Doron Kushnir - Curriculum Vitae

Department of Particle Physics and Astrophysics
Weizmann Institute of Science
Rehovot 76100
Israel.

Phone: +972-54-7577-285 (mobile), +972-8-934-3696 (office)
Fax: +972-8-934-4172
Office: Benoziyo, Room 274
Email: doron.kushnir@weizmann.ac.il
Nationality: Israeli
Born: September 27, 1979, Israel
Family status: Married + 2 Homepage: http://www.weizmann.ac.il/particle/kushnir/

Education

2006-2011 Ph.D., Department of Particle Physics and Astrophysics, Weizmann Institute of Science, Israel.

Thesis: Shocks in astrophysical plasma flows: Hydrodynamics, relativistic particle population, and magnetic fields.

Advisor: Prof. Eli Waxman.

2000-2004 M.Sc., *Summa Cum Laude*, in physics, The Hebrew University of Jerusalem, Israel.

Thesis: On the stability of decelerating shocks.

Advisors: Prof. Ami Glazner, The Hebrew University of Jerusalem; Prof. Dov Shvarts, Nuclear Research Center- Negev (NRCN).

1997-2000 B.Sc., *Summa Cum Laude*, in mathematics and physics, Talpiot program, The Hebrew University of Jerusalem, Israel.

Employment

2016- Senior Scientist, Weizmann Institute of Science, Israel.

2012-2016 Postdoctoral fellow, School of Natural Sciences, Institute for Advanced Study, Princeton, NJ, USA.

2000-2008 Scientific researcher, Physics department, Nuclear Research Center- Negev (NRCN), Israel.

1997-2000 Army service: Talpiot program.

Awards and Honors

2015 John N. Bahcall Fellowship.

2012 IAS postdoctoral fellowship in astrophysics.

2011 Caltech theoretical prize postdoctoral fellowship (declined).

2011 The Dostrovsky prize for an outstanding PhD Thesis (Weizmann Institute of Science).

1999 The Hebrew University of Jerusalem, Dean's list.

1998 The Hebrew University of Jerusalem, Dean's list.

Grants

Pazi Foundation, 2017-2021: Simulating collisions of white dwarfs as a primary channel for type Ia supernovae. 2M NIS.

Computing Grants

NSF XSEDE, 2016 : 2 million CPU hours on Stampede located at Texas Advanced Computing Center (worth of $68,250).

NSF XSEDE, 2013-2014: 2 million CPU hours on Stampede located at Texas Advanced Computing Center (worth of $66,500). Stampede, which went into production on January 2013, is one of the most powerful machines in the world for open science research, and was located at the 6th place in the June 2013 Top500 list. The allocation of high-end computational resources was subject to peer review through the XSEDE Resource Allocations Committee via a competitive process, designed in a similar fashion to the NSF peer review system.

Observing Grants

NOAO, 2016 : Imaging the only known white dwarf with a > 8 Msun progenitor (2016A-0217, PI: Brandt) GEM-SQ (0.15n).

Student Mentoring

2017-: A. Sharon, M.Sc. at Weizmann Institute of Science

2017-: M. Da Silva, M.Sc. at Weizmann Institute of Science

2014-2015: C. Holcomb, graduate project at Princeton University

Service to the scientific community

Referee: Physical Review Letters.

Referee: The astrophysical journal.

Referee: The astrophysical journal letters.

Referee: Physics of fluids.

Proposal review: NSF Stellar Astronomy Program, 2013.

Talks at International Conferences

"The Dawning Era of Gravitational-Wave Astrophysics", 2017, Aspen, CO, USA, *GW150914: spin constraints on the merger time of the progenitor*

"High energy neutrino and cosmic-ray astrophysics: The way forward", 2017, Weizmann Institute of Science, Israel, *Core-collapse supernovae are thermonuclear explosions – Implications for nu-detection*

"The Transient Sky", 2016, Cambridge, MA , USA, *Panel Discussion: Singles, Doubles or Triples?*

"Fourteenth Marcel Grossmann Meeting", 2015, Rome, Italy, *Thermonuclear Explosions of Rotating Massive Stars Could Explain Core-Collapse Supernovae*

"Second Annual GMT Community Science Meeting", 2014, Smithsonian National Museum of the American Indian, Washington, D.C., USA, *An unambiguous test for direct collisions as the primary channel for type Ia SNe is possible in the near future*

"Type Ia supernovae: progenitors, explosions, and cosmology", 2014, University of Chicago, Chicago, IL, USA, *An unambiguous test for direct collisions as the primary channel for type Ia SNe is possible in the near future*

"Ias @ IAS Workshop", 2014, Princeton, NJ, USA, *The main Ia challenges are met for collisions: 1. Ignition of a detonation - resolved by 10 km simulations 2. Observed* ^{56}Ni *range: 0.1-1* $M_{\odot}$

"Multi-Messenger Astronomy of Cosmic Rays", 2011, KIAA, Beijing, China, Invited, *Magnetic Fields, Relativistic particles, and Nonthermal Emission in Galaxy Clusters*

"31st International Cosmic Ray Conference", 2009, Lodz, Poland, *Magnetic Fields, Relativistic particles, and Nonthermal Emission in Galaxy Clusters*

"TeV Particle Astrophysics 2009", SLAC, Menlo Park, CA, USA, *Magnetic Fields, Relativistic particles, and Nonthermal Emission in Galaxy Clusters*

"Heidelberg International Symposium on High Energy Gamma-Ray Astronomy", 2008, Heidelberg, Germany, *Nonthermal Emission from Galaxy Clusters*

Seminars and Colloquia

Core collapse supernovae are thermonuclear explosions, 2017, Technion, Israel

Spin-based constraints on the progenitors of the LIGO events, 2017, High energy Astrophysics workshop, The Hebrew University of Jerusalem, Israel

Thermonuclear Explosions of Rotating Massive Stars Could Explain Core-Collapse Supernovae, 2016, Mini-workshop on core-collapse supernovae, Weizmann Institute of Science, Israel

Unlike previously thought: Type Ia supernovae are direct collisions of white dwarfs; Core collapse supernovae may be thermonuclear explosions, 2014, Tel-Aviv University, Israel

Unlike previously thought: Type Ia supernovae are direct collisions of white dwarfs; Core collapse supernovae may be thermonuclear explosions, 2014, Physics Colloquia, Weizmann Institute of Science, Israel

Unlike previously thought: Type Ia supernovae are direct collisions of white dwarfs; Core collapse supernovae may be thermonuclear explosions, 2014, Technion, Israel

Thermonuclear explosion of rotating helium-oxygen shells could explain core-collapse supernovae, 2014, The Hebrew University of Jerusalem, Israel

We believe type Ia supernovae are direct collisions of white dwarfs in triple systems, 2014, UCL, London, UK

Unlike previously thought: Type Ia supernovae are direct collisions of white dwarfs; Core collapse supernovae may be thermonuclear explosions, 2014, LBNL, Berkeley, CA, USA

Unlike previously thought: Type Ia supernovae are direct collisions of white dwarfs; Core collapse supernovae may be thermonuclear explosions, 2014, UCSC, Santa Cruz, CA, USA

We believe type Ia supernovae are direct WD-WD collisions in triple systems , 2014, Astronomy Department Colloquia, Cornell University, Ithaca, NY, USA

We believe type Ia supernovae are direct collisions of white dwarfs in triple systems, 2014, Weizmann Institute of Science, Israel

We believe type Ia supernovae are direct collisions of white dwarfs in triple systems, 2014, The Hebrew University of Jerusalem, Israel

We believe type Ia supernovae are direct WD-WD collisions in triple systems, 2014, The Pennsylvania State University, State College, PA, USA

The Progenitors of Type Ia SNe Are Head-On Collisions of WDs in Triple Systems, 2013, Weizmann Institute of Science, Israel

The Progenitors of Type Ia SNe Are Head-On Collisions of WDs in Triple Systems, 2013, The Hebrew University of Jerusalem, Israel

The Progenitors of Type Ia SNe Are Head-On Collisions of WDs in Triple Systems, 2013, Tel-Aviv University, Israel

Imploding Ignition Waves, 2012, Ben-Gurion University, Israel

Imploding Ignition Waves, 2011, Caltech, CA, USA

Imploding Ignition Waves, 2011, UCB, Berkeley, CA, USA

Imploding Ignition Waves, 2011, KIPAC, Stanford, CA, USA

Imploding Ignition Waves, 2011, UCSC, Santa Cruz, CA, USA

Imploding Ignition Waves, 2011, IAS, Princeton, NJ, USA

Imploding Ignition Waves, 2011, CfA, MA, USA

Magnetic Fields, Relativistic particles, and Nonthermal Emission in Galaxy Clusters, 2010, CCCP, NY, NY, USA

Magnetic Fields, Relativistic particles, and Nonthermal Emission in Galaxy Clusters, 2010, CfA, MA, USA

Magnetic Fields, Relativistic particles, and Nonthermal Emission in Galaxy Clusters, 2010, Princeton University, Princeton, NJ, USA

Magnetic Fields, Relativistic particles, and Nonthermal Emission in Galaxy Clusters, 2009, The Hebrew University of Jerusalem, Israel

List of Publications

Refereed Journals

Zaldarriaga, M., Kushnir, D., Kollmeier, J. *The Expected Spins of Gravitational Wave Sources With Isolated Field Binary Progenitors*, 2017, MNRAS accepted (arXiv:1702.00885)

Keshet, U., Kushnir, D., Loeb, A., & Waxman, E. *Preliminary Evidence for a Virial Shock around the Coma Galaxy Cluster*, 2017, ApJ, 845, 24 (arXiv:1210.1574)

Kushnir, D., Zaldarriaga, M., Kollmeier, J., & Waldman, R. *Dynamical tides reexpressed*, 2017, MNRAS, 467, 2146 (arXiv:1605.03810)

Kushnir, D., Zaldarriaga, M., Kollmeier, J., & Waldman, R. *GW150914: Spin based constraints on the merger time of the progenitor system*, 2016, MNRAS, 462, 844 (arXiv:1605.03810)

Blum, K. & Kushnir, D. *Neutrino Signal of Collapse-Induced Thermonuclear Supernovae: The Case for Prompt Black Hole Formation in SN1987A*, 2016, ApJ, 828, 31 (arXiv:1601.03422)

Holcomb, C. & Kushnir, D. *Can helium envelopes change the outcome of direct white dwarf collisions?*, 2016, ApJ, 826, 169 (arXiv:1510.07649)

Kushnir, D., & Katz, B. *Failure of a neutrino-driven explosion after core-collapse may lead to a thermonuclear supernova*, 2015, ApJ, 811, 97 (arXiv:1412.1096)

Dong, S., Katz, B., Kushnir, D., & Prieto, Jose L. *Type Ia supernovae with bimodal explosions are common – possible smoking gun for direct collisions of white dwarfs*, 2015, MNRAS, 454, L61 (arXiv:1401.3347)

Kushnir, D., & Katz, B. *Early Hydrodynamic Evolution of a Stellar Collision*, 2014, ApJ, 785, 124 (arXiv:1311.1209)

Kushnir, D., Katz, B., Dong, S., Livne, E., & Fernández, R. *Head-on Collisions of White Dwarfs in Triple Systems Could Explain Type Ia Supernovae*, 2013, ApJL, 778, L37 (arXiv:1303.1180)

Kushnir, D., Livne, E., & Waxman, E. *Imploding ignition waves: I. one dimensional analysis*, 2012, ApJ, 752, 89 (12pp) (arXiv:1108.4690)

Kushnir, D., & Waxman, E. *Closing the gap in the solutions of the strong explosion problem: an expansion of the family of second-type self-similar solutions*, 2010, ApJ, 723, 10-19 (arXiv:1002.3869)

Kushnir, D., & Waxman, E. *Hard X-ray emission from accretion shocks around galaxy clusters*, 2010, JCAP, 02, 25 (arXiv:0905.1950)

Kushnir, D., Katz, B., & Waxman, E. *Magnetic fields and cosmic rays in clusters of galaxies*, 2009, JCAP, 09, 24 (arXiv:0903.2275)

Kushnir, D., & Waxman, E. *Nonthermal emission from clusters of galaxies*, 2009, JCAP, 08, 2 (arXiv:0903.2271)

Kushnir, D., & Waxman, E., & Shvarts, D. *The Stability of Decelerating Shocks Revisited*, 2005, ApJ, 643, 407-418 (astro-ph/0502125)

Srebro, Y., Kushnir, D., Elbaz, Y., & Shvarts, D. *Modeling turbulent mixing in inertial confinement fusion implosions*, 2003, Laser and Particle Beams, 21, 355-361

ArXiv submitted

Kushnir, D. *The progenitors of core-collapse supernovae suggest thermonuclear origin for the explosions*, 2015, arXiv:1506.02655

Kushnir, D. *Thermonuclear explosion of rotating massive stars could explain core-collapse supernovae*, 2015, arXiv:1502.031

Katz, B., Dong, S., & Kushnir, D. *Luminosity function suggests up to 100 white dwarfs within 20 pc may be hiding in multiple systems*, 2014, arXiv:1402.7083

Rave, G., Kushnir, D., & Waxman, E. *What can we really learn about Magnetic Fields in Galaxy Clusters from Faraday Rotation observations?*, 2013, arXiv:1304.4234

Katz, B., Kushnir, D., & Dong, S. *An exact integral relation between the Ni56 mass and the bolometric light curve of a type Ia supernova*, 2013, arXiv:1301.6766

Semi-popular

Kushnir, D. *The Astrophysics Behind LIGOs Detection Or the Trees That Grow on Mulberry Street* , 2016, The Institute Letter, Princeton, Summer 2016

Katz, B., Dong, S., & Kushnir, D. *Unlike Previously Thought, Many Supernovae Result from Stellar Collisions*, 2013, The Institute Letter, Princeton, Summer 2013

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