Iva Laginja

Curriculum Vitae - March 2023

Current affiliation:	LESIA, Observatoire de Paris, Meudon by Paris, France
Nationality:	Austria
ORCID iD:	https://orcid.org/0000-0003-1783-5023
email:	iva.laginja@obspm.fr

Research interests: Astronomical instrumentation, high-contrast imaging, coronagraphy, image formation theory, Fourier optics, wavefront sensing and control, exoplanet detection

Education

2021 **PhD**, **Astronomy and Astrophysics**, STScI/ONERA/LAM, USA/France
Thesis: "Contrast-based tolerancing of space telescopes for exoEarth imaging"
Supervisors: Rémi Soummer, Laurent Mugnier, Jean-François Sauvage

2017 **MSc**, **Astronomy and Instrumentation**, Leiden University, Netherlands
Major (MSc) Thesis: "Laboratory characterization and end-to-end simulations of the Apodizing Phase Plate Coronagraph"
Minor Thesis: "Exo-ringsystem in the Edge-On Planetary System of β Pictoris"
Supervisors: Matthew Kenworthy, Christoph Keller

2015 **BSc**, **Astronomy** and **Physics**, University of Vienna, Austria

2011 High School Diploma, Theresianische Akademie Wien, Austria

Work Experience

Mar 2022 - *Current* **CNES postdoctoral fellow**
LESIA/Observatoire de Paris, Meudon, France
Research in high-contrast imaging and coronagraphy

Jul 2020 - Dec 2021 **Graduate student researcher**
Jul 2020 - Dec 2021: *ONERA*, Marseille, France
Oct 2018 - Jul 2020: *Space Telescope Science Institute*, Baltimore, USA

Nov 2019 - Jul 2020 **Astronomical Optics Scientist**
Space Telescope Science Institute, Baltimore, USA
Research and operational work at the Russell B. Makidon Optics Laboratory

Sep 2017 - Nov 2019 **Research and Instrument Analyst**
Space Telescope Science Institute, Baltimore, USA
Research and operational work at the Russell B. Makidon Optics Laboratory

Technical skills

Python, conda, git, GitHub (expert); bash, LaTeX, IDL, Matlab, Mathematica

Languages

German:	Mothertongue	Croatian:	Mothertongue
English:	Fluent	French:	Fluent
Russian:	Basic Knowledge	Dutch:	Basic Knowledge

Talks and seminars

2023	•	Invited review talk at Lorentz Center Workshop, Leiden, Netherlands
2022	•	LESIA seminar talk, Paris, France
2021	•	MPO seminar talk, Nice, France
	•	Journée des doctorants LAM, bilingual presentation of my PhD thesis in 180 seconds Video: https://youtu.be/oXEest5A23s?t=16
2020	•	NYRIA workshop contributed talk, online
	•	LESIA seminar talk, Paris, France
	•	GRD/LAM seminar talk, online
2019	•	Spirit of Lyot contributed talk, Tokyo, Japan *"Laboratory Demonstration of High Contrast Imaging on Segmented Apertures: Results from the STScI HiCAT Testbed"*
	•	SPIE Optics&Photonics contributed talk, San Diego, USA *"Wavefront error tolerancing for direct imaging of exo-Earths with a large segmented telescope in space"*
2018	•	GRD/LAM seminar talk, Marseille, France
	•	STScI Instruments Division Science meeting talk, Baltimore, USA
2016	•	Leiden Observatory Science Day talk, Leiden, Netherlands
	•	Contributed talk at the interdisciplinary conference ReTHINK, Maigen, Austria
2015	•	Contributed talk at the interdisciplinary conference THINK, Küb, Austria

Summerschools and Workshops

2020	LAM High Angular Resolution Summer School, online
2019	CfAO Adaptive Optics Summer School, University of Santa Cruz, USA
2016	ESA Concurrent Engineering Workshop, Redu, Belgium From Rocks to Pebbles Lorentz Center Workshop, Leiden, Netherlands Exoplanets I Conference, Davos, Switzerland 2nd Tautenburg School for Advanced Astronomical Observations, TLS Tautenburg, Germany
2014	Dunlap Institute Instrumentation Summer School, University of Toronto, Canada

Community Service and Outreach

Organization and realization of version control courses

- Development of a completely new way to teach software version control for scientists
- Definition of content, scope and objectives of the courses, creation of course material
- Teaching of the course series in the spring of 2021 and 2022, for an audience from interns to senior researchers

EDI (Equity, Diversity and Inclusion) committee member of the international society of optics and photonics (SPIE), 2020-2022

- Discussions about the politics and action points in the context of EDI, for a more inclusive and diverse workforce in optics around the world
- Implementation of action points to promote diversity and inclusion at SPIE conferences

Seminar organizer of the GRD group at LAM, 2020/2021

- Contacting international researchers, invitation and organization of their presentations for the weekly virtual group seminars
- Structuring and management of seminar organization and digital tools

International collaboration platform "CAOTIC" for the instrumentation community

- Co-organization and development of a collaborative and international online platform for all astronomical testbeds dedicated to high-contrast imaging of exoplanets
- Website: https://sites.google.com/view/highcontrastlabs/

Coronagraphy outreach with the portable testbed "BabyCAT"

- Developing coronagraphy outreach activities for the general public
- Presentations and demonstrations with a portable coronagraph testbed

Tour guide at the Leiden Old Observatory, 2016-2017
- Giving tours and leading demonstrations of the historical telescopes
- Video: https://youtu.be/BYc1hTZNFSk?t=34

Volunteer translator for TED
- Subtitling and translation of TED videos on scientific topics
- Translator profile: https://www.ted.com/profiles/5884302/translator

Mentoring of students and interns

2021	David Bourgeois	6-month intern (LAM), masters student, co-supervised with J.-F. Sauvage
2020	Kelsey Glazer	6-month intern (STScI), physics undergrad, supervisor: R. Soummer
2019	Lucas Batista	2-month SASP intern (STScI), "BabyCAT" outreach, supervisor: T. Rhue
2019	Maggie Kautz	3-month intern (STScI), optics undergrad, supervisor: R. Soummer

Publications

Peer-Reviewed Journal Articles (first author):

3. *Wavefront tolerances of space-based segmented telescopes at very high contrast: Experimental validation*
   Laginja, I., Sauvage, J.-F., Mugnier, L.M., Pueyo, L., Perrin, M.D., Noss, J., Will, S.D., Brooks, K.J., Por, E.H., Petrone, P., Soummer, R.
   2022, Astronomy & Astrophysics, 658, A84

2. *Analytical tolerancing of segmented telescope co-phasing for exo-Earth high-contrast imaging*
   Laginja, I., Soummer, R., Mugnier, L.M., Pueyo, L., Sauvage, J.-F., Leboulleux, L., Coyle, L., Knight, J. S.
   2021, Journal of Astronomical Telescopes, Instruments, and Systems 7(1), 015004

1. *ExoTiC-ISM: A Python package for marginalised exoplanet transit parameters across a grid of systematic instrument models*
   Laginja, I. and Wakeford, H. R.
   2020, Journal of Open Source Software, 5(51), 2281

Peer-Reviewed Journal Articles (contributions):

6. *Low-order wavefront control using a Zernike sensor through Lyot coronagraphs for exoplanet imaging: II. Concurrent operation with stroke minimization*
   Pourcelot, R., Por, E.H., N'Diaye, M., Brady, G., Carbillet, M., Dohlen, K., **Laginja, I.**, Lugten, J., Noss, J., Perrin, M.D., Petrone, P., Pueyo, L., Redmond, S.F., Sahoo, A., Vigan, A., Will, S.D., Soummer, R.
   2023, Accepted in Astronomy & Astrophysics

5. *Coronagraphic detection of Earth-like planets with large, actively controlled space telescopes*
   Pueyo, L., Juanola-Parramon, R., Tumlinson, J., Soummer, R., **Laginja, I.**, Hammel, H.B., Mountain, C.M.
   2022, Journal of Astronomical Telescopes, Instruments, and Systems 8(4), 049002

4. *Implementation of a dark zone maintenance algorithm for speckle drift correction in a high contrast space coronagraph*
   Redmond, S.F., Pogorelyuk, L., Pueyo, L., Por, E.H., Noss, J., Will, S.D., **Laginja, I.**, Brooks, K.J., Maclay, M., Fowler, J., Kasdin, N.J., Perrin, M.D., Soummer, R.
   2022, Journal of Astronomical Telescopes, Instruments, and Systems 8(3), 035001

3. *Low-order wavefront control using a Zernike sensor through Lyot coronagraphs for exoplanet imaging: Blind stabilization of an image dark hole*
   Pourcelot, R., N'Diaye, M., Por, E.H., **Laginja, I.**, Carbillet, M., Benard, H., Brady, G., Canas, L., Dohlen, K., Fowler, J., Lai, O., Maclay, M., McChesney, E., Noss, J., Perrin, M.D., Petrone, P.,

Pueyo, L., Redmond, S.F., Sahoo, A., Vigan, A., Will, S.D., Soummer, R.
2022, Astronomy & Astrophysics, 663, A49

2. *The β Pictoris b Hill sphere transit campaign. I: Photometric limits to dust and rings*
Kenworthy, M.A., Mellon, S.N., Bailey, J.I. III, Stuik, R., Dorval, P., Talens, G.J.J., Crawford, S.M., Mamajek, E.E., **Laginja, I.**, Ireland, M., Lomberg, B.B.D., Kuhn, R.B.
2021, Astronomy & Astrophysics, 648, A15

1. *bRing: An observatory dedicated to monitoring the β Pictoris b Hill sphere transit*
Stuik, R., Bailey, J.E., Lomberg, B.B.D., Dorval, P., Talens, G.J.J., Mellon, S.N., **Laginja, I.**, Rieder, S., Crawford, S.M., Mamajek, E.E., Kenworthy M.A.
2017, Astronomy & Astrophysics, 607, A45

SPIE Papers, Conference Proceedings (first author):

4. *Connecting the astronomical testbed community - the CAOTIC project: optimized teaching methods for software version control concepts*
Laginja, I., Robles, P., Barjot, K., Leboulleux, L., Jensen-Clem, R., Brooks, K.J., Moriarty, C.
2022, Proc. SPIE 12185, Adaptive Optics Systems VIII, 121853A

3. *Predicting contrast sensitivity to segmented aperture misalignment modes for the HiCAT testbed*
Laginja, I., Soummer, R., Mugnier, L.M., Pueyo, L., Sauvage, J.-F., Leboulleux, L., Coyle, L., Knight, J.S., Perrin, M.D., Will, S.D., Noss, J., Brooks, K.J., Fowler, J.
2020, Proc. SPIE 11443, Space Telescopes and Instrumentation 2020: Optical, Infrared, and Millimeter Wave; 11443J

2. *Wavefront error tolerancing for direct imaging of exo-Earths with a large segmented telescope in space*
Laginja, I., Leboulleux, L., Pueyo, L., Soummer, R., Sauvage, J.-F., Mugnier, L., Coyle, L., Knight, J.S., St.Laurent, K., Por, E., Noss, J.
2019, Proc. SPIE 11117, Techniques and Instrumentation for Detection of Exoplanets IX, 1111717

1. *James Webb Space Telescope Optical Simulation Testbed V: Wide-field phase retrieval assessment*
Laginja, I., Brady, G., Soummer, R., Egron, S., Lajoie, C.-P., Bonnefois, A., Michau, V., Choquet, É., Ferrari, M., Leboulleux, L., Levecq, O., N'Diaye, M., Perrin, M.D., Petrone, P., Pueyo, L., Sivaramakrishnan, A.
2018, Proc. SPIE 10698, Space Telescopes and Instrumentation 2018: Optical, Infrared, and Millimeter Wave, 106983N

SPIE Papers, Conference Proceedings (contributions):

16. *High-contrast imager for complex aperture telescopes (HiCAT): 8. Dark zone demonstration with simultaneous closed-loop low-order wavefront sensing and control*
Soummer, R., Por, E.H., Pourcelot, R., Redmond, S.F., **Laginja, I.**, Will, S.D., Perrin, M., Pueyo, L., Sahoo, A., Petrone, P., Brooks, K.J., Fox, R., Klein, A., Nickson, B., Comeau, T., Ferrari, M., Gontrum, R., Hagopian, J., Leboulleux, L., Leongomez, D., Lugten, J., Mugnier, L.M., N'Diaye, M., Nguyen, M., Noss, J., Sauvage, J.-F., Scott, N., Sivaramakrishnan, A., Subedi, H.B., Weinstock, S.
2022, Proc. SPIE 12180, Space Telescopes and Instrumentation 2022: Optical, Infrared, and Millimeter Wave, 1218026

15. *Architecture trades to optimize wavefront stability requirements for exoplanet imaging in space.*
Pueyo, L., Pogorelyuk, L., **Laginja, I.**, Soummer, R., Sahoo, A., Por, E.H., Cahoy, K., Coyle, L., Knight, S.
2022, Proc. SPIE 12180, Space Telescopes and Instrumentation 2022: Optical, Infrared, and Millimeter Wave, 121802J

14. *Dark zone maintenance for future coronagraphic space missions*
Redmond, S.F., Pueyo, L., Pogorelyuk, L., Por, E.H., Noss, J., Brooks, K.J., **Laginja, I.**, Perrin, M.D., Soummer, R., Kasdin, N.J.
2022, Proc. SPIE 12180, Space Telescopes and Instrumentation 2022: Optical, Infrared, and Millimeter Wave, 121802B

13. *APLC-optimization: an apodized pupil Lyot coronagraph design survey toolkit*
Nickson, B., Por, E.H., Nguyen, M., Soummer, R., **Laginja, I.**, Sahoo, A., Pueyo, L., St.Laurent, K., N'Diaye, M., Zimmerman, N., Noss, J., Perrin, M.D.
2022, Proc. SPIE 12180, Space Telescopes and Instrumentation 2022: Optical, Infrared, and Millimeter Wave, 121805K

12. *Segment-level thermal sensitivity analysis for exo-Earth imaging*
Sahoo, A., **Laginja, I.**, Pueyo, L., Soummer, R., Coyle, L., Knight, J.S, East, M.
2022, Proc. SPIE 12180, Space Telescopes and Instrumentation 2022: Optical, Infrared, and Millimeter Wave, 121805V

11. *Experimental validation of active control of low-order aberrations with a Zernike sensor through a Lyot coronagraph*
Pourcelot, R., N'Diaye, M., Por, E.H., Perrin, M., Soummer, R., **Laginja, I.**, Sahoo, A., Carbillet, M., Brady, G.R., Dohlen, K., Maclay, M., McChesney, E., Noss, J., Petrone, P., Pueyo, L., Vigan, A., Will, S.D.
2021, Proc. SPIE 11823, Techniques and Instrumentation for Detection of Exoplanets X, 118231M

10. *Dark zone maintenance results for segmented aperture wavefront error drift in a high contrast space coronagraph*
Redmond, S.F., Pueyo, L., Pogorelyuk, L., Por, E., Noss, J., **Laginja, I.**, Brooks, K., Perrin, M.D., Soummer, R., Kasdin, N.J.
2021, Proc. SPIE 11823, Techniques and Instrumentation for Detection of Exoplanets X, 118231K

9. *Implementation of a broadband focal plane estimator for high-contrast dark zones*
Redmond, S.F., Pueyo, L., Pogorelyuk, L., Noss, J., Will, S.D., **Laginja, I.**, Kasdin, N.J., Perrin, M.D., Soummer, R.
2021, Proc. SPIE 11823, Techniques and Instrumentation for Detection of Exoplanets X, 118231Q

8. *Wavefront control with algorithmic differentiation on the HiCAT testbed*
Will, S.D, Perrin, M.D, Por, E.H., Noss, J., Sahoo, A., Petrone, P., **Laginja, I.**, Pourcelot, R., Redmond, S.M., Pueyo, L., Groff, T.D., Fienup, J.R., Soummer, R.
2021, Proc. SPIE 11823, Techniques and Instrumentation for Detection of Exoplanets X, 118230V

7. *Implementation of a dark hole maintenance algorithm for speckle drift in a high contrast space coronagraph*
Redmond, S.M., Kasdin, N. J., Pogorelyuk, L., Soummer, R., Pueyo, L., Perrin, M.D., Maclay, M., Noss, J., **Laginja, I.**, Will, S.D., Fowler, J.
2020, Proc. SPIE 11443, Space Telescopes and Instrumentation 2020: Optical, Infrared, and Millimeter Wave; 114432K

6. *Estimating low-order aberrations through a Lyot coronagraph with a Zernike wavefront sensor for exoplanet imaging*
Pourcelot, R., N'Diaye, M., Brady, G., Carbillet, M., Dohlen, K., Fowler, J., **Laginja, I.**, Maclay, M., Noss, J., Perrin, M., Petrone, P., Por, E., Sauvage, J.-F., Soummer, R., Vigan, A., Will, S.
2020, Proc. SPIE 11443, Space Telescopes and Instrumentation 2020: Optical, Infrared, and Millimeter Wave; 1144346

5. *First error budget of a deployable CubeSat telescope*
Sauvage, J.-F., Schwartz, N., Vievard, S., Bonnefois, A., Velluet, M.-T., Correia, C., Cassaing, F., Fusco, T., Michau, V., Krapez, J.-C., Ferrari, M., **Laginja, I.**
2020, Proc. SPIE 11443, Space Telescopes and Instrumentation 2020: Optical, Infrared, and Millimeter Wave; 1144330

4. *Phase-retrieval-based wavefront metrology for high-contrast coronography: 2. Reconstructions through a shaped pupil apodizer*
Brady, G.R., Petrone, P., **Laginja, I.**, Brooks, K., Zhang, M., N'Diaye, M., Moriarty, C., Hagopian, J., Soummer, R.
2019, Proc. SPIE 11117, Techniques and Instrumentation for Detection of Exoplanets IX, 1111712

3. *The LUVOIR Extreme Coronagraph for Living Planetary Systems (ECLIPS) I: searching and characterizing exoplanetary gems*
Pueyo, L., Stark, C., Juanola-Parramon, R., Zimmerman, N., Bolcar, M., Roberge, A., Arney, G.,

Ruane, G., Riggs, A.J., Belikov, R., Sirbu, D., Redding, D., Soummer, R., **Laginja, I.**, Will, S.
2019, Proc. SPIE 11117, Techniques and Instrumentation for Detection of Exoplanets IX, 1111703

2. *High-contrast imager for complex aperture telescopes (HiCAT): 5. first results with segmented-aperture coronagraph and wavefront control*
Soummer, R., Brady, G.R., Brooks, K., Comeau, T., Choquet, É., Dillon, T., Egron, S., Gontrum, R., Hagopian, J., **Laginja, I.**, Leboulleux, L., Perrin, M.D., Petrone, P., Pueyo, L., Mazoyer, J., N'Diaye, M., Riggs, A.J.E., Shiri, R., Sivaramakrishnan, A., St.Laurent, K., Valenzuela, A.-M., Zimmerman, N.T.
2018, Proc. SPIE 10698, Space Telescopes and Instrumentation 2018: Optical, Infrared, and Millimeter Wave, 1069810

1. *Phase-retrieval-based wavefront metrology for high contrast coronagraphy*
Brady, G.R. , Moriarty, C., Petrone, P., **Laginja, I.**, Brooks, K., Comeau, T., Leboulleux, L., Soummer, R.
2018, Proc. SPIE 10698, Space Telescopes and Instrumentation 2018: Optical, Infrared, and Millimeter Wave, 106986I

Software:

In the context of my research, I write a significant amount of code and I have contributed to various projects over time, many of which are open-source. The below table lists GitHub repositories I have made contributions to. The PASTIS package contains the bulk of my PhD work.

Public repositories:

Namw	GitHub	
PASTIS	spacetelescope/PASTIS	Analytical tolerancing of coronagraphs
Asterix	johanmazoyer/Asterix	Simulations for the THD2 optical testbed
ExoTiC-ISM	Exo-TiC/ExoTiC-ISM	Marginalizing exoplanet transit parameters
FouFourier	ivalaginja/FouFourier	Learning notebooks for Fourier optics
catkit	spacetelescope/catkit	Hardware control interfaces for lab intstrumentation
hcipy	ehpor/hcipy	Optical propagations for HCI
poppy	spacetelescope/poppy	Physical optical propagation
Sherpa	sherpa/sherpa	Modeling and fitting of data in Python

Private repositories:

Name	GitHub	
hicat-package2	spacetelescope/hicat-package2	Control code and simulator for HiCAT testbed
jost-package	spacetelescope/jost-package	Control code for JOST testbed
catkit2	spacetelescope/catkit2	Control interfaces for optical testbeds
thdsim	ivalaginja/thd-simulator	Optical model for the THD2 testbed