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Samuel D. Homiller

Curriculum Vitae
Last Updated: May 13, 2022

Academic Positions

- **Post-Doctoral Fellow**, Harvard University
  September 2020 - Present
- **DOE Graduate Research Fellow**, Brookhaven National Laboratory
  August 2018 - August 2019
- **Research Assistant**, C. N. Yang Institute for Theoretical Physics, Stony Brook University
  May 2017 - August 2020
- **Undergraduate Research Asst.**, Inst. for Condensed Matter Theory, University of Illinois
  May 2015 - August 2015
- **Undergraduate Research Asst.**, Nuclear Experimental Group, University of Illinois
  August 2012 - August 2015

Education

- **Stony Brook University**
  Ph.D. in Physics, 2020 — Advisor: Patrick Meade
  Thesis: Higgs Couplings as a Gateway to New Fundamental Physics
- **University of Illinois at Urbana-Champaign**
  B.S., Physics – Magna cum Laude, Highest Distinction, 2015 — Advisor: Liang Yang
  Thesis: Search for Nucleon Decays into Invisible Channels in Xe-136

  B.S., Mathematics – Magna cum Laude, Highest Distinction, 2015
- **North Carolina School of Science and Math**
  High School Diploma, 2011.

Notable Awards and Honors

- J. J. and Noriko Sakurai Dissertation Award in Theoretical Particle Physics, American Physical Society, 2021
- DOE Office of Science Graduate Research Fellowship, 2018 - 2019.
- Ernest M. Lyman Prize, University of Illinois, 2015.

Publications

Notes: Following high-energy physics convention, order of authorship was determined alphabetically unless otherwise noted. An up-to-date list of my publications can be found at the Inspire-HEP database

Peer Reviewed Journal Articles

16. *The Muon Smasher's Guide*,
with H. Al Ali, et al., Reports on Progress in Physics (2022), [arXiv:2103.14043].
15. *Challenges for Unsupervised Anomaly Detection in Particle Physics*,
with K. Fraser, R. K. Mishra, B. Ostdiek and M. D. Schwartz, JHEP **03**, 066 (2022) [arXiv:2110.06948].
14. *The Impact of Dimension-8 SMEFT Contributions: A Case Study*,
with S. Dawson and M. Sullivan, Phys. Rev. D **104**, 115013 (2021) [arXiv:2110.06929].
13. *Searching for Leptoquarks at Future Muon Colliders*,
with P. Asadi, R. Capdevilla and C. Cesarotti, JHEP **10**, 182 (2021) [arXiv:2104.05720].
12. *Multi-Higgs Production Probes Higgs Flavor*,
with D. Egaña-Ugrinovic and P. Meade, Phys. Rev. D **103**, 115005 (2021) [arXiv:2101.04119].
11. *Uncovering the High Scale Higgs Singlet Model*,
with P. P. Giardino and S. Dawson, Phys. Rev. D **103**, 075016 (2021) [arXiv:2102.02823].
10. *Putting Standard Model EFT Fits to Work*,
with S. Dawson and S. Lane, Phys. Rev. D **102**, 055012 (2020) [arXiv:2007.01296].
9. *Validity of Standard Model EFT Studies of VH and VV Production at NLO*,
with J. Baglio, S. Dawson, S. Lane and I. Lewis, Phys. Rev. D **101**, 115004 (2020) [arXiv:2003.07862].
8. *Light scalars and the KOTO anomaly*,
with D. Egaña-Ugrinovic and P. Meade, Phys. Rev. Lett **124**, 191801 (2020) [arXiv:1911.10203].
7. *QCD Corrections in SMEFT Fits to WZ and WW Production*,
with J. Baglio and S. Dawson, Phys. Rev. D **100**, 113010 (2019) [arXiv:1909.11576].
6. *Higgs bosons with large couplings to light quarks*,
with D. Egaña-Ugrinovic and P. Meade, Phys. Rev. D **100**, 115041 (2019) [arXiv:1908.11376].
5. *Benchmarking simplified template cross sections in WH production*,
with J. Brehmer, S. Dawson, F. Kling and T. Plehn, JHEP **11**, 034 (2019) [arXiv:1908.06980].
4. *Aligned and Spontaneous Flavor Violation*,
with D. Egaña-Ugrinovic and P. Meade, Phys. Rev. Lett **123**, 031802 (2019) [arXiv:1811.00017].
3. *Measurement of the Triple Higgs Coupling at a HE-LHC*,
with P. Meade, JHEP **03**, 055 (2019) [arXiv:1811.02572].
2. *Search for nucleon decays with EXO-200*,
J. B. Albert et al. (EXO-200 Collaboration), Phys. Rev. D **97**, 072007 (2018) [arXiv:1710.07670].
1. *First search for Lorentz and CPT violation in double beta decay with EXO-200*,
J. B. Albert et al. (EXO-200 Collaboration), Phys. Rev. D **93**, 072001 (2016) [arXiv:1601.07266].

Recent Preprints (Awaiting Peer Review)

- *Beyond 6: the role of dimension-8 operators in an EFT for the 2HDM*,
with S. Dawson, D. Fontes and M. Sullivan, [arXiv:2205.01561], submitted to PRD.

- *Oblique Lessons from the W Mass Measurement at CDF II*,
  with P. Asadi, C. Cesarotti, K. Fraser and A. Parikh, [arXiv:2204.05283], submitted to PRD.
- *Complementary Signals of Lepton Flavor Violation at a High-Energy Muon Collider*,
  with Q. Lu and M. Reece, [arXiv:2203.08825], submitted to JHEP.
- *Probing New Gauge Forces with a High-Energy Muon Beam Dump*,
  with C. Cesarotti, R. K. Mishra and M. Reece, [arXiv:2202.12302], submitted to PRL.

White Papers & Working Group Reports

Note: Standards for authorship on community-based reports in high-energy physics vary widely. Where relevant, my particular contributions to these reports are noted below.

- *The REDTOP Experiment: Rare η/η' Decays to Probe New Physics*,
  with C. Gatto, M. Murray (eds.), Contributed to section "Scalar Portal Models", [arXiv:2203.07651].
- *The International Linear Collider: Report to Snowmass 2021*,
  with A. Aryshev et al., as part of the ILC Community, [arXiv:2203.07622].
- *Strange quark as a probe for new physics in the Higgs sector*,
  with M. Basso, V. Cairo, J. Va'vra, et al., Contributed discussion on "Implications for BSM models", [arXiv:2203.07535].
- *The physics case of a 3 TeV muon collider stage*,
  with J. de Blas, et al. (eds.), Contributed section on "Lepton Flavor Violation", [arXiv:2203.07261].
- *Snowmass 2021 Community Survey Report*,
  with G. Agarwal, et al., [arXiv:2203.07328].
- *Muon Collider Physics Summary*,
  with A. Wulzer, et al., [arXiv:2203.07256],
- *New Physics Searches at Kaon and Hyperon Factories*,
  with E. Goudzovski, D. Redigolo, K. Tobioka and J. Zupan (eds.), Convener for "Higgs portal scalar", [arXiv:2201.07805].
- *Higgs Physics at the HL-LHC and HE-LHC*,
  with M. Cepeda, S. Gori, P. Ilten, F. Riva and M. Kado (eds.), Contributed Section 3.4.2,
  CERN Yellow Rep. Monogr. 7 (2019) 221-584, [arXiv:1902.00134].

Workshops, Programs & Conferences Organized

- Organizer of the Cambridge High Energy Workshop (CHEW) 2021: Axion Physics,
  Harvard University & Massachusetts Institute of Technology, July 27 - 30, 2021.
- Organizer of the Cambridge High Energy Workshop (CHEW) 2022: Phase Transitions and Topological Defects in the Early Universe,
  CMSA, Harvard University & Massachusetts Institute of Technology, August 2-5, 2022.

Talks Given

Plenary or Keynote Talks at Conferences and Workshops

- *Summary of Parallel Discussions for EF09: BSM General Explorations*,
  Energy Frontier Workshop, Brown University, April 1, 2022.

- *Higgs Couplings as a Gateway to New Fundamental Physics*,
  APS April Meeting, April 17, 2021.
- *NLO QCD Effects on Diboson Production in the SMEFT*,
  MBI 2021, Universita di Bicocca, Milan, Italy, August 24, 2021.

Invited Seminars and Conference Talks

- *Putting SMEFT Fits to Work: Lessons from Matching Simple Models*,
  Joint Cavendish-DAMTP HEP Phenomenology Seminar, Cambridge University, May 13, 2022.
- *Complementary Signals of Lepton Flavor Violation at a High-Energy Muon Collider*,
  Particle Theory Seminar, Cornell University, April 13, 2022.
- *Complementary Signals of Lepton Flavor Violation at a High-Energy Muon Collider*,
  Phenomenology Seminar, PITT PACC, Pittsburgh University, April 6, 2022.
- *Putting SMEFT Fits to Work: Lessons from Matching Simple Models*,
  Phenomenology Seminar, ITP, Heidelberg University, December 8, 2021.
- *Higgs Flavor and Multi-Higgs Production*,
  Boston University High Energy Seminar, October 7, 2021.
- *Highlights from EF02: BSM Higgs*,
  Snowmass Day Energy Frontier Parallel Session, September 24, 2021.
- *Higgs Flavor and Multi-Higgs Production*,
  Oklahoma State High Energy Seminar, September 9, 2021.
- *Putting SMEFT Fits to Work*,
  HEFT 2021, University of Science and Technology of China, April 14, 2021.
- *Physics at a High-Energy Muon Collider*,
  QCD-DM-BSM-LHC Meeting, MIT Center for Theoretical Physics, March 12, 2021.
- *Higgs Flavor and Multi-Higgs Production*,
  Particle Physics on the Plains Theory Seminar, University of Kansas, March 9, 2021.
- *Higgs Flavor and Multi-Higgs Production*,
  Particle Physics Seminar, Carleton University, March 8, 2021.
- *Putting SMEFT Fits to Work*,
  LHC EFT Working Group Area 5 Meeting: Benchmark Scenarios from UV Models, February 8, 2021.
- *Complementary Probers of Lepton Flavor at a Muon Collider*,
  PITT PACC Workshop: Muon Collider Physics, November 30, 2020.
- *Higgs and Flavor: Theories of Enhanced Light Yukawas*,
  Higgs 2020, October 29, 2020.
- *The Higgs and New Physics with Flavor*,
  YITP Seminar, Stony Brook University, April 9, 2020.

Other Talks at Conferences and Workshops

- *Precision Higgs Physics at High-Energy Muon Colliders*,
  Awarded best parallel presentation
  Higgs 2021, Stony Brook University, October 19, 2021.

- *Higgs Flavor and Multi-Higgs Production*,
  MIT QCD-DM-BSM-LHC Casual Seminar, MIT Center for Theoretical Physics, September 17, 2021.
- *The Higgs Inverse Problem*,
  Snowmass EF01 Meeting, August 18th, 2021.
- *Putting SMEFT Fits to Work*,
  Weak Interactions and Neutrinos 2021, June 9, 2020.
- *Higgs Flavor and Multi-Higgs Production*,
  Phenomenology Symposium 2021, University of Pittsburgh, May 25, 2021.
- *Higgs Flavor and Multi-Higgs Production*,
  PPC 2021, University of Oklahoma, May 20, 2021.
- *Putting SMEFT Fits to Work*,
  Higgs 2020, October 28, 2020.
- *Introduction to the Theory Frontier*,
  Snowmass Early Career Frontier Introductory Series, August 21, 2020.
- *Theories of Enhanced Light Yukawa Couplings*,
  Snowmass EF02 Meeting: Higgs and Flavor, August 7, 2020.
- *SMEFT Fits and the Higgs Inverse Problem*,
  Preparatory Joint Sessions, Snowmass Energy Frontier Meeting, July 7, 2020.
- *Light Scalars and the KOTO Anomaly*,
  Phenomenology Symposium 2020, University of Pittsburgh, May 4, 2020.
- *Flavorful Higgs Physics from the MeV to TeV scale*,
  High Energy Theory Lunch Seminar, Brookhaven National Laboratory, May 1, 2020.
- *Light Scalars and the KOTO Anomaly*,
  APS April Meeting 2020, Washington D.C., April 21, 2020.
- *The Higgs and New Physics with Flavor*,
  LHC/BSM Journal Club, MIT Center for Theoretical Physics, April 10, 2020.
- *Higgs bosons with large couplings to light quarks*,
  Brookhaven Forum 2019, Brookhaven National Laboratory, September 26, 2019.
- *Unearthing Kinematic Information in WH Production*,
  APS DPF Meeting 2019, Northeastern University, August 01, 2019.
- *Spontaneous Flavor Violation and the 2HDM*,
  Phenomenolgy Symposium 2019, University of Pittsburgh, May 07, 2019.
- *Spontaneous Flavor Violation and the 2HDM*,
  High Energy Theory Lunch Seminar, Brookhaven National Laboratory, April 19, 2019.
- *Measuring the Higgs Trilinear Coupling at an HE-LHC*,
  High Energy Theory Lunch Seminar, Brookhaven National Laboratory, October 19, 2018.
- *Exploring the Higgs Sector*,
  TASI 2018 Student Talk, University of Colorado, Boulder, June 22, 2018.
- *Measuring the Higgs Trilinear Coupling at an HE-LHC*,
  Phenomenology Symposium 2018, University of Pittsburgh, May 8, 2018.

- *The Higgs Self-Coupling and Future Colliders*,
  Hang Yuan Physics Lecture (No. 109), Shaanxi Normal University, Xi'an, China, April 16, 2018.
- *Measuring the Higgs Trilinear Coupling at an HE-LHC*,
  HL/HE-LHC Meeting, Fermi National Accelerator Laboratory, April 5, 2018.
- *Measuring the Higgs Trilinear Coupling at an HE-LHC*,
  Brookhaven Forum 2017, Brookhaven National Laboratory, October 12, 2017.
- *Search for Nucleon Decays in 136-Xe with EXO-200*,
  Physics Undergraduate Research Symposium, University of Illinois, January 30, 2015.

Professional Service

- Snowmass 2021 Early Career (SEC) Leadership:
  - Theory Frontier SEC Liaison
  - Survey Team Member (Co-Leader from Oct. 2020 - Apr. 2021)
- Referee for *Physical Review Letters*, *Physical Review D*, *Journal of High Energy Physics*, *Nuclear Physics B*, *European Physics Journal C*
- Member of Working Group 2 (Higgs Physics) on the Physics of the HL-LHC, and Perspectives at the HE-LHC Program

Workshops, Programs & Schools Attended

- PITT PACC Workshop: LHC physics for Run 3,
  April 7 - 9, 2021, University of Pittsburgh, PA.
- PITT PACC Workshop: Muon collider physics,
  November 30 - December 2, 2020, University of Pittsburgh, PA.
- Lighting new Lampposts for Dark Matter and Beyond the Standard Model,
  February 23 - April 8, 2020, Simons Center for Geometry and Physics, Stony Brook, NY.
- ICTP Summer School on Particle Physics, June 2019,
  Abdus Salam International Center for Theoretical Physics, Trieste, Italy.
- Theoretical Advanced Study Institute (TASI), *Theory in an Era of Data*,
  June 2018, University of Colorado, Boulder, CO.
- Prospects in Theoretical Physics (PiTP), *Particle Physics at the LHC and Beyond*,
  July 2017, Institute for Advanced Study, Princeton, NJ.
- Workshop: Beyond WIMPs: From Theory to Detection, March 2017.
  Simons Center for Geometry and Physics, Stony Brook, NY.

Experimental Collaborations

- REDTOP Collaboration, *Member*.
- EXO-200 Collaboration, *Undergraduate Researcher (Data Analysis)*.

Awards and Fellowships

- J. J. and Noriko Sakurai Dissertation Award in Theoretical Particle Physics, 2021
- DOE Office of Science Graduate Research Fellowship, 2018 - 2019.
- Rosaline and Milton Sterman Travel Award, 2019.
- American Physical Society Division of Particles and Fields (DPF) Meeting Travel Award, 2019.
- Silsbee Prize (Travel Award), 2017.
- Phi Beta Kappa, 2015.
- Ernest M. Lyman Prize (Outstanding Graduating Senior in Physics), 2015.
- Robert E. Hetrick Oustanding Senior Thesis Award, 2015.
- Lorella M. Jones Summer Research Award, 2014.
- James Scholar, University of Illinois at Urbana-Champaign, 2011 - 2015.
- Dean's List, University of Illinois at Urbana-Champaign, Fall 2011 - Spring 2015.
- University Achievement Scholar, University of Illinois at Urbana-Champaign, 2011 - 2015.

Teaching Experience

- **Teaching Assistant, Dept. of Physics, Stony Brook University**
  August 2015 - May 2018
  Courses Taught or Graded For:
  - PHY 524: Graduate Cosmology (Grader), Spring 2020
  - PHY 610: Quantum Field Theory I (Grader), Spring 2018
  - PHY 252: Modern Physics Laboratory, Fall 2016, Spring 2017
  - PHY 123: Classical Physics A (Laboratory), Summer 2016
  - PHY 134: Classical Physics Laboratory II, Spring 2016
  - PHY 133: Classical Physics Laboratory I, Fall 2015