

Anson Hook
Department of Physics
University of Maryland
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I.B. Academic Appointments at UMD

Assistant Professor, Department of Physics
December 31, 2017 - Present

Academic Appointments Elsewhere

2022-2024 Perimeter Institute, Waterloo, Canada
Visiting Fellow

2015-2018 Stanford University, Stanford, USA
Postdoctoral Scholar. Advisor: Prof. Savas Dimopoulos

2012-2015 Institute for Advanced Study, Princeton, USA
Postdoctoral Scholar. Advisor: Prof. Nima Arkani-Hamed

Education

2008-2012 Stanford University, Palo Alto, USA
PhD. Advisor: Prof. Jacob Wacker

2004-2008 Princeton University, New Jersey, USA

II. **Research, Scholarly, Creative and/or Professional Activities**

Interests:

- *Gauge theories: supersymmetry, dualities, confinement*
- *Theoretical particle physics beyond the Standard Model: model building, supersymmetry breaking, strong CP problem, gauge unification, naturalness*
- *Particle discovery: small scale experiments, collider physics, new discovery modes, jet substructure, cosmology, gravitational waves*

II.C. Refereed Journals

II.C.1. Refereed Journal Articles (Mentorship - **Boldface** = post doc; *italics* = grad student; underline = under graduate)

1. **Buschmann, M.**, *Foster, J. W.*, Hook, A., Peterson, A., Willcox, D. E., Zhang, W., Safdi, B. R. (2022). Dark matter from axion strings with adaptive mesh refinement. *Nature Commun.*, 13(1), 1049.

2. Aryshev, A., others (2022). The International Linear Collider: Report to Snowmass 2021.
3. *Brzeminski, D.*, Hook, A., **Marques-Tavares, G.** (2022). Precision Early Universe Cosmology from Stochastic Gravitational Waves.
4. Asadi, P., others (2022). Early-Universe Model Building.
5. Hook, A. (2021). Naturalness without new particles. *JHEP*, 04, 048.
6. Hook, A., **Marques-Tavares, G.**, *Ristow, C.* (2021). Supernova constraints on an axion-photon-dark photon interaction. *JHEP*, 06, 167.
7. Hook, A., **Marques-Tavares, G.**, **Racco, D.** (2021). Causal gravitational waves as a probe of free streaming particles and the expansion of the Universe. *JHEP*, 02, 117.
8. **Carney, D.**, Hook, A., **Liu, Z.**, Taylor, J. M., Zhao, Y. (2021). Ultralight dark matter detection with mechanical quantum sensors. *New J. Phys.*, 23(2), 023041.
9. *Brzeminski, D.*, Chacko, Z., *Dev, A.*, Hook, A. (2021). Time-varying fine structure constant from naturally ultralight dark matter. *Phys. Rev. D*, 104(7), 075019.
10. *Ekhterachian, M.*, Hook, A., **Kumar, S.**, **Tsai, Y.** (2021). Bounds on gauge bosons coupled to nonconserved currents. *Phys. Rev. D*, 104(3), 035034.
11. *Das, S.*, Hook, A. (2021). Black hole production of monopoles in the early universe. *JHEP*, 12, 145.
12. Hook, A., **Marques-Tavares, G.**, **Tsai, Y.** (2020). Scalars Gliding through an Expanding Universe. *Phys. Rev. Lett.*, 124(21), 211801.
13. Hook, A., **Huang, J.**, **Racco, D.** (2020). Minimal signatures of the Standard Model in non-Gaussianities. *Phys. Rev. D*, 101(2), 023519.
14. Hook, A., **Huang, J.**, **Racco, D.** (2020). Searches for other vacua. Part II. A new Higgstory at the cosmological collider. *JHEP*, 01, 105.
15. Hook, A., *Kumar, S.*, **Liu, Z.**, Sundrum, R. (2020). High Quality QCD Axion and the LHC. *Phys. Rev. Lett.*, 124(22), 221801.
16. **Berlin, A.**, Hook, A. (2020). Searching for Millicharged Particles with Superconducting Radio-Frequency Cavities. *Phys. Rev. D*, 102(3), 035010.
17. Agrawal, P., Hook, A., **Huang, J.** (2020). A CMB Millikan experiment with cosmic axiverse strings. *JHEP*, 07, 138.
18. Agrawal, P., Hook, A., **Huang, J.**, **Marques-Tavares, G.** (2020). Axion string signatures II: A cosmological plasma collider.

19. Das, S., Hook, A. (2020). Non-linearly realized discrete symmetries. *JHEP* 10 (2020) 071
20. Hook, A. (2019). TASI Lectures on the Strong CP Problem and Axions. *PoS, TASI2018*, 004.
21. Hook, A., **Huang, J.** (2019). Searches for other vacua. Part I. Bubbles in our universe. *JHEP*, 08, 148.
22. Curtin, D., others (2019). Long-Lived Particles at the Energy Frontier: The MATHUSLA Physics Case. *Rept. Prog. Phys.*, 82(11), 116201.
23. Bogorad, Z., Hook, A., Kahn, Y., Soreq, Y. (2019). Probing Axionlike Particles and the Axiverse with Superconducting Radio-Frequency Cavities. *Phys. Rev. Lett.*, 123(2), 021801.
24. Hook, A. (2018). Solving the Hierarchy Problem Discretely. *Phys. Rev. Lett.*, 120(26), 261802.
25. Hook, A., *Huang, J.* (2018). Probing axions with neutron star inspirals and other stellar processes. *JHEP*, 06, 036.
26. Hook, A., *McGehee, R.*, Murayama, H. (2018). Cosmologically Viable Low-energy Supersymmetry Breaking. *Phys. Rev. D*, 98(11), 115036.
27. Hook, A., Kahn, Y., Safdi, B. R., Sun, Z. (2018). Radio Signals from Axion Dark Matter Conversion in Neutron Star Magnetospheres. *Phys. Rev. Lett.*, 121(24), 241102.
28. **Geller, M.**, Hook, A., Sundrum, R., **Tsai, Y.** (2018). Primordial Anisotropies in the Gravitational Wave Background from Cosmological Phase Transitions. *Phys. Rev. Lett.*, 121(20), 201303.
29. Craig, N., Hook, A., Kasko, S. (2018). The Photophobic ALP. *JHEP*, 09, 028.
30. **Blinov, N.**, **Ellis, S. A.R.**, Hook, A. (2018). Consequences of Fine-Tuning for Fifth Force Searches. *JHEP*, 11, 029.
31. *DeRocco, W.*, Hook, A. (2018). Axion interferometry. *Phys. Rev. D*, 98(3), 035021.
32. Hook, A., *Huang, J.* (2017). Bounding millimagnetically charged particles with magnetars. *Phys. Rev. D*, 96(5), 055010.
33. Blinov, N., Hook, A. (2017). Particle Asymmetries from Quantum Statistics. *Phys. Rev. D*, 95(9), 095014.
34. Hook, A., Marques-Tavares, G. (2016). Relaxation from particle production. *JHEP*, 12, 101.
35. Blinov, N., Hook, A. (2016). Solving the Wrong Hierarchy Problem. *JHEP*, 06, 176.

36. Arkani-Hamed, N., Cohen, T., D'Agnolo, R. T., Hook, A., Kim, H. D., Pinner, D. (2016). Solving the Hierarchy Problem at Reheating with a Large Number of Degrees of Freedom. *Phys. Rev. Lett.*, 117(25), 251801.
37. D'Agnolo, R. T., Hook, A. (2016). Finding the Strong CP problem at the LHC. *Phys. Lett. B*, 762, 421--425.
38. Dimopoulos, S., Hook, A., Huang, J., Marques-Tavares, G. (2016). A collider observable QCD axion. *JHEP*, 11, 052.
39. Hook, A. (2015). Anomalous solutions to the strong CP problem. *Phys. Rev. Lett.*, 114(14), 141801.
40. Hook, A. (2015). Baryogenesis in a CP invariant theory. *JHEP*, 11, 143.
41. Hook, A., Murayama, H. (2015). Low-energy Supersymmetry Breaking Without the Gravitino Problem. *Phys. Rev. D*, 92(1), 015004.
42. Hook, A., Kearney, J., Shakya, B., Zurek, K. M. (2015). Probable or Improbable Universe? Correlating Electroweak Vacuum Instability with the Scale of Inflation. *JHEP*, 01, 061.
43. D'Agnolo, R. T., Hook, A. (2015). Selfish Dark Matter. *Phys. Rev. D*, 91(11), 115020.
44. Ahmad, M., others (2015). CEPC-SPPC Preliminary Conceptual Design Report. 1. Physics and Detector.
45. Altheimer, A., others (2014). Boosted Objects and Jet Substructure at the LHC. Report of BOOST2012, held at IFIC Valencia, 23rd-27th of July 2012. *Eur. Phys. J. C*, 74(3), 2792.
46. Hook, A. (2014). Baryogenesis from Hawking Radiation. *Phys. Rev. D*, 90(8), 083535.
47. Hook, A. (2014). New self dualities and duality cascades. *Phys. Rev. D*, 89(8), 086009.
48. Hook, A., Katz, A. (2014). Unbroken $SU(2)$ at a 100 TeV collider. *JHEP*, 09, 175.
49. Hook, A., Torroba, G. (2014). S-duality of nonsupersymmetric gauge theories. *Phys. Rev. D*, 89(2), 025006.
50. Hook, A., Kachru, S., Torroba, G., Wang, H. (2014). Emergent Fermi surfaces, fractionalization and duality in supersymmetric QED. *JHEP*, 08, 031.
51. Blum, K., Hook, A., Murase, K. (2014). High energy neutrino telescopes as a probe of the neutrino mass mechanism.
52. Hook, A. (2013). Measuring SUSY quartics from stop decays. *JHEP*, 10, 114.

53. Hook, A., Kachru, S., Torroba, G. (2013). Supersymmetric Defect Models and Mirror Symmetry. *JHEP*, 11, 004.
54. *El Hedri*, S., Hook, A. (2013). Minimal Signatures of Naturalness. *JHEP*, 10, 105.
55. *El Hedri*, S., Hook, A., Jankowiak, M., Wacker, J. G. (2013). Learning How to Count: A High Multiplicity Search for the LHC. *JHEP*, 08, 136.
56. Altheimer, A., others (2012). Jet Substructure at the Tevatron and LHC: New results, new tools, new benchmarks. *J. Phys. G*, 39, 063001.
57. Hook, A. (2012). A Test for emergent dynamics. *JHEP*, 07, 040.
58. Hook, A., Izaguirre, E., Lisanti, M., Wacker, J. G. (2012). High Multiplicity Searches at the LHC Using Jet Masses. *Phys. Rev. D*, 85, 055029.
59. Hook, A., Jankowiak, M., Wacker, J. G. (2012). Jet Dipolarity: Top Tagging with Color Flow. *JHEP*, 04, 007.
60. Cohen, T., Hook, A., Wecht, B. (2012). Comments on Gaugino Screening. *Phys. Rev. D*, 85, 115004.
61. Cohen, T., Hook, A., Torroba, G. (2012). An Attractor for Natural Supersymmetry. *Phys. Rev. D*, 86, 115005.
62. Hook, A. (2011). Unitarity constraints on asymmetric freeze-in. *Phys. Rev. D*, 84, 055003.
63. Hook, A., Izaguirre, E., Wacker, J. G. (2011). Model Independent Bounds on Kinetic Mixing. *Adv. High Energy Phys.*, 2011, 859762.
64. Hook, A., Torroba, G. (2011). A Microscopic theory of gauge mediation. *JHEP*, 08, 113.
65. Craig, N., Essig, R., Hook, A., Torroba, G. (2011). New dynamics and dualities in supersymmetric chiral gauge theories. *JHEP*, 09, 046.
66. Craig, N., Essig, R., Hook, A., Torroba, G. (2011). Phases of N=1 supersymmetric chiral gauge theories. *JHEP*, 12, 074.
67. Hook, A., Wacker, J. G. (2010). Collective Quartics from Simple Groups. *JHEP*, 06, 041.

II.E. Conferences, Workshops, and Talks

II.E.2. Invited Conference Talks

Dec. 2021, *Dark Sectors of Astroparticle Physics* – Online

Aug. 2021, *Cosmo'21*, Online
Jul. 2021, *European Physical Society Conference on High Energy Physics*, Online
Mar. 2021, *Invisibles21* - Online
Jan. 2021, *Chung-An University Beyond the Standard model Workshop* – Online
Aug. 2020, *11th CMB S4 Workshop* - KICP University of Chicago
Jan. 2020, *From Inflation to the Hot Big Bang* - KITP
Oct. 2019, *From Scattering to Expansion* - Northwestern
Jul. 2019, *Origin of the Vacuum Energy and Electroweak Scales* - KITP
Jun. 2019, *BSM - the Weak Scale MIAPP* - Germany
May. 2019, *Searching for New Physics on the Horizon* NPKI - South Korea
Mar. 2019, *PITT PACC - BSM Circa 2020* - University of Pittsburgh
Nov. 2018, *PIA 2018 - Interplay between Particle and Astroparticle Physics* - University of Cincinnati
Oct. 2018, *Beyond Standard Model: Where do we go from here?* - GGI in Italy
May. 2018, *High Energy Physics at the Sensitivity Frontier* - KITP
Mar. 2018, *Ultralight Dark Matter and Axions* - University of Michigan

II.E.15. Colloquia

Mar. 2020 MIT
Oct. 2019 Dartmouth
Apr. 2019 University of Maryland

II.J. Sponsored Research and Programs - Administered by the Office of Research Administration (ORA)

II.J.1. Grants

Hook, A. (Lead Investigator), "Light Fields and Their Role in Particle Physics," Sponsored by National Science Foundation. (August 15, 2019 - July 31, 2022).

III. Teaching, Extension, Mentoring, and Advising

III.A. Courses Taught

Fall 2021

PHYS274 0101 (Fall 2021), Mathematical Methods for Physics I. 29 enrolled.

PHYS899 0175 (Fall 2021), Doctoral Dissertation Research. 1 enrolled.

Spring 2021

PHYS899 0175 (Spring 2021), Doctoral Dissertation Research. 1 enrolled.

Fall 2020

PHYS624 0101 (Fall 2020), Advanced Quantum Mechanics. 27 enrolled.

PHYS898 0175 (Fall 2020), Pre-Candidacy Research. 2 enrolled.

PHYS899 0175 (Fall 2020), Doctoral Dissertation Research. 1 enrolled.

Spring 2020

PHYS411 0101 (Spring 2020), Intermediate Electricity and Magnetism. 43 enrolled.

Fall 2019

PHYS624 0101 (Fall 2019), Advanced Quantum Mechanics. 17 enrolled.

PHYS898 0361 (Fall 2019), Pre-Candidacy Research. 2 enrolled.

Spring 2019

PHYS411 0101 (Spring 2019), Intermediate Electricity and Magnetism. 80 enrolled.

Fall 2018

PHYS624 0101 (Fall 2018), Advanced Quantum Mechanics. 36 enrolled.

III.B. Advising: Research or Clinical

III.B.3. Doctoral

Advisor; Dawid Brzeminski (January 2019 - Present).

Advisor; Saurav Das (January 2019 - Present).

Advisor; Clayton Ristow (January 2019 - Present).

Committee Member; Deshpande, Kaustubh Sudhir Ph.D. Physics (August 20, 2021).

Committee Member; Dev, Abhish Ph.D. Physics (August 20, 2021).

Committee Member; Feng, Yongbin Ph.D. Physics (December 20, 2020).

Committee Member; Kumar, Soubhik Ph.D. Physics (August 21, 2020).

III.B.4. Post-Doctoral

Mentor; Manuel Buen Abad (September 2021 - Present).

Mentor; Jae Hyeok Chang (September 2020 - Present).

Mentor; Zhen Liu (January 2019 - Present).

Mentor; Gustavo Marques Tavares (January 2019 - Present).

Mentor; Yuhsin Tsai (January 2019 - Present).

IV. Service and Outreach

IV.A. Editorships, Editorial Boards, and Reviewing Activities

IV.A.3. Reviewing Activities for Journals and Presses

Reviewer, Physical Review (PRD and PRL). (January 2019 - Present).

Reviewer, Journal of Higher Energy Physics (JHEP). (November 2019 - Present).

IV.B. Committees, Professional & Campus Service

IV.B.1. Campus Service – Department

Co-chair of the Physics Colloquium Committee, 2018-2021

IV.B.8. Leadership Roles in Meetings and Conferences

July. 2022 Taught at Cargese International Summer School – Rethinking Beyond the Standard Model

Aug. 2019 Organized Aspen conference - The Energy Frontier Beyond LHC Run 2

Jun. 2018 Taught at TASI 2018 - Anticipating the Next Discoveries in Particle Physics

IV.B.10. Other

Member, Graduate School Admissions for Physics (CMNS-Physics). December 2019 – December 2020.