Dr. Aleksandra Olejak

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Research positions

2023 – now — **Max Planck Institute for Astrophysics**, Postdoc fellow at the Stellar Department. Director: prof. Selma de Mink.

2019 – 2023 — **Nicolaus Copernicus Astronomical Center, the Polish Academy of Sciences**, PhD student under the MAESTRO research grant: *Astrophysics of Gravitational Waves* (PI K. Belczynski). Supervisor: prof. Tomasz Bulik.

2018 – 2019 — **Center of Theoretical Physics, the Polish Academy of Sciences.** A scholarship student under the MAESTRO research grant: *Constraints on the dark energy properties from observations of active galactic nuclei* (PI B. Czerny). Supervisor: prof. Bozena Czerny.

Education

Oct. 2019–Sept. 2023 — **Nicolaus Copernicus Astronomical Center, Warsaw.** Ph.D. degree (with distinction), thesis defense on Sept. 29th, 2023.

2017–2019 — **University of Warsaw, Department of Physics.** M.Sc. in Astronomy.

2013–2017 — **Warsaw University of Technology, Department of Physics.** B.Sc. in Applied Physics.

Selected talks and seminars

September 2025 — Catania, Italy; [**Invited talk** (upcoming)] during conference *Crossroads in Strong Gravity Challenges & Future Directions*.

Oxford, England; [**Invited talk** (upcoming)] during conference *5th Philip Wetton Workshop in Oxford*.

June 2025 — Princeton, USA; [Seminar] *The origin of gravitational wave sources. Isolated binary progenitors of binary black hole mergers*. Informal seminar for the research group of prof. Eliot Quataert at Princeton University, Department of Astrophysical Sciences.

April 2025 — Milano, Italy; [Seminar] *Supermassive black holes stripping a subgiant star down to its helium core: a new type of multi-messenger source for LISA*. Seminar for the astrophysics department of Milano Bicocca.

March 2025 — Munich, Germany; [Talk] *Supermassive black holes stripping a subgiant star down to its helium core: a new type of multi-messenger source for LISA*. Talk during MIAPbP workshops *Unveiling a Universe of Black Holes: The next Generation of AGN Surveys*.

December 2024 — Paris, France; [Seminar] *The origin of compact object mergers*. Seminar for high energy group of the Institut d'Astrophysique de Paris.

September 2024 — Garching bei Munchen, Germany; [Talk] *Gravitational wave signal from circular, mass transferring star- supermassive black hole systems* during conference *LISA Astrophysics Working Group Meeting 2024.*

Selected talks and seminars (continued)

October 2024 — Leiden, Netherlands; [**Invited talk**] *The origin of compact object mergers.Isolated binary formation scenarios.* during conference *Challenges and future perspectives in gravitational- wave astronomy: O4 and beyond.*

September 2024 — Warsaw, Poland; [Talk] *Gravitational wave signal from circular, mass transferring star-supermassive black hole systems* during conference *Galactic and extragalactic X-ray transients, theory and observational perspectives.*

August 2024 — Cape Town, South Africa; [Talk] *Unequal-mass, highly-spinning binary black hole mergers in stable mass transfer formation channel* during *IAU General Assembly 2024.*

July 2024 — Liege, Belgium; [Talk] *Unequal-mass, highly-spinning binary black hole mergers in stable mass transfer formation channel* during *41st Liège International Astrophysical Colloquium: The eventful life of massive star multiples.*

May 2024 — Birmingham, UK; [**Invited Panelist**] *Panel Discussion - Binary Formation Channels* during *Gravitational Wave Physics and Astronomy Workshop GWPAW 2024.*

March 2024 — Warsaw, Poland; [Seminar] *Fingerprints of binary star interactions in the parameters of binary black hole mergers* - department seminar at Warsaw Astronomical Observatory.

November 2023 — Garching bei Munchen, Germany; [Seminar] *The origin of gravitational wave sources. Isolated binary progenitors of binary black hole mergers - department seminar at Max Planck Institute of Astrophysics.*

July 2023 — Milano, Italy; [Panelist] *What can/should astrophysicists and pop-synthers predict?* during *Gravitational-wave populations: what's next?*

Jan. 2023 — Garching bei Munchen, Germany; [Seminar] *What can we learn about stars from gravitational waves?* - seminar at Max Planck Institute for Astrophysics during Stellar Department Meeting.

Jan. 2023 — Quy Nhon, Vietnam; [**Invited Talk**] *What can we learn about stars from gravitational waves?* during *Rencontres du Vietnam. TMEX-2023 Conference.*

April 2022 — San Juan, Puerto Rico; [Talk] *The role of supernova convection for the depth of lower mass gap and the isolated binary formation of LVK sources* during *2022 INTERMEDIATE-MASS BLACK HOLES New Science from Stellar Evolution to Cosmology.*

Nov. 2021 — Torun, Poland; [Seminar] *Impact of common envelope development criteria on the formation of BH-BH mergers* - departmental seminar at Nicolaus Copernicus Astronomical Center in Torun.

Nov. 2021 — Online; [Seminar] *The origin of BH-BH mergers. The isolated binary evolution scenario*. Seminar for high energy group of the Institut d'Astrophysique de Paris.

Sept. 2021 — Online; [Talk] *Impact of common envelope development criteria on the formation of LIGO/Virgo sources* during *XL Congress of the Polish Astronomical Society 2021.*

Aug. 2021 — Lisbon, Portugal; [Talk] *Impact of common envelope development criteria on the formation of LIGO/Virgo sources* during *Global meeting of the GWVerse COST action Lisbon.*

July 2021 — Online; [Talk] *Binary neutron star formation and the origin of GW170817* during *Sixteenth Marcel Grossman Meeting*.

Sept. 2019 — Warsaw, Poland; [Talk] *Synthetic catalog of black holes in the Milky Way* during *Astrophysics with GW detections.*

Summer schools

Aug. 2022 — Sanata Barbara, USA. Participation in *The 2022 MESA Summer School.*

Aug. 2021 — Copenhagen, Denmark. Participation in *NBIA Summer School on Gravitational Wave Astrophysics.*

Awards and funding

- Feb 2025 — Winner of **Procope Mobility** scholarship for 1-month research visit sponsored by the French Embassy in Germany.
- Winner of **SALTO** exchange program between MPG, Germany, and CNRS, France.
- July 2022 — Winner of scholarships from **the Minister of Education and Science (Poland)** for outstanding young scientists in 2022.
- May 2022 — Winner of **START 2022** stipend of the Foundation for Polish Science dedicated to 100 best young scientists (under 30 year old) that represent all fields of science with additional honor award of **the Prof. Adam Sobiczewski Prize** for researchers who conduct scientific research in the field of mathematics, theoretical physics, or astronomy.
- Dec. 2021 — Winner of **Award for young researcher 2021** of Nicolaus Copernicus Astronomical Center.

Skills

- Programming — C, C++, Python, Bash, LaTeX, html
- Other tools — Overleaf, Population synthesis codes, MESA, WordPress
- Language — Polish (native), English (excellent), French (beginner), German (beginner)

Additional activities

Duties and roles

- Team member (by invite) of the International Space Science Institute project titled: *Can we be spin doctors and determine the spins of black holes?* led by prof A. Zdziarski.
- Core member of LISA Consortium (since May 2025).
- Postdoc representative at Max Planck Institute for Astrophysics (since June 2024).
- Part of the Stellar Department's recruitment committee in selecting PhD candidates for IMPRS) program
- Referee for journals: MNRAS, ApJL, A&A, Nature and Nature Commmunications.
- PhD students representative in the Scientific Council (2021/22) of the Nicolaus Copernicus Astronomical Center, Warsaw.

Organization

- Part of Local Organizing Committee of LISA Astrophysics Working Group Meeting at Max Planck Institute for Astrophysics: https://events.gwdg.de/event/875/overview
- Co-organized Stellar Department Seminars (SESTAS) at Max Planck Institute for Astrophysics (2023/24)
- Organizer and main coordinator of *5th Meeting of young astronomers* 2022 at Nicolaus Copernicus Astronomical Center (online). Event website: https://events.camk.edu.pl/event/41/.

Teaching

- Teaching Assistant during MESA workshops being a part of *IAU General Assembly 2024, Cape Town* (IAU Hackathons).
- Physics and Computer Science teacher for middle and high school students during two editions of the school under the sails program, Niebieska Szkoła, specifically the 14th edition (September-November 2016) and the 24th edition(January-March 2020).

Additional activities (continued)

- Assistance in introducing new members (PhD students and postdocs) to the science and software of the research group.

Science popularization

April 2025 — **Phys.org** and **Universe Today.** Popular science articles summarizing my publication by *Phys.org* and *Universe Today* titled *Supermassive black holes could strip stars down to their helium cores*

April 2025 — **Science News Today** Popular science articles summarizing my publication *Science News Today* titled *Quiet Deaths: Helium Stars Spiraling into Supermassive Black Holes*

Oct. 2022 — **Magazine ACADEMIA.** Article for ACADEMIA, the Magazine of Polish Academy of Sciences: *Space-time ripples*

July 2022 — **Magazine Interia.** Interview for Tygodnik Interia: *Our Galaxy is expected to host around 150 million black holes*

June 2022 — **Polish Radio.** Interview for Polish Radio: *Secrets of the black holes formation.*

Oct. 2020 — **Nature Research Highlights.** Interview for Nature Research Highlights: *The odd couple: how a pair of mismatched black holes formed*.

Oct. 2020 — **Science in Poland.** Interview for Science in Poland website: *Scientists explain how two black holes of hugely different masses collided*.

Nov. 2019 — **Warsaw, Poland.** Lecture for general public organized by Nicolaus Copernicus Astronomical Center *Black holes in the Milky Way.*.

Sept. 2019 — **Warsaw, Poland.** Lecture for physics teachers organized by Nicolaus Copernicus Astronomical Center *Black holes in the Milky Way.*.

Publications

I am a co-author of **24** peer-reviewed scientific articles and the leading author of **7** of them.
ADS Public Library: https://ui.adsabs.harvard.edu/public-libraries/UoLMup96RQe2hPXDjU3Mcw.
ORCID: https://orcid.org/0000-0002-6105-6492/.

Peer-reviewed:

First and second author

1. **Olejak A.**, Stegmann J., de Mink S. E., Valli R., Sari R., Justham S., 2025. *Supermassive black holes stripping a subgiant star down to its helium core: a new type of multi-messenger source for LISA*,(accepted for publication in ApJL) doi:10.48550/arXiv.2503.21995

2. **Olejak A.**, Klencki J., Xu X.-T., Wang C., Belczynski K., Lasota J.-P., 2024, A&A, 689, A305. *Unequal-mass highly spinning binary black hole mergers in the stable mass transfer formation channel*, doi:10.1051/0004-6361/202450480.

3. **Olejak A.**, Fryer C. L., Belczynski K., Baibhav V., 2022, MNRAS, 516, 2252. *The role of supernova convection for the lower mass gap in the isolated binary formation of gravitational wave sources,* doi:10.1093/mnras/stac2359.

4. **Olejak A.**, Belczynski K., 2021, ApJL, 921, L2. *The Implications of High Black Hole Spins for the Origin of Binary Black Hole Mergers*, doi:10.3847/2041-8213/ac2f48.

5. **Olejak A.**, Belczynski K., Ivanova N., 2021, A&A, 651, A100. *Impact of common envelope development criteria on the formation of LIGO/Virgo sources*, doi:10.1051/0004-6361/202140520.

6. **Olejak A.**, Fishbach M., Belczynski K., Holz D. E., Lasota J.-P., Miller M. C., Bulik T., 2020, ApJL, 901, L39. *The Origin of Inequality: Isolated Formation of a 30+10 Msun Binary Black Hole Merger*, doi:10.3847/2041-8213/abb5b5.

7. **Olejak A.**, Belczynski K., Bulik T., Sobolewska M., 2020, A&A, 638, A94. *Synthetic catalog of black holes in the Milky Way*, doi:10.1051/0004-6361/201936557.

8. Sen K., **Olejak A.**, Banerjee S., 2025, A&A, 696, A54. doi:10.1051/0004-6361/202553829

9. Banerjee S., **Olejak A.**, Belczynski K., 2023, ApJ, 953, 80. *Symmetry Breaking in Merging Binary Black Holes from Young Massive Clusters and Isolated Binaries* , doi:10.3847/1538-4357/acdd59.

10. Romagnolo A., **Olejak A.**, Hypki A., Wiktorowicz G., Belczynski K., 2022, A&A, 667, A55. *Testing the presence of a dormant black hole inside HR 6819*, doi:10.1051/0004-6361/202141992.

11. Fryer C. L., **Olejak A.**, Belczynski K., 2022, ApJ, 931, 94. *The Effect of Supernova Convection On Neutron Star and Black Hole Masses* , doi:10.3847/1538-4357/ac6ac9.

12. Czerny B., **Olejak A.**, Rałowski M., Kozłowski S., Martinez Aldama M. L., Zajacek M., Pych W., et al., 2019, ApJ, 880, 46. *Time Delay Measurement of Mg II Line in CTS C30.10 with SALT*, doi:10.3847/1538-4357/ab2913.

Other co-authored

1. Wang C., Bodensteiner J., Xu X.-T., de Mink S. E., Langer N., Laplace E., Vigna-Gómez A., et al., 2024, *ApJL*, 975, L20. *Stripped Helium Star and Compact Object Binaries in Coeval Populations: Predictions Based on Detailed Binary Evolution Models* , doi:10.3847/2041-8213/ad86b7.

2. Fumagalli G., Romero-Shaw I., Gerosa D., De Renzis V., Kritos K., **Olejak A.**, 2024, *PhRvD*, 110, 063012. *Residual eccentricity as a systematic uncertainty on the formation channels of binary black holes*, doi:10.1103/PhysRevD.110.063012.

3. Prince R., Zajaček M., Panda S., Hryniewicz K., Kumar Jaiswal V., Czerny B., Trzcionkowski P., et al., 2023, A&A, 678, A189. *Wavelength-resolved reverberation mapping of intermediate-redshift quasars HE 0413-4031 and HE 0435-4312: Dissecting Mg II, optical Fe II, and UV Fe II emission regions*, doi:10.1051/0004-6361/202346738.

4. Leveque A., Giersz M., Askar A., Arca-Sedda M., **Olejak A.**, 2023, MNRAS, 520, 2593. *MOCCA-Survey Database: extra galactic globular clusters - III. The population of black holes in Milky Way and Andromeda-like galaxies*, doi:10.1093/mnras/stad240.

5. Prince R., Zajaček M., Czerny B., Trzcionkowski P., Bronikowski M., Sobrino Figaredo C., Panda S., et al., 2022, A&A, 667, A42. *Wavelength-resolved reverberation mapping of quasar CTS C30.10: Dissecting Mg II and Fe II emission regions*, doi:10.1051/0004-6361/202243194.

6. Wang Y., Liao S., Giacobbo N., **Olejak A.**, Gao J., Liu J., 2022, A&A, 665, A111. *Astrometric mass measurement of compact companions in binary systems with Gaia*, doi:10.1051/0004-6361/202243684.

7. Belczynski K., Doctor Z., Zevin M., **Olejak A.**, Banerje S., Chattopadhyay D., 2022, ApJ, 935, 126. *Black Hole-Black Hole Total Merger Mass and the Origin of LIGO/Virgo Sources*, doi:10.3847/1538-4357/ac8167.

8. Belczynski K., Romagnolo A., **Olejak A.**, Klencki J., Chattopadhyay D., Stevenson S., Coleman Miller M., et al., 2022, ApJ, 925, 69. *The Uncertain Future of Massive Binaries Obscures the Origin of LIGO/Virgo Sources*, doi:10.3847/1538-4357/ac375a.

9. Zajaček M., Czerny B., Martinez-Aldama M. L., Rałowski M., **Olejak A.**, Przyłuski R., Panda S., et al., 2021, ApJ, 912, 10. *Time Delay of Mg II Emission Response for the Luminous Quasar HE 0435-4312: toward Application of the High-accretor Radius-Luminosity Relation in Cosmology*, doi:10.3847/1538-4357/abe9b2.

10. Zajaček M., Czerny B., Martinez-Aldama M. L., Rałowski M., **Olejak A.**, Panda S., Hryniewicz K., et al., 2020, ApJ, 896, 146. *Time-delay Measurement of Mg II Broad-line Response for the Highly Accreting Quasar HE 0413-4031: Implications for the Mg II-based Radius-Luminosity Relation*, doi:10.3847/1538-4357/ab94ae.

11. Belczynski K., Klencki J., Fields C. E., **Olejak A.** Berti E., Meynet G., Fryer C. L., et al., 2020, A&A, 636, A104. *Evolutionary roads leading to low effective spins, high black hole masses, and O1/O2 rates for LIGO/Virgo binary black holes* , doi:10.1051/0004-6361/201936528.

Other submitted

1. Zdziarski A. A., Marcel G., Veledina A., **Olejak A.,** Lancova D., 2025, *Spins of Black Holes in X-ray Binaries and the Tension with the Gravitational Wave Measurements*, (submitted to New Astronomy Review) doi:10.48550/arXiv.2506.00623

2. Klencki J., Podsiadlowski P., Langer N., **Olejak A.,** Justham S., Vigna-Gómez A., de Mink S. E., 2025, *A fundamental limit to how close binary systems can get via stable mass transfer shapes the properties of binary black hole mergers*, (submitted to A&A) doi:10.48550/arXiv.2505.0886

3. Vigna-Gomez A., Grishin E., Stegmann J., **Olejak A.**, Popa S. A., Liu B., Rajamuthukumar A. S., et al., 2025. *Prompt Stellar and Binary Black Hole Mergers from Chemically Homogeneous Evolution in Triples,* (accepted for publication for A&A) doi:10.48550/arXiv.2503.17006

4. Banerjee S., **Olejak A.**, 2024. *On the effective spin-mass ratio $\chi_{\rm eff} - q$ relation of binary black hole mergers that evolved in isolation*, (submitted to A&A) doi:10.48550/arXiv.2411.15112

5. Belczynski K., Bulik T., **Olejak A.**, Chruslinska M., Singh N., Pol N., Zdunik L., et al., 2018. *Binary neutron star formation and the origin of GW170817*, doi:10.48550/arXiv.1812.10065.