

Application for participation in the summer course
"Impacts and their Role in the Evolution of Life"
Nördlingen, Germany 5 - 14 September 2023

Name	Viktória Fröhlich				
Gender	O Male	X Female	Date of birth	2001. 05. 08.	
Nationality	Hungarian				
Present university	Eötvös Loránd University, Faculty of Science				
Address	Damjanich street 49. 1/2				
Postcode/Zip	1071	City	Budapest	Country	Hungary
Phone	+36303420340	e-mail		frohlich.viktoria@csfk.org	
Field of study	N-body codes, orbital dynamics, supernovae				
Last obtained degree (B. Sc. /M. Sc. etc)	B.Sc.	Year	2023	Subject	dynamical effects of supernovae
Honours, Mark/Grade or awards if applicable	Outstanding Student of the Faculty Award of the Eötvös University II. place at the National Scientific Students' Associations Conference				
Year of start of University education	2020	Extent of study	O Part-time X Full-time		
Title of diploma thesis/ Project work (if applicable)	Dynamical effects of type II supernovae in double and triple systems				
Title of poster to be presented at the summer school	Mitigating potentially hazardous asteroid impacts revisited				
Please name two referees Please DO NOT send recommendation letters, we will contact the referees ourselves in case we need	Name	Zsolt Regály			
	Affiliation	Konkoly Observatory			
	Phone	+36302501735	Fax		
	e-mail	regaly@konkoly.hu			
	Name	Zsolt Sándor			
	Affiliation	Eötvös Loránd University			
	Phone	+36305595797	Fax		
	e-mail	sandor.zsolt@ttk.elte.hu			

Curriculum vitae (maximum 2 pages, 12 pt Times New Roman font size):

Personal data:

Name: Viktória Fröhlich

Born in 8500 Pápa, Hungary, on 2001. 05. 08.

Address: 1071 Budapest, Damjanich street 49. 1/2

Phone: +36 30 342 0340

E-mail: frohlich.viktoria@csfk.org

Education:

2007-2015 Tarczy Lajos Elementary School, Hungarian - English bilingual class, Pápa

2015-2020 Türr István High School, Pápa

2020-2023 Eötvös Loránd University, B.Sc. in Physics, specialised in astronomy, Budapest

Professional and public engagement:

2020- Member of the Hungarian Astronomical Association, with multiple observations published in the journal Meteor

2021- Joined multiple research projects as a research assistant at the Konkoly Observatory under the supervision of Zsolt Regály

2021- Member of the Vega Astronomical Association, regularly publishing popular science articles on the vcse.hu website and in the journal VEGA

2021, 2022 Received the Vega Astronomical Association's Certificate of Recognition for high-quality observations and popularisation of amateur astronomy

2022- Member of the Presidency of the Vega Astronomical Association

2022- Regular publishing of popular science and science articles on the blog svabhegyicsillagvizsgalo.hu and in the journals Fizikai Szemle and Természet Világa

2022- Contributing to the organisation of The Universe to Youths international Erasmus Plus grant and attending the project meetings

2022 Received the National Scholarship for Higher Education

2023 Attended the Konkoly Kickoff Workshop

2023 Attended the Earth and planetary materials and dynamics online PhD course

2023 Attended the 4th Advanced School on Exoplanetary Science summer school

2023 Received the Outstanding Student of the Faculty Award of the Eötvös University

Competitions:

2020 International Olympiad in Astronomy and Astrophysics: national 12. place

2020 Gothard Jenő Astronomical Association online astronomical competition: 1. place

2021 Hungarian Astronomical Association - Konkoly Observatory joint call for scientific dissemination articles: 3. place

2021 ELTE Astronomy Scientific Students' Associations Conference: 2. place

2022 ELTE Astronomy Scientific Students' Associations Conference: 3. place

2023 National Scientific Students' Associations Conference: 2. place

Spoken languages:

2017 English: C1 certificate

2019 German: B2 certificate

Free time activities:

Amateur astronomy, reading, playing the guitar, cycling, photography, music, drawing

Short description of why you want to attend the summer school (maximum 30 lines 12 pt Times New Roman font size)

Impact events on Earth can pose a major threat to the biodiversity of our planet. The mitigation of such impacts, or the complete avoidance of them, is an essential skill that humanity has yet to learn. Our research team at the Konkoly Observatory (3DNAL, PI: Zsolt Regály) has recently found that the success of the most feasible mitigation technique (disintegration of the impactor and generation of a fragment cloud by explosive penetrating devices, Lubin & Cohen 2023) depends strongly on the orbital dynamics and orbital shear (Regály, Fröhlich & Berczik, under review). Thus, impact events cannot be investigated analytically. Using the computing power available at the Konkoly Observatory, we performed high-precision numerical integrations and were able to show that both the orbit of the penetrator and the timing of the interception are critical to the survival of humanity. However, our work neglected the presence of the Earth's atmosphere and did not calculate the energies required to disassemble the impactor. Since I have not yet had the opportunity to take a deep dive into geosciences and material dynamics, my goal is to broaden my knowledge of asteroidal and cometary material and structure. I would also like to get a more complete picture of the role of impacts on other potentially habitable extrasolar worlds, as I would like to extend my research interests to the theory of planet formation and habitability through numerical hydrodynamical simulations, while also keeping an eye on astrobiology and the ecological consequences of impacts on inhabited planets. I also want to explore the idea of panspermia, to see if impact events play an important role not only in the destruction, but also in the possible fertilisation of worlds. Bringing a poster of our recent work and talking to experts in the field of impact events will help me to achieve this goal. Knowledge of the above topics is essential to continue our work and, as a final product, to publish a software package capable of calculating the best evasion or mitigation scenario as a function of the impactor orbit, shape, size, porosity, interception time, available technological resources and, if the event cannot be completely evaded, outputting the number, size and kinetic energy of the fragments that will hit the Earth and showing a map of the predicted impact events. This tool would also utilise a new method of impact mitigation, and could compare the results of this new technique with those already explored in the literature. All that I have learnt at the school will be of great use in further developing our research into a new mitigation technique, the results of which will be published next year, in time for the Nördlingen conference on "Impacts and their role in the evolution of life".

Publication list

Published refereed articles:

- Regály, Fröhlich & Vinkó: *Lost in Space: Companions' Fatal Dance around Massive Dying Stars*, The Astrophysical Journal, 941, 121
- Fröhlich, Regály & Vinkó: *Double neutron star formation via consecutive type II supernova explosions*, accepted for publication in MNRAS, <https://arxiv.org/abs/2306.07099>

Articles under review/in preparation:

- Regály, Fröhlich & Berczik: *Mitigating potentially hazardous asteroid impacts revisited*, under review at A&AL
- Fröhlich, Regály & Vinkó: *Exomoons of rogue planets: type II supernova explosions as a possible formation channel*, in preparation

Scientific dissemination:

- Fröhlich, V., Fizikai Szemle 2022/5., English title: *Destruction of planets around white dwarfs*
- Fröhlich, V., Természet Világa, 2022/9., English title: *Outliving a supernova explosion? - Abandoned planets*
- Fröhlich, V., 2022, www.svabhegyicsillagvizsgalo.hu, English title: *Stripped envelope supernovae*
- Fröhlich, V., 2021, Meteor LI/12., English title: *Venus and the migration of Jupiter*
- Fröhlich, V., 2022, Meteor LII/7-8., English title: *How I observe*
- Fröhlich, V., 2022, www.vcse.hu, English title: *Visual observation of comet 67P Churyumov-Gerasimenko*
- Fröhlich, V., 2022, www.vcse.hu, English title: *Building blocks of life found on asteroid Ryugu*
- Fröhlich, V., 2022, www.vcse.hu, English title: *Silent black holes*
- Fröhlich, V., 2022, www.vcse.hu, English title: *Camp report: VEGA '22*
- Fröhlich, V., 2022, www.vcse.hu, English title: *TOI-500: a quadruple planet system with an intriguing past*
- Fröhlich, V., Schmall, R., Szalontai, T., Vizsi, Cs., Mezei, B., Ágoston, Zs., Csizmadia, Sz., 2022, www.vcse.hu, English title: *VAA observing weekend in Austria*
- Fröhlich, V., Csizmadia, Sz., 2022, www.vcse.hu, English title: *Visual observations - the wonderful spiral arms of M33 with a big telescope*
- Fröhlich, V., 2022, www.vcse.hu, English title: *Judith Pipher (1940-2022)*
- Fröhlich, V., 2022, VEGA, English title: *Bringing the Universe down to Earth - The romance of drawing the night sky*

Talks and posters:

- Sidewalk astronomy at VEGA'21 camp
- Vega Astronomical Association advanced workshop, 2022, *Analog observations with a Dobsonian telescope*
- Türr István High School, 2022, *Ad Astra - why and how to become an astronomer?*
- Visegrád House of Culture, 2023, *Thinking stardust - on the formation of planets and life*
- Eötvös Conference, 2023, *Dynamical effects of type II supernovae in double and triple systems* poster