

# Savvas M. Koushiappas

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## Contact Information

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University  
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Department of Physics  
Brown

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## Education

Ph.D. Physics, The Ohio State University, Columbus, OH, USA, 2004, Advisor: Terry P. Walker.  
B.S. Astrophysics, The University of New Mexico, Albuquerque, NM, USA, 1998.

## Professional Appointments

Professor of Physics Department of Physics, Brown University Providence, RI, USA	7/2023 --
Associate Professor of Physics Department of Physics, Brown University Providence, RI, USA	7/2015 - 6/2023
Visiting Professor Institute for Computational Science, University of Zurich Zurich, Switzerland	5/2017 - 8/2017
Visiting Professor Institute for Theory and Computation, Harvard University Cambridge, MA, USA	9/2016 - 4/2017
Assistant Professor of Physics Department of Physics, Brown University Providence, RI, USA	7/2008 - 6/2015
Postdoctoral Researcher Theoretical Division, Los Alamos National Laboratory Los Alamos, NM, USA	10/2005-6/2008
Postdoctoral Researcher ETH-Zurich (Swiss Federal Institute of Technology) Zurich, Switzerland	10/2204-9/2005

## Research Interests

My research is in the interface between cosmology, particle physics and astrophysics. I work predominantly in the area of dark matter physics and the search for the nature of the dark matter particle from an experimentally-motivated theoretical perspective. More recently my work includes work in

# Savvas M. Koushiappas

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astrophysical black hole physics and gravitational waves, dynamics of cosmological expansion in the context of dark matter and dark energy physics as well as AI/Machine Learning as applied to gravitational lensing.

## Awards

### Research:

- Single PI: National Science Foundation, Division of Physics (Theoretical Physics), 2020-2023.
- Co-PI: Brown University Seed Award, 2020.
- Single PI: Department of Energy (Office of High Energy Physics), 2017-2019.
- Single PI: Brown University Seed Award, 2017.
- Single PI: National Science Foundation, Division of Physics (Theoretical Physics), 2014-2017.
- Single PI: NASA Fermi Guest Investigator Cycle 7, 2013-2015.
- Single PI: Department of Energy (Office of High Energy Physics), 2013-2016.
- Single PI: Brown University Salomon Award, 2012.
- Single PI: NASA EPSCoR award, 2010-2011.
- Single PI: National Science Foundation, Division of Physics (Theoretical Physics), 2010-2013.

### Other:

- Leon Heller Prize in Theoretical Physics, Los Alamos National Laboratory, 2008.

## Publications and Preprints (students/postdocs underlined>:

- “Cosmological Features in the Late-Universe from Quantum Gravity”, Michael W. Toomey, Savvas M. Koushiappas, Bruno Alexandre, and Joao Magueijo, arXiv: 2301.13855, Phys. Rev. D submitted (2023).
- “Viability of ultralight bosonic dark matter in dwarf galaxies”, Isabelle S. Goldstein, Savvas M. Koushiappas, Matthew G. Walker, Phys. Rev. D 106, 063010 (2022).
- “The H0 and S8 tensions necessitate early and late time changes to  $\Lambda$ CDM”, Steven J. Clark, Kyriakos Vattis, JiJi Fan, Savvas M. Koushiappas, Phys. Rev. D (accepted), arXiv: 2110.09562 (2021).
- “Deep learning the astrometric signature of dark matter substructure”, Kyriakos Vattis, Michael Toomey, Savvas M. Koushiappas, Phys. Rev. D 103, 043014 (2021).
- “Cosmological constraints on late-Universe decaying dark matter as a solution to the H0 tension”, Steven J. Clark, Kyriakos Vattis, Savvas M. Koushiappas, Phys. Rev. D 102, 061301 (2020).
- “Could the 2.6Msun object in GW190814 be a primordial black hole?”, Kyriakos Vattis, Isabelle Goldstein, Savvas M. Koushiappas, Phys. Rev. D 102, 061301 (2020).
- “Late universe decaying dark matter can relieve the H0 tension”, Kyriakos Vattis, Savvas M. Koushiappas, Abraham Loeb, Phys. Rev. D 99, 121302 (2019).
- “Astrophysical explanations of suspected dark matter signals in dwarf galaxies”, Alex Geringer-Sameth, Savvas M. Koushiappas, Matthew G. Walker, Vincent Bonnavard, Celine Combet & David Maurin, Phys. Rev. D (submitted), arXiv:1807.08740 (2018).
- “Self-interacting dark matter constraints in a thick dark disk scenario”, Kyriakos Vattis & Savvas M. Koushiappas Phys. Rev. D, 97, 103003 (2018).
- “Maximum redshift of gravitational wave merger events”,

# Savvas M. Koushiappas

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- Savvas M. Koushiappas & Abraham Loeb  
Phys. Rev. Lett., 119, 221104 (2017).
- “Dynamics of dwarf galaxies disfavor stellar-mass black hole dark matter”, Savvas M. Koushiappas & Abraham Loeb, Phys. Rev. Lett. 115, 081101 (2017).
  - “Dark matter constraints from a joint analysis of dwarf galaxy observations with VERITAS”, The VERITAS Collaboration (including [Alex Geringer-Sameth](#) and Savvas M. Koushiappas), Phys. Rev. D 95, 082001 (2017).
  - “Pseudoscalar portal dark matter and new signatures of vector-like fermions”, JiJi Fan, Savvas M. Koushiappas, Greg Landsberg, J. High En. Phys. 01, 111 (2016).
  - “Cosmological constraints to dark matter with two- and many-body decays”, [Gordon Blackadder](#) & Savvas M. Koushiappas, Phys. Rev. D 93, 023510 (2016).
  - “Dark matter annihilation and decay profiles for the Reticulum II dwarf spheroidal galaxy”, B. Bonnivard, C. Combet, D. Maurin, [A. Geringer-Sameth](#), S. M. Koushiappas, M. G. Walker, M. Mateo, E. Olszewski, J. I. Bailey III, The Astrophys J. Lett., 808, L36 (2015).
  - “Indication of gamma-ray emission from the newly discovered dwarf galaxy Reticulum 2”, [Alex Geringer-Sameth](#), Matthew G. Walker, Savvas M. Koushiappas, Sergey E. Koposov, Vasily Belokurov, Gabriel Torrealba, N. Wyn Evans, Phys. Rev. Lett. 115, 081101 (2015).
  - “A comprehensive search for dark matter in dwarf galaxies”, [Alex Geringer-Sameth](#), Savvas M. Koushiappas & Matthew Walker, Phys. Rev. D 91, 083535 (2015).
  - “Dwarf galaxy annihilation and decay emission profiles for dark matter experiments”, [Alex Geringer-Sameth](#), Savvas M. Koushiappas & Matthew Walker, The Astrophys. J. 801, 74 (2015).
  - “Two and many body decaying dark matter”, [Gordon Blackadder](#) & Savvas M. Koushiappas, Phys. Rev. D 90, 103527 (2014).
  - “Dark Matter line search using a joint analysis of dwarf galaxies with the Fermi Gamma-ray Space Telescope”, [Alex Geringer-Sameth](#) & Savvas M. Koushiappas, Phys. Rev. D 86, 021302(R) (2012).
  - “Detecting unresolved moving sources in a diffuse background”, [Alex Geringer-Sameth](#) & Savvas M. Koushiappas, Mon. Not. R. Astron. Soc. 425, 862 (2012).
  - “Extracting the unresolved pulsar contribution to the gamma-ray background”, [Alex Geringer-Sameth](#) & Savvas M. Koushiappas, Mon. Not. R. Astron. Soc. 421, 1813 (2012).
  - “Exclusion of canonical WIMPs by the joint analysis of Milky Way dwarfs with Fermi”, [Alex Geringer-Sameth](#) & Savvas M. Koushiappas, Phys. Rev. Lett. 107, 241303 (2011).
  - “The effects of halo-to-halo variation on substructure lensing”, [Jacqueline Chen](#), Savvas M. Koushiappas & Andrew R. Zentner, Astrophys. J. 741, 117 (2011).
  - “Non-universality of halo profiles and implications for dark matter experiments”, [Darren S. Reed](#), Savvas M. Koushiappas & Liang Gao, Mon. Not. R. Astron. Soc. 415, 3177 (2011).
  - “Constraining dark matter in Galactic substructure”, [Eric J. Baxter](#), Scott Dodelson, Savvas M. Koushiappas & Louis E. Strigari, Phys. Rev. D 82, 123511 (2010).
  - “Gravitational nanolensing from sub-solar mass dark matter halos”, [Jacqueline Chen](#) & Savvas M. Koushiappas, Astrophys. J. 724, 400 (2010).
  - “Distribution of annihilation luminosities in dark matter substructure”

# Savvas M. Koushiappas

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- Savvas M. Koushiappas, Andrey V. Kravtsov, Andrew R. Zentner, Phys. Rev. D 82, 083504 (2010).
- “Galactic substructure and dark matter annihilation in the Milky Way halo”, Marc Kamionkowski, Savvas M. Koushiappas & [Michael Kuhlen](#), Phys. Rev. D 81 043532 (2010).
  - “Galactic substructure and energetic neutrinos from the Sun and the Earth”, Savvas M. Koushiappas & Marc Kamionkowski, Phys. Rev. Lett. 103, 121301 (2009).
  - “The detection of sub-solar mass dark matter halos”, Savvas M. Koushiappas, New J. Phys. 11, 105012 (2009).
  - “Can proper motions of dark-matter subhalos be detected?”, Shin'ichiro Ando, Marc Kamionkowski, [Samuel K. Lee](#), & Savvas M. Koushiappas, Phys. Rev. D. 78, 101301 (2008).
  - “Galactic substructure and direct detection of dark matter”, Marc Kamionkowski & Savvas M. Koushiappas, Phys. Rev. D 77, 103509 (2008).
  - “The most dark matter dominated galaxies: Predicted gamma-ray signals from the faintest Milky Way dwarfs”, Louis E. Strigari, Savvas M. Koushiappas, James S. Bullock, Manoj Kaplinghat, Joshua D. Simon, Marla Geha & Beth Willman, Astrophys. J. 678, 614 (2008).
  - “Angular anisotropies in the cosmic gamma-ray background as a probe of its origin”, Francesco Miniati, Savvas M. Koushiappas & Tiziana di Matteo, Astrophys. J. 667 L1 (2007).
  - “Precision constraints on the dark matter content of Milky Way dwarf galaxies for gamma-ray experiments”, Louis E. Strigari, Savvas M. Koushiappas, Manoj Kaplinghat & James S. Bullock, Phys. Rev. D 75, 083526 (2007).
  - “Limits on the radiative decay of sterile neutrino dark matter from the unresolved cosmic and soft X-ray backgrounds”, Kevork N. Abazajian, Maxim Markevitch, Savvas M. Koushiappas & Ryan C. Hickox, Phys. Rev. D 75, 063511 (2007).
  - “Proper motion of  $\gamma$ -rays from microhalo sources”, Savvas M. Koushiappas, Phys. Rev. Lett. 97, 191301 (2006).
  - “Constraints on sterile neutrino dark matter”, Kevork N. Abazajian & Savvas M. Koushiappas, Phys. Rev. D 74, 023527 (2006).
  - “Testing models of supermassive black hole seed formation with gravity waves”, Savvas M. Koushiappas & Andrew R. Zentner, Astrophys. J. 639, 7 (2005).
  - “Massive black hole seeds from low spin material”, Savvas M. Koushiappas, James S. Bullock & Avishai Dekel, Mon. Not. R. Astron. Soc. 354, 292 (2004).
  - “The observability of gamma-rays from neutralino annihilation in Milky Way substructure”, Savvas M. Koushiappas, Andrew R. Zentner & Terrence P. Walker, Phys. Rev. D 69, 043501 (2004).

## White papers and Conference Proceedings

- “New Horizons for Fundamental Physics with LISA”, K. G. Arun, et al. (including Savvas M. Koushiappas),

# Savvas M. Koushiappas

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- arXiv:2205.01597.
- “Cosmology with the Laser Interferometer Space Antenna”, P. Auclair, et al. (including Savvas M. Koushiappas), arXiv:2204.05434.
- “From the Early Universe: Cosmic Neutrinos and Other Light Relics”, D. Green, et al. (including Savvas M. Koushiappas), White paper submitted to the Astro2020 Decadal Survey, [arXiv:1903.04763].
- Dark Matter Science in the Era of LSST”, K. Bechtol et al. (including Savvas M. Koushiappas), White paper submitted to the Astro2020 Decadal Survey, [arXiv:1903.04425].
- “Electromagnetic probes of primordial black holes as dark matter”, Y. Ali-Haïmoud et al. (including Savvas M. Koushiappas), White paper submitted to the Astro2020 Decadal Survey, [arXiv:1903.04424].
- “Primordial non-Gaussianity”, P. D. Meerburg et al. (including Savvas M. Koushiappas), White paper submitted to the Astro2020 Decadal Survey, [arXiv:1903.04409].
- “Probing the fundamental nature of dark matter with the Large Synoptic Survey Telescope”, A. Drlica-Wagner et al. (including Savvas M. Koushiappas), White paper submitted to the Astro2020 Decadal Survey, [arXiv:1903.01055].
- “CF2 White Paper: Status and Prospects of the VERITAS Indirect Dark Matter Detection Program”, A. W. Smith, et al. (including Savvas M. Koushiappas), Submitted to the Snowmass 2013 proceedings, Cosmic Frontier Subgroup 2, [arXiv:1304.6367S].
- Energetic neutrinos from the Sun and Earth and Galactic substructure”, Savvas M. Koushiappas & Marc Kamionkowski, AIP Proceedings of the CCAPP Symposium 2009, Ed. M. Stamatikos, [arXiv:0912.1573].
- “Strong gravitational lensing probes of the particle nature of dark matter”, L. A. Moustakas, et al. (including Savvas M. Koushiappas), Science White Paper submitted to the Astro2010 Decadal Cosmology and Fundamental Science Frontier Panel, [arXiv:0902.3219].
- “Cosmology and Fundamental Physics with Gamma-ray Astronomy”, J. H. Buckley, et al (including Savvas M. Koushiappas), Astro 2010: The Astronomy and Astrophysics Decadal Survey, Science White Papers, no. 31, <https://ui.adsabs.harvard.edu/abs/2009astro2010S..31B>.
- “Status and Future of Ground-based TeV Gamma-ray Astronomy”, J. Buckley, et al (including Savvas M. Koushiappas), Report from the Dark Matter Science Working group of the APS commissioned white paper on ground-based TeV gamma-ray astronomy [arXiv:0812.0795].
- “Detecting the dark matter via the proper motion of  $\gamma$ -rays from microhalos”, Savvas M. Koushiappas, Published in *The Proceedings of the First International GLAST symposium*, February 5-8, 2007, Stanford University, AIP, Eds, S. Ritz, P. F. Michelson, and C. Meegan, [arXiv:astro-ph/0703778].
- “Dark matter halos: Shapes, the substructure crisis and indirect detection”, Andrew R. Zentner, Savvas M. Koushiappas & S. Kazantzidis, Review in *The Proceedings of the 5th International Workshop on the Identification of Dark Matter*, September 6-10, 2005, Edinburgh, UK, World Scientific, Eds. N. J. C. Spooner, V. Kudryavtsev [arXiv:astro-ph/0502118].
- “Gamma-rays from neutralino annihilation in Milky Way substructure: What do we learn?”, Savvas M. Koushiappas, Andrew R. Zentner & Terry P. Walker, Contribution in *Proceedings of the IV Marseille International Cosmology Meeting*, Eds. V. Le Brun, S. Basa, A. Mazure, Frontier, 2005 [arXiv:astro-ph/0309516].

# Savvas M. Koushiappas

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## Invited presentations (since arrival at Brown University)

- Seminar: Trinity College Dublin, Ireland, August 13, 2022
- Conference: Astrophysics in the Next Decade: From the First Stars to Intelligent Life, Martha's Vineyard, MA, June 6, 2022.
- Workshop: Focus week on primordial black holes II, Kavli IPMU, Kashiwa City, Chiba, Japan, December 6, 2019.
- Conference: SUSY2019, Corpus Christi, TX, May 21, 2019.
- Seminar: Center for Cosmology and Particle Physics, New York University, September 25, 2018.
- Conference: Particle Astrophysics and Cosmology including Fundamental Interactions, 2018.9, Mo'orea, French Polynesia, September 2, 2018.
- Workshop: Mitchell Workshop on Collider and Dark Matter Physics, Texas A&M, May 22, 2018.
- Workshop: LSST dark matter working group, University of Pittsburgh, March 5, 2018.
- Conference: Pacific 2018, Akaigawa, Hokkaido, Japan, February 16, 2018.
- Workshop: Focus week on primordial black holes, Kavli IPMU, Kashiwa City, Chiba, Japan, November 16, 2017.
- Conference: Thin, Thick & Dark discs, Ascona, Switzerland, July 25, 2017.
- Seminar: ITC Luncheon, Harvard Center for Astrophysics, April 20, 2017.
- Colloquium: Institute for Theory and Computation, Harvard University, March 16, 2017.
- Seminar: Carnegie Mellon University, Department of Physics, December 3, 2016.
- Seminar: LA-Astro Seminar, Theoretical Division, Los Alamos National Laboratory, October 3, 2016.
- Workshop: New England Theoretical Cosmology and Gravity, September 17, 2016.
- Conference: COSMO 2016, University of Michigan, August 10, 2016.
- Conference: Identification of Dark Matter, Sheffield University, UK, July 20, 2016.
- Conference: European Week on Astronomy and Space Physics, Athens, Greece, July 5, 2016.
- Colloquium: Department of Physics, Vanderbilt University, March 24, 2016.
- Colloquium: Department of Physics, Michigan State University, March 2, 2016.
- Colloquium: Department of Physics, University of Michigan, February 3, 2016.
- Colloquium: Department of Physics & Astronomy, Dartmouth College, January 22, 2016.
- Conference: Particle Physics at the Verge of Discovery, Aspen Center for Physics, January 12, 2016.
- Workshop: Gamma-rays and Dark Matter, Oberggurgl, Austria, December 8, 2015.
- Conference: TeV Particle Astrophysics, University of Tokyo, Japan, October 27, 2015.
- Conference: COSMO 2015, Warsaw, Poland, September 8, 2015.
- Workshop: VERITAS Collaboration meeting, Galway, Ireland, July 24, 2015.
- Workshop: Santa Fe Cosmology Workshop, Santa Fe, NM, July 13, 2015.
- Workshop: Mitchell Workshop on Collider and Dark Matter Physics, Texas A&M, May 20, 2015.
- Colloquium: Department of Physics, Syracuse University, December 13, 2014.
- Conference: Fifth Fermi Symposium, Nagoya, Japan, October 23, 2014.
- Workshop: Midwest Dark Matter workshop, Columbus Center for Cosmology and Astroparticle Physics, The Ohio State University, August 15, 2014.
- Workshop: Probing Non-Minimal Dark Sectors, Pittsburgh Particle Astrophysics and Cosmology Center, June 9, 2014.
- Colloquium: Department of Physics, University of New Mexico, May 16, 2014.
- Workshop: VERITAS Collaboration meeting, Tucson, AZ, January 16, 2014.
- Seminar: Texas A&M University, Department of Physics & Astronomy, October 10, 2013.
- Conference: TeV Particle Astrophysics, University of California-Irvine, August 28, 2013.
- Workshop: Dark Matter in Galaxies, the LHC and Direct and Indirect searches: Are we near the end of the road?, Aspen Center for Physics, August 29, 2013.
- Conference: VII International Conference on Interconnections between Particle Physics and Cosmology, Deadwood, SD, July 8, 2013.
- Workshop: Center for Experimental and Theoretical Underground Physics, Deadwood, SD, July 3, 2013
- Summer School: Fermi Summer School, June 27 - July 1, 2013.

# Savvas M. Koushiappas

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- Workshop: Dark Matter: from Space to Supercolliders, Columbus Center for Cosmology and Astroparticle Physics, The Ohio State University, May 13, 2013.
- Conference: The American Physical Society, April 15, 2013.
- Workshop: CosmoStat 2013, Banff, March 20, 2013.
- Seminar: University of Utah, Department of Physics, February 22, 2013.
- Workshop: Closing in on Dark Matter, Aspen Center for Physics, January 30, 2013.
- Seminar: McGill University, Department of Physics, December 12, 2012.
- Symposium: 4th Fermi Symposium, Monterey, CA, October, 30, 2012.
- Colloquium: University of Kentucky, Department of Physics & Astronomy, October 19, 2012.
- Seminar: University of Kentucky, Department of Physics & Astronomy, October 19, 2012.
- Workshop: Dark Matter Signatures in the Gamma-Ray Sky, University of Texas, Austin TX, May 7, 2012.
- Seminar: Department of Physics, University of Cyprus, Nicosia, Cyprus, March 28, 2012.
- Seminar: Department of Physics, University College Dublin, Dublin, Ireland, March 22, 2012.
- Conference: 2012 Dark Matter meeting at University of California - Los Angeles, February 23, 2012.
- Colloquium: Divisional Colloquium, Argonne National Laboratory, Chicago, IL, December 14, 2011.
- Seminar: University of Pittsburgh, Pittsburgh Pennsylvania, November 15, 2011.
- Seminar: Theoretical Division, Los Alamos National Laboratory, Los Alamos NM, October 29, 2011.
- Workshop: A Theoretical & Experimental vision for Direct & Indirect dark matter detection, Aspen Center for Physics, Aug. 14 - Sep. 11, 2011.
- Workshop: Dark Matter Underground and in the Heavens, CERN, Geneva, Switzerland, July 18-29, 2011.
- Fermi Summer School: Lectures on Dark Matter, University of Delaware Conference Center, May 31 - Jun 10, 2011.
- Conference: III Fermi Symposium, Università di Roma "La Sapienza", Rome, Italy, May 10, 2011.
- Colloquium: Stanford University, Kavli Institute for Particle Physics and Cosmology, May 5, 2011.
- Colloquium: University of Maryland - College Park, Department of Physics, April 19, 2011.
- Seminar: University of Texas - Austin, Texas Cosmology Center, March 29, 2011.
- Workshop: Indirect and Direct Detection of Dark Matter, Aspen Center for Physics, February 7, 2011.
- Seminar: University of Florida, High Energy Physics Seminar, December 3, 2010.
- Seminar: University of Pennsylvania, Astrophysics & Cosmology Seminar, November 17, 2010.
- Seminar: Vanderbilt University, High-Energy Theory/Cosmology Seminar, April 2010.
- Workshop: Dark Matter Annihilation and the Interstellar Medium, Fermilab, September 2009.
- Workshop: Dark Matter, Keck Institute for Space Studies, California Institute of Technology & Jet Propulsion Laboratory, July 2009.
- Colloquium, Yale University, Department of Physics and Department of Astronomy, April, 2009.
- Workshop: Shedding Light on Dark Matter, Maryland Center for Fundamental Physics & Center for Scientific Computing and Mathematical Modeling, University of Maryland, April, 2009.
- Colloquium, Northwestern University, Department of Physics, December, 2008.
- Colloquium, Boston College, Department of Physics, November, 2008.

## Service

### To the Profession:

- Fermi Gamma-ray Space Telescope User's Group committee member (2009-2015).
- Referee for Physical Review Letters, Physical Review D, Journal of Cosmology and Astrophysics, The Astrophysical Journal and the Monthly Notices of the Royal Astronomical Society.
- Reviewer for the DOE, NSF, NASA, and the Swiss Supercomputing Center.

# Savvas M. Koushiappas

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## To the Department/University:

- Director, Graduate Studies.
- Departmental Committees: Graduate Admissions (Chair), Advising (Chair), Curriculum, Qualifier (Chair), Computer, Colloquia/Seminars (Chair), Outreach (Chair).
- Member: Provost's Task Force on Doctoral Education.
- Board Member: Data Science Initiative Campus Advising Board, Campus Planning Advising Board.
- University Committees: Honorary Degree nominations committee.

## To the Community:

- Public speaker at Ladd Observatory
- Mentor to science students at East Providence High School
- Lunch & Learn discussions, Barrington Public Schools
- Speaker at the Rhode Island Amateur Astronomical Society

## Organization

- Co-organizer of "The nature of Dark Matter and Large Scale Structure", Nicosia, Cyprus, June 11-15, 2019.
- Local Organizing Committee, "Identification of Dark Matter" (international conference), Brown University, July 23-27, 2018.
- Brown Physics Degree Day, 2012, 2015.
- Scientific Organizing Committee, "SnowDOG 2012 meeting", Park City, Utah, Mar. 24-26 2012.
- Local Organizing Committee, 2011 American Physics Society, Division of Particles & Fields, Providence RI, Aug. 9-13 2011, IDM 2018, Providence, RI, July 23-27, 2018.

## Membership (scientific)

- LISA Consortium (associate member)
- VERITAS Collaboration (associate member).

## Membership (professional)

- American Physical Society

## Teaching

- PHYS 0040, Physics, Spring 2016, 2020, 2021, 2022 (a course on electricity, magnetism, optics, and modern physics for concentrators in sciences other than physics).
- PHYS 0220, Astronomy, Spring 2009, 2010, 2014 (an introductory course on astronomy, including observational astronomy, properties of stars, galaxies, and the Universe as a whole, including the basic ideas of cosmology).
- PHYS 0470, Electricity & Magnetism, Fall 2011, 2012, 2013, 2017, 2018, 2019, 2020, 2021 (an undergraduate course on electrodynamics, electric and magnetic properties of matter and Maxwell's equations).



# Savvas M. Koushiappas

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- PHYS 0500, Advanced Classical Mechanics, Fall 2023 (a core physics course on Newtonian, Lagrangian and Hamiltonian dynamics, central force, rigid bodies, and dynamics of systems of particles).
- PHYS 1250, Theory of Stellar Structure, Fall 2008, 2010, Spring 2012, Spring 2018 (an upper undergraduate course on the physics of stars).
- PHYS 1270, Galactic Dynamics, Fall 2015 (a graduate course on the physics of galaxies and astrophysical processes in the universe).
- PHYS 1510, Advanced Electromagnetic Theory, Fall 2022 (an upper undergraduate course on advanced electrodynamics, including multipole expansion, waves, radiation, and relativity).
- PHYS 2280, Cosmology, Spring 2011, 2013, 2015, 2019 (a graduate course on the fundamentals of modern cosmology).

## Advising

### Undergraduate:

- Ross Kliegman (Sc.B., May 2020, currently at Zeteo, Inc)
- Andrew Marmor (Sc.B., May 2018)
- Nathaniel Dick (Sc.B., May 2018)
- London Cooper-Troendle (Sc.B., May 2016, currently a graduate student at Yale U.)
- Nora Shipp (Sc.B., May 2014, currently postdoc at MIT)
- Jason Poh (Sc.B., May 2014, currently graduate student at the U. of Chicago)
- Deivid Ribeiro (Sc.B., Dec. 2013, currently graduate student at Columbia U.)
- Alejo Stark (Sc.B., May 2013, Ph.D. U. of Michigan)
- Urmila Chadayammuri (Sc.B., May 2013, Ph.D., Yale U.)
- Laura M. Mocanu (Sc.B., May 2010, Ph.D., U. of Chicago)
- Max Abrahams (Sc.B., May 2011)

### Masters:

- Jinglong Liu (Sc.M, 2020)
- Louis Hamaide (Sc.M., 2019, now graduate student at King's College, London, UK).
- William Blaine (Sc.M, 2016, now at Los Alamos National Laboratory).

### Doctoral:

- Alexis Ortega (2021 - Present).
- Isabelle Goldstein (2019 - Present).
- Kyriakos Vattis (Ph.D., May 2021, now at Department of Neurology, MGH, Boston, MA).
- Gordon Blackadder (Ph.D., May 2016, now at ASOS, London, UK).
- Alex Geringer-Sameth (Ph.D., May 2013, now Lecturer at Department of Mathematics, Imperial College, London, UK).
- Andrew Favaloro (2010-2011, now at Henry Street School for International Studies, New York City, NY).

### Postdoc:

- Dr. Steven J. Clark (2019 - 2022, now faculty at Hood College).
- Dr. Jacqueline Chen (2009-2011, now at AIR Worldwide).