

Lieke van Son

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Education

PhD candidate in Astrophysics (Joint degree)

CENTER FOR ASTROPHYSICS | HARVARD & SMITHSONIAN – UNIVERSITY OF AMSTERDAM

Cambridge, USA – Amsterdam, NL

Jan. 2019 - Awarded May 2023

MSc in Astronomy, Cosmology

LEIDEN UNIVERSITY

Leiden, the Netherlands

Feb. 2016 - Awarded Jun. 2018

BSc in Astronomy

LEIDEN UNIVERSITY

Leiden, the Netherlands

Sep. 2012 - Awarded Jun. 2015

Research Experience

PhD candidate (joint degree)

CENTER FOR ASTROPHYSICS | HARVARD & SMITHSONIAN – UNIVERSITY OF AMSTERDAM

Cambridge, USA – Amsterdam, NL

Jan 2019 - 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

Guest researcher and Pre-doctoral Fellow

CENTER FOR COMPUTATIONAL ASTROPHYSICS - SIMONS FOUNDATION

New York, USA

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

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

MSc thesis research Project

LEIDEN UNIVERSITY

Leiden, The Netherlands

Feb. 2016 - Dec. 2016

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

Subject: Overmassive black holes in the C-Eagle Simulation

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 ~ \$225K

FLATIRON INSTITUTE PRE-DOCTORAL FELLOWSHIP

2021-2022

5 month fellowship including s 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.

OXFORD HINZE PHD FELLOWSHIP (OFFER DECLINED)

2018

PhD scholarship (3.5 years, Oxford University).

JANNEKE FRUIN-HELB GRANT

2017

Nominated for most exceptional grant proposal.

Publication Record – Lieke van Son

First-authored publications

- 12- **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.; 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),
- 10- **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)
- 9- **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)
- 8- **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

- 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 $\geq 500\text{Myrs}$ ”, 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 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 Astronomía, Chile
- Dec. 2019* LORENTZ WORKSHOP - LEIDEN UNIVERSITY *Lead Discussion Session:* "Black Holes in the Pair Instability mass gap", NL

Selection of Further 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, SPACEU - SPACE IN YOUR LIVING ROOM *(Jul 2020 - Aug 2020)*

Online astronomy workshops to engage primary school children during the 2020 COVID-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](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](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