

Lieke van Son

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Research Positions

Flatiron Research Fellow

CENTER FOR COMPUTATIONAL ASTROPHYSICS, FLATIRON INSTITUTE

[New York, USA](#)

Sept 2023 - present

Cotsen Postdoctoral Fellow in the Society of Fellows

PRINCETON UNIVERSITY

[Princeton, USA](#)

Sept 2023 - present

Lyman Spitzer, Jr. Postdoctoral Fellow

PRINCETON UNIVERSITY

[Princeton, USA](#)

Sept 2025 - Sept 2027

Ph.D. candidate

CENTER FOR ASTROPHYSICS | HARVARD & SMITHSONIAN

[Cambridge, USA](#)

Jan 2019 - May 2023

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

Guest researcher and Pre-doctoral Fellow

CENTER FOR COMPUTATIONAL ASTROPHYSICS - SIMONS FOUNDATION

[New York, USA](#)

Sep. 2021 - Oct. 2021

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

International research internship

OBSERVATÓRIO NACIONAL - RIO DE JANEIRO

[Rio de Janeiro, Brazil](#)

Mar. 2017 - Jun 2017

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

Education

Ph.D. in Astrophysics

CENTER FOR ASTROPHYSICS | HARVARD & SMITHSONIAN

[Cambridge, USA](#)

Jan. 2019 - Awarded May 2023

Subject: The massive stellar progenitors of gravitational-wave sources

MSc in Astronomy, specialisation: Cosmology

LEIDEN UNIVERSITY

[Leiden, the Netherlands](#)

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 UNIVERSITY

[Leiden, the Netherlands](#)

Sep.2012 - Awarded Jun. 2015

Grants, Awards, and Honors

[AUI/IAU/Heising-Simons Scholar](#)

August 2024

Incl. travel support, networking events, dinners, and career-development workshops during the IAU General

Assembly meeting in Cape Town ~ \$1.6K

[NASA Hubble Fellowship program \(offer declined\)](#)

2023-2026

3 year fellowship supporting promising postdoctoral scientists to pursue independent research which contributes to NASA Astrophysics ~ \$225K

[Barbara Bell Graduate Student Dissertation Fellowship](#)

spring 2023

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: ~ \$5K

[Flatiron Institute Pre-Doctoral fellowship](#)

2021-2022

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

[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.

Invited and Contributed Talks

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

SELECTION OF INVITED (15 OUT OF 20)

- Jun. 2024* [CURRENT THEMES IN THEORETICAL PHYSICS](#) invited speaker, Niels Bohr International Academy, Denmark
- Dec. 2023* [RESCEU-NBIA WORKSHOP ON GRAVITATIONAL-WAVE SOURCES](#) invited speaker and panellist, Tokyo, Japan
- Nov. 2023* [UNIVERSITY OF MARYLAND, BALTIMORE COUNTY](#) physics colloquium, Baltimore, USA
- Jul. 2023* [MAX PLANCK INSTITUTE FOR ASTROPHYSICS KAVLI SUMMER PROGRAM](#) Invited Seminar, Munich, Ger.
- Jul. 2023* [CONFERENCE '3,2,1: MASSIVE TRIPLES, BINARIES AND MERGERS'](#) [Invited review](#) on populations in the GW context, Leuven
- Jun. 2023* [LORENTZ WORKSHOP: 'THE RENAISSANCE OF STELLAR BLACK-HOLE DETECTIONS IN THE LOCAL GROUP'](#) [Invited review](#) on the mass distribution of merging binary black holes, Leiden, NL
- Apr. 2023* [APS APRIL MEETING 2023](#) [Invited review talk](#), Physical Review Session on Gravitational Waves
- Nov. 2022* [PERIMETER INSTITUTE](#) Strong Gravity Seminar, Canada
- Oct. 2022* [CALTECH](#) TAPIR seminar, USA
- Apr. 2022* [TEL AVIV UNIVERSITY](#) Astrophysics Seminar, Israel
- 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
- Aug. 2020* [UNIVERSIDAD DE CONCEPCIÓN, CONCEPCIÓN](#) Astronomy Seminar, Dep. de Astronomía, 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+)

- Nov. 2023* [PRINCETON SOCIETY OF FELLOWS SEMINAR](#) Princeton, USA
- Jun. 2023* [CAMBRIDGE UNIVERSITY, DAMTP FRIDAY GR SEMINAR](#) Cambridge, UK
- 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
- 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.
- 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

Hackathon: A first taste of MESA – IAU general assembly meeting - Lead instructor

Summer 2024

Two-day hackathon in South Africa as part of the IAU general assembly. Geared towards both participants and local students. Material is now available online. - [Received AUI/IAU/Heising-Simons Scholarship for this hackathon](#)

Graduate class: ASTRON 204 ‘Stellar Astrophysics’, Harvard University - Teaching Fellow

Fall 2021

Instructor: Prof. Charlie Conroy – [Received Certificate of Distinction in Teaching for this class](#)

Undergraduate class: ASTRON 120 ‘Stellar Physics’, Harvard University - Teaching Fellow

Spring 2020

Instructor: Prof. Selma de Mink – [Received Special Commendation Derek Bok Center for this class](#)

Masters class: ‘High energy astrophysics’, Amsterdam University - Teaching Assistant

Spring 2019

Instructor: Dr. Phil Uttley

Bachelor class: ‘Modern Astronomical Research’, Leiden University - Teaching Assistant

Spring 2017

Instructor: Prof. Simon Portegies Zwart

MELANIE SANTIAGO (HAVERFORD COLLEGE)

April 2024 - August 2024

Melanie, an undergraduate student, is joining me as part of the National Society of Black Physicists Summer Program, where I serve as her main advisor.

SOUMENDRA ROY (SUNY STONYBROOK)

Sept 2023 - present

Soumendra is a third year graduate student Stony Brook, co-advising on project with Prof. W. Farr. Soumendra is exploring what constraint we can place on cosmology (i.e., H_0) through binary neutron star mergers in the era of third-generation detectors.

SASHA LEVINA (JOHNS HOPKINS UNIVERSITY)

Sept 2023 - present

First year graduate student project, co-advising with dr. Floor Broekgaarden. and Prof. Emanuelle Berti. Sasha is investigating the effects of cosmic star formation on GW sources, building on the models in *van Son et al ApJ, 948, 105 (2023)*.

KATIE SHARPE (HARVARD ASTRONOMY)

Fall 2020 - Fall 2023

Co-advised on undergraduate project with Prof. Selma de Mink. Her bachelor project on the origin of the observed Wolf-Rayet binary system HD 5980 culminated in a paper subm. to ApJ. **Started PhD program at Berkely in fall 2023**

OTHER MENTORING/ADVISING EXPERIENCE

I have helped several undergraduate and master students to prepare for their PhD applications, and have advised numerous highschoolers about what it means to pursue a career in STEM. I furthermore joined the peer-mentoring program at Harvard during my time as a PhD student.

Scientific outreach (Selection)

CHAIR OF LOCAL ORGANISING COMMITTEE, COMSCI CON-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 workshop budget** and overseeing the workshop programming.

MEMBER OF LEADERSHIP TEAM, COMSCI CON (Jan 2020 - present)

This science communication workshop for graduate students aims to empower future leaders in science communication. Currently helping to establish relationships and funding with e.g., Harvard University to ensure long-term continuation of ComSciCon.

EXHIBITION 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.

ORGANISER/VOLUNTEER, ASTRONOMY ON TAP (Feb 2022 - present) I led the revival of the ‘Astronomy on Tap’ event in Boston, which hosts free accessible, engaging science presentations on space and science aimed at the general public.

VOLUNTEERING EXPERT, SPACEEU - SPACE IN YOUR LIVING ROOM (Jul 2020 - Aug 2020)

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

MEMBER OF PUBLIC RELATIONS TEAM, BRING THE SUN TO LEIDEN (Jan 2015 - Apr 2015)

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

PHYSICS OUTREACH VOLUNTEER. STICHTING RINO *Sep 2012 - Sep 2016* promoting STEM careers among high school students. Leiden, The Netherlands

Press releases and popular media about my work

[DUTCH RADIO DR. KELDER & CO \(NPO radio 1\)](#) “Zwarte gaten, je ziet ze nauwelijks, maar ze zijn er wel” - Sept 2023

[PODCAST: DANIEL AND JORGE EXPLAIN THE UNIVERSE](#) Hour-long interview for episode “Have we seen more or fewer gravitational waves than expected?” - Aug 2023

[SCIENTIFIC AMERICAN](#) “Gravitational-Wave Search Resumes after Three Years and Lots of Headaches” - May 2023

[KIJK MAGAZINE](#) “Meest nabije zwarte gat ontdekt” - May 2020

Professional Services (Selection)

SCIENTIFIC ORGANISING COMMITTEE **IAU General Assembly Focus Meeting 7: *New Horizons at the interface between computational astrophysics and big data*** (*May 2023 - present*)

LEAD ORGANISER **Workshop on Stable mass transfer: from onset to remnants** (*July 2023 - March 2024*) Spearheaded the proposal, obtained funding, designed and currently executing the workshop together with 2 colleagues at the Flatiron institute.

SCIENTIFIC ORGANISING COMMITTEE **Gravitational Waves Physics and Astronomy Workshop 2024** (*July 2023 - present*) Session on astrophysical gravitational-wave sources

MEMBER OF ACCESSIBILITY SUBGROUP **CfA Inclusion, Diversity & Equity Alliance** (*Jul 2020 - Jul 2023*)

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

EXTERNAL PANELIST **HST Time Allocation Panel in Stellar Populations.** (*spring 2023*) For Cycle 31.

JOURNAL REFEREE Monthly Notices of the Royal Astronomical Society (MNRAS), The Astrophysical Journal (ApJ), Astronomy & Astrophysics (A&A), and Nature Astronomy

REPRESENTATIVE OF GRADUATE STUDENTS for the Promotion of a Vibrant Graduate Student Community, (*Jul. 2020 - May 2023*)

ARETE FELLOW Harvard Effective Altruism organization- 9-week fellowship, [Link to Fellowship Details](#) (*Feb. 2021 - May. 2021*)

International collaborations

The Einstein Telescope collaboration. Member of the Population Division of the Observation Science Board. Currently co-authoring of Blue Book. Member since May 2023

Cosmic Explorer Consortium. I wrote several science letters for the CE consortium, to respond to the NSF MPSAC Subcommittee on Next-Generation Gravitational-Wave Observatories, co-author on the corresponding publication. Member since fall 2021

LISA Consortium. Member of the LISA Consortium since Fall 2021.

BlackGEM Member since Fall 2023

Coding and other skills

COMPAS: core-member and co-developer Compact Object Mergers: Population Astrophysics and Statistics. [Co-author to method paper](#), and implemented several new physics modules. 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>) Taught during multiple advanced stellar evolution courses. Currently leading development of ‘MESA Hackathon’ during IAU general assembly meeting 2024.

Software development — **PYTHON:** Expert, this is the main language I use in all my analysis work. — **C++:** Intermediate proficiency. Main application in COMPAS code. — **FORTRAN:** Basic working proficiency. Main application in 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
Connection PhD Thesis advisor
Contact sedemink@mpa-garching.mpg.de

Name Assistant Prof. Dr. Maya Fishbach
Institute Canadian Institute for Theoretical Astrophysics, University of Toronto, Canada.
Connection External collaborator
Contact fishbach@cita.utoronto.ca

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

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

Publication Record – Lieke van Son

My full list of publications can also be found on the SAO/NASA Astrophysics Data System.

First- and second-authored publications

- 18- **L.A.C. van Son**; Roy, S. K.; Mandel, I.; Farr, W. M.; Lam, A.; Merritt, J.; Broekgaarden, F. S.; Sander, A.; Andrews, J. J.
“Winds of change: why binary black hole formation is metallicity dependent, while binary neutron star formation is not”, subm. ApJ (2024),
- 17- Roy, Soumendhra Kishore; **van Son, Lieke A. C.**; Ray, Anarya; Farr, Will M.
“Cosmology with Binary Neutron Stars: Does the Redshift Evolution of the Mass Function Matter?”, Subm. ApJ letter, (2024),
- 16- K. Sharpe; **L.A.C. van Son**; S. E. de Mink; R. Farmer; P. Marchant; G. Koenigsberger
“Investigating the Chemically Homogeneous Evolution Channel and its Role in the Formation of the Enigmatic Binary Black Hole Progenitor Candidate HD 5980”, ApJ, Vol. 966, 1, (2024),
- 15- Hendriks, D. D.; **van Son, L. A. C.**; Renzo, M.; Izzard, R. G.; Farmer, R.
“Pulsational pair-instability supernovae in gravitational-wave and electromagnetic transients”, MNRAS, Vol. 526, 3, (2023),
- 14- Fishbach, Maya & **van Son, Lieke**
“LIGO-Virgo-KAGRA’s Oldest Black Holes: Probing star formation at cosmic noon with GWTC-3”, ApJ Letters, Vol. 957, 2, id.L31, (2023),
- 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.”, ApJ, 948, 105 (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),
- 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 publications

- 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",
 ApJ, Vol. 937, Issue 2, id.118 (2022)
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 ≥ 500 Myrs",
 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 sections 3 'Single Stellar Evolution' and section 4 'Binary Stellar Evolution', and 7 'Usage Examples'. Provided 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.