Eugene Vasiliev

PERSONAL INFORMATION

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EDUCATION AND ACADEMIC CAREER:

- 1997–2003: Moscow Institute of Physics and Technology (MIPT), Department of General and Applied Physics (bachelor and masters degrees cum laude).
- 2003–2006: Lebedev Physical Institute (LPI – Moscow, Russia), Theory department (PhD thesis in Theoretical physics: "Dynamics of dark matter in galactic centers" – January 2007).
- 2003–2010, 2013–2015: Lebedev Physical Institute (Moscow, Russia), Theory Department, researcher.
- 2010: Laboratoire d'Astrophysique de Marseille; short-term CNRS employee (3 months).
- 2011–2012: Rochester Institute of Technology (RIT – Rochester, NY, USA), postdoc.
- 2015–2017: University of Oxford, Rudolf Peierls Centre for Theoretical Physics, postdoc.
- 2017–2022: University of Cambridge, Institute of Astronomy (IoA), postdoc.
- since 2024: University of Surrey, School of Mathematics and Physics, Ernest Rutherford fellow.

GRANTS, FELLOWSHIPS AND OTHER FUNDING SOURCES:

- Dynasty Foundation, fellowship for students in physics (2003).
- Russian Fund for Basic Research, young researcher support fellowship #03-02-06745 (2003).
- Fellow of Landau Foundation, Forschungszentrum Jülich (Germany) (2003–2005).
- Russian Ministry of Science and Education, PI on the early career grant MK-446.2008.2 "Gravitational dynamics in non-axisymmetric systems" (2008–2009).
- CNRS short-term visitor programme (2010).
- Institut Henri Poincaré trimester programme "Gravasco" (2013).
- Aix-Marseille University visitor programme (2014).
- Maria de Maeztu visitor programme at the University of Barcelona (2017).
- Severo Ochoa visitor programme at the Institute of Astrophysics, Canary islands (2022).
- STFC Ernest Rutherford fellowship "Decoding the structure and formation history of the Milky Way halo with non-equilibrium models" (2023).

MENTORING:

two masters students at MIPT/LPI (2010–2012, 2015–2016);
four Part III (masters) students at the University of Cambridge (2018–2019, 2020–2022);
co-supervising a PhD student at IoA (2021–2023);
five summer internship projects at the University of Oxford (2015,2016) and Cambridge (2020,2021,2022).

TEACHING:

"Introduction to physical cosmology" (a semestral class for 3rd year undergratuate students at MIPT/LPI, 2008 – lectures and problem sets);
"Introduction to gravitational N-body simulations" (an elective class for undergraduate and graduate students at MIPT, one semester in 2013 – lectures, hands-on sessions);
"Numerical simulations of gravitational dynamics" (one-week course at the XII Summer School of Modern Astrophysics, Moscow, 2016 – lectures and hands-on sessions);
"Galactic and planetary dynamics" (tutorials for a semestral course at the University of Oxford, 2016 and 2017);

"Kinetic theory" (core course of Oxford MMathPhys programme, one semester in 2016 – lectures for part of the course, tutorials for the entire course);
"Dynamical modelling of stellar systems" (one-week course at the Summer School on Galactic Dynamics, Shanghai, 2019 – lectures and practical exercises);
"Modern galactic dynamics in the era of plentiful data" (10-lecture course at the Heidelberg Physics Graduate Days, 2020);
"Stellar dynamics and structure of galaxies" (supervisions for the Part II course at the University of Cambridge, 2020);
"Modern stellar dynamics" (16-lecture Part III course at the University of Cambridge, winter 2022 and autumn 2022);
"Galactic dynamics with Agama" (Lectures at the Galaxy modelling and Galactic Centre workshop, University of Surrey, 2024).

PUBLIC OUTREACH:

Science Festival in Cambridge (2018, 2019, 2022), Royal Society Exhibition in London (2019), Open Astronomy day in Ely (2019), Doors Open days at the Royal Observatory Edinburgh (2023) – preparing and manning the Gaia section, entertaining the visitors.
Public lectures at the Institute of Astronomy open evenings series: Life and adventures of binary supermassive black holes (2021); Galactic archeology with stellar streams (2021).
Public lectures at the Royal Observatory Edinburgh (2023); World Space Week in Guildford (2024).
Lectures at the Dundee Astronomical Society meeting (2023) and Guildford Astronomical Society meeting (2024).
Three short introductory video lectures on Gaia (part of a broader course in astronomy aimed at the high-school audience in Russia) recorded in 2019.

PROGRAMMING EXPERIENCE

Developed several publicly available software products for astrophysics:
AGAMA (action-based galaxy modelling library),
SMILE and FORSTAND (Schwarzschild modelling),
PhaseFlow (Fokker-Planck solver for self-gravitating stellar systems),
LOSSCONE (Fokker-Planck solver for stars around black holes),
RAGA (Monte Carlo simulation of star clusters and galactic nuclei);
worked in international teams developing software for the ALMA observatory;
participated in the development of several engineering- and industry-related software products (mechanics of materials; applied spectroscopy; geological modelling);
programming languages: C/C++, Python, Java, Fortran, Perl, etc.

OTHER PROFESSIONAL ACTIVITIES:

secretary of the astrophysical seminar at LPI (2007–2010);
organizer of the astrophysical seminar at RIT (2012);
co-organizer of the galaxy evolution seminar at Cambridge (2018–2022);
helped in organization of annual Summer School of Modern Astrophysics in Russia (2013–2014);
refereeing papers for ApJ, MNRAS, A&A, Phys.Rev., Nature Astronomy, Clas.Quant.Grav., Astronomy and Computing, New Astronomy, Open Journal of Astrophysics, Research in Astronomy & Astrophysics, Astrophysics and Space Science and other journals ($\gtrsim$ 70 papers);
external referee for two astronomy PhD thesis defences in Moscow (2015) and Milan (2024);
examiner/jury member for three astronomy PhD theses in Paris (2020,2022,2023), one in Barcelona (2024), and a habilitation defence in Paris (2022);
external referee for grant proposals at NSF, ERC, STFC, Polish and Chilean funding agencies.

List of publications

Refereed publications (59 total, including 12 single-author and further 11 first-author papers; papers led by students marked by Ⓢ , review papers – by Ⓡ ; full list available here)

[1] M.Zelnikov, E.Vasiliev, "The influence of dark matter halo on the evolution of supermassive black hole", Int. J. of Modern Physics A, 20, 2005

[2] M.Zelnikov, E.Vasiliev, "Absorption of dark matter by a supermassive black hole at the Galactic center: role of boundary conditions", JETP Letters 81, 85, 2005 (in Russian, translated)

[3] E.Vasiliev, "A simple analytical model for dark matter halo structure and adiabatic contraction", JETP Letters 84, 2, 2006 (in Russian, translated)

[4] E.Vasiliev, "Dark matter annihilation near a black hole: plateau vs. weak cusp", Phys. Rev. D 76, 103532, 2007

[5] E.Vasiliev, M.Zelnikov, "Dark matter dynamics in the galactic center", Phys. Rev. D 78, 083506, 2008

[6] D.Merritt, E.Vasiliev, "Orbits around black holes in triaxial nuclei", ApJ 726, 61, 2011

[7] E.Vasiliev, E.Athanassoula, "Chaotic mixing and the secular evolution of triaxial cuspy galaxy models built with Schwarzschild's method", MNRAS 419, 3268, 2012

[8] D.Merritt, E.Vasiliev, "Spin evolution of supermassive black holes and galactic nuclei", Phys. Rev. D 86, 102002, 2012

[9] E.Vasiliev, D.Merritt, "The loss cone problem in axisymmetric nuclei", ApJ 774, 87, 2013

[10] E.Vasiliev, "A new code for orbital analysis and Schwarzschild modelling of triaxial stellar systems", MNRAS, 434, 3174, 2013

[11] E.Vasiliev, F.Antonini, D.Merritt, "The final-parsec problem in non-spherical galaxies revisited", ApJ, 785, 163, 2014

[12] E.Vasiliev, "Rates of capture of stars by supermassive black holes in non-spherical galactic nuclei", Classical and Quantum Gravity, 31, 244002, 2014

[13] E.Vasiliev, "A new Monte Carlo method for dynamical evolution of non-spherical stellar systems", MNRAS, 446, 3150, 2015

[14] E.Vasiliev, E.Athanassoula, "Applying Schwarzschild's orbit superposition method to barred or non-barred disc galaxies", MNRAS, 450, 2842, 2015

[15] Ⓢ K.Lezhnin, E.Vasiliev, "Suppression of stellar tidal disruption rates by anisotropic initial conditions", ApJ, 808, L5, 2015

[16] E.Vasiliev, F.Antonini, D.Merritt, "The final-parsec problem in the collisionless limit", ApJ, 810, 49, 2015

[17] Ⓢ K.Lezhnin, E.Vasiliev, "Tidal disruption rates in non-spherical galactic nuclei formed by galaxy mergers", ApJ, 831, 84, 2016

[18] E.Vasiliev, "A new Fokker–Planck approach for relaxation-driven evolution of galactic nuclei", ApJ, 848, 10, 2017

[19] Ⓢ Q.Zhu, E.Vasiliev, Y.Li, Y.Jing, "Primordial black holes as dark matter: constraints from compact ultra-faint dwarfs", MNRAS, 476, 2, 2018

[20] N.Stone, A.Generozov, E.Vasiliev, B.Metzger, "The delay time distribution of tidal disruption flares", MNRAS, 480, 5060, 2018

[21] E.Vasiliev, "Internal dynamics of the Large Magellanic Cloud from Gaia DR2", MNRAS Letters, 481, L100, 2018

[22] E.Vasiliev, "AGAMA: Action-based galaxy modelling architecture", MNRAS, 482, 1525, 2019

[23] E.Vasiliev, “Proper motions and dynamics of the Milky Way globular cluster system from Gaia DR2”, MNRAS, 484, 2832, 2019

[24] Ⓢ K.Lezhnin, E.Vasiliev, “Evolution of supermassive black hole binaries and tidal disruption rates in nonspherical galactic nuclei”, MNRAS, 484, 2851, 2019

[25] Ⓢ G.C.Myeong, E.Vasiliev, G.Iorio, N.W.Evans, V.Belokurov, “Evidence for two early accretion events that built up the Milky Way halo”, MNRAS, 488, 1235, 2019

[26] E.Vasiliev, “Systematic errors in Gaia DR2 astrometry and their impact on measurements of internal kinematics of star clusters”, MNRAS, 489, 623, 2019

[27] E.Vasiliev, M.Valluri, “A new implementation of the Schwarzchild method for constructing observationally-driven dynamical models of galaxies of all morphological types”, ApJ, 889, 39, 2020

[28] Ⓡ N.Stone, E.Vasiliev, M.Kesden, E.Rossi, H.Perets, P.Amaro-Seoane, “Rates of stellar tidal disruptions”, Space Science Reviews, 216, 35, 2020 / chapter in the book “Tidal Disruption of Stars by Massive Black Holes” (Space Science series of ISSI, Springer, 2022)

[29] E.Vasiliev, V.Belokurov, “The last breath of the Sagittarius dSph”, MNRAS, 497, 4162, 2020

[30] J.Sanders, E.Lilley, E.Vasiliev, N.W.Evans, D.Erkal, “Models of distorted and evolving dark matter haloes”, MNRAS, 499, 4793, 2020

[31] J.Read, G.Mamon, E.Vasiliev, et al., “Breaking Beta: A comparison of mass modelling methods for spherical systems”, MNRAS, 501, 978, 2021

[32] E.Vasiliev, V.Belokurov, D.Erkal, “Tango for three: Sagittarius, LMC, and the Milky Way”, MNRAS, 501, 2279, 2021

[33] E.Vasiliev, H.Baumgardt, “Gaia EDR3 view on Galactic globular clusters”, MNRAS, 505, 5978, 2021

[34] H.Baumgardt, E.Vasiliev, “Accurate distances to Galactic globular clusters through a combination of Gaia EDR3, HST and literature data”, MNRAS, 505, 5957, 2021

[35] Ⓢ C.Roberts, M.Bentz, E.Vasiliev, M.Valluri, C.Onken, “The black hole mass of NGC 4151 from stellar dynamical modeling”, ApJ, 916, 25, 2021

[36] K.Hattori, M.Valluri, E.Vasiliev, “Action-based distribution function modelling for constraining the shape of the Galactic dark matter halo”, MNRAS, 508, 5468, 2021

[37] E.Vasiliev, V.Belokurov, N.W.Evans, “Radialization of satellite orbits in galaxy mergers”, ApJ, 926, 203, 2022

[38] Ⓢ C.A.Dong Páez, E.Vasiliev, N.W.Evans, “A 6d view of stellar shells”, MNRAS, 510, 230, 2022

[39] Ⓢ L.Correa Magnus, E.Vasiliev, “Measuring the Milky Way mass distribution in the presence of the LMC”, MNRAS, 511, 2610, 2022

[40] Ⓢ N.Rehemtulla, M.Valluri, E.Vasiliev, “Non-parametric spherical Jeans mass estimation with B-splines”, MNRAS, 511, 5536, 2022

[41] D.Benisty, E.Vasiliev, N.W.Evans, A.-C.Davis, O.Hartl, L.Strigari, “The Local Group mass in the light of Gaia”, ApJ Lett., 928, 5, 2022

[42] M.Sormani et al. (17 authors incl. E.Vasiliev), “Self-consistent modelling of the Milky Way’s Nuclear Stellar Disc”, MNRAS, 512, 1857, 2022

[43] M.Sormani, O.Gerhard, M.Portail, E.Vasiliev, J.Clarke, “The stellar mass distribution of the Milky Way’s bar: an analytic model”, MNRAS Lett., 514, 1, 2022

[44] V.Belokurov, E.Vasiliev, A.Deason, S.Koposov, A.Fattahi, A.Dillamore, E.Davies, R.Grand, “Energy wrinkles and phase-space folds of the last major merger”, MNRAS, 518, 6200, 2023

[45] Ⓢ E.Davies, E.Vasiliev, V.Belokurov, N.W.Evans, A.Dillamore, “Ironing the folds: the phase space chevrons of a GSE-like merger as a dark matter subhalo detector”, MNRAS, 519, 530, 2023

[46] J.Binney, E.Vasiliev, “Self-consistent models of our Galaxy”, MNRAS, 520, 1832, 2023

[47] Ⓢ P.Galán-de Anta, E.Vasiliev, M.Sarzi, M.Dotti, P.Capelo, A.Incatasciato, L.Posti, L.Morelli, E.Corsini, “The fragility of thin discs in galaxies – I. Building tailored N-body galaxy models”, MNRAS, 520, 4490, 2023

[48] Ⓢ E.Davies, A.Dillamore, E.Vasiliev, V.Belokurov, “Accelerated phase mixing in the stellar halo due to a rotating bar”, MNRAS Lett., 521, 24, 2023

[49] Ⓢ K.Merrell, E.Vasiliev, M.Bentz, M.Valluri, C.Onken, ”The mass of the black hole in NGC 5273 from stellar-dynamical modelling”, ApJ, 949, 13, 2023

[50] Ⓢ P.Galán-de Anta, P.Capelo, E.Vasiliev, M.Dotti, M.Sarzi, E.Corsini, L.Morelli, “The fragility of thin discs in galaxies – II. Thin discs as tracers of the assembly history of galaxies”, MNRAS, 523, 3939, 2023

[51] Ⓡ E.Vasiliev, “The effect of the LMC on the Milky Way system”, Galaxies, 11, 59, 2023

[52] E.Vasiliev, “Dear Magellanic Clouds, welcome back!”, MNRAS, 527, 437, 2024

[53] J.Binney, E.Vasiliev, “Chemodynamical models of our Galaxy”, MNRAS, 527, 1915, 2024

[54] Ⓢ S.Dattathri, M.Valluri, E.Vasiliev, V.Wheeler, P.Erwin, “Deprojection and stellar-dynamical modelling of boxy/peanut bars in edge-on discs”, MNRAS, 530, 1195, 2024

[55] C.Gallart et al. (18 authors incl. E.Vasiliev), “Chronology of our Galaxy from Gaia Colour-Magnitude Diagram-fitting (ChronoGal). I. The formation and evolution of the thin disk from the Gaia Catalogue of Nearby Stars”, A&A, 687, 168, 2024

[56] B.Tahmasebzadeh, A.Lapeer, E.Vasiliev, M.Valluri, M.Taylor, S.Thompson, “The Lower Limit of Dynamical Black Hole Masses Detectable in Virgo Compact Stellar Systems Using the JWST/NIRSpec IFU”, ApJ, 974, 69, 2024

[57] T.Tepper-García, J.Bland-Hawthorn, E.Vasiliev, O.Agertz, R.Teyssier, C.Federrath, “Nexus: a framework for simulations of idealised galaxies”, MNRAS, 535, 187, 2024

[58] Ⓢ G.Hunter, M.Sormani, J.Beckmann, E.Vasiliev, et al., “Testing kinematic distances under a realistic Galactic potential”, A&A, 692, 216, 2024

[59] Ⓡ J.Hunt, E.Vasiliev, “Milky Way dynamics in light of Gaia”, New Astronomy Reviews, 100, 101721, 2025

Other publications

[60] E.Vasiliev, “Evolution of binary supermassive black holes and the final-parsec problem”, Proceedings of the IAU symposium #312, “Star clusters and black holes in galaxies across cosmic time”, arXiv:1411.1762

[61] E.Vasiliev, “Agama reference documentation”, arXiv:1802.08255

[62] E.Vasiliev, “Using Gaia for studying Milky Way star clusters”, Proceedings of the IAU symposium #351, “Star Clusters: from the Milky Way to the Early Universe”, arXiv:1908.00009

[63] E.Vasiliev, M.Valluri, “Schwarzschild modeling of barred galaxies”, Proceedings of the IAU symposium #353, “Galactic dynamics in the era of large surveys”, arXiv:1909.03119

[64] T.Tepper-García, J.Bland-Hawthorn, E.Vasiliev, et al., “A barred Milky Way surrogate from an N-body simulation”, arXiv:2111.05466

[65] L.Beraldo e Silva, M.Valluri, E.Vasiliev, K.Hattori, W.de Siqueira Pedra, K.Daniel, “Minimum-entropy constraints on galactic potentials”, ApJ (submitted), arXiv:2407.07947

[66] Ⓢ L.Stanić, M.Eberlein, S.Linchakovskyy, C.Magnoli, M.Mesiura, L.Morf, P.Saha, E.Vasiliev, “Dark Matter Particle Flux in a Dynamically Self-consistent Milky Way Model”, arXiv:2502.08805

[67] M.Taylor, B.Tahmasebzadeh, S.Thompson, E.Vasiliev, et al., “A Supermassive Black Hole in a Diminutive Ultra-compact Dwarf Galaxy Discovered with JWST/NIRSpec+IFU”, ApJL (submitted), arXiv:2503.00113