiv:2307.15824 (2023) ,

-13- **van Son, L. A. C.;** de Mink, S. E; Renzo, M.; Justham, S.; Zapartas, E.; Breivik, K. ; Callister, T. ; Farr, W. M. ; Conroy, C.
"No peaks without valleys: The stable mass transfer channel for gravitational-wave sources in light of the neutron star-black hole mass gap.", ApJ, 940, 184, (2022),

-12- **van Son, L. A. C.;** de Mink, S. E.; Chruslinska, M. ; Conroy, C. ; Pakmor, R. ; Hernquist, L.,
"The locations of features in the mass distribution of merging binary black holes are robust against uncertainties in the metallicity-dependent cosmic star formation history.", arXiv:2209.03385 (submitted to ApJ),

-11- **van Son, L. A. C.;** de Mink, S. E; Callister, T.; Justham, S.; Renzo, M.; Wagg, T.; Broekgaarden, F.; Kummer,F.; Pakmor, R.; Mandel,I. *"The redshift evolution of the binary black hole merger rate: a weighty matter "*, ApJ, 931 17,(2022)

-10- **van Son, L. A. C.;** de Mink, S. E; Broekgaarden, F. S.; Renzo, M.; Justham, S.; Laplace, E.; Morán Fraile, J. Hendriks, D. D.; R. Farmer, *"Polluting the pair-Instability mass gap with super-Eddington accretion in binary systems"*, ApJ, 897 100, (2020)

-9- **van Son, L. A. C.;** Barber, C.; Bahé, Y. M.; Schaye, J.; Barnes, D. J.; Crain, R. A.; Kay, S. T.; Theuns, T.; Dalla Vecchia, C.,
"Galaxies with monstrous black holes in galaxy cluster environments", MNRAS, 485 396, (2019)

Co-authored papers

-8- Evans, Matthew, (w/ 75 further co-authors including **van Son, L. A. C.**)
'Cosmic Explorer: A Submission to the NSF MPSAC ngGW Subcommittee ", arXiv:2306.13745 (2023)
Contribution: reviewed and commented on sections of the white paper, in particular related to the science goal: 'Black Holes and Neutron Stars Throughout Cosmic Time'.

-7- Ruediger Pakmor, (w/ 8 further co-authors including **van Son, L. A. C.**)
"Formation and fate of low-metallicity stars in TNG50", MNRAS, 512 3602 (2022)
Contribution: I was involved in the initial discussion about what topics would be most interesting to address in this work. I further provided general feedback and comments on the manuscript.

-6- Broekgaarden, F. S. et al., (w/ 11 further co-authors including **van Son, L. A. C.**),
"Impact of Massive Binary Star and Cosmic Evolution on Gravitational Wave Observations II: Double Compact Object Mergers", MNRAS stac1677 (2022)
Contribution: In depth conversations with first author about the best way to display the large sets of simulations conducted for this work. This included discussions about the structure and setup of the main figures in the paper.

-5- Wagg, Tom ; Broekgaarden, Floor S. ; de Mink, Selma E. ; **van Son, Lieke A. C.** ; Frankel, Neige ; Justham, Stephen
"Gravitational wave sources in our Galactic backyard: Predictions for BHBH, BHNS and NSNS binaries detectable with LISA", arXiv:2111.13704 (Subm. to ApJ)
Contribution: Helped with the interpretation of the properties of detectable systems as predicted by this work. Generally provided feedback and support to main author and contributed detailed comments on the manuscript draft.

-4- Naidu, Rohan P. (w/ 12 further co-authors including **van Son, L. A. C.**)
"Evidence from Disrupted Halo Dwarfs that r-process Enrichment via Neutron Star Mergers is Delayed by $\gtrsim$ 500Myrs", ApJL 926 L36 (2022)
Contribution: Provided the input for the discussion on the scientific significance of the inferred delay time for binary neutron star enrichment in comparison to the merger delay times from stellar population synthesis.

-3- **COMPAS team** et al. (w/ 21 further co-authors including **van Son, L. A. C.**)
"Rapid stellar and binary population synthesis with COMPAS" , ApJS 258 34 (2022)
Contribution: Writing and detailed comments to several parts of section 3 'Single Stellar Evolution' and section 4 'Binary Stellar Evolution'. I have provided more general comments on the rest of the manuscript throughout several feedback rounds.

-2- Law-Smith, J., A., P.; (w/ 12 further co-authors including **van Son, L. A. C.**)
"Successful Common Envelope Ejection and Binary Neutron Star Formation in 3D Hydrodynamics.",
arXiv:2011.06630 (Subm. to ApJ)
Contribution: Provided input on the discussion surrounding Roche lobe overflow as discussed around Figure 1. Furthermore provided general feedback and comments on the manuscript.

-1- Renzo, M.; Callister, T.; Chatziioannou, K.; **van Son, L. A. C.;** Mingarelli, C., M., F.; Cantiello, M.; Ford, K., E., S.; McKernan, B.; and Ashton, G.,
"Prospects of gravitational-waves detections from common-envelope evolution with LISA" , ApJ, 919 128 (2021)
Contribution: This project was born out of the LISA sprint, held at the Flatiron institute. I was among the original group that devised this project during the sprint meeting, and have as such contributed significantly to the shaping of this project. I have written Section 2 and produced the corresponding Figure 2.

– Renzo, M.; Hendriks, D. D.; **van Son, L. A. C.;** Farmer, R.
"Pair-instability Mass Loss for Top-down Compact Object Mass Calculations", Res. Notes AAS, 6 25 (2022)
Contribution: Derived the new prescriptions presented in this work together with the first author. I have furthermore provided feedback and comments on the manuscript.

Invited and Contributed Talks

Invited (14)

Jul. 2023 Conference '3,2,1: massive triples, binaries and mergers' review on pop. synth. in the GW context, Leuven, Be.
Jun. 2023 Lorentz workshop: 'The Renaissance of Stellar Black-Hole Detections in The Local Group' The mass distribution of merging binary black holes, Leiden, NL
Apr. 2023 Invited review talk, Physical Review Session on Gravitational Waves APS April Meeting 2023
Nov. 2022 Perimeter Institute Strong Gravity Seminar, Canada
Oct. 2022 Caltech TAPIR seminar, USA
Sep. 2022 American Museum of Natural History Seminar at Department of Astrophysics, USA
Apr. 2022 Tel Aviv University Astrophysics Seminar, Israel
Mar. 2022 Inst. for Theory and Computation - Harvard University ITC luncheon, USA. (recording of talk)
Dec. 2021 Black Hole Initiative - Harvard University BHI colloquium, USA. (recording of talk)
Dec. 2021 State University of New York College - Geneseo Physics Colloquium, USA
Apr. 2021 Tufts University Astronomy Seminar, USA
Oct. 2020 Massachusetts Institute for Technology Brown Bag lunch Talk, USA
Aug. 2020 Universidad de Concepción, Concepción Astronomy Seminar, Dep. de Astronomia, Chile
Dec. 2019 Lorentz workshop - Leiden University *Lead Discussion Session:* "Black Holes in the Pair Instability mass gap", NL

Selection of Contributed Talks & Workshops (20 out of 30+)

A full list of talks can be found on my website.

Feb. 2023 Caltech, Astro Seminar Pasadena, USA
Feb. 2023 Carnegie Observatories, lunch talk Pasadena, USA
Dec. 2022 Conference: Gravitational Wave Physics and Astronomy Workshop contrib. talk, Melbourne, Aus.

Nov. 2022 **MIAPbP stellar multiplicity workshop** contrib. talk/discussion session, Garching, Ger.

Oct. 2022 **Berkeley Explosive Astro Talk** University of California, Berkeley, USA

Sep. 2022 **CIERA - Science Happy Hour talk** Northwestern University, USA

Jun. 2022 **Center for Computational Astrophysics, Pre-doc symposium** CCA, New York, USA

Jun. 2022 **Workshop: 'Black Hole Dynamics: From Gaseous Environments to Empty Space'** Contrib. talk, NBIA, Denm.

May 2022 **Conference on Intermediate-mass black holes** Contrib. talk, Puerto Rico (COVID)

Mar. 2022 **Kavli Institute for Theoretical Physics program - invited as an affiliate**
"Bridging the Gap: Accretion and Orbital Evolution in Stellar and Black Hole Binaries," Santa barbara, USA

Dec. 2021 **Conference: Gravitational Wave Physics and Astronomy Workshop** Contrib. talk, Hannover, Germany

Dec. 2021 **Cosmic Explorer Consortium - Science call** (online)

Nov. 2021 **Outreach Seminar: Beacon Hill seminar series** "Unveiling the Cosmos", Boston, MA, USA

Jul. 2021 **Max-Planck-Gesellschaft, Ringberg retreat** Contributed talk, Kreuth, Germany

Jul. 2021 **Conference: European Astronomical Society** Contrib. talk, session 9, Leiden University, NL

May 2021 **Conference: IAUS 361: Massive Stars Near & Far** Contrib. talk, Dublin, Ireland

Mar. 2021 **Consortium meeting: VLT-FLAMES Massive Star** Contributed talk, Heidelberg Institute for Theoretical Studies, Ger.

Feb. 2021 **Conference: 43rd COSPAR Scientific Assembly** Contrib. talk, Sydney, Australia

Sep. 2020 **Annual meeting of the German Astronomical Society** Contrib. talk, Heidelberg, Germany

Sep. 2017 **Conference: The Young European Radio Astronomers Conference** Contrib. talk, Bologna, Italy

Teaching & Advising

Teaching Fellow, Graduate class ASTRON 204: 'Stellar Astrophysics', Harvard University *Fall 2021*

Instructor: Prof. Charlie Conroy

Teaching Fellow, Undergraduate class ASTRON 120: 'Stellar Physics', Harvard University *Spring 2020*

Instructor: Prof. Selma de Mink

Teaching Assistant, Graduate class : 'High energy astrophysics', Amsterdam University *Spring 2019*

Instructor: Dr. Phil Uttley

Katie Sharpe (Harvard Astronomy) *Fall 2020 -*

Co-advised on Sophomore project with Prof. Selma de Mink, one paper to be submitted.

Other advising experience

I joined the peer-mentoring program during my time as a PhD graduate student. I have furthermore helped several undergraduate and master students to prepare for their PhD applications

Outreach and Public service

Leadership Roles in Outreach

Chair of local Organising Committee, ComSciCon-Flagship Workshop 2022 *(September 2021 - September 2022)*

Lead team of 20 organisers to realise Communicating Science workshop for graduate students in STEM. This includes setting up application process and reviewing applicants, managing the $ 60,000 budget and overseeing the workshop programming.

Exhibition project Manager, Visitors centre Old Observatory, Leiden, The Netherlands *(April 2016 - Jun 2018)*

Coordinator of the development of a new exhibition for the astronomy visitors' center. Apart from the main exhibition, this included organising and hosting many astronomy related outreach events, such as annual spring lectures and the night of discoveries.

Selected Service in Outreach & Promoting Diversity, Equity and Inclusion

Volunteer/Organizer , Astronomy on Tap *(Feb 2022 - present)*

I led the revival of the Astronomy on Tap in Boston, which hosts free accessible, engaging science presentations on space and science aimed at the general public.

Member of accessibility subgroup , CfA Inclusion, Diversity & Equity Alliance *(Jul 2020 - present)*

The goal of the alliance is to improve equity, diversity, belonging, and inclusion through sustained actionable implementation.

Member of Organising and leadership committee, ComSciCon *(Jan 2020 - present)*

This science communication workshop for graduate students aims to empower future leaders in science communication. As such, we place a large emphasis on diversity equity inclusion and belonging, example workshops from this years' conference include "Diversity in SciComm" and "Disability in STEM".

Volunteering expert, spaceEU - Space in Your Living Room *(Jul 2020 - Aug 2020)*

Online astronomy workshops to engage primary school children during the 2020 COVIDD-19 pandemic.

Member of Public Relations Team , Bring the Sun to Leiden, Leiden University *(Jan 2015 - Apr 2015)*

Successful project with the goal of buying and installing a heliostat used for public outreach.

Miscellaneous Professional Services

- Journal referee for the Monthly Notices of the Royal Astronomical Society (MNRAS) and Astronomy & Astrophysics (A&A).
- Served on Colloquium selection committee for the Center for Astrophysics. *(Sep. 2020 - May 2022)*
- Represented graduate students in efforts to update the graduate student lounge, promoting vibrant graduate student community *(Jul. 2020 - present)*
- Arete fellow, Harvard Effective Altruism organisation - 9 week fellowship involving readings, discussions, writing and research. *(Feb. 2021 - May. 2021)*
- Established a departmental-wide weekly social gathering ('the Borrel') that continues to this day. *(Jan. 2019 - Jun. 2019)*

Coding and other skills

Astrophysical Codes

— COMPAS: Compact Object Mergers: Population Astrophysics and Statistics (http://compas.science) *Proficiency:* Advanced User and Co-developer, Contributions as co-developer: Implemented several new physics modules and co-author on the method paper. `COMPAS` uses Git as the main tool for review and version control. The code is publicly available at https://github.com/TeamCOMPAS/COMPAS.

— MESA: Modules for Experiments in Stellar Astrophysics, (http://mesa.sourceforge.net) *Proficiency:* Taught during multiple advanced stellar evolution courses. Invited as Teaching assistant for the MESA summer school (postponed).

Computing

— Python: *Proficiency:* This is the main language I use in all my analysis work.

— C++: *Proficiency:* Intermediate proficiency. Main application in COMPAS code.

— Fortran: *Proficiency:* Basic working proficiency. Used when making adaptations to MESA.

Languages

Dutch: Native language – *English*: Fluent – *Spanish*: Intermediate – *German*: Intermediate – *French*: Basic.

References

Name:	Prof. Dr. S. E. de Mink
Institute:	Max Planck Institute for Astrophysics, Garching GER & UvA, Amsterdam NL
Connection	Primary PhD Thesis advisor
Contact	sedemink@mpa-garching.mpg.de

Name	Prof. Dr. Will Farr
Institute	Stony Brook University and the Center for Computational Astrophysics, USA
Connection	External collaborator
Contact	wfarr@flatironinstitute.org

Name	Prof. Dr. Charlie Conroy
Institute	Center for Astrophysics, Harvard, Cambridge USA
Connection	Advisor at Harvard
Contact	cconroy@cfa.harvard.edu

Name	Prof. Dr. Ilya Mandel
Institute	Monash Centre for Astrophysics, Monash University, Clayton, AUS.
Connection	External collaborator
Contact	ilya.mandel@monash.edu