



Curriculum Vitae

prof. dr. Saša Prelovšek Komelj

November 2022

Employment:

Associate Professor

Faculty of Mathematics and Physics, University of Ljubljana, Slovenia

Research Counsellor

Department for Theoretical Physics, Jožef Stefan Institute, Ljubljana, Slovenia

Contact:

e-mail: sasa.prelovsek@ijs.si

tel: 01 477 3223

<http://www-f1.ijs.si/~sasa/>

1. Personal information:

- born on 3rd May 1971 in Ljubljana, Slovenia
- married, three children (2004, 2006, 2006)
- nationality: Slovenian

2. Education:

- 1986-1990: *Natural Sciences High School* in Ljubljana, Slovenia
- 1991-1995: B.Sc in physics, *University of Ljubljana*, Slovenia
- 1995-1999: Ph.D., University of Ljubljana, Slovenia
 "Weak decays of heavy mesons" (defended in 2000), supervisor: prof. dr. Svjetlana Fajfer

3. Employment:

- 1995-1999: young researcher, Jozef Stefan Institute, Slovenia
- 2000-2001: post-doctoral researcher, *University of Trieste*, Italy
- 2001-2002: post-doctoral researcher, *Brookhaven National Laboratory*, New York
- 2002- : Faculty of Mathematics and Physics, University of Ljubljana, Slovenia
- 2002- : Department of Theoretical Physics, Jozef Stefan Institute, Slovenia
- maternity leave from work:
February 2004 - February 2005, October 2006 - October 2007
- Staff Scientist at *Theory Center, Jefferson Lab*, Virginia, USA
February-August 2015
- Guest Professor, University of Regensburg, 2016-2021
- Present employment:
 - Associate Professor of Physics at *Faculty of Mathematics and Physics, University of Ljubljana*, Slovenia
 - Research Counsellor in the *Group for theoretical physics of Nuclei, Particles and Fields*
Department of Theoretical Physics, Jozef Stefan Institute, Slovenia

4. Academic and research titles:

- Assistant in Physics, University of Ljubljana: 1998
- Assistant Professor in Physics, University of Ljubljana: 2006
- Associate Professor in Physics, University of Ljubljana: 2015
- Research Counsellor, Jozef Stefan Institute: 2022

Citations

- INSPIRE, inspirehep.net
number of citations: 4936, h-index: 38
- Web of Science, apps.webofknowledge.com
number of citations (without self-citations): 2135, h-index: 30
- Google Scholar: 4352, h-index: 37

Awards:

- Zois Certificate of Recognition, 2018 (national award for scientific achievements)
- Excellent in Science, 2018 (among ten scientific achievements chosen by national research agency)
- The Jozef Stefan Golden Emblem Prize, 2002 (for PhD thesis)

Invited talks at international symposia

1. invited plenary review talk at *Lepton-Photon*, january 2021, Manchester (online)
Hadron physics: theory
2. Invited talk at "Hard problems of hadron physics", Russia, november 2021 (online)
Lattice study of quarkonium-like states
3. invited talk at *XYZ workshop*, GSI, April 2021 (online)
Heavy four-quark states
4. invited talk at *Heavy quarkonium*, QWG, March 2021 (online)
 Z_b tetraquarks
5. invited review plenary talk at *FPCP 2021*, June 2021, Shanghai (online)
Exotic hadrons in lattice QCD
6. invited talk at *Excited QCD 2020*, February 2020, Krnyca Zdroj, Poland
Lattice study of Z_b and two quarkonium-like channels
7. invited review talk at *LHCb workshop 2019*, 16 october, CERN, Geneva
Lattice results on exotics with hidden charm and bottom
8. invited lecture related to Zois recognition award, DMFA, 27.9.2019, Bled, Slovenija
Quarks, strong force, conventional and exotic hadrons
9. invited review talk at *Beauty 2019*, September 2019, Ljubljana, Slovenia,
Lattice spectroscopy (focus on exotics)
10. Invited talk at *Workshop on Heavy quarkonium*, may 2019, Tornio, Italy
"Charmonium resonances"

11. invited talk *From Euclidian spectral densities to real time physics*, CERN, March 2019
"Towards understanding of charmonia and charmed pentaquarks P_c "
12. invited plenary talk at *Conference on Quarks and Nuclear Physics*, Tsukuba, 2018
"Hadron spectroscopy from lattice QCD"
13. invited talk at *QCD and Its Symmetries*, Oberwölz, September 2018.
"Advances in hadron interactions and spectroscopy from lattice QCD"
14. invited talk at *Technical advances in Lattice Field Theory*, CP3-Origins, Odense, 2017
"Scattering of hadrons with spin and the Roper resonance"
15. invited talk at *Hadron 2017*, 25.9-29.9.2017, Salamanca, Spain
"Lattice studies of charmonia and exotics"
16. invited review talk at LHC Physics 2017 (LHCP 2017), Shanghai, 15-20 May, China
"Heavy flavors on the lattice"
17. invited review talk at *QCD@Work*
"Hadronic spectroscopy and interactions from lattice QCD"
 27-30- June 2016, Martina Franca, Italy
18. invited talk at *Quarkonium 2016*, PNNL, Richland, Washington, USA, 2016
"Charmonia above open thresholds from lattice QCD"
19. invited talk at *Strong interactions in Quantum Field Theory*
"Conventional and exotic hadrons from lattice QCD"
 7.10-9.10.2015, Leibnitz, Austria
20. invited talk at *Belle II B2TiP Workshop*, KEK, Tsukuba, Japan, October 2015
"Conventional and exotic charmonia from lattice QCD"
21. invited talk at *International Workshop on Exotic Hadrons*, Istanbul, Turkey, 2015
"Exotic and conventional charmonia from lattice QCD" (remote talk)
22. invited review plenary talk at *CHARM 2015*, Detroit, USA, May 2015
"Lattice studies of charmonia and exotics"
23. invited review talk at *APS 2015*, Baltimore, USA, April 2015
"Lattice results for new hadronic states"

24. invited talk at *Royal Society Scientific Seminar*, Chicheley Hall, UK, January 2015
"Charmed and beauty states from lattice QCD"
25. invited talk at *Quarkonium 2014*, CERN, November, 2014
" Z_c and tetraquarks with Lattice QCD"
26. invited plenary review talk at *Lattice 2014*, Columbia University, New York, June 2014
"Haddon Spectroscopy"
27. invited plenary review talk at the conference *Mesons 2014*, Cracow, June 2014
"Exotic and conventional mesons from lattice"
28. invited plenary talk at *CHARM 2013*, Manchester, UK, September 2013
"Lattice QCD review of charmonium and open-charm spectroscopy"
29. invited talk at STRONGnet (FP7 Marie Curie EU), Graz September 2013
"Extracting bound states and resonances from the scattering"
30. invited talk at *Excited QCD 2013*, Sarajevo, February 2013
"Hadron resonances from lattice QCD"
31. invited talk at *$B \rightarrow D^{**}$ decays and related issues*, Paris, November 2012
"D-meson resonances in $D\pi$ scattering from lattice QCD"
32. invited talk at symposium of University of Maribor, Slovenia, December 2012
"Hadronic resonances in quantum chromodynamics on the lattice"
33. invited talk at national yearly symposium, Rimske Toplice, Slovenia, October 2012
"Hadronic resonances in quantum chromodynamics on the lattice"
34. invited talk at *Studies of multi-hadron systems*, INT, Seattle, August 2012
"Resonances in $D\pi$ and $K\pi$ scattering"
35. invited talk at the workshop *Hadron Physics from Lattice QCD*, Graz, September, 2012
"Resonances in $D\pi$ and $K\pi$ scattering"
36. invited talk at *Excited QCD 2010*, Stara Lesna, Slovakia, February 2010
"Lattice searches for tetraquarks and mesonic molecules"
37. invited talk at workshop *Hadrons, Lattice QCD and ChPT*, Graz, September 2010
"Lattice QCD simulations of X, Y, Z and light scalar mesons"

Lectures at international schools

1. invited series of lectures at the school "*Bad Honnef Physics school: Methods of Effective field Theory and Lattice Field Theory*", july 2021 (online)
topic: "*Spectroscopy of excited states*"
2. invited series of lectures at the school "*Europlex online school 2020*", Horizon 2020, october 2020 (online)
topic: "*QCD in finite volume*"
3. invited series of lectures at the school "*Scattering from the lattice: applications to phenomenology and beyond*", Trinity College, Dublin, Ireland, 2018
topic: "*Scattering of hadrons in lattice QCD: some applications*"
4. invited lectures at School within Marie Curie Initial Training Network (ITN), STRONGnet 2013, 16.9-20.9 2013, Graz, Austria
topic: "*Extracting bound states and resonances*"
5. invited lectures at School within Marie Curie Initial Training Network (ITN), STRONGnet 2011, 4.10-7.10. 2011, Trento, Italy
topic: "*Tetraquarks*"

Formal projects

- sub-topic convener for planning research activities on *Hadron spectroscopy* in USA for 10-year period (Snowmass 2021)

https://snowmass21.org/rare/hadron_spectroscopy
- principal investigator, MR+ 2019, PhD methorship position in the call of Research Agency ARRS
- principal investigator, joint project between Austrian (FWF) and Slovenian (ARRS) research agencies (October 2013 - October 2015), ARRS N1-0020, "*Lattice QCD study of charmonium-like states*"
principal investigator on the Slovenian side (prof. C.B. Lang from University of Graz:
principal investigator on the Austrian side)
- convener, lattice QCD at Quarkonium(like) Working Group (2014-2017) *Belle II-Theory Interface Platform*, theoretical and experimental panel for proposing measurements at Belle II, book appeared on arxiv 1808.10567

- member, theory coordinators for spectroscopy in forthcoming experiment PANDA at Fair facility, Darmstadt
- member, Horizon 2020 Framework Programme, STRONG-2020, *Hadron Physics from lattice quantum field theory*, NA6 LatticeHadrons, responsible for lattice QCD on the slovenian side, 2019-2022
- member, international project SFB-TR55, *Hadron Physics from Lattice QCD*; Collaborative Research Center financed by German Research Foundation DFG (2008-2020)
- member, "*New physics implications of scalar resonances at the LHC*", ARRS project J1-8137 , 2017-2020 (PI: J. F. Kamenik)
- principal investigator, Slovenian-Austrian bilateral project 2009-2011; ARRS bilateral project BI-AT/09-10-012, principal investigator the on slovenian side
- member, granted computed time on Dirac supercomputer (Great Britain), *Signature of compositness at the LHC*, 2018, 7 million CPUs (PI: V. Drach)
- member, RTN European network FLAVIANet, 2006-2010

Referee for

Physical Review Letters
 Physical Review D
 Journal of High Energy Physics
 European Physical Journal A
 Physics Letters B
 International Journal of Modern Physics C
 Journal of Chinese Physics Letters

Organization of international symposia

- *Physics of the flavorful Universe* , Portoroz 2021, september 2021
- *Belle II Theory Interface Platform*
 26-October 29, 2015, KEK, Tsukuba, Japan
- *Belle II Theory Interface platform*,
 KEK, Tsukuba, Japan, 28.-31.10.2014
- *From Strange, through Charm and Beauty, to the Top*
 16 April 2014, IJS, Ljubljana, Slovenia

- *Probing the Standard Model and New Physics at Low and High Energies*
April 14 - 18 2013, Portorož, Slovenia

Advisory committee or convener at international conferences

- LHCb implications workshop, CERN, October 2021
- Hadrons 2021, Mexico, 2021
- Charm 2018, Novosibirsk, Russia, 2018
- Lattice 2018, Michigan State University, USA, 2018
- Lattice 2015, Kobe, Japan, 2015
- Partial Wave Analysis for Hadron Spectroscopy, Ashburn, Virginia, 2015
- Lattice 2014, New York, USA, 2014

Other committees

- Presern prize for students (2017-), president of the committee at the Faculty, 2017
- Management board, Faculty of Mathematics and Physics UL, 2017-
- Management board, Department of Theoretical Physics, Jozef Stefan Institute, 2017-2020
- selection committee for Tenure Track Professorship at Graz University, 2019

Outreach

- interview: *My journey as a Physicist*, podcast, 2021
- interview: *70 years of Jozef Stefan Institute*, National Geographics, june 2019
- interview: *Zois award winners about science*, RTV Slovenia, 2018
- interview, RTV Slovenija, Jaunary 2019
- article: *Običajni in eksotični hadroni*, Obzornik za matematiko in fiziko, 2016
- article: *Ukrotimo močno interakcijo!*, Novice IJS, 2002

Referee for foreign research agencies and computer projects

- projects for Dirac supercomputer, Great Britain
- research grants by Royal Society, Great Britain
- research grants by Austrian Research agency FWF, Austria

Selected other talks at symposia

1. *Lattice 2021*, MIT, USA, july 2021 (online)
2. *Lattice 2019*, Wuhan, China, june 2019
3. *SFB meeting*, Regensburg, june 2019,
4. *Lattice 2016*, Southampton, UK, july 2016
5. *SFB meeting*, University of Regensburg, October 2016
6. *Belle II Theory Interface platform*, KEK, Tsukuba, Japan, October 2014
7. *Quark confinement and Hadron spectrum IX*, Saint Petersburg, Russia, September 2014
8. *Lattice 2013*, Mainz, Germany, August 3 2013
9. *Lattice 2011*, Squaw Valley, Lake Tahoe, California, July 2011
10. poster at *Lepton-Photon 2009*, Hamburg, poster received the first prize in the theory section
11. *Lattice 2009*, July 26-31, 2009, Peking University, Beijing, China
12. *Lattice 2008*, July 14-19 2008 Williamsburg, Virginia, USA
13. *Scalar mesons and Related Topics* (SCADRON70), Lisbon, Portugal, February 2008
14. *Lattice 2005*, Trinity College, Dublin, July 25-30, 2005
15. *Lattice 2002*, MIT, Boston, USA, July 2002
16. *Lattice QCD and Hadron Phenomenology'*, Seattle, USA, November 2001
17. *Cairo International Conference on High Energy Physics*, Egypt, January 2001
18. konferenca fizikov v osnovnih raziskavah, Zreče, Slovenija, 2000
19. DESY Theory Workshop, Hamburg, September, 2000

20. Rencontre de Moriond, *Electroweak interactions and unified theories*, Les Arcs, March 1999
21. *Hyperons, charm and Beauty Hadrons*, Genova, July 1998

Selected talks at various Institutions

1. TU Munich, 2021 (online)
2. physics colloquium at Physics Department, FMF, Ljubljana, april 2017
3. HICforFAIR colloquium at Justus-Liebig-Universitat Giessen, January 2016
4. Fermilab, Batavia, USA
5. physics colloquium at *Brookhaven National Lab*, New York, USA, July 2015
6. College of William and Mary, Williamsburg, Virginia, USA, april 2015
7. Jefferson Lab, Newport News, Virginia, USA, February 2015
8. George Washington University, Washington DC, USA, March 2015
9. CP3-Origins, Odense, Denmark, march 2014
10. TU Muenchen, Garching , Germany, november 2013
11. Universtitat Wuppertal, Theoretische Physik, Wuppertal, Germany, june 2011
12. Universitat Graz, Institut fur Physik, FB Theoretische Physik, june 2011
13. Universite Paris Sud, Centre d'Orsay, Orsay-Cedex, France, 2010
14. University of Bonn, Germany, 2010
15. University of Graz, Austria, December 2005
16. Centre D'Orsay, Universite Paris Sud, France, September 2005
17. Kolokvij Oddelka za fiziko, FMF, Ljubljana, Maj 2005
18. Brookhaven National Laboratory, New York, USA, May 2002
19. Columbia University, New York, USA, 2002
20. Brookhaven National Laboratory, New York, USA, October 2001
21. Johannes Gutenberg Universitat, Mainz, Germany, July 2001

22. ICTP and SISSA, Trieste, Italy, 2001
23. Vienna, February 2001
24. University of Bari, Italy, 2001
25. University of Trieste, Italy, 2001
26. Technion, Haifa, Israel, 1999
27. University of Zagreb, Croatia, 1998

Mentorship for diploma/master thesis

- Jan Petković, *Lattice QCD study of Z_b tetraquark channel with lattice QCD*, 2020
- Luka Šantelj, *Calculation of masses for the lightest mesons in lattice QCD*, 2009, awarded student Prešern Prize by the faculty
- Luka Leskovec, *Scattering of a pion and kaon in lattice QCD*, 2011

Mentorship for PhD

- dr. Luka Leskovec: *Hadronic resonance in lattice QCD*
defended May 13th 2015
Luka Leskovec received The Jozef Stefan Golden Emblem Prize 2017 (for PhD thesis)
- dr. Urša Skerbiš Štok: *Scattering of particles with spin in lattice QCD*
defended March 2nd 2021
- Mitja Šadl
initiated PhD in October 2019

Examiner of PhD at foreign Universities

- dr. Christian W. Andersen: "*Meson-baryon scattering from lattice QCD ensembles*"
University of Southern Denmark, 2020
- dr. Carlos Hidalgo: "*An Effective Field Theory study of heavy meson-heavy antimeson molecules based on Heavy Quark Symmetries*"
Universitat de Valencia, Spain, 2015

- dr.Valentina Verduci: *"Pion-Nucleon Scattering in Lattice QCD"*
Karl-Franzens-Universitat Graz, september 2014
- dr. Georg Engel: *"Excited Hadrons in Two-Flavor Lattice QCD"*,
Karl-Franzens-Universitat Graz, june 2012

Teaching

- permanently employed as associate professor at Faculty of Mathematics and Physics

Lectures:

- Quantum Field Theory : 2015-
- Mathematical methods for physics students ("Proseminar"): 2017-
- Physics 2 (for mathematics students): 2016-
- Physics (for students at Biotechnical Faculty): 2009-2016
- Physics 2 (for students at Faculty of Chemistry): 2018-

Problem solving classes for physics students:

- Quantum Field Theory
- Physics of nuclei and elementary particles
- Nuclei, quarks and leptons
- Modern Physics II [molecules, nuclei, and particles]
- Introduction to Theoretical Physics I, II, III, IV
- General course on classical physics
- Theory of elasticity
- Labs I

Problem solving classes for non-physics students

of Mathematics, Biochemistry, Biology, students from Bio-technical Faculty, Pharmacy

Textbooks

1. "Solved problems in Physics I and II"
S. Čopar, D. Svenšek, A. Mohorič, S. Prelovšek Komelj
textbook in slovenian with title: Rešene kolokvijske naloge iz fizike I in II
DMFA , 2017, 125 pages, ISBN 978-961-212-273-7 , COBISS.SI-ID 291308544

Scripta for students

1. PRELOVŠEK, Saša in ŠIRCA, Simon: *Exercises for "Modern Physics 2"*
[Fakulteta za matematiko in fiziko], 2014
[COBISS.SI-ID 2717028]
<http://predmeti.fmf.uni-lj.si/modfiz2?action=AttachFile&do=get&target=mf2.pdf>
2. PRELOVŠEK, Saša *Proseminar A*
[Fakulteta za matematiko in fiziko], 2018
<http://predmeti.fmf.uni-lj.si/proseminarA> (pdf of scripta there)
3. PRELOVŠEK, Saša: *Exercises for "Physics 1"*
Ljubljana: [Fakulteta za matematiko in fiziko], 2013.
[COBISS.SI-ID 2601060]
<http://predmeti.fmf.uni-lj.si/fizika1?action=AttachFile&do=get&target=f1.pdf>
4. PRELOVŠEK, Saša: *Exercises for "Physics 2"*
Ljubljana: [Fakulteta za matematiko in fiziko], 2013.
[COBISS.SI-ID 2602340]
<http://predmeti.fmf.uni-lj.si/fizika2?action=AttachFile&do=get&target=f2.pdf>
5. *Exercises for "Nuclei, quarks and leptons"*
<http://ucilnica.fmf.uni-lj.si/course/view.php?id=171>
6. *Exercises for "Physics of Nuclei and Elementary Particles"*
<http://ucilnica.fmf.uni-lj.si/course/view.php?id=288>
7. *Exercises for "Physics 1 and Physics 2" for students of Biochemistry*
<http://ucilnica.fkkt.uni-lj.si/course/view.php?id=2>

Research interests

research area: theoretical physics of elementary particles

Ab-initio study of hadrons using Quantum field theory on the lattice

- Hadron spectroscopy
 - mesons and baryons including light, strange, charmed and bottom quarks
 - masses and decay widths of hadronic resonances
 - hadron states near the strong decay threshold, bound states
 - exotic hadrons, tetraquarks, pentaquarks, mesonic molecules
 - interactions between hadrons, scattering phase shifts and scattering matrix
 - analytic study of relation between scattering matrix and eigen-energies
 - coupled-channel scattering
 - multi-hadron interpolating fields for hadrons with spin
 - systems with two heavy static quarks and light degrees of freedom
- Strongly coupled theories beyond the Standard Model on the lattice
- Symmetries of QCD at high temperatures
- Analytic study of effects from finite volume, non-physical quark masses, mixed actions, (partial) quenching
- Form factors for weak decays
- Wave functions of hadrons

Search for physics beyond the Standard Model in processes including charm quarks (during PhD):

- flavour changing neutral currents: $c \rightarrow u\gamma$, $c \rightarrow ul^+l^-$, $c\bar{u} \rightarrow u\bar{c}$, $\bar{c}u \rightarrow l^+l^-$
- predictions for probabilities of quark processes within and beyond Standard Model (supersymmetric theories, Little Higgs models, ...)
- predictions for corresponding hadron processes using effective field theories: chiral perturbation theory, heavy quark effective theory, and their combinations