



Center for Theoretical Physics

Polish Academy of Sciences

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PhD student fellowships position at Center for Theoretical Physics PAS

The Director of the Center for Theoretical Physics PAS invites applications for **one PhD student fellowship** at the CTP PAS, financed from the project OPUS 18 "*Origin of Gamma RayBurst and their multimessenger appearance*" funded by National Science Center (grant agreement No." UMO- UMO-2019/35/B/ST9/04000).

PI of the project is Prof. Dr hab. Agnieszka Janiuk

The aim of the project is to study accretion flows at the base of gamma-ray flares, formed after the merger of a pair of neutron stars. Using numerical computer simulations, a model of the accretion disk around the black hole, and the wind flowing out of it, will be made. The role of the magnetic field and neutrino transport in the disk and their influence on the dynamics of the process will be investigated. Calculations of nuclear reaction networks and heavy isotope fusion will allow the theoretical glow curves to be confronted with kilonova observations.

In the accretion flows at the base of gamma-ray flares, the physical conditions physical conditions allow nuclear reactions to take place and heavy isotopes to be synthesised. Light nuclides (helium, lithium, beryllium), as well as heavier isotopes with atomic masses in the range $A \sim 60-80$, corresponding to the first maximum of abundance, are formed in the accretion disk. Outflows of matter, accelerated due to the presence of a magnetic field, can harbour the formation of further heavy isotopes, in the range of the second and third maxima in the process of rapid neutron capture ('r-process'), where nuclides up to $A \sim 200$ are produced. Recent observational findings (e.g. the flare associated with source GW 170817) have shown that the subsequent rapid radioactive decay of isotopes is responsible for emission in the optical range and for the so-called 'kilonova' effect.

Details of the project will appear under the link:

<http://warsaw4phd.eu/en/candidates/research-projects/> - tab Center for Theoretical Physics PAS.

We expect the candidates to have:

- Master's degree in physics or astronomy,
- very good knowledge of numerical methods and programming,
- interest in fluid dynamics and magnetohydrodynamics,
- independence and creativity in solving problems.

The application must include:

1. The scientific CV, including the progress in the university studies, scientific achievements (publications, participation in research projects and conferences), with the clause *"I agree to the processing of my personal data contained in the application documents for the purposes necessary for the implementation of the process recruitment by the doctoral school Warsaw-4-PhD"*.
2. Cover letter.
3. A copy of the master's degree diploma (by 2023-07-14)
4. Copies of documents confirming scientific or professional achievements.
5. Two letters of recommendation from a researcher with at least a PhD degree, concerning the candidate and his/her current scientific activity.

The application should be submitted electronically **via the recruitment system** at www.warsaw4phd.eu **between 2023-05-22 and 2023-06-04**. The scholarship will be granted in accordance with the annex to the resolution of the NCN Council 96/2016 of 27 October 2016 **(around 4800 PLN per month)**. If you have any questions, please send an e-mail to: agnes@cft.edu.pl

The competition will be settled by 2023-07-13. Candidates will be informed electronically of the results of the competition. Admission to the Doctoral School and the **beginning of the scholarship are scheduled for 2023-10-01.**