

# Árpád Lukács

## Curriculum Vitæ

Durham University  
Department of Mathematical Sciences  
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## Experience

### Research

- 2021–present **Postdoctoral Research Associate**, *Durham University*, Durham, UK  
Research in applied mathematics; Research topic: optimal near-miss polyhedral cages
- 2020–2021 **Postdoctoral Fellow**, *University of the Basque Country UPV/EHU*, Bilbao, Spain  
Research in theoretical physics; Research topics: quantum information science, quantum metrology
- 2012–present **Research Fellow**, *Institute for Particle and Nuclear Physics, Wigner Research Centre for Physics*, Budapest, Hungary  
Research in theoretical physics; Research topics: Localised solutions in classical field theories  
– 9 conference and 7 seminar talks  
– 6 conference posters  
– 9 papers published, 1 paper submitted
- 2017–2019 **Postdoctoral Fellow**, *TU Delft, Kavli Institute of Nanoscience*, Delft, The Netherlands  
Research in theoretical physics; Research topics: Quantum mechanics of superconducting nanodevices  
– 2 conference and 2 seminar talks  
– 1 conference poster  
– 1 paper published, 1 paper submitted
- 2014–2015 **Postdoctoral Fellow**, *Department of Mathematics, Physics and Computational Sciences, Aristotle University of Thessaloniki*, Thessaloniki, Greece  
Research in theoretical physics; Research topics: Localised solutions in classical field theories (topological solitons, skyrmions)  
– 2 conference talks  
– 1 conference poster  
– 1 paper submitted  
– 1 paper published
- 2011–2012 **Research Fellow**, *MTA KFKI Research Institute for Particle and Nuclear Physics*, Budapest, Hungary  
Research in theoretical physics; Research topics: Localised solutions in classical field theories
- 2004–2011 **Research Assistant**, *MTA KFKI Research Institute for Particle and Nuclear Physics*, Budapest, Hungary  
Research in theoretical physics; Research topics: Localised solutions in classical field theories  
Achievements:  
– Writing of my PhD thesis  
– 7 scientific papers published (5 in refereed journals)  
– Participation in 2 succesful grant applications

### Visits

- 2015 **UNLP**, *La Plata, Argentina*, 13 August 2015 – 5 September 2015  
Collaboration with Prof. Fidel A. Schaposnik

- 2014 **UNLP, La Plata, Argentina**, 12 April 2014 – 11 May 2014  
Collaboration with Prof. Fidel A. Schaposnik
- 2002 **Nuclear Physics Institute, Řež, Czech Republic**, July – August, 2002  
Summer internship, Evaluation of gamma ray spectra of nuclear decay
- Organising activities**
- 2021 **QIntern 20201, Online**, 21–22 August 2021  
Jury member
- 2015 **Solitons: Topology, Geometry, and Applications, Thessaloniki, Greece**, 14–18 April 2015  
Member of the Local Organising Committee

### Teaching

- 2013 winter semester **Teaching Assistant, ELTE Eötvös Loránd University**, Budapest, Hungary  
Theoretical Mechanics for students of the Physics BSc School (specialisation: Physics)
- 2011 summer semester **Teaching Assistant, ELTE Eötvös Loránd University**, Budapest, Hungary  
Theoretical Physics 1. (Mechanics), for students of the Geosciences BSc School (specialisations: Geophysics, Meteorology)
- 2010 winter semester **Teaching Assistant, ELTE Eötvös Loránd University**, Budapest, Hungary  
Theoretical Mechanics for students of the Physics BSc School (specialisation: Physics)
- 2010 summer semester **Teaching Assistant, ELTE Eötvös Loránd University**, Budapest, Hungary  
Theoretical Physics 1. (Mechanics), for students of the Geosciences BSc School (specialisations: Geophysics, Meteorology)
- 2009 winter semester **Teaching Assistant, ELTE Eötvös Loránd University**, Budapest, Hungary  
Theoretical Mechanics for students of the Physics BSc School (specialisation: Physics)

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### Education

- 2010 **PhD in Physics, ELTE Eötvös Loránd University**, Budapest, Hungary, *Grade: summa cum laude*  
Thesis title 'Localised solutions and their perturbations in Field Theory',  
Supervisor: Prof. Péter Forgács
- 2004–2008 **PhD School, ELTE Eötvös Loránd University**, Budapest, Hungary  
PhD programme 'Particle Physics and Astronomy'
- 2007 **MSc in Mathematics, ELTE Eötvös Loránd University**, Budapest, Hungary, *Grade: good*  
Thesis title 'Perturbations of solitons',  
Supervisors: Prof. Péter Forgács and Prof. Gisbert Stoyan
- 2001–2007 **University Studies (Mathematician), ELTE Eötvös Loránd University**, Budapest, Hungary  
Specialisations: Differential Geometry, Functional Analysis, Mathematical Physics, Operations Research
- 2003–2006 **Supplementary Course (Scientific Translator), ELTE Eötvös Loránd University**, Budapest, Hungary, *Grade: very good*  
Languages: English–Hungarian, Specialisation: Physics
- 2004 **MSc in Physics, ELTE Eötvös Loránd University**, Budapest, Hungary, *Grade: with honours*  
Thesis title 'Canonical Quantum Gravity',  
Supervisor: Prof. Zoltán Perjés

- 1999–2004 **University Studies (Physicist)**, *ELTE Eötvös Loránd University*, Budapest, Hungary  
Specialisations: Particle Physics, Statistical Physics
- 1993–1999 **Secondary School**, *Fazekas Mihály Gimnázium*, Budapest, Hungary  
Specialisation: Mathematics

## Theses

- PhD Thesis *Localised solutions and their perturbations in Field Theory* (in Hungarian)  
supervisor Prof. Péter Forgács (MTA KFKI RMKI)  
description The interaction of localised objects (1D kinks and 2D vortices) with radiation is studied and the radiation pressure is found to be negative. The stability of twisted strings in the SU(2) symmetric extended Abelian Higgs model is analysed and the strings are found to be unstable. String solutions in non SU(2) symmetric two-component extended Abelian Higgs models are obtained.
- MSc Thesis *Perturbations of solitons* (in Hungarian)  
supervisors Prof. Péter Forgács (MTA KFKI RMKI) and Prof. Gisbert Stoyan (Eötvös University)  
description The numerical methods used for the study of perturbations of vortices are analysed. Results on the convergence of the shooting method with a singularity on the boundary are summarised. The methods are applied for the analysis of the perturbations of the Abrikosov–Nielsen–Olesen strings and the twisted strings in the SU(2) symmetric extended Abelian Higgs model.
- MSc Thesis *Canonical Quantum Gravity* (in Hungarian)  
supervisor Prof. Zoltán Perjés (MTA KFKI RMKI)  
description Classical results (Gupta’s approach, ADM quantum gravity, the Perjés–Fodor parametric manifold picture) are summarised. An attempt is made at quantizing Black Hole perturbations by finding a Lagrangian for Teukolsky’s equation. It is shown that the differential operator in Teukolsky’s equation is not self-adjoint. The non-self-adjoint part is taken into account as a perturbation.

## Languages

- Hungarian Mother tongue
- English Fluent *IELTS Academic, score 8.5 (2021), State language exam, intermediate level, spoken and written (2003)*
- German Fluent *State language exam, intermediate level, spoken and written (2003)*

## Computer skills

- Environments Unix/Linux, MS Windows                      Programming C/C++, Fortran, Matlab/Octave
- Applications MS Office, OpenOffice,  $\text{T}_{\text{E}}\text{X}/\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$                       Scientific Mathematica, Gnuplot, Reduce

## Research interests

- Field Theory Localised solutions in classical field theories, analogies between particle physics and condensed matter systems
- Mathematical Physics Mathematics and implementation of numerical methods, mixed application of numerics and analytical perturbation techniques
- Quantum Information Quantum metrology

Quantum  
mechanics of  
nanodevices

General Relativity Black holes, Cosmology

Particle  
Physics

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## Awards

- 2017 **Outstanding contribution in Reviewing**, *Physics Letters B*
- 2010 **Eugene P. Wigner Diploma**, *International School of Subnuclear Physics*, Erice, Sicily
- 2001 **Honourable Mention**, *Rudolf Ortway Competition in Physics*, Budapest, Hungary
- 2000 **Honourable Mention**, *Rudolf Ortway Competition in Physics*, Budapest, Hungary

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## Refereeing

Eur. Phys. J., Nucl. Phys. B, Phys. Lett. B, Phys. Rev. D

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## References

**Prof. Péter Forgács**, *Principal investigator*, Wigner RCP, Budapest, Hungary, [forgacs.peter@wigner.mta.hu](mailto:forgacs.peter@wigner.mta.hu)

**Prof. Géza Tóth**, *Principal investigator*, University of the Basque Country UPV/EHU, [geza.toth.hu@gmail.com](mailto:geza.toth.hu@gmail.com)

**Prof. Fidel A. Schaposnik**, *Collaborator*, University of La Plata, La Plata, Argentina, [fschaposnik@gmail.com](mailto:fschaposnik@gmail.com)

**Dr. Tomasz Romańczukiewicz**, *Collaborator*, Jagiellonian University, Cracow, Poland, [trom@th.if.uj.edu.pl](mailto:trom@th.if.uj.edu.pl)

**Prof. Géza Györgyi**, *Teaching*, ELTE Eötvös Loránd University, Budapest, Hungary, [geza.gyorgyi@ttk.elte.hu](mailto:geza.gyorgyi@ttk.elte.hu)

**Prof. Yuli V. Nazarov**, *Principal investigator*, Kavli institute of nanoscience, TU Delft, The Netherlands, [y.v.nazarov@tudelft.nl](mailto:y.v.nazarov@tudelft.nl)