Dr. Predrag Jovanović – Biography

Basic Info: Dr. Predrag Jovanović was born on April 14, 1968 in Višnjićevo, Municipality of Šid, Republic of Serbia. He attended primary school and two-year general course of gymnasium in Šid, after which he attended two-year Mathematics course of gymnasium in Sremska Mitrovica. He received his diploma, magister and doctoral degrees from Department of Astronomy, Faculty of Mathematics, University of Belgrade in 1995, 1999 and 2005, after the successful defenses of his diploma, magister's and doctoral theses entitled "1999 Total Solar Eclipse", "Solar activity influence on Earth rotation" and "Influence of gravitational microlensing on X-ray radiation from accretion disks of active galaxies", respectivelly. Since January 1, 1996 he has been employed and working under the affiliation of the Astronomical Observatory of Belgrade. He became the assistant research professor (research associate) in 2007, associate research professor (senior research associate) in 2010, and he received tenure as a full research professor (principal research fellow) of Astronomical Observatory of Belgrade in 2015. Dr. Jovanović is member of Society of Astronomers of Serbia, International Astronomical Union, European Astronomical Society, Southeastern European Network in Mathematical and Theoretical Physics (SEENET-MTP) and Association of Italian and Serbian Scientists and Scholars (AIS3). He was elected a corresponding member of Serbian Academy of Nonlinear Sciences on March 31, 2021. He has spent his research career so far in Serbia.

Research Interests: The research areas of interest of Dr. Jovanović so far have included several fields of astronomy and astrophysics, such as: numerical processing of astronomical observations, Earth's rotation, solar activity, celestial mechanics, binary stars, active galaxies and quasars, high-energy astrophysics, astrophysical gravitational phenomena (black holes, gravitational lenses, gravitational waves), galactic and extragalactic dynamics, General Relativity, theories of modified gravity and cosmology.

Scientific Results: Dr. Predrag Jovanović initiated several new investigations in our country, mainly in the fields of gravitational lenses, supermassive black holes, high-energy astrophysics and applications of the theories of modified gravity as possible alternatives to the dark matter hypothesis. Within these fields, he achieved the significant scientific results which made an important contribution to the Serbian astrophysics. So far, he has published more than 150 bibliographic items, most of which are papers in the peer reviewed journals and conference proceedings, with about 50 papers in the international scientific journals with SCI impact factor. In addition, he published one monograph and three chapters in the books. A complete list of published bibliographic items of Dr. Predrag Jovanović is available at the following website: https://orcid.org/0000-0003-4259-0101

Response to Research Results: According to *NASA ADS* and *Scopus,* the papers of Dr. Jovanović were cited more than 1500 times (*h*-index of 23). His 14 papers about the astronomical tests of the modified gravity theories, as well as about the constraints on the graviton mass obtained from the observed orbit of the S2 star around the Galactic center, were cited 31 times in total in the papers by Dr. Andrea Ghez and Dr. Reinhard Genzel, winners of the Nobel Prize for Physics in 2020. Since 2019, the mentioned graviton mass estimates have been included in the table of gauge and Higgs bosons by the Particle Data Group (PDG), an international collaboration for particle physics and cosmology, and also published on page 1014 of their book: P. A. Zyla et al. (Particle Data Group), *Review of Particle Physics*, Prog. Theor. Exp. Phys. 2020, 083C01 (2020). Besides, the paper: P. Jovanović & L. Č. Popović, *Observational Effects of Strong Gravity in Vicinity of Supermassive Black Holes*, Fortschritte der Physik, 56, 456-461 (2008) was selected in March 2009 by

astronomers from Armagh Observatory, Northern Ireland, United Kingdom as Astronomy Paper of the Month within the International Year of Astronomy (IYA2009). The Scientific Council of the Astronomical Observatory awarded Dr. Jovanović in 2012 with the annual award of the Astronomical Observatory in Belgrade for scientific work. Dr. Jovanović acted as referee for the following peer-reviewed journals: *The Astrophysical Journal, Astronomy and Astrophysics*, *New Astronomy Reviews*, *Advances in Space Research, Modern Physics Letters A, Journal of Physics, Serbian Astronomical Journal* and *Publications of the Astronomical Observatory of Belgrade*.

Educational activities: During 2012-2018, Dr. Jovanović was hired by the University of Belgrade as lecturer for the "Gravitational Lenses" course within the *AstroMundus* programme, a 2-years Erasmus+: Erasmus Mundus Joint Masters Degree programme in Astronomy and Astrophysics between Austria, Italy, Germany and Serbia. During 2022-2024 he was a lecturer for "Gravitation and Cosmology" and "Gravitational Lenses" courses within the MASS (Master in Astrophysics and Space Science) programme of joint Erasmus Mundus master studies between universities of Italy, Germany, Serbia and France. Currently, he is teaching "Classical cosmology" and "Selected topics of modern cosmology" courses at doctoral studies from Astronomy and Astrophysics at Mathematical Faculty, University of Belgrade. He was co-supervisor of one doctoral dissertation, supervisor and co-supervisor of three master theses, as well as member of several defense committees for doctoral dissertations and master theses at the Faculty of Mathematics, University of Belgrade and Faculty of Sciences and Mathematics, University of Niš. He also gave several popular lectures and scientific seminars at the Faculty of Sciences and Mathematics in Niš, Faculty of Mathematics in Belgrade, planetarium of the Astronomical Society Ruđer Bošković at Kalemegdan in Belgrade, the Ilija M. Kolarac Endowment in Belgrade and Smederevo Centre for Culture.

Organizational: As a representative of the employed researchers, Dr. Jovanović was member of board of directors of the Astronomical Observatory of Belgrade for the period 2010-2014. During 2011-2019, he was leader of the project 176003: "Gravitation and the large scale structure of the Universe" funded by Ministry of Education, Science and Technological Development of the Republic of Serbia, and during the previous project period from 2006-2010, he was leader of the project task: "Gravitational lenses and relativistic effects in accretion disk", in the frame of the project 146002: "Astrophysical spectroscopy of extragalactic objects". Since 2022 he is leader of the "Gravitation and cosmology" group at Astronomical Observatory in Belgrade, that researches gravity and related astronomical and cosmological phenomena and objects, with aim to get new fundamental knowledge about gravitational intercation and its effects on different astrophysical scales, from the Solar System, through galactic, extragalactic to cosmological scales. He also participated in several international projects and represented Serbia as a member and member substitute in the Management Committees of two COST Actions: *MP1304 - Exploring fundamental physics with compact stars (NewCompStar)* and *MP0905 - Black Holes in a Violent Universe*. He established an extensive international scientific collabortaion and coauthored a number of papers with researchers from Russia, Italy, USA, Spain, Belgium and Republic of Srpska. He was also member of the Scienticific Organizing Committees of a number of national and international conferences.

Contribution to Nonlinear Sciences: Dr. Predrag Jovanović achieved the important scientific results by studying the nonlinear problems in astrophysics and cosmology, among which the investigations of nonlinear effects of gravitational lenses, modified gravity theories and general relativity are of particular significance. Analytical and numerical solutions of the lens equation which, due to its nonlinearity, induces formation of multiple images of a distant background source are examples of such problems, since in its scalar form, this equation can be written as a system of two nonlinear differential equations. In his other studies, such as e.g. investigations of radiation and matter motion in vicinity of the central supermassive black holes of the galaxies, Dr. Jovanović also uses the methods which include analytical modeling of the problems and numerical solving of the nonlinear differential equations, thus making a significant contribution to the nonlinear sciences.

A List of 5 Selected Research Publications

1. P. Jovanović, *The broad Fe Kα line and supermassive black holes*. New Astronomy Reviews 56, 37-48 (2012).
2. P. Jovanović, V. Borka Jovanović, D. Borka, A. F. Zakharov, *Constraints on Yukawa gravity parameters from observations of bright stars*, Journal of Cosmology and Astroparticle Physics 2023, No. 03, 056-1-26 (2023).
3. P. Jovanović, V. Borka Jovanović, D. Borka, A. F. Zakharov, *Improvement of graviton mass constraints using GRAVITY's detection of Schwarzschild precession in the orbit of S2 star around the Galactic Center*, Physical Review D 109, 064046-1-16 (2024).
4. P. Jovanović, V. Borka Jovanović, D. Borka, A. F. Zakharov, *Constraints on Graviton Mass from Schwarzschild Precession in the Orbits of S-Stars around the Galactic Center*, Symmetry 16, 397-1-16 (2024).
5. P. Jovanović, S. Simić, V. Borka Jovanović, D. Borka, L. Č. Popović, *The comparison of an optical and X-ray counterpart of subparsec supermassive binary black holes*, Advances in Space Research 75, 1441-1458 (2025).

Link to Extended CV: http://pjovanovic.aob.rs/