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Andrew P. Turner

Philadelphia, PA
(US Citizen)

Education

Ph.D. Physics — Massachusetts Institute of Technology (GPA: 4.0) *September 2020*

B.S. Mathematics–Physics Double Major (First in Class) — Harvey Mudd College (GPA: 3.99) *May 2014*

High School Diploma (Valedictorian) — Southern Boone County R1 High School (GPA: 4.0) *May 2010*

Research Experience

Postdoctoral Researcher — UPenn High Energy Theory Group (Philadelphia, PA) *2020–Present*

- F-theory and supergravity
- Stringy constructions of disorder averaging
- Topological non-decoupling in QFT
- Development of computational tool FTheoryTools
- Machine learning Calabi–Yau topologies

Graduate Researcher — MIT Center for Theoretical Physics (Cambridge, MA) *2014–2020*

- Supergravity and F-theory under Dr. Washington Taylor
- Supersymmetry and heavy-ion jet physics under Dr. Jesse Thaler
- Transformation optics

Undergraduate Researcher — HMC Department of Physics (Claremont, CA) *2013–2014*

- Quantum information and optics under Dr. Theresa Lynn

REU Intern — Harvard–Smithsonian Center for Astrophysics (Cambridge, MA) *Summer 2013*

- Polar coronal jets under Drs. Mari Paz Miralles and John Raymond

Fletcher Jones Fellow — Pomona College (Claremont, CA) *Summer 2012*

- Supercharacter theory and its applications under Dr. Stephan Garcia

SULI Intern — Los Alamos National Laboratory (Los Alamos, NM) *Summer 2011*

- IAT-3: Nuclear Counterterrorism Response

Manuscripts in Preparation

1. **Terminal singularities and U(1) factors in F-theory**
   Antonella Grassi, Nikhil Raghuram, Andrew P. Turner, and Timo Weigand

Publications and Preprints

18. **SymTrees and Multi-Sector QFTs** — arXiv:2310.12980
    Florent Baume, Jonathan J. Heckman, Max Hübner, Ethan Torres, Andrew P. Turner, and Xingyang Yu
    Preparing for publication

17. **Chiral spectrum of the universal tuned (SU(3)×SU(2)×U(1))/$\mathbb{Z}_6$ 4D F-theory model** — arXiv:2210.09473
    Patrick Jefferson, Washington Taylor, and Andrew P. Turner
    Journal of High Energy Physics, Volume 2023, Issue 2: 254
    https://doi.org/10.1007/JHEP02(2023)254

16. **Generating functions for intersection products of divisors in resolved F-theory models** — arXiv:2206.11527
    Patrick Jefferson and Andrew P. Turner
    Nuclear Physics B, Volume 991: 116177
    https://doi.org/10.1016/j.nuclphysb.2023.116177

15. **Identifying equivalent Calabi–Yau topologies: A discrete challenge from math and physics for machine learning** — arXiv:2202.07590
    Vishnu Jejjala, Washington Taylor, and Andrew P. Turner
    Contribution to: Nankai Symposium on Mathematical Dialogues

14. **Disorder Averaging and its UV (Dis)Contents** — arXiv:2111.06404

Jonathan J. Heckman, Andrew P. Turner, and Xingyang Yu
Physical Review D, Volume 105, Issue 8: 086021
https://doi.org/10.1103/PhysRevD.105.086021

13. **Orders of vanishing and U(1) charges in F-theory** — arXiv:2110.10159
Nikhil Raghuram and Andrew P. Turner
Journal of High Energy Physics, Volume 2022, Issue 3: 51
https://doi.org/10.1007/JHEP03(2022)051

12. **Flavor Symmetries and Automatic Enhancement in the 6d Supergravity Swampland** — arXiv:2110.00008
Mirjam Cvetič, Ling Lin, and Andrew P. Turner
Physical Review D, Volume 105, Issue 4: 046005
https://doi.org/10.1103/PhysRevD.105.046005

11. **Chiral matter multiplicities and resolution-independent structure in 4D F-theory models** — arXiv:2108.07810
Patrick Jefferson, Washington Taylor, and Andrew P. Turner
Accepted for publication in Communications in Mathematical Physics

10. **Statistical coupling constants from hidden sector entanglement** — arXiv:2012.09182
Vijay Balasubramanian, Jonathan J. Heckman, Elliot Lipeles, and Andrew P. Turner
Physical Review D, Volume 103, Issue 6: 066024
https://doi.org/10.1103/PhysRevD.103.066024

9. **Automatic Enhancement in 6D Supergravity and F-theory Models** — arXiv:2012.01437
Nikhil Raghuram, Washington Taylor, and Andrew P. Turner
Journal of High Energy Physics, Volume 2021, Issue 7: 48
https://doi.org/10.1007/JHEP07(2021)048

8. **Data-driven quark and gluon jet modification in heavy-ion collisions** — arXiv:2008.08596
Jasmine Brewer, Jesse Thaler, and Andrew P. Turner
Physical Review C, Volume 103, Issue 2: L021901
https://doi.org/10.1103/PhysRevC.103.L021901

7. **General F-theory models with tuned (SU(3)×SU(2)×U(1))/$\mathbb{Z}_6$ symmetry** — arXiv:1912.10991
Nikhil Raghuram, Washington Taylor, and Andrew P. Turner
Journal of High Energy Physics, Volume 2020, Issue 4: 8
https://doi.org/10.1007/JHEP04(2020)008

6. **Optical analogues to the equatorial Kerr–Newman black hole** — arXiv:1909.05256
R. A. Tinguely and Andrew P. Turner
Nature Communications Physics, Volume 3, Issue 1: 120
https://doi.org/10.1038/s42005-020-0384-5

5. **Generic construction of the Standard Model gauge group and matter representations in F-theory** — arXiv:1906.11092
Washington Taylor and Andrew P. Turner
Fortschritte der Physik, Volume 68, Issue 5: 2000009
https://doi.org/10.1002/prop.202000009

4. **Generic matter representations in 6D supergravity theories** — arXiv:1901.02012
Washington Taylor and Andrew P. Turner
Journal of High Energy Physics, Volume 2019, Issue 5: 81
https://doi.org/10.1007/JHEP05(2019)081

3. **An infinite swampland of U(1) charge spectra in 6D supergravity theories** — arXiv:1803.04447
Washington Taylor and Andrew P. Turner
Journal of High Energy Physics, Volume 2018, Issue 6: 10
https://doi.org/10.1007/JHEP06(2018)010

2. **The Graphic Nature of the Symmetric Group** — arXiv:1305.4913
   J. L. Brumbaugh, Madeleine Bulkow, Luis Alberto Garcia German, Stephan Ramon Garcia, Matt Michal, and Andrew P. Turner
   Experimental Mathematics, 22:4, 2013, 421–442
   https://doi.org/10.1080/10586458.2013.833431

1. **Supercharacters, exponential sums, and the uncertainty principle** — arXiv:1208.5271
   J. L. Brumbaugh, Madeleine Bulkow, Patrick S. Fleming, Luis Alberto Garcia German, Stephan Ramon Garcia, Gizem Karaali, Matt Michal, Hong Suh, and Andrew P. Turner
   Journal of Number Theory, Volume 144, 2014, 151–175
   https://doi.org/10.1016/j.jnt.2014.04.019

Other Publications

How Black Holes Nearly Ruined Time — Fourth Prize, Black Hole Initiative Essay Competition
Andrew P. Turner and R. A. Tinguely
Nautilus Magazine *Jan 2019*

Teaching Experience

Hadron Collider Physics Summer School Discussion Leader — CERN (Remote) *2021*

Graduate Physics Teaching Assistant — MIT Department of Physics (Cambridge, MA) *2015–2020*

8.04: Quantum Physics I (F2015, S2016)
8.21: Physics of Energy (S2018, S2020)
8.321: Quantum Theory I (F2017)
8.962: General Relativity (S2017)

- Designed and taught content recitations (8.21, 8.321)
- Taught substitute lectures (8.21, 8.321)
- Held regular tutoring hours (8.04, 8.21, 8.321, 8.962)
- Wrote weekly problem set solutions (8.04, 8.21, 8.321, 8.962)
- Typeset lecture notes (8.04, 8.321, 8.962)
- Graded problem sets (8.962), papers (8.21), exams (8.04, 8.21, 8.321, 8.962)

Mathematics Teaching Assistant — HMC Department of Mathematics (Claremont, CA) *2014*

Math 106: Combinatorics (S2014)

- Held regular tutoring hours
- Graded problem sets

Computational Skills

Languages and Software: Proficient in Mathematica, Python, Julia, OSCAR, LaTeX; Knowledge of MATLAB, Igor Pro, Sage, Java, Bash, SQL, Lisp

Operating Systems: macOS, Linux, Windows

Awards and Honors

Goodwin Medal — MIT *May 2019*
Black Hole Initiative Essay Competition, Fourth Prize — BHI *Dec 2018*
Tushar Shah and Sara Zion Physics Graduate Fellowship — MIT *Jun 2018*
Doroghazi Eagle Scout Award — BSA Great Rivers Council *Aug 2017*
Arthur Kerman Fellowship — MIT *Sep 2014*
Mindlin Prize for Innovative Ideas in Science — HMC *May 2014*
William and Wyllis Leonhard Merit Scholarship — HMC *Oct 2013*
Giovanni Borrelli Mathematics Prize — HMC Department of Mathematics *Sep 2013*
John and Ellen Townsend Award in Physics — HMC Department of Physics *Sep 2013*
Jean and Joseph Platt Freshman Prize — HMC *Aug 2011*
Robert James Prize in Mathematics — HMC *Aug 2011*
Commendation: Superior Academic Performance in Chemistry — HMC *2010–2011*
Commendation: Superior Academic Performance — HMC *2010*
Dean's List — HMC Dean for Academic Affairs *2010–2014*
Harvey S. Mudd Merit Award — HMC *Aug 2010*

Conferences and Workshops

String Phenomenology 2023 — Institute for Basic Science (Daejeon, South Korea) *Jul 2023*
Strings and Geometry 2023 (Organizer) — University of Pennsylvania (Philadelphia, PA) *Mar 2023*
MIT–Imperial–Wits Workshop — MIT Center for Theoretical Physics (Cambridge, MA) *Jul 2022*
String Phenomenology 2022 — University of Liverpool (Liverpool, UK) *Jul 2022*
String Phenomenology 2021 — Remote *Jul 2021*
Strings 2021 — Remote *Jun 2021*
String Math 2021 — Remote *Jun 2021*
String Math 2020 — Remote *Jul 2020*
Strings 2020 — Remote *Jun 2020*
String Phenomenology 2020 — Remote *Jun 2020*
Calabi–Yaus, Machine Learning, and Aspects of 6D QFT — Wits Rural Facility (South Africa) *Dec 2019*
Theoretical Tests of the Swampland — University of Massachusetts Amherst (Amherst, MA) *Oct 2019*
String Math 2019 — Uppsala University (Uppsala, Sweden) *Jul 2019*
String Phenomenology 2019 — CERN (Geneva, Switzerland) *Jun 2019*
Black Hole Initiative Conference 2019 — Harvard BHI (Cambridge, MA) *May 2019*
Workshop on Physics and Mathematics of F-theory — Florida State University (Tallahassee, FL) *Apr 2019*
Workshop on Physics and Mathematics of F-theory — Harvard University (Cambridge, MA) *Sep 2018*
Stringy Geometry for Junior Researchers — Northeastern University (Boston, MA) *Sep 2018*
Cargèse Summer School: Quantum Gravity, Strings and Fields — IESC (Cargèse, Corsica) *Jun 2018*
Workshop on Geometry and Physics of F-theory — BIRS (Banff, Alberta) *Jan 2018*
Strings 2017 (Tel Aviv, Israel) *Jun 2017*
SFT@HIT — Holon Institute of Technology (Holon, Israel) *Jun 2017*
Pre-Strings Advanced Strings School — Technion (Haifa, Israel) *Jun 2017*
Workshop on Physics and Mathematics of F-theory — Virginia Tech (Blacksburg, VA) *Oct 2016*
16th Annual SQuInT Workshop (Santa Fe, NM) *Feb 2014*

Presentations

19. **FTheoryTools: A computational tool for analysis of singular elliptic fibrations**
String Phenomenology 2023 *Jul 2023*

18. **F-theory and Singular Elliptic Fibrations**
RPTU Kaiserslautern–Landau Groups and Representations Seminar *May 2023*

17. **Automatic enhancement and the supergravity swampland**
MIT–Imperial–Wits Workshop *Jul 2022*

16. **Terminal singularities and U(1) factors in F-theory**
String Phenomenology 2022 *Jul 2022*

15. **Statistical coupling constants from hidden sector entanglement**
Northeastern High Energy Theory Group Meeting *Mar 2021*

14. **Automatic Enhancement in 6D Supergravity and F-theory Models**
Seminar Series on String Phenomenology *Feb 2021*

13. **Chiral matter in 4D Standard Model-like F-theory constructions**
Penn High Energy Theory Seminar *Sep 2020*

12. **General F-theory models with (SU(3)×SU(2)×U(1))/$\mathbb{Z}_6$ symmetry**
Harvard CMSA Condensed Matter/Math Seminar *Oct 2019*

11. **General F-theory models with (SU(3)×SU(2)×U(1))/$\mathbb{Z}_6$ symmetry**
MIT String Club *Oct 2019*

10. **General F-theory models with (SU(3)×SU(2)×U(1))/$\mathbb{Z}_6$ symmetry**
Princeton Institute for Advanced Study High Energy Seminar *Sep 2019*

9. **General F-theory models with (SU(3)×SU(2)×U(1))/$\mathbb{Z}_6$ symmetry**
   MIT Center for Theoretical Physics *Sep 2019*

8. **Generic matter representations in 6D supergravity theories**
   Northeastern/MIT Joint String Geometry Meeting *Jan 2019*

7. **Generic matter representations in 6D supergravity theories**
   Stringy Geometry for Junior Researchers *Sep 2018*

6. **Anomaly constraints and U(1) charges for 6D $\mathcal{N} = 1$ supergravity theories**
   MIT String Club *Dec 2017*

5. **Anomaly constraints and U(1) charges for 6D $\mathcal{N} = 1$ supergravity theories**
   MIT Center for Theoretical Physics *Nov 2017*

4. **Distinguishability of Qudit Hyperentangled States by Linear Evolution and Local Measurement**
   Harvey Mudd College *May 2014*

3. **A no-go theorem for hyper-entangled Bell state measurement with linear devices**
   Harvey Mudd College *Oct 2013*

2. **A Study of the Properties of Polar Coronal Jets**
   Smithsonian Astrophysical Observatory *Aug 2013*

1. **Graphical Supercharacters**
   Pomona College *Jul 2012*

Posters

4. **Separating quark and gluon jet distributions in heavy-ion collisions** (Presented by collaborator)
   Quark Matter 2019 *Nov 2019*

3. **Distinguishability of Qudit Hyperentangled States by Linear Evolution and Local Measurement**
   SQuInT Workshop *Feb 2014*

2. **A Study of the Properties of Polar Coronal Jets** (Presented by collaborator)
   AGU Fall Meeting *Dec 2013*

1. **Graphical Supercharacters**
   Pomona College *Jul 2012*