Contact Information

Fermi National Accelerator Laboratory
Theoretical Physics Division, Astrophysics Department
Website: https://samueldmcdermott.github.io/
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Citizenship: USA
Phone: (215) 990-7036

Areas of Expertise

General: High-dimensional Bayesian parameter inference; uncertainty quantification; numerical methods; machine learning; simulation-based inference; 1D and 2D signal analysis; wavelet transforms.

Academic: CMB analysis; identification of particle physics beyond the Standard Model; maximizing utility of astrophysical data sets; new physics in stars, extreme astrophysical environments, and cosmological settings.

Employment

University of Chicago Department of Astronomy & Astrophysics — Sept 2022
Postdoctoral associate, member of Deep Skies Lab

Fermi National Accelerator Laboratory Theory Division — Sept 2017 - Sept 2022
Postdoctoral associate and Schramm Fellow

C. N. Yang Institute for Theoretical Physics — Sept 2014 - Sept 2017
Postdoctoral associate

Education

Ph.D., Physics, The University of Michigan, Ann Arbor — Aug 2014
Dissertation Advisor: Dr. Kathryn M. Zurek

B.A., Physics and **B.A.,** Math, The University of Pennsylvania — Dec 2008
Research Advisor: Dr. Marija Drndic

Awards and Recognition

Fermilab

- Schramm Fellowship — 2019
- URA Thesis Award — 2015
- Predoctoral Theory Fellowship — 2013-2014

The University of Michigan

- Rackham Predoctoral Fellowship — 2013-2014

The University of Pennsylvania

- *Summa cum Laude*, with Distinction in Physics; Dean's List, all semesters; Benjamin Franklin Scholar; Phi Beta Kappa scholar

Publication Statistics

According to the **inSpireHEP** database, as of September 16, 2022:

- 47 research publications and 1 review article
- 9 *Letters* published (7 in the Physical Review, 1 in the Astrophysical Journal, 1 in Physics Letters B)
- one solicited whitepaper for Snowmass 2020; numerous letters of interest for Snowmass 2020 and Astro20 Decadal
- more than 3,900 total citations
- h-index: 28

PUBLICATIONS Prepared while at Fermilab as a postdoctoral associate:

48. SDM, Yi-Ming Zhong, and Ilias Cholis. *A Phantom Menace: On the Morphology of the Galactic Center Excess*. arXiv:2209.00006. FERMILAB-PUB-22-650-T.

47. Jeremy Sakstein, Djuna Croon, and SDM. *Axion Instability Supernovae*. Phys. Rev. D **105**, 095038 (2022). arXiv:2203.06160. FERMILAB-PUB-22-118-T.

46. Ilias Cholis, Yi-Ming Zhong, SDM, and Joseph P. Surdutovich. *The Return of the Templates: Revisiting the Galactic Center Excess with Multi-Messenger Observations*. Phys. Rev. D **105**, no.10, 103023 (2022). arXiv:2112.09706 [astro-ph]. FERMILAB-PUB-21-709-T.

45. Marcela Carena, Nina M. Coyle, Yingying Li, SDM, and Yuhsin Tsai. *Cosmologically Degenerate Fermions*. arXiv:2108.02785. FERMILAB-PUB-21-325-T.

44. Susan Gardner, SDM, and Brian Yanny. *The Milky Way, Coming into Focus: Precision Astrometry Probes its Evolution, and its Dark Matter*. Prog. Part. Nucl. Phys. **121**, 103904 (2021). arXiv:2106.13284 [astro-ph]. FERMILAB-PUB-21-297-T.

43. Pierce Giffin, John Lloyd, SDM, and Stefano Profumo. *Neutron Star Quantum Death by Small Black Holes*. Phys. Rev. D **105**, 123030 (2022). arXiv:2105.06504. FERMILAB-PUB-21-259-T.

42. Eric J. Baxter, Djuna Croon, SDM, and Jeremy Sakstein. *Find the Gap: Black Hole Population Analysis with an Astrophysically Motivated Mass Function*. Astrophys. J. Lett. **916**, no.2, L16 (2021). arXiv:2104.02685 [astro-ph]. FERMILAB-PUB-21-148-T.

41. Carlos Blanco, Yonatan Kahn, Benjamin Lillard, and SDM, *Dark Matter Daily Modulation With Anisotropic Organic Crystals*. Phys. Rev. D **104**, 036011 (2021). arXiv:2103.08601. FERMILAB-PUB-21-066-T.

40. James M. Cline, Guillermo Gambini, SDM, and Matteo Puel, *Late-Time Dark Matter Oscillations and the Core-Cusp Problem*. JHEP **04**, 223 (2021). arXiv:2010.12583. FERMILAB-PUB-20-556-T.

39. Jeremy Sakstein, Djuna Croon, SDM, Maria C. Straight and Eric J. Baxter, *Beyond the Standard Model Explanations of GW190521*. Phys. Rev. Lett. **125**, no.26, 261105 (2020). arXiv:2009.01213 [gr-qc]. FERMILAB-PUB-20-461-T.

38. Djuna Croon, SDM, and Jeremy Sakstein. *Missing in Action: New Physics and the Black Hole Mass Gap*. Phys. Rev. D **102**, no. 11, 115024; selected as an **Editor's Choice** article. arXiv:2007.07889 [gr-qc]. FERMILAB-PUB-20-328-T.

37. Djuna Croon, SDM, and Jeremy Sakstein. *Missing in Axion: where are XENON1T's big black holes?* Phys. Dark Univ. **32**, 100801 (2021). arXiv:2007.00650. FERMILAB-PUB-20-270-T.

36. Djuna Croon, Gilly Elor, Rebecca Leane, and SDM. *Supernova Muons: New Constraints on Z' Bosons, Axions, and ALPs*. JHEP **01**, 107 (2021). arXiv:2006.13942. FERMILAB-PUB-20-246-A-T.

35. Celeste Keith, Dan Hooper, SDM, and Nikita Blinov. *Constraints on Primordial Black Holes From Big Bang Nucleosynthesis Revisited.* Phys. Rev. D **102**, no.10, 103512 (2020). arXiv:2006.03608 [astro-ph]. FERMILAB-PUB-20-224-A.

34. Dan Hooper, Gordan Krnjaic, John March-Russell, SDM, and Rudin Petrossian-Byrne. *Hot Gravitons and Gravitational Waves From Kerr Black Holes in the Early Universe.* arXiv:2004.00618 [astro-ph]. FERMILAB-PUB-20-125-A-T.

33. Samuel J. Witte, Salvador Rosauro-Alcaraz, SDM, and Vivian Poulin. *Dark Photon Dark Matter in the Presence of Inhomogeneous Structure.* JHEP **06**, 132 (2020). arXiv:2003.13698 [astro-ph]. FERMILAB-PUB-20-121-T.

32. Yi-Ming Zhong, SDM, Ilias Cholis, and Patrick J. Fox. *A New Mask for An Old Suspect: Testing the Sensitivity of the Galactic Center Excess to the Point Source Mask.* Phys. Rev. Lett. **124**, no.23, 231103 (2020). arXiv:1911.12369 [astro-ph]. FERMILAB-PUB-19-575-T.

31. SDM and Samuel J. Witte. *The Cosmological Evolution of Light Dark Photon Dark Matter.* Phys. Rev. D **101**, 063030 (2020). arXiv:1911.05086 [hep-ph]. FERMILAB-PUB-19-565-T.

30. Gordan Krnjaic and SDM. *Implications of BBN Bounds for Cosmic Ray Upscattered Dark Matter.* Phys. Rev. D **101**, no.12, 123022 (2020). arXiv:1908.00007 [hep-ph]. FERMILAB-PUB-19-358-A.

29. Nikita Blinov, Kevin J. Kelly, Gordan Krnjaic, and SDM. *Constraining the Self-Interacting Neutrino Interpretation of the Hubble Tension.* Phys. Rev. Lett. **123**, no. 19, 191102 (2019). arXiv:1905.02727 [astro-ph]. FERMILAB-PUB-19-175-A-T.

28. Dan Hooper, Gordan Krnjaic, and SDM. *Dark Radiation and Superheavy Dark Matter from Black Hole Domination.* JHEP **08**, 001 (2019). arXiv:1905.01301 [hep-ph]. FERMILAB-PUB-19-186-A.

27. SDM and Michael S. Turner. *Nuclear Kinetic Equilibrium During Big Bang Nucleosynthesis.* arXiv:1811.04932 [hep-ph]. FERMILAB-PUB-18-625-A

26. SDM, Sanjay Reddy, and Srimoyee Sen. *A Deeply Bound Dibaryon is Incompatible with Neutron Stars and Supernovae.* Phys. Rev. D **99**, no. 3, 035013 (2019). arXiv:1809.06765 [hep-ph]. FERMILAB-PUB-18-490-A.

25. Rouven Essig, SDM, Hai-Bo Yu, and Yi-Ming Zhong. *Constraining Dissipative Dark Matter Self-Interactions.* Phys. Rev. Lett. **123**, no. 12, 121102 (2019). arXiv:1809.01144 [hep-ph]. FERMILAB-PUB-18-437-A.

24. Dan Hooper, Gordan Krnjaic, Andrew J. Long, and SDM. *WIMPflation.* Phys. Rev. Lett. **122**, no. 9, 091802 (2019). arXiv:1807.03308 [hep-ph]. FERMILAB-PUB-18-309-A.

23. Asher Berlin, Dan Hooper, Gordan Krnjaic, and SDM. *Severely Constraining Dark Matter Interpretations of the 21-cm Anomaly.* Phys. Rev. Lett. **121**, no. 1, 011102 (2018); selected as an **Editor's Choice** article. arXiv:1803.02804 [hep-ph]. FERMILAB-PUB-18-066-A.

22. Bhaskaran Balaji, Ilias Cholis, Patrick J. Fox, and SDM. *Analyzing the Gamma-ray Sky with Wavelets.* arXiv:1803.01952 [astro-ph]. Phys. Rev. D **98**, no. 4, 043009 (2018). FERMILAB-PUB-18-057-A-T.

21. Jae Hyeok Chang, Rouven Essig, and SDM. *Supernova 1987A Constraints on Sub-GeV Dark Sectors, Millicharged Particles, the QCD Axion, and an Axion-like Particle.* JHEP **09**, 051 (2018). arXiv:1803.00993 [hep-ph]. YITP-SB-18-01, FERMILAB-PUB-17-432-T.

20. Dan Hooper and SDM. *Robust Constraints and Novel Gamma-Ray Signatures of Dark Matter That Interacts Strongly With Nucleons.* Phys. Rev. D **97**, 115006 (2018). arXiv:1802.03025 [hep-ph]. FERMILAB-PUB-18-032-A.

19. SDM. *Is Self-Interacting Dark Matter Undergoing Dark Fusion?* Phys. Rev. Lett. **120**, 221806 (2018); selected as an **Editor's Choice** article. arXiv:1711.00857 [hep-ph]. FERMILAB-PUB-17-483-A-T.

Prepared while at YITP Stony Brook as a postdoctoral associate:

18. SDM, Hiren H. Patel, and Harikrishnan Ramani. *Dark Photon Decay Beyond The Euler-Heisenberg Limit.* Phys. Rev. D **97**, no. 7, 073005 (2018). arXiv:1705.00619 [hep-ph]. YITP-SB-17-14.

17. Samuel Witte, Vera Gluscevic, and SDM. *Prospects for Distinguishing Dark Matter Models Using Annual Modulation.* JCAP **02**, no. 02, 044 (2017). arXiv:1612.07808 [hep-ph]. YITP-SB-16-51.

16. Jae Hyeok Chang, Rouven Essig, and SDM. *Revisiting Supernova 1987A Bounds on Dark Photons.* JHEP **01**, 107 (2017). arXiv:1611.03864 [hep-ph]. YITP-SB-16-44.

15. SDM, Patrick Meade, and Harikrishnan Ramani. *Singlet Scalar Resonances and the Diphoton Excess.* Phys. Lett. B **755**, 353 (2016). arXiv:1512.05326 [hep-ph]. YITP-SB-15-47.

14. SDM, Ilias Cholis, Patrick J. Fox, and Samuel K. Lee. *Wavelet-Based Techniques for the Gamma-Ray Sky.* JCAP **07**, 07, 045, (2016). arXiv:1512.00012 [astro-ph]. YITP-SB-15-43.

13. Asher Berlin, Dan Hooper, and SDM. *Dark matter elastic scattering through Higgs loops.* Phys. Rev. D **92**, no. 12, 123531 (2015). arXiv:1508.05390 [hep-ph]. YITP-SB-15-29.

12. Hooman Davoudiasl, Dan Hooper, and SDM. *Inflatable Dark Matter.* Phys. Rev. Lett. **116**, 031303 (2016); selected as an **Editor's Choice** article. arXiv:1507.08660 [hep-ph]. YITP-SB-15-26.

11. Vera Gluscevic, Moira Gresham, SDM, Annika H. G. Peter, and Kathryn M. Zurek. *Identifying the Theory of Dark Matter with Direct Detection.* JCAP **12**, 12, 057 (2015). arXiv:1506.04454 [hep-ph]. YITP-SB-15-16. Associated code publicly available on github and ASCL.

Prepared while at Fermilab as a Fermilab Fellow:

10. SDM. *Lining up the Galactic Center Gamma-Ray Excess.* Phys. Dark Univ. **7-8**, 12 (2015). arXiv:1406.6408 [hep-ph]. FERMILAB-PUB-14-205-A-T.

9. Asher Berlin, Pierre Gratia, Dan Hooper, and SDM. *Hidden Sector Dark Matter Models for the Galactic Center Gamma-Ray Excess*. Phys. Rev. D **90**, 015032 (2014). arXiv:1405.5204 [hep-ph]. MCTP-14-12, FERMILAB-PUB-14-134-A.

8. Asher Berlin, Dan Hooper, and SDM. *Simplified Dark Matter Models for the Galactic Center Gamma-Ray Excess*. Phys. Rev. D **89**, 115022 (2014). arXiv:1404.0022 [hep-ph]. MCTP-14-07, FERMILAB-PUB-14-060-A.

7. Ilias Cholis, Dan Hooper, and SDM. *Dissecting the Gamma-Ray Background in Search of Dark Matter*. JCAP **02**, 014 (2014). arXiv:1312.0608 [astro-ph]. MCTP-13-40, FERMILAB-PUB-13-546-A.

6. Rouven Essig, Eric Kuflik, SDM, Tomer Volansky, and Kathryn M. Zurek. *Constraining Light Dark Matter with Diffuse X-Ray and Gamma-Ray Observations*. JHEP **11**, 193 (2013). arXiv:1309.4091 [hep-ph]. MCTP-13-27, FERMILAB-PUB-13-377-A-T.

Prepared while a graduate student at the University of Michigan and a member of the Michigan Center for Theoretical Physics (**MCTP**):

5. Clifford Cheung, SDM, and Kathryn M. Zurek. *Inspecting the Higgs for New Weakly Interacting Particles*. JHEP **04**, 074 (2013). arXiv:1302.0314 [hep-ph]. MCTP-13-01.

4. Eric Kuflik, SDM, and Kathryn M. Zurek. *Neutrino Phenomenology in a 3+1+1 Framework*. Phys. Rev. D **86**, 033015 (2012). arXiv:1205.1791 [hep-ph]. MCTP-12-11.

3. SDM, Hai-Bo Yu, and Kathryn M. Zurek. *The Dark Matter Inverse Problem: Extracting Particle Physics from Scattering Events*. Phys. Rev. D **85**, 123507 (2012). arXiv:1110.4281 [hep-ph]. MCTP-11-34.

2. SDM, Hai-Bo Yu, and Kathryn M. Zurek. *Constraints on Scalar Asymmetric Dark Matter from Black Hole Formation in Neutron Stars*. Phys. Rev. D **85**, 023519 (2012). arXiv:1103.5472 [hep-ph]. MCTP-11-16.

1. SDM, Hai-Bo Yu, and Kathryn M. Zurek. *Turning off the Lights: How Dark is Dark Matter?* Phys. Rev. D **83**, 063509 (2011). arXiv:1011.2907 [hep-ph]. MCTP-10-52.

Code

I have the following programming language skills

- **Proficiency:** Python (`numpy`, `scipy`, `jax`, `numpyro`, `pytorch`, `keras`/`tensorflow`, …), Mathematica, HTML
- **Familiarity:** Cython, CSS, bash, slurm

In addition, I wrote the following code packages:

- `gcepy` is a code for sampling for testing models of the Galactic center excess (GCE). This code relies on jax for all basic definitions, building up to a log-likelihood for the model given the data. The repository provides an ipynb demonstrating how to use two high-dimensional samplers, dynesty and numpyro, to derive constraints on the parameters.

- `dmdd`, ascl:1506.002, is a python package that enables simple simulation and Bayesian posterior analysis of nuclear-recoil data from dark matter direct detection experiments for a wide variety of theories of dark matter-nucleon interactions. `dmdd` was developed in collaboration with Vera Gluscevic for use in arXiv:1506.04454, additionally with Moira Gresham, Annika H. G. Peter, and Kathryn M. Zurek. `dmdd` was used by the PICO collaboration to set official limits in arXiv:1510.07754 [hep-ex]

Colloquia and Summary Talks

New Physics at the Stellar Frontier
- Argonne National Laboratory Physics Division **Jan 27, 2022**
- University of Utah Department of Physics & Astronomy **Jan 25, 2022**
- King's College London Theoretical Particle Physics & Cosmology **Oct 25, 2021**

Stellar Probes of New Physics Topical Review
- Brookhaven Forum 2021 **Nov 3, 2021**

Hunting for Dark Matter in the Lab, the Galaxy, and the Universe
- University of Victoria Department of Physics & Astronomy **Mar 9, 2020**

Invited Talks (*remote)

Assorted topics:
- Carnegie Mellon University Stellar Tests of Gravity Workshop **Mar 18 2022**
- 4D Seminar, University of California Berkeley **Feb 14, 2022**
- *Carleton HEP Seminar **Nov 8, 2021**
- *INT Workshop **Sept 21, 2021**
- *BSM PANDEMIC Series **Sept 14, 2021**
- *Particles and Nuclei International Conference **Sept 8, 2021**
- *Cambridge (Mass.) High Energy Workshop 2021 - Axion Physics **July 28, 2021**
- *APS DPF 2021 **July 13, 2021**
- *The 16th Marcel Grossman Meeting **July 8, 2021**
- *Cosmology from Home **July 7, 2021**
- *A Rainbow of Dark Sectors, Aspen Center for Physics **Apr 1, 2021**
- *HEP Seminar, UC Santa Barbara **Nov 16, 2020**
- *APEC Seminar, Kavli IPMU **Oct 21, 2020**
- *SITP Seminar, Stanford University **Oct 15, 2020**
- *High Energy Theory Seminar, Brown University **Oct 14, 2020**
- *High Energy Physics Seminar, Caltech **Oct 12, 2020**
- *Perimeter Institute Seminar **Apr 28, 2020**
- *MCFP Seminar, University of Maryland **Mar 26, 2020**
- *Theory Seminar, Notre Dame **Feb 23, 2020**
- *N3AS Seminar **Feb 2, 2020**
- *Israeli Joint Particle Physics Seminar, Hebrew University **Jun 24, 2020**
- *Thursday Seminar, CERN Th **Mar 19, 2020**
- New Techniques for Dark Matter Discovery, TRIUMF **Mar 12, 2020**
- CCPP Seminar, New York University **Jan 31, 2020**
- YITP-Brookhaven Joint Seminar, Stony Brook University **Jan 29, 2020**
- Informal Seminar, Harvard University **Jan 24, 2020**
- Nuclear Theory Seminar, University of Kentucky **Dec 19, 2019**
- Nuclear and Particle Theory Seminar, MIT **Oct 28, 2019**
- Exceptional Seminar, CERN Th **Sept 30, 2019**
- CCPP Seminar, New York University **Feb 9, 2019**
- Brown Bag Seminar, University of Michigan **Oct 31, 2018**

- Cosmic Controversies, KICP **Oct 7, 2019**
- No Stone Unturned Workshop, Utah **Aug 7, 2019**
- Current Trends in Particle Theory, UIC **June 16, 2019**
- AAS Dark Matter "Meeting within a Meeting" **June 11, 2019**
- LSST Dark Matter Workshop, KICP **Aug 5, 2019**
- multiple, Aspen Center for Physics **2015, 2016, 2017, and 2019**
- Seventh PIMKIO meeting, University of Michigan **March 29, 2019**
- Theory Seminar, Argonne National Lab **April 9, 2019**
- Twelfth Conference on the Identification of Dark Matter **July 23, 2018**
- CIPANP XIII **May 30 and 31, 2018**
- Theoretical Astrophysics Seminar, Fermilab **May 21, 2018**
- Kavli Institute for Theoretical Physics **Apr 10, 2018**
- Theoretical Physics Seminar, Brandeis University **Feb 15, 2018**
- Theoretical Astrophysics Seminar, Fermilab **Feb 5, 2018**
- Particle Theory Seminar, Perimeter Institute **Dec 1, 2017**
- HPS Collaboration Telecon **Nov 15, 2017**
- Particle Physics Seminar, University of Washington **Oct 24, 2017**
- ITS Seminar, University of Oregon **Oct 23, 2017**
- Theory Seminar, SLAC **Oct 20, 2017**
- 4D Seminar, Berkeley **Oct 18, 2017**
- Particle Theory Seminar, Boston University **Oct 11, 2017**
- CFP Seminar, University of Maryland **Apr 10, 2017**
- Nuclear Theory Seminar, University of Kentucky **Apr 6, 2017**
- High Energy Theory Seminar, University of Minnesota **Mar 10, 2017**
- HEP Seminar, Johns Hopkins University **Oct 25, 2016**
- Dark Interactions Workshop, Brookhaven **Sep 7, 2016**
- Joint Particle Seminar, UC Irvine **Apr 27, 2016**
- High Energy Physics Seminar, Caltech **Apr 25, 2016**
- Astro Coffee, IAS **Feb 3, 2016**
- Pheno & Vino, Princeton **Feb 2, 2016**
- Galileo Galilei Institute workshop **Sep 30, 2015**
- APS DPF meeting, Ann Arbor **Aug 5, 2015**
- URA Thesis Award Presentation, Fermilab Users Meeting **June 10, 2015**
- Cornell Particle Theory Seminar **Apr 10, 2015**
- Maryland CFP **Mar 9, 2015**
- Brookhaven National Lab **Mar 4, 2015**
- UT Austin Theory Group Seminar **Nov 4, 2014**
- IAS Astro Coffee **Oct 8, 2014**
- MIT CTP **Oct 1, 2014**
- Université de Montréal and McGill dark matter workshop **July 24, 2014**
- University of Chicago Dark Matter Hub meeting **Apr 15, 2014**
- Los Alamos T2 Seminar **Dec 5, 2013**
- Wisconsin Theory Seminar **Nov 8, 2013**
- SLAC Theoretical Physics Seminar **Oct 30, 2013**
- Fermilab Theory Seminar **Oct 17, 2013**

In addition, I have given parallel and other talks at the Midwest Relativity Meeting, FNAL, Brookhaven Forum, YITP, COSMO2014, TeVPA/IDM 2014, the Pitt Phenomenology meetings, and the 19th SUSY meeting

Professional Service

Referee: **Phys. Rev. Letters**, the **Astrophysical Journal**, **MNRAS Letters**, **JHEP**, **Phys. Rev. D**, and **Phys. Letters B**.

Organizer of the following conferences, workshops, and meetings:

- Dark Matter in Compact Objects, Stars, and in Low Energy Experiments (22-2b) (Aug 1- Sep 2, 2022) at the University of Washington's Institute for Nuclear Theory; inclusive of a $106,400 grant from the Institute for Nuclear Theory
- Next Frontiers in the Search for Dark Matter (Aug 26 - Oct 11, 2019) at Galileo Galilei Institute in Arcetri, Italy; inclusive of a five-day conference
- New Directions in the Search for Light Dark Matter Particles (June 4-7, 2019) at Fermilab and KICP; awarded $24,525 grant from the Gordon and Betty Moore Foundation
- Beyond WIMPs: from Theory to Detection (March 27-29, 2017) at the Simons Center for Geometry and Physics
- Light Dark Matter: Asymmetric, thermal and non-thermal dark matter and its detection (April, 2013) at the Michigan Center for Theoretical Physics

Press

Hershberger, Scott. "Physics at Tiniest Scale Could Explain 'Impossible' Black Holes" *Symmetry Magazine*, 16 December 2020.

Hershberger, Scott. "If Betelgeuse goes boom: How DUNE would respond to a nearby supernova." *Fermilab News*, 5 October 2020.

Sakstein, Jeremy and Croon, Djuna, and SDM. "Beyond the Standard Model Explanations of GW190521." *Newsletter of the CERN Experimental Physics Department*, 29 September 2020.

Hekkenberg, Ans. "Overschot straling centrum Melkweg niet te verklaren met donkere materie" (Dutch) *newscientist.nl*, 8 September 2020.

Fadelli, Ingrid. "Could recently spotted dim point sources explain the galactic center excess (GCE)?" *Phys.org*, 14 July 2020.

Muñoz, Julian and Loeb, Abraham. "The First Stars May Shed Light on Dark Matter." *APS Physics*, 2 July 2018.

Conover, Emily. "If real, dark fusion could help demystify this physics puzzle." *Science News*, 6 June 2018.

Inglis-Arkell, Esther. "'Inflatable Dark Matter' Could Explain Why We See Less Than Many Theories Predict." *Gizmodo*, 18 January 2016.