

Obrazloženje predloga za izbor Prof. Dr Časlava Bruknera za gostujućeg profesora Fizičkog fakulteta Univerziteta u Beogradu

1 OSNOVNI BIOGRAFSKI PODACI

Licni podaci:

Časlav Brukner je redovni profesor za „*Osnove kvantne mehanike i kvantne teorije informacije*“ („Quantum foundations and quantum information theory“) na Fakultetu za Fiziku Univerziteta u Beču (Boltzmanng. 5, 1090 Vienna) i naučni direktor Instituta za Kvantnu Optiku i Kvantnu Informaciju Austrijske akademije nauka u Beču (IQOQI-Vienna, Boltzmanng. 3, 1090 Vienna). Njegov email je: caslav.brukner@univie.ac.at, a podaci o njegovom istraživanju se mogu naći na web stranicama: <http://quantumfoundations.org> i www.iqoqi-vienna.at

Radno iskustvo:

Brukner je bio zaposlen kao asistent na Fakultetu za Fiziku Univerziteta u Beču od 1999 do 2003 god., a potom kao vanredni profesor u periodu između 2003 i 2013 god. Redovan profesor na katedri „Osnove kvantne mehanike i kvantne teorije informacije“ postaje 2014, a od 2013 istovremeno i „senior group leader“ na Institutu za Kvantnu Optiku i Kvantnu Informaciju Austrijske akademije nauka. Usputne stanice njegove karijere obuhvataju Imperial College London, gde provodi 2003 kao Marie Curie stipendista, Tsinghua University u Pekingu kao „Chair Professor“ u periodu od 2005 do 2008, Univerzitet u Beogradu gde je gostujući profesor od 2008, i konačno, Internacionalni Institut za Fiziku u Natalu, Brazil, gde je „Distinguished Visiting Full Professorship“ od 2017 god. U periodu od 2013 do 2019 biva izvršni direktor Instituta za Kvantnu Optiku i Kvantnu Informaciju u Beču, a od 2020 postaje njegov naučni direktor.

Školovanje:

Brukner je studirao fiziku na Univerzitetima u Beogradu i Beču. Dobija zvanje MSc in Physics (Mag. Rer. Nat.) od Univerziteta u Beču 1995 god. Doktorske studije na temu „*Information in Individual Quantum Systems*“ radi kod Antona Zeilinger-a (inostranog člana SANU i dobitnika Wolf nagrade za fiziku 2010, koja vazi kao druga najznačajnija nagrada nakon Nobelove nagrade) i dobija zvanje Dr. Tech 1999 god od Tehničkog Fakulteta u Beču. Konačno, god. 2003 habilitira u oblasti „*Teoretska Kvantna Fizika*“ na Univerzitetu u Beču na temu „*Information-theoretical Foundations of Quantum Entanglement, Bell's Theorem and Quantum Communication Complexity*“.

2 NASTAVNA AKTIVNOST

Brukner predaje redovno na osnovnim i postdiplomskim studijama kao i na letnjim školama iz kvantne fizike. U okviru osnovnih studija držao je predavanja iz predmeta „Teoretska Klasična Mehanika“ (2012–2016, 2018–2020) i „Kvantna Mehanika“ (2014–2015, 2017–2018, 2021), „Advanced Quantum Mechanics“ (2020) na Univerzitetu u Beču, kao i „Teorijska kvantna optika“ na Imperial College London u Velikoj Britaniji. Drži sledeće kurseve i predavanja na nivou postdiplomskih studija: „Modern Foundations of Quantum Mechanics“ (2005–do sada), „Quantum Information“ (2005–do sada) na Univerzitetima u Beču i Beogradu, „Quantum Causality“ (2017) na VI Quantum Information School Paraty, Brazil; „Gravitational quantum physics“ (2014) na National Laboratory for Physical, University of Science and Technology of China, Hefei University. Objavio je članke u 7 knjiga o kvantnoj informaciji i osnovama kvantne mehanike, od kojih izdajamo: Č. Brukner, *On the quantum measurement problem*, in „[Quantum \[Un\]speakables II](#)“, Eds. R. Bertlmann and A. Zeilinger (The Frontiers Collection, Springer, 2016) i Č. Brukner and M. Zukowski, *Bell's Inequalities: Foundations and Quantum Communication*, in „[Handbook of Natural Computing](#)“, Eds. G. Rozenberg, T.H.W. Baeck, J.N. Kok (Springer, 2011). Zajedno sa vrhunskim naucnicima (među njima su Jeffrey Bub, Arthur

Fine, Anthony Leggett – Nobelova nagrada za fiziku 2003 god., David Mermin, Lee Smolin, Anton Zeilinger i Wojciech Zurek) mu je objavljen intervju u knjizi „Elegance and Enigma: The Quantum Interviews“ (Springer 2011).

Do sada je Brukner bio ili jeste mentor 20-tak PhD i 15-tak Master studenata, kao i velikog broja projekata studenata osnovnih studija. Njegovi studenti su cesto nagrađivani za njihove PhD i Mater teze (dobitnici Hans-Thirring nagrade, nagrade Wilhelm and Else Heraeus Foundation, Loschmidt nagrade Austrian Chemical Physical Society, Doc Award grada Beca, finalisti DPG AMOP Doctorske nagrade etc.) i nakon promocije dobijaju ponude na eminentnim istraživačkim centrima (npr. Harvard University, Perimeter University, University of Oxford, MPQ Munich, University of Queensland etc.) ili dobijaju prestižne post-doc stipendije kao sto je Marie-Curie stipendija. PhD teze dva njegova studenta su nominovana od strane Nemačkog Fizičkog Društva za štampu u izdanju Springer-a. Pet njegovih bivših studenata drže univerzitetske pozicije.

3 NAUCNA AKTIVNOST

Profesionalne aktivnosti:

Brukner je recezent za veliki broj casopisa, ukljucujuci Nature Physics, Nature Communication i Physical Review Letters, kao i naucnih fondacija od kojih izdvajamo European Research Council, John Templeton Foundation, Killam Research Foundations itd. Organizator je 7 velikih internacionalnih konferencija, osnivač i inicijator nagrade “*Paul Ehrenfest Best Paper Award for Quantum Foundations*”, koja se od 2016 dodeljuje za najveća dostignuća u oblasti osnova kvantne mehanike u poslednjih pet godina. Od 2009 do 2012 bio je član John Templeton Foundation’s Eurasian Board of Advisors, a od 2008 do 2015 član Editorial Board casopisa New Journal of Physics. Sluzio je kao član European council u drustvu “International Society of Relativistic Quantum Information” do 2015, a od 2019 do 2022 je councilor istog drustva za Evropu, Srednji Istok i Afriku.

Nagrade:

Sa svojim kolegama (medju njima i Robert M. Wald sa Enrico Fermi Instituta) dobija 2019 god. prvu nagradu *Gravity Research Foundation*-a za najbolje napisani esej o gravitaciji.

(<https://www.gravityresearchfoundation.org/year?rq=brukner> U prošlosti su ovi nagradu dobili pet dobitnika Nobelove nagrade).

Godine 2015 dobija nagradu „*Marko Jarić*“ „za doprinos konceptualnom i teorijskom zasnivanju kvantne mehanike, odnosno za rad na kvantnoj nelokalnosti i problemu kauzalnosti u kvantnoj mehanici, kao i primenu kvantnih korelacija u kvantnoj informatici.“

Naučni rad:

Oblast istraživanja Časlava Bruknera su osnove kvantne mehanike, i njena primena u polju kvantne informatike, kao i fenomeni na granici izmedju kvantne fizike i opšte teorije relativnosti. Njegov h-index je 45, a broj heterocitata 6730 (od toga 570 za članke objavqene u prethodnih 5 godina (SCOPUS, avgust 2021). Njegovi rezultati su publikovani u preko 141 recenziranom radu, izmedju ostalih 28 Physical Review Letters-a, 2 Nature-a, 7 Nature Physics-a i 7 Nature Communications-a, 2 PNAS-a a ima i nekoliko revijalnih radova. Njegov skorasnji rad „Bell’s Theorem for Temporal Order“ je medju 25 najcitanijih radova u Nature Communication u svim disciplinama u 2019 godini. Brukner je održao vise od 190 predavanja na prestiznim univerzitetima i naucnim institutima ukljucujuci Princeton University, ETH Zürich, Berlin-Brandenburgischen Akademie der Wissenschaften und der Deutschen Akademie der Naturforscher Leopoldina, Perimeter Institute, Max-Planck Institut für Quantenoptik u Garching-u i Oxford University. Njegovi radovi su izabrani više puta kao „highlight“ i o njima se pisalo u medijima i naučno-popularnim časopisima. Izdvajamo da je *Nature* tri puta izabrao njegove radove za pregled u okviru “News & Views”, dva puta je *Physics Today* izvestavao o njegovim radovima kao „Top Stories“, kao i *Scientific American*. Čak i je čuveni časopis *Economist* izvestio o rezultatima njegovog istraživanja („[Time may be fuzzy. If so, the idea of](#)

[causality may be in trouble](#)", 8. jun, 2017). Rezultati Bruknera se mogu podeliti u sledeće celine:

1. Kvantna nelokalnost i kvantne korelacije
2. Kvantno-klasični prelaz
3. Kvantna teorija informacije
4. Informaciono-teoretsko zasnivanje kvantne mehanike
5. Kvantni referentni sistemi i kvantna kauzalnost
6. Makroskopski kvantni fenomeni i klasični limit

1. Kvantna nelokalnost i kvantne korelacije: Brukner je stekao međunarodnu naučnu reputaciju najpre svojim rezultatima iz oblasti Belovih nejednakosti i kvantne nelokalnosti. Njegovi radovi i otkrića su omogućila da se na egzaktn način definišu razlike između „kvantnih“ i „klasičnih“ korelacija i čine jednu od najrasprostranjenijih metoda za eksperimentalnu verifikaciju kvantnih korelacija za potrebe kvantne komunikacije i kvantnog računarstva. Jedan od najznačajnijih rezultata Bruknera je otkriće nejednakosti koje nose i njegovo ime, „Werner-Wolf-Zukowski-Brukner nejednakosti“ (ili WWZB nejednakosti), koje je omogućilo egzaktn metod za sistematsku klasifikaciju nelokalnih stanja [122].

2. Kvantna teorija informacija: Jedan od najvažnijih problema u oblasti kvantne informacije jeste izračunavanje kompleksnosti komunikacije (communication complexity). Brukner je dokazao da je narušenje bar jedne Belove nejednakosti potreban i dovoljan uslov da efikasnost kvantnog protokola prevaziđe efikasnost bilo kog klasičnog protokola u ovim problemima [109, 119]. Time je uspeo da pokaže duboku vezu između fundamentalnih i primenjenih osobina kvantnih korelacija i formuliše jedan od retkih kriterijuma u literaturi koji definiše koja kvantno-korelisana stanja su „korisna“. U saradnji sa eksperimentalnom grupom Antona Zeilinger-a, Brukner je razvio prvi teorijski predlog za „pročišćenje“ kvantnih korelacija (entanglement purification) na bazi linearne optike. Veruje se da će metoda iz ovog rada, publikovanog u Nature-u [126] i citiranog preko 723 puta, biti sastavni deo svih budućih protokola kvantne komunikacije na daljinu. U njegovom radu [66] sa najviše citata (1194) Brukner izvodi jednostavan kriterijum za izračunavanje „quantum discord-a“ kao mere neklasičnih korelacija i potencijalnog resursa za kvantne računare.

3. Kvantno-klasični prelaz: Zajedno sa svojim doktorantom Johannes Koflerom, Brukner je 2007. godine razvio novi pristup klasičnom limitu sa težištem na pitanju minimalne preciznosti mernih aparatura da bi se kvantni fenomeni uopšte mogli opservirati. Pokazao je da će, ukoliko je ova preciznost neograničena, kvantni sistemi proizvoljno velike dimenzije narušiti klasičnost definisanu kroz zadovoljenje tzv. Leggett-Garg nejednakosti. Time je potvrdio da limit „velikih kvantnih brojeva“ nije klasični limit. Ukoliko se ograničimo na „zrnasta merenja“ (coarse-grained measurements) – što odgovara preciznosti naših čula u svakodnevnom životu – opservirani fenomeni postaju klasični. Dva rada iz ove oblasti [85,89] su ukupno citirani oko 550 puta. Osim toga Brukner je dokazao da efekti kvantnih korelacija mogu biti detektovani čak i u termodinamičkom limesu velikog broja čestica i visokih temperature merenjem makroskopskih velicina kao što je magnetna susceptibilnost ili toplotni kapacitet [84,100].

4. Informaciono-teorijsko zasnivanje kvantne mehanike: U zajedničkom radu sa Antonom Zeilingerom, Brukner je predložio da se mnogi kvantni fenomeni poput kvantne komplementarnosti, kvantne slučajnosti i kvantnih korelacija mogu razumeti ukoliko se pretpostavi *da jedan kubit sadrži jedan bit informacije* [130,140]. Naslovna priča is New Scientist-a iz 2001 godine posvećena je njihovom pristupu. Ova ideja o konačnosti informacijskog sadržaja kvantno-mehaničkih sistema je korišćena kao osnova za rekonstrukciju formalizma kvantne mehanike iz informaciono-teorijskih aksioma u njegovom radu sa doktorantom Borivojem Dakićem [137]. Ovaj rad iz 2009 godine je otvorio citavu oblast istraživanja koja je poznata kao „rekonstrukcija kvantne teorije“.

5. Kvantni referentni sistemi i kvantna kauzalnost: Poslednjih godina Brukner se bavi fenomenima na granici između kvantne fizike i opšte teorije relativnosti. U okviru ove teme Brukner sa svojim doktorantima predlaže prvi eksperiment u kome bi se gravitaciona vremenska dilataciju opazila kod prostorno delokalizovanih „kvantnih satova“ [61], kao i

ekperiment za merenje moguće deformacije komutacionih relacija kao što se pretpostavlja u fenomenologiji teorije kvantne gravitacije [62]. U nastavku tog istraživačkog pravca predlaže da efekat gravitacione vremenske dilatacija može da dovede do dekoherencije i time klasičnog limesa makroskopskih superpozicija na Zemlji [46]. Nezavisni istraživački pravac u okviru ove teme je utvrđivanje pod kojim se uslovima kauzalne relacije između događaja mogu naći u kvantnoj superpoziciji. 2017 god. Brukner i njegova istraživačka grupa je razvila formalizam kvantne mehanike bez pretpostavke o postojanju globalne kauzalne strukture [51,55] da bi analizirale takve uslove. Veruje se da će ovaj formalizam biti od važnosti u domenu kvantne gravitacije u kome zbog „fluktuacije metrike“ redosled dva događaja nije dobro definisan. U radu iz 2019 god., Brukner i njegova grupa uvode koncept „kvantnih referentnih sistema“ i predlažu da se princip kovarijantnosti proširi na transformacije između ovih referentnih sistema [9,18].

4 SPISAK PUBLIKACIJA

A RADOVI U MEDJUNARODNIM CASOPISIMA

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3. G. Rubino, L. A. Rozema, D. Ebler, H. Kristjánsson, S. Salek, P. A. Guérin, A. A. Abbott, C. Branciard, Č. Brukner, G. Chiribella, and P. Walther, Experimental quantum communication enhancement by superposing trajectories, *Phys. Rev. Research* **3**, 013093 (2021).
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162. Č. Brukner, "Do You Have a Permanent Position?" Selected manuscript at the open

G PREDAVANJA PO POZIVU

1. *Quantum reference frames for space and space-time*, Conference "Quantizing Time", Perimeter Institute, Waterloo, Canada (online), June 14th, 2021

2. *Quantum superposition of entropic times*, Complex Systems and Biological Physics Seminar, Stockholm University, Sweden (online), June 10th, 2021
3. *Quantum reference frames and Einstein's equivalence principle*, Workshop on Quantum Foundations, Gravity, and Causal Order, Perimeter Institute, Waterloo, Canada, June 3rd, 2021
4. *Quantum causality: fundamentals and quantum information applications*, Workshop: "Basic Problems in Quantum Information", The Graduate Centre CUNY, New York, USA (online), May 14th, 2021
5. *The weak and the Einstein equivalence principle for quantum reference frames and spacetimes*, Seminar at the Atomic Institute, Vienna, Austria (online), May 7th, 2021
6. *Formulation and tests of Einstein's equivalence principle in quantum framework*, Quantum Optics Seminar, Ben Gurion University of the Negev, Israel (online), May 5th, 2021
7. *Einstein's equivalence principle for quantum reference frames and spacetimes*, Workshop "The Quantum & The Gravity 2021" (online), April 26th, 2021.
8. *The role of the observer in quantum mechanics (Science Popular, in Serbian)*, Uloga posmatraca u kvantnoj fizici, Üredavanje na Kolarcu, Beograd (online), April 19th, 2021.
9. *On the persistent reality of the observer's perception*, Les Ateliers du Laboratoire Kastler Brossel (online), March 18th, 2021.
10. Participant at the Panel discussion "*Is the moon there when nobody looks?*" hosted by Ignacio Cirac, "Munich Quantum Stammtisch" (online), March 17th, 2021.
11. Participant at the Panel discussion "*Optomechanical interfaces of quantum mechanics and gravity*" (online), 17th February, 2021, UNIKORN Seminars, British Optomechanical Research Network, video: <https://www.youtube.com/watch?v=YwGN0JbTJdM&feature=youtu.be>
12. *Einstein's equivalence principle for quantum reference frames and spacetimes*, WE-Heraeus-Seminar on "Experimental Tests and Signatures of Modified and Quantum Gravity" (online), February 5th, 2021
13. *Quantum superposition of processes with opposing thermodynamic arrows of time*, the virtual seminar of the Quantum Information Structure of Spacetime (qiss.fr), 17th December 2020
14. *Quantum superposition of processes with opposing thermodynamic arrows of time*, Workshop "Is Quantum Theory exact? Exploring Quantum Boundaries" (online), 10th December 2020.
15. *The covariance of physical laws in quantum reference frames*, Seminar at the Particle Physics Group, Vienna, Austria, March 10th, 2020
16. *Timeless formulation of Wigner's friend scenarios*, The Quantum Information Structure of Spacetime Workshop, The Hong Kong University, 15th January 2020
17. *Timeless formulation of Wigner's friend scenarios*, Invited Colloquium at Perimeter Institute, December 11th, 2019.
18. *Observing the observer*, Académie des Sciences Morales et Politiques, 5th November 2019, Paris, France
19. *The covariance of physical laws in quantum reference frames*, 5th International Conference for Young Quantum Information Scientists, 27th September 2019, Sopot, Poland
20. *How the world look like for a quantum particle*, Conference "Quantum Limits of Knowledge", the Niels Bohr Institute, June 18th, 2019, Copenhagen, Denmark
21. *Quantum Causality: Fundamentals and Applications*, Peng Cheng Laboratory - SUSTech, May 29th, 2019, Shenzhen, China
22. *The covariance of physical laws in quantum reference frames*, X International Symposium "Quantum resources: theory and applications", May 23rd, 2019, Gdansk, Poland
23. *Quantum Causal Structures*, Program "New Directions in Quantum Information" (The S Week), April 15th, 2019, Stockholm, Sweden
24. *How the world looks like for a quantum particle? - The covariance of physical laws in quantum reference frames*, Seminar at the Belgian Quantum Physics Initiative, April 4th, 2019, Brussels, Belgium

25. *A no-go theorem for objective facts*, Subjectivistic interpretations of quantum probabilities, Journées d'étude à l'Ecole Normale Supérieure, March 14th, 2019, Paris, France
26. *Wigner's friend as a rational agent*, Invited talk at the APS March Meeting 2019, March 7th, 2019, Boston, Massachusetts, USA
27. *Quantum Causal Structures*, Workshop of the COST Action MP1405, Quantum Structure of Spacetime QSPACE, February 15th, 2019, Bratislava, Slovakia
28. *How the world looks like for a quantum particle? - The covariance of physical laws in quantum reference frames*, 2nd Hong Kong-Shenzhen Workshop on Quantum Information Science, November 26th, 2018, Shenzhen, China
29. *Quantum mechanics and the covariance of physical laws from quantum reference frames*, Workshop "Gravity in Qubits", SAS Congress Center, Smolenice, November 22nd, 2018, Slovakia
30. *Wigner's friend as a rational agent*, Quantum Maiwair Workshop, The University of Queensland, November 6th, 2018, Australia
31. *(In)definite causal structures in quantum theory and gravity*, The University of Queensland Physics Colloquium, November 2nd, 2018, Australia
32. *Wigner's friend as a rational agent*, Workshop on Concepts of Probability in the Sciences, Erwin Schrödinger Institute, October 30th, 2018, Vienna, Austria
33. *Time and Causality in Quantum Mechanics*, Paul Scherrer Institute Colloquium, October 25th, 2018, Villigen PSI, Switzerland
34. *Quantum Causal Structures*, Progress and Visions in Quantum Theory in View of Gravity: Bridging foundations of physics and mathematics, Max Planck Institute for Mathematics in the Sciences, October 5th, 2018, Leipzig, Germany
35. *Quantum mechanics and the covariance of physical laws from quantum reference frames*, Keynote Speaker, Quantum Foundations and Quantum Information Workshop, July 21st, 2018, Natal, Brazil
36. *Quantum mechanics and the covariance of physical laws from quantum reference frames*, 4th Seefeld workshop on Quantum Information, July 6th, 2018, Seefeld, Austria
37. *Quantum Causal Structures*, Conference "New Directions in the Foundations of Physics", Palazzo dei Papi, June 10th, 2018, Viterbo, Italy
38. *Review of Process Matrix Formalism*, Workshop "Interplay of quantum information, foundations and gravity", June 1st, 2018, Austrian Academy of Sciences, Vienna, Austria
39. *A no go theorem for observer-independent facts*, Workshop: "Algorithmic Information, Induction and Observers in Physics" at the Perimeter Institute, April 10th, 2018, Waterloo, Canada
40. *Quantum superpositions of causal orders*, Symposium on the latest achievements in physics on the occasion of the 20th anniversary of the "Prof. Dr. Marko Jaric" Foundation, March 24th, 2018, Faculty of Physics, Belgrade, Serbia
41. *Kauzalnost u kvatnom svetu* (in Serbian), Beogradska škola kvantne mehanike, Serija predavanja, March 22nd, 2018, Faculty of Physics, Belgrade, Serbia
42. *Causality in a Quantum World*, Colloquium at the International Institute of Physics, February, 27th, 2018, Natal, Brazil
43. *Bell's theorem for temporal order*, January 22nd, 2018; *A no-go theorem for the "facts of the world"*, January 23rd, 2018, Workshop on Observers in Quantum Gravity, The University of Rome La Sapienza, Italy
44. *Quantum tests of time dilation and equivalence principle*, The 48th Winter Colloquium on the Physics of Quantum Electronics, January 10th, 2018, Snowbird, Utah, USA
45. *Causality in a Quantum World*, Discussion meeting: Foundations of quantum mechanics and their impact on contemporary society, The Royal Society, December 12th, 2017, London, UK
46. *Bell's Theorem for Temporal Order*, Seminar at the Perimeter Institute, November 15th, 2017, Waterloo, Canada.

47. *Bell's Theorem for Temporal Order*, Seminar of the Gravitational Group, University of Vienna, November 9th, 2017
48. *Quantum Causality Lectures*, the VI Quantum Information School Paraty 2017, Lecture I: Device-independent approach to causality: Causal inequalities and causal polytope; Lecture II: Device-dependent approach to causality: Causally non-separable processes; Lecture III: Quantum information processing on indefinite causal structures, August 14th to 18th, 2017 Paraty, Brazil
49. *Quantum theory with no global causal order*, Probing the spacetime fabric: from concepts to phenomenology, SISSA/ISAS, July 14th, 2017, Trieste, Italy
50. *Can causal relations be put in a quantum superposition?* Wolfson Time Unconference, Wolfson College, University of Oxford, June 30th, 2017, Oxford, UK
51. *Quantum formulation of the Einstein Equivalence Principle*, Theoriekolloquium der Uni Duisburg-Essen, June 23rd, 2017, Germany
52. *A no-go theorem for "facts of the world"*, Workshop on Participatory Realism, Stellenbosch Institute for Advanced Study, June 7th, 2017, Stellenbosch, South Africa.
53. *Bell's theorem for temporal order*, 14th Central European Quantum Information Processing Workshop (CeQIP), May 31st, 2017, Smolenice, Slovakia
54. *Wigner & Friends: A no-go theorem for "facts of the world"*, Workshop Quantum Foundations: The physics of "what happens" and the measurement problem, May 25th, 2017, Frascati, Italy.
55. *Quantenspiele*, Das Festival der österreichischen Wissenschaft WissensDurst, May 17th, 2017, Vienna, Austria
56. *Quantum information on indefinite causal structures*, Conference Secure Communication via Quantum Channels, April 26th, 2017, Zentrum für interdisziplinäre Forschung, Universität Bielefeld, Germany
57. *The Rashomon effect: when interpretations of quantum theory disagree*, "Shut Up and Contemplate!" Symposium, University of Vienna, March 3rd, 2017, Vienna, Austria
58. *Quantum formulation of the Einstein Equivalence Principle*, Scuola Internazionale Superiore di Studi Avanzati (SISSA), February 15th, 2017, Trieste, Italy
59. *Quantum-to-classical transition via coarse-grained measurements*, Nikola Buric Memorial Workshop, Institute of Physics, December 10th, 2016, Zemun, Serbia
60. *Bell's theorem for temporal order*, "Quantum Networks" Workshop, International Institute of Physics, November 22nd, 2016, Natal, Brazil
61. *A no go theorem for "facts of the world"*, conference „Quantum phenomena: Between the whole and the parts“, National Quantum Information Centre, Keynote Speaker, September 23rd, 2016 Gdańsk, Poland
62. *Quantum formulation of the Einstein's Equivalence Principle*, Eighth International Workshop DICE 2016 Spacetime - Matter - Quantum Mechanics, September 15th, 2016, Castiglioncello (Tuscany), Italy
63. *Quantum formulation of the Einstein's Equivalence Principle*, the Frontiers of Matter Wave Optics conference (FOMO) 2016, September 13th, 2016, Arcachon, France
64. *Quantum mechanics and quantum information on indefinite causal structures*, Quantum Technologies Workshop Program Jerusalem-Vienna, Hebrew University, May 30th, 2016, Jerusalem, Israel
65. *Quantum information on indefinite causal structures*, Hong Kong Workshop on Quantum Information and Quantum Foundations, Hong Kong University, May 4th, 2016, Hong Kong, China
66. *Quantum information on indefinite causal structures*, "Quantum Information in Spain ICE-3", at IFISC (CSIC-UIB), April 13th, 2016, Palma de Mallorca, Spain
67. *Indefinite causal order in quantum physics*, The joint McGill-Oxford Workshop on Causality in Quantum Foundations, March 20th, 2016, Bellairs Research Institute, Barbados
68. *Bell's theorem for causal order between events*, Workshop "Quantum Limits of Information Processing", School of Physical & Mathematical Sciences, NTU, March 4th, 2016, Singapore

69. *Time dilation in quantum systems and decoherence*, DPG-Frühjahrestagung, 29.02. – 04.03.2016, Keynote Speaker, February 29th, 2016, Hamburg, Germany
70. *Decoherence due to time dilation*, 605. WE-Heraeus-Seminar on “Macroscopic Entanglement”, January 21st, 2016, the “Physikzentrum Bad Honnef”, Germany
71. *Indefinite causal order in quantum mechanics*, The 11th “Vienna Central European Seminar on Particle Physics and Quantum Field Theory” with the topic “Quantum & Gravity”, Faculty of Physics, University of Vienna, November 28th, 2015, Austria
72. *Time Dilation in Quantum Systems*, Seminar at the Physics Department, University of Basel, November 6th, 2015, Basel, Switzerland
73. *Quantum Clocks and Time*, Conference “Emergent Quantum Mechanics 2015”, Vienna University of Technology, October 25th, 2015, Vienna, Austria
74. *Progress on studies of indefinite causal order in quantum physics*, Conference on “Experimental Tests of Quantum Reality” at St Anne’s College, Oxford, September 29th, 2015, UK
75. *QIPC on indefinite causal structures*, Quantum Information Processing and Communication (QIPC), Plenary Speaker, September 17th, 2015, Leeds, UK
76. *Detecting indefinite causal orders in quantum physics*, Workshop on Time in Physics, ETH Zurich, September 9th, 2015, Zürich, Switzerland
77. *Gravitationally interacting quantum clocks*, Relativistic Quantum Information – North 2015, Dartmouth College, July 7th, 2015, Hanover, USA
78. *Quantum time and quantum causality*, Physics Week School, Federal University of Goiás, June 10th -12th, 2015, Brasil
79. *On the quantum measurement problem*, Seminar “Quantum antinomies and reality”, Fondation des Treilles – Tourtour, June 5th, 2015, France
80. *On the quantum measurement problem*, Conference “Quantum Physics of Nature” (QUPON) May 22nd, 2015, Vienna, Austria
81. *Indefinite causal order in quantum mechanics*, Information Theoretic Foundations for Physics Conference, May 11th, 2015, Perimeter Institute, Waterloo, Canada
82. *Quantum clocks and quantum causality*, Colloquium at the Naturwissenschaftlich-Technische Fakultät, Universität Siegen, April 16th, 2015, Germany
83. *Quantum clocks and quantum causality*, Physics Colloquium at the Physics Department of the University of Crete, March 26th, 2015, Iraklion, Greece
84. *Physical reality in the eye of a quantum physicist*, Talk given at the occasion of receiving “Marko Jaric” Prize, Rectorate of the University of Belgrade, March 20th, 2015, Belgrade, Serbia
85. *Quantum clocks and decoherence due to time dilation* (in Serbian), Seminar of the Institute of Physics, March 19th, 2015, Zemun, Serbia
86. *Quantum causality* (in Serbian), Seminar of the Faculty of Physics, March 18th, 2015, Belgrade, Serbia
87. *Decoherence due to time dilation*, Advances and future of fundamental problems of quantum physics studied at different energies – COST-workshop MP1006 “Fundamental Problems in Quantum Theory”, February, 27th, 2015 Vienna, Austria
88. *Decoherence due to time dilation*, Workshop on Hierarchy of Quantum Mechanics, February 22nd, 2015 Okazaki, Japan
89. *Quantum Clocks and Quantum Causality*, seminar at the Gravitational Physics Group of the University of Vienna, January 15th, 2015, Vienna, Austria
90. Lecturer at the University of Innsbruck, Mini Series of Lectures: *Gravitational Quantum Physics*, January 7th to 9th, 2015, Innsbruck, Austria
91. *Quantum Clocks and Quantum Causality*, seminar at the Excellence Cluster “PRISMA” and the Graduate School “Symmetry Breaking” at the University of Mainz, December 3rd, 2014 Germany

92. *Quantum Clocks and Quantum Causality*, Colloquium at the opening event Quantum Information Technologies, Madrid 2014 (QUITEMAD+), Facultad de Ciencias Matemáticas UCM, November 28th, 2014, Madrid, Spain
93. *Communication and computation without causal order*, Inauguration workshop of the Paris Centre for Quantum Computing (PCQC) in Paris, Institute Henri Poincare, August 28th, Paris, France
94. *Can quantum-mechanical description of causal relations be considered complete?*, Quantum [Un]Speakables II: 50 Years of Bell's Theorem, June 19th, 2014, Vienna, Austria
95. *Quantum theory: First reconstruction and then interpretation*, Quantum Theory: from Problems to Advances – QTPA at Linnaeus University, Vaxjo, June 12th, 2014, Sweden,
96. *Quantum Causality: from suppositions of clocks to quantum correlations with no causal order*, Physics Colloquia, Graduate School in Science and Technology, University of Pavia, April 10th, 2014, Italy
97. *Quantum Causality: from suppositions of clocks to quantum correlations with no causal order*, Plenary Speaker, The COST action Fundamental Problems in Quantum Physics, Weizmann Institute of Science, March 27th, 2014, Israel
98. *Quantum correlations compatible with no-causal loops*, Symposium Quantum Correlations Beyond Entanglement, DPG Tagung, March 18th, 2014, Berlin, Germany
99. *No-causal loop principle and quantum correlations*, 554. WE-Heraeus-Seminar: “Quantum Contextuality, Non-Locality, and the Foundations of Quantum Mechanics”, February 19th, 2014, Badhonnef, Germany
100. *Quantum correlations with indefinite causal order*, Conference of the Foundational Questions Institute FQXi, January 7th, 2014, Vieques, Puerto Rico
101. Lecture Series, *Physics of Quantum Information*, Faculty of Physics, University of Belgrade, December 23rd – 27th, 2013, Belgrade, Serbia
102. *Quantum indefiniteness of causal relations*, EmQM13 Emergent Quantum Mechanics – 2nd International Symposium, October 3rd – 6th, 2013, Vienna
103. Lectures Series, *Gravitational quantum physics*, National Laboratory for Physical Sciences at Microscale, University of Science and Technology of China, September 18th – October 2nd, 2013, Hefei, P. R. China
104. Plenary talk, *Quantum interference of “clocks”*, Congress of the South African Institute of Physics, Richardsbay (University of Zululand) July 12th, 2013, South Africa
105. *Quantum correlations with indefinite causal order*, School of Chemistry and Physics, University of KwaZulu-Natal, July 5th, 2013, Durban, South Africa
106. *Quantum correlations with indefinite causal order*, Workshop on closed time-like curves in quantum mechanics, June 24th – 29th, 2013, Les Treilles, France.
107. *Quantum information, time and causality*, Photonics & Quantum Sciences Research Institute, Heriot-Watt University, May 10th, 2013, Edinburgh, UK
108. Plenary Talk, *Quantum correlations with indefinite causal order*, XII Конгрес физичара Србије, Vrnjacka Banja, 2nd May, 2013.
109. *Formalism for operational theories with no causal order*, Quantum Malawi Workshop, April 19th – 29th, 2013, Malawi.
110. *Quantum correlations with indefinite causal order*, Invited Session at the APS March Meeting, Baltimore, March 2013.
111. *New Tests of Quantum Physics*, Department of Physics and Astronomy, University of Sussex, March 4th, 2013, Brighton, United Kingdom.
112. Keynote Speaker, *Quantum Causality*, Workshop: Quo Vadis Quantum Physics, International Institute of Physics, 18th February – March 1st, 2013, Natal, Brazil,
113. *Quantum correlations with no causal order*, Macroscopic Realism and Quantum Physics (MareQ) Symposium, December 13th, 2012, Gdansk, Poland.

114. *Quantum correlations with indefinite causal order*, The Eleventh International Conference on Quantum Communication, Measurement and Computation (QCMC), Vienna University of Technology, 30 July – 3 August 2012, Vienna, Austria.
115. *Quantum correlations with indefinite causal relation*, Quantum Information Workshop, July 1 – 6th, 2012, in Seefeld in Tirol, Austria.
116. *Quantum Interference of “Clocks”*, Conference: “Relativistic Quantum Information”, Perimeter Institute, June 25 – 28th, 2012, Waterloo, Canada.
117. *Quantum interference of “clocks”*, 508. WE-Heraeus-Seminar: “Quantum Meets Gravity and Metrology”, Physikzentrum Bad Honnef, 4th – 8th June, 2012, Bad Honnef, Germany
118. *Quantum tests with clocks and mirrors in gravity*, Seminar für Neutron-, Festkörper-, und Quantenphysik, Atominstitut der österreichischen Universitäten, May 25th 2012, Vienna, Austria
119. *Quantum tests with clocks, mirrors and Alice and Bob in gravity*, Seminar at Palacký University Olomouc, Faculty of Science, May 11th 2012, Olomouc, Czech Republic
120. *Interference experiments distinguishing between quantum and generalized probabilistic theories*, Seminar at the Department of Theory of Programming Faculty of Informatics, Masaryk University, May 9th 2012, Brno, Czech Republic
121. *Tests distinguishing between quantum and more general probabilistic theories*, Workshop “Foundational questions of quantum information” in CEA, April 4 – 5, Paris, France
122. *Quantum information meets gravity*, Quantum Information Sciences Workshop, March 23 – 26th, 2012, Oxford, UK
123. *Towards the new generation of tests of quantum mechanics*, Workshop: Quantum Foundations in the Light of Quantum Information III”, Centre De Recherches Mathématiques, December 6-12, 2011, Montreal, Canada.
124. *Quantum Games*, „physics:science@school“, eine Kooperation der Fakultät für Physik und des Stadtschulrates Wien, GRG 17, Parhamerplatz 18, November 30, 2011.
125. *Reconstruction of quantum theory: The role of information*, Workshop: Foundations of Quantum Theory: measurement, the quantum to classical transition, and the flow of time, October 26 – 28, 2011, Cape Town/Stellenbosch, South Africa.
126. *Quantum theory in space of probabilistic theories*, International Workshop, Relativistic Quantum Information North, 6 – 8 September 2011, Madrid, Spain.
127. *For and Against Measurement*, The Quantum Physics and the Nature of Reality Meeting, July 3 – 7, 2011, International Academy Traunkirchen, Austria.
128. *Quantum correlations with no causal order*, International Conference: Computability in Europe 2011, “Models of Computation in Context”, 27th June – July 2nd, 2011, Sofia, Bulgaria.
129. *Quantum Discord: Quantification and Operational Meaning*, ESF-PESC Strategic Workshop on Signatures of Quantumness in Complex Systems, June 29th – July 3rd, 2011, Nottingham, United Kingdom.
130. Lecturer at the University of Belgrade, Project of the World University Service, Course: “*The Physics of Quantum Information*”, Faculty of Physics, University of Belgrade, May 23rd – June 3rd, 2011, Belgrade, Serbia.
131. *Quantum correlation with no causal order*, International Conference: Conceptual Foundations and Foils for Quantum Information Processing, Perimeter Institute, May 9 – 13, 2011, Ontario, Canada.
132. *Bell’s inequalities: quantum versus classical probabilities*, Seminar at Kurt Gödel Research Center for Mathematical Logic, April 6th, 2011, Vienna, Austria
133. *Quantum Discord: what it is good for and how to measure it*, Seminar at the Department of Theory of Programming Faculty of Informatics, Masaryk University, March 30th, 2011, Brno, Czech Republic
134. *Quantum correlations do not imply causal order*, International Conference: “New Frontiers in Quantum Foundations, CUPi 2011”, Clemson University, March 10th, 2011, South Caroline, USA.

135. *Measuring Quantum Discord*, International School and Conference on Quantum Information Processing and Applications (QIPA-2011), February 19th, 2011, Harish-Chandra Research Institute (HRI), Allahabad, India.
136. Lecturer at an International School on Quantum Information Processing and Applications (QIPA-2011), Lectures: *Harnessing Quantum No-Go Theorems*, 14 – 20 February, 2011, Harish-Chandra Research Institute (HRI), Allahabad, India.
137. *Measuring Quantum Discord*, Seminar at NORDITA, University of Stockholm, November 10th, 2010, Stockholm, Sweden.
138. *Classical Limit of Quantum Fields*, International Conference: “Quantum coherence and correlations in condensed-matter and cold-atom systems”, 11 – 15 October 2010, Évora, Portugal.
139. *Harnessing Quantum Paradoxes*, October 16th, 2010, VERA Seminar, Vera Laboratory, Fakultät für Physik, Universität Wien.
140. *Why the Quantum? News from an information-theoretical approach*, “Quantum Physics and the Nature of Reality”, International Conference in honour of John Polkinghorne’s 80th birthday, 26 – 29 September 2010, University of Oxford, UK.
141. *MUBs in generalized probabilistic theories*, Workshop: “Quantum Physics in Higher-Dimensional Hilbert Spaces”, July 27 – August 01, 2010, Internationale Akademie Traunkirchen, Austria.
142. *Quantum theory and beyond: Is entanglement special?*, Workshop: “What exists in the quantum world?”, July 19 – 24, 2010, Internationale Akademie Traunkirchen, Austria.
143. *Information Complementary Relation in Quantum Mechanics*, Lecture Series “Contemporary Views on Entropy in Classical, Quantum and Complex Systems”, University of Vienna & Medical University of Vienna, June 23rd, 2010, Austria
144. *Probabilistic Theories: Why Quantum Theory?*, 7th Central European Quantum Information Processing Workshop, 3 – 6 June 2010, Valtice, Czech Republic
145. *Nonlocal Setting and Outcome Information for Violation of Bell’s Inequalities*, 9th Conference „New Directions in the Foundations of Physics“, the Mathematical Association of America, April 30th to May 2nd, 2010 Washington, DC, USA
146. *Quantum theory and beyond: Is entanglement special?*, Seminar at the Department of Theory of Programming Faculty of Informatics, Masaryk University, April 21st, 2010, Brno, Czech Republic
147. *Quantum theory and beyond: Is entanglement special?*, Seminar at Faculty of Science, University of Granada, April 13th, 2010, Spain
148. *Correlations: Classical, Quantum and Beyond Quantum?*, Vortrag im Rahmen des Chemisch-Physikalischen Gesellschaft, 9. März 2010, Vienna, Austria.
149. *Impossibility of “mirror” quantum mechanics*, Seminar at Institute of Theoretical Physics, ETH Zürich, 18th February, 2010, Zürich, Switzerland.
150. *The quantum to classical transition and the complexity of Schrödinger-cat states*, Workshop “Fluctuations, information flow and experimental measurements”, 28 – 29 January 2010, Complex Systems Institute, École Supérieure de Physique et de Chimie Industrielles, Paris, France
151. Plenary talk, *Quantum theory and beyond: Is entanglement special?*, 4th QNET Workshop, 10 – 11 December 2009, in the Computing Laboratory of the University of Oxford, UK.
152. *Impossibility of “mirror” quantum mechanics*, Workshop on Quantum Correlations, 30 Nov. - 4 Dec. 2009, Centre for Quantum Technologies, NUS Singapore, Singapore
153. *Going Beyond Classical and Quantum Probabilities*, Erwin Schrödinger Symposium 2009, November 20 – 21 2009, Prague, Czech Republic.
154. *What are the costs of dealing with “states of reality” in quantum theory?* Perimeter Institute, International Conference: The Perimeter Institute Australia Foundations (PIAF) ‘09, “New Perspectives on the Quantum State”, September 27th - October 2nd, 2009, Waterloo, Canada.
155. *Quantum Mechanics as a Theory of Systems with Limited Information Content*, Perimeter Institute, International Conference: Reconstructing Quantum Mechanics, August 9th – 16th, 2009, Waterloo, Canada.

156. *Resources for simulating quantum measurements*, Seminar at Slovak Academy of Sciences, May 12th, 2009, Bratislava, Slovakia.
157. *Recent research results of the Vienna theory group*, Seminar at the Institute of Photonic Sciences ICFO, October 17th, 2008, Barcelona, Spain.
158. Keynote Speaker, *Quantum experiment can test mathematical undecidability*, UC 2008 - 7th International Conference on Unconventional Computation, August 25-28th, 2008, Vienna, Austria.
159. *The quantum to classical transition and the complexity of Schrödinger-cat states*, 15th Central European Workshop on Quantum Optics 2008, May 30th - June 3rd, 2008, Belgrade, Serbia.
160. *Physics of systems with limited information resources*, Workshop "Information primitives and laws of nature", May 14th, 2008, ETH Zürich, Switzerland.
161. *Quantum, classical and coarse-grained measurements*, "Quantum Prague", Workshop on modern trends in quantum optics and quantum information, Department of Physics & Doppler Institute, FNSPE CTU, May 2nd, 2008, Prague, Czech Republic.
162. *Quantum Information and the Foundations of Quantum Physics*, Transdisziplinärer Workshop "Information, Control and Communication", Die Junge Akademie an der Berlin-Brandenburgischen Akademie der Wissenschaften und der Deutschen Akademie der Naturforscher Leopoldina, April 10th - 12th, 2008, Berlin, Germany.
163. *Testing the (un)decidability of mathematical propositions in quantum experiments*, International School and Conference on Quantum Information, Institute of Physics, Bhubaneswar, Orissa, 4th to 13th March, 2008, India.
164. *Quantum Physics and the Finiteness of Information*, Deep Beauty: Mathematical Innovation and the Search for an Underlying Intelligibility of the Quantum World, Princeton University, 3rd to 4th October 2007, Princeton, USA.
165. *Non-locality and Information in Quantum Physics*, Meeting and Symposium ENRAGEing Ideas (Meeting of the Marie Curie Research and Training Network: Random Geometry and Random Matrices: From Quantum Gravity to Econophysics), Utrecht University, 7th to 8th September 2007, Utrecht, Netherlands.
166. Lecturer at the School of Quantum Information and Quantum Computation (SQIQC 07): *Quantum Information Theory*, 14th to 21st May 2007, University of Kragujevac, Serbia.
167. *Classical Physics from Quantum World*, Gdansk 2006 Advanced NATO Workshop, 10th -13th September 2006, Gdansk, Poland.
168. *From quantum nonlocality to communication complexity* (1. talk), 29 May 2006 & *Testing and utilizing macroscopic entanglement* (2. talk) 30th May, Korean Institute of Advanced Studies, Seoul, Korea.
169. *Testing and utilizing macroscopic entanglement*, Annual Meeting of the Atom and Molecular Physics Division in Korean Physical Society, 26th to 27th May 2006, Seoul, Republic of Korea
170. *Quantum Nonlocality: Fundamentals & Reduction of the Communication Costs*, the 3rd workshop Central European Quantum Information Processing, May 4th - 8th, 2006, Znojmo, Czech Republic.
171. *Macroscopic Effects of Quantum Entanglement*, Seminar "Order and disorder in complex systems", Institut für Materialphysik, University of Vienna, January 18th, 2006, Vienna, Austria.
172. *Fundamental Link: Bell's Inequalities and Quantum Communication Complexity*, The meeting "Quantum computation and communication with errors" of the Quantum Information Processing Program of the Canada Institute for Advanced Research, December 8th -10th, 2005, Quebec City, Canada.
173. *Measures of Information in Quantum Physics*, Workshop: "Information Beyond Shannon", Interdisciplinary Information Science and Technology Laboratory of the University of Central Florida, October 27-28, 2005, Orlando, USA.
174. Lecturer at the Quantum Information Theory & Technology Summer School, the Cambridge-MIT Institute, Course: *Quantum Nonlocality and Quantum Communication Complexity*, 31st August-5th September 2005, Belfast, United Kingdom.
175. *Macroscopic Phenomena of Quantum Entanglement*, Nonlocal Seminar Vienna-Bratislava, University of Vienna, 24th June 2005, Vienna, Austria.

176. *Quantum versus Classical: Physics and Computation*, Workshop „What is Quantum in Quantum Computation“, 18th – 20th May 2005, University of Konstanz, Germany.
177. *How to compute a function without knowing its input? Using quantum entanglement!*, Seminar at the Centre for Logic and Computation, Department of Mathematics, University of Lisbon, 19th April 2005, Lisbon, Portugal.
178. *Quantenkommunikation: Sicherer und Effizienter*, Seminar at the Statistical Group, Department of Mathematics, University of Klagenfurt, 27th January 2005, Klagenfurt, Austria.
179. *Macroscopic Phenomena of Quantum Entanglement*, Seminar at the Ecole Polytechnique, Faculte des Sciences Appliquees, University of Bruxelles, December 22nd, 2004, Brussels, Belgium.
180. *Macroscopic Effects of Quantum Entanglement*, Seminar at the Max-Planck Institut für Quantenoptik, 11th November 2004, Garching, Germany.
181. *From “Clicks” to the “Quantum”*, International Workshop on “Information and Quantum Physics” University of Vienna, October 31st - November 1st, 2004, Vienna, Austria.
182. *Information, Quantum and Complexity*, ESF International Workshop on Quantum Information & Logical Aspects, September 23rd – 25th, 2004, Porto Conte (Sassari, Sardinia), Italy.
183. *Entanglement in Space and in Time*, QUOXIC (Quantum Oxford Imperial) Meeting, Oxford University – Computing Laboratory, 19th March 2004, Oxford, United Kingdom.
184. *Can Quantum Nonlocality be Used to Save on Communication?*, Seminar at the Physics Department, Imperial College London, 10th December 2003, London, United Kingdom.
185. Lecturer at the University of Belgrade, Project of the World University Service, Course: „*The Physics of Quantum Information*“, Faculty of Physics, University of Belgrade, 16th – 19th December 2003, Belgrade, Serbia.
186. *Entanglement and Complexity of Communication*, Seminar at the Institute of Theoretical Physics and Astrophysics, Faculty of Science, Masaryk University, 11th November 2003, Brno, Czech Republic.
187. *Nonlocal Computation via Quantum Nonlocality*, Seminar at the Department of Optics, Palacky University, 10th November 2003, Olomouc, Czech Republic.
188. *Bell's Theorem: From a Discrete to a Continuous Quantum System*, Seminar at the Research Centre for Quantum Information, Slovak Academy of Sciences, 7th November 2003, Bratislava, Slovakia.
189. Lecturer at the Triangle Graduate School 2003 in Particle Physics, Course: “*The Physics of Quantum Information*“, 22nd – 26th September 2003, Bundesheim Raach, Semmering, Austria.
190. *What are Bell's inequalities good for?*, Young European Physicists Meeting: “Experimental Realization of Quantum Bits”, 2nd May 2003, Budmerice, Slovakia.
191. *Information, Bell's Inequalities and Quantum Communication Complexity*, Quantum Structures 2002, Biannual Meeting of the International Quantum Structure Association, Technical University of Vienna, 3rd July 2002, Vienna, Austria.
192. *Quantum Nonlocality: Fundamentals and Applications*, Seminar at the School of Mathematics and Physics, Queen's University, 17th May 2002, Belfast, United Kingdom.
193. *Local Realism, Information and Entanglement*, Seminar at the Faculty of Physics, University of Belgrade, 24th April 2002, Belgrade, Serbia.
194. *Optimal Quantum Procedures and Optimal State Estimation*, Workshop on Quantum Information, 28th – 31st October 2000, Budmerice, Slovakia.
195. *Information and the Foundations of Quantum Physics*, Seminar at the Institute for Physics, 22nd October 1999, Belgrade, Serbia.
196. *Quantum Complementarity and Information Invariance*, Workshop on Quantum Coherence, University of Vienna, 13th August 1999, Vienna, Austria.

Magistar Fizičkih nauka, Magistarska teza: "*Diffraction of Matter Waves in Space and Time*", 1995, Univerzitet u Beču

Doktor tehničkih nauka, Doktorska disertacija: "*Information in Individual Quantum Systems*", 1999, Bečki Univerzitet Tehnologije

ZAKLJUČAK

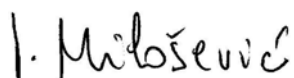
U okviru naučne oblasti Kvantna i matematička fizika, kvantna informatika je jedna od najmodernijih i danas najpropulzivnija disciplina, od koje se očekuje da u bliskoj budućnosti reformiše informacionu tehnologiju kroz razvoj kvantnih računara i time značajno doprinese opštem napretku. U ovoj oblasti se zapravo proučavaju najdublja pitanja zasnivanja kvantne mehanike, kvantno-mehaničke korelacije, koje su od nastanka kvantne mehanike spadale u najteže i nedovoljno razjašnjene fenomene. Mnogi pomaci su napravljeni u poslednjoj deceniji, upravo kroz proučavanja vezana za kvantnu informaciju.

Doktorske studije na Fizičkom fakultetu obuhvataju i nekoliko predmeta vezanih za užu naučnu oblast kvantne i matematičke fizike, među kojima je, u skladu sa gore navedenim, i predmet *Kvantna informacija i zasnivanje kvantne mehanike*, koji svojim sadržajem pokriva upravo gore navedena pitanja kvantne informacije, kvantnog računanja i dodirne oblasti zasnivanja kvantne mehanike.

Prof. Dr Časlav Brukner je među vodećim svetskim ekspertima za ovu oblast, a Institut za Kvantnu Optiku i Kvantnu Informaciju, u kome radi i u kojem je Brukner jedan od nauczih direktora je svakako jedna od vodećih svetskih naučnih institucija u oblasti, čuvena, na primer, po eksperimentalnim rezultatima iz kvantne teleportacije (koja je sastavni deo kvantne informatike). Njegovi izuzetni naučni rezultati, citirani preko 6700 puta i publikovani u preko 140 članaka (od toga 28 Physical Review Letters-a, 2 Nature-a, 7 Nature Physics-a i 7 Nature Communications-a, 2 PNAS-a) te želja da doprinese nastavi na Univerzitetu u Beogradu na kome je i počeo studije, i više puta držao takav kurs, preporučuju ga kao izuzetno kvalitetnog nastavnika, bez makar približno adekvatne alternative za ovu naučnu disciplinu.

Zato smatramo da je izbor Prof. Časlava Bruknera za gostujućeg profesora na Univerzitetu u Beogradu naophodan za obezbeđivanje vrhunskog kvaliteta nastave iz oblasti kvantne informatike, i da će dodatno doprineti naučnoj i nastavnoj saradnji koju Fizički fakultet već godinama ostvaruje sa Univerzitetom u Beču, pre svega sa Institutom za Kvantnu Optiku i Kvantnu Informaciju.

Beograd, 20. avgust 2021.



Dr Ivanka Milošević

Redovni profesor Fizičkog fakulteta



Dr Tatjana Vuković

Redovni profesor Fizičkog fakulteta



Akademik Dr Milan Damnjanović,
Profesor emeritus Univerziteta u Beogradu