

Dr. Conor Henderson
Associate Professor of Physics
University of Cincinnati

Department of Physics
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Academic Positions

- 2021 – present **Associate Professor**
Department of Physics, University of Cincinnati.
Cincinnati, OH 45221, USA.
- 2016 – 2021 **Associate Professor**
Department of Physics and Astronomy, University of Alabama.
Tuscaloosa, AL 35487, USA.
- 2011 – 2016 **Assistant Professor**
Department of Physics and Astronomy, University of Alabama.
Tuscaloosa, AL 35487, USA.
- 2008 – 2010 **CERN Research Fellow**
CERN, Geneva, Switzerland.
Mentor: Dr. Albert de Roeck
- 2005 – 2008 **Postdoctoral Research Associate**
Massachusetts Institute of Technology, Cambridge, MA 02139, USA.
Mentor: Professor Bruce Knuteson

Education

- 1999 – 2005 **PhD, Relativistic Heavy-Ion Physics**
Massachusetts Institute of Technology, Cambridge, MA 02139, USA.
Thesis: *‘Identified Particle Transverse Momentum Distributions
from Au+Au collisions at $\sqrt{s_{NN}} = 62.4$ GeV’*
Thesis Advisor: Professor Gunther Roland
- 1995 – 1999 **MSci, Physics and Applied Mathematics**
Queen’s University, Belfast, Northern Ireland, UK.

Research Funding

- US Department of Energy (PI of Energy Frontier portion of award DE-SC0012447), 34% share of \$1,200,000, 2020-23
- University of Alabama Office for Research Small Grant Program, \$6,000, 2020
- US Department of Energy (PI of Energy Frontier portion of award DE-SC0012447), 50% share of \$630,000, 2017-20
- Universities Research Association, \$15,000 (salary support for postdoctoral researcher), 2018
- US Department of Energy (PI of Energy Frontier portion of award DE-SC0012447), 50% share of \$630,000, 2014-17
- University of Alabama Research Grants Committee, \$6,000, 2012-14
- University of Alabama College Academy of Research, Scholarship and Creative Activity, \$7,000, 2012-13

Research Activities

With the LHCb experiment at the Large Hadron Collider (2021-):

- Searches for exotic physics and measurement of electroweak processes

With the CMS Experiment¹ at the Large Hadron Collider in CERN (2008-2021):

- Co-Convener of Future New Physics working group for CMS Upgrade Performance Studies group, focusing on the CMS upgrade physics performance for HL-LHC (Spring 2020 - summer 2021)
- Searches for physics beyond the Standard Model in multi-photon final states
- Co-Chair of Conference Committee for CMS Hadronic Calorimeter subsystem, 2018-2021
- Chair, Language Editor and Member of several CMS internal analysis review committees for publications in Exotica, Higgs and Standard Model physics
- Co-convener of Hadronic Calorimeter Performance Studies working group (2016-17)
- Co-convener of CMS working group on Exotica with High-pT Photons (2009-10)
- High-Level Trigger operations support and on-call expert (2009-10)

As a University of Alabama Collaborative Arts Initiative Faculty Fellow² (2019-2021):

¹The Compact Muon Solenoid (CMS) is an experiment at the CERN Large Hadron Collider. Over 3000 scientists from 185 institutions in 42 countries collaborate on this project.

²University of Alabama Collaborative Arts Research Initiative: <https://cari.ua.edu/>

- Collaborations with other researchers and creators to explore the concepts and develop new representations of elementary particle physics in creative media, such as dance.

With the CDF experiment³ at the Fermilab Tevatron collider (2005 - 2008):

- Analysis of high-pT data from proton-antiproton collisions, for a model-independent search for new physics beyond the Standard Model of particle physics.
- Co-convener of the CDF Working Group on Very Exotic Phenomena (Sept 2007 - Sept 2008).
- Project Leader (May 2006 - Aug 2008) for the CDF Event-Builder and Level 3 Trigger Hardware systems, the final stages in the CDF trigger and data acquisition system.

With the PHOBOS experiment⁴ at the Brookhaven Relativistic Heavy-Ion Collider (2000 - 2005):

- Analysis of pion, kaon, proton and charged hadron transverse momentum spectra from heavy-ion collisions at RHIC
- Development and maintenance of track-finding algorithms for the PHOBOS silicon spectrometer, and combination of tracks with Time-of-Flight information
- Design and implementation of a high-level trigger system for selecting high-momentum tracks; VHDL programming for electronic logic devices.

Teaching and Student Supervision

Courses taught since 2011:

- Introductory and Intermediate physics major labs
- General Physics with Calculus I (PH 105)
- General Physics with Algebra I (PH 101)
- Classical Mechanics (PH 301/2)
- Graduate Introduction to Nuclear and Particle Physics (PH 561)
- Introduction to Nuclear and Particle Physics for Undergraduates (PH 461)
- Unsolved Mysteries in Physics (PH 482)
- Independent Study courses in Elementary Particle Physics

PhD student supervision:

- B. Bam, 2020-21, introduction to research with the CMS detector at the LHC

³The Collider Detector Facility (CDF) was an experiment at the Fermilab Tevatron collider. About 600 scientists from 60 institutions collaborated on this project.

⁴PHOBOS was a 50-person heavy-ion experiment at Brookhaven's Relativistic Heavy-Ion Collider. It took data from 2000 to 2005.

- U. Perez, 2017-present, “Measurement of Triphoton Production with the CMS detector at the Large Hadron Collider”
- A. Buccilli, 2013 - 2018, “Search for Signatures of Large Extra Dimensions in High-Mass Diphoton Events from Proton-Proton Collisions at $\sqrt{s}=13$ TeV with CMS”, CERN-THESIS-2018-380, <https://cds.cern.ch/record/2668304>; Andrew was awarded a prize for Outstanding PhD Dissertation by the UA Department of Physics & Astronomy

Graduate Thesis and Dissertation committee memberships:

- PhD Dissertation committee member:
 - Ongoing: C. Cartwright, S. Talei, E. Zolghadr
 - Completed: R. Koirala (2020), A. Srivastava (2020), J.W. Hue (2020), D. Villalba (2019), C. Hoang (Mathematics, 2017), J. Pepper (2016), N. Papapietro (2016), A. Singh (2014), J. Yu (2014).
- MS Thesis committee member:
 - M. Larson, October 2013; Z. Burell, May 2011
- PhD Prelim exam committee member:
 - C. Cartwright, Fall 2019; S. Talei, Spring 2019; R. Koirala, Fall 2017; E. Zolghadr, Fall 2017; A. Srivastava, Spring 2018; D. Villalba, December 2016; J.W. Hue, December 2016; S. Hou, April 2014; A. Chaney, April 2014; N. Papapietro, May 2013; L. Lu, May 2013; A. Singh, May 2013; J. Pepper, November 2012
- MS Examination committees:
 - A. Daniels, Summer 2018; Y. Chang, Spring 2018; M. Zhu, Spring 2017; S. Dhirwani, Spring 2017

Undergraduate research supervision at UA since 2011:

- Lauren Mackey (2020-21), now PhD program at Syracuse; Sarah Deutsch (2017-20), awarded UA’s Catherine J. Randall prize for outstanding senior based on academic performance and scholarly activity, and an NSF Graduate Fellowship for PhD study at Cornell; Shaun Hogan (2014-17), now PhD program at Cornell; Jacob Morrison (2015), PhD from Michigan State; Jason Britchkow (2015); Alison Marsh (2013-14); Justin Brooks (2012-13); Ann-Kathryn Rockwell (2012); Joseph Murray (2011)

Undergraduate students supervised as part of the CERN Summer Student programme (8-12 weeks each):

- 2010: D Hill, ‘Search for High-Mass Diphoton resonances with the CMS Detector’; M Ross-Lonergan, ‘Search for Technicolor in the Three Photon Final State with the CMS Detector’
- 2009: M Peruzzi, ‘Search for Randall-Sundrum Gravitons in the Diphoton Final State with the CMS Detector’

Attended American Association of Physics Teachers Workshop for New Physics Faculty, 27-30 June 2011.

Outreach Activities

- “Inside the Atom: from Quarks and Leptons to the Higgs Boson”, public outreach lecture to New Horizons retiree group at UAB (April 2015)
- Public Night talk at UA, ‘Hunting the Higgs Boson at the Large Hadron Collider’ (26 January 2013)
- Talks with A-level physics students at Lismore Comprehensive School, Craigavon, Northern Ireland (May 2008, September 2009)
- Interview with local newspaper (Lurgan Mail, 1 October 2009)
- Interviewed for Northern Ireland schools documentary films on CERN, and a career as a physicist (2010)
- ‘Putting the Fizz Back Into Physics’, article for Physics World magazine (September 1998)

Professional Organisations

- Member, American Physical Society
- Associate member, Institute of Physics (UK)

High Energy Physics Community Activities and Service

- Invited reviewer for Department of Energy ‘Energy Frontier’ grant proposals and Early Career Award proposals
- Invited reviewer for journals Physical Review D and Physics Letters B: Nuclear and Particle Physics
- Session organizer and chair, ‘Direct Dark Matter Search Experiments’, 2019 Annual meeting of the Southeastern Section of the American Physical Society (SESAPS 2019), 7-9 November 2019
- Invited participant in workshop *Les Houches Physics at TeV Colliders: Beyond the Standard Model*, 17-26 June 2009, Les Houches, France.

Academic and Institutional Service (Selected)

- Director of Graduate Studies, University of Alabama Department of Physics & Astronomy, 2017-19
- UA College of Arts & Sciences Dean’s Postdoctoral Fellowship Selection Committee member, 2019-20
- UA Faculty Senate member, 2019-20 (member of Research & Service Committee)

Awards and Honors

- 2008-2010 CERN Research Fellowship
- 1999-2000 John F Kennedy Memorial Scholar at MIT
(awarded by the Kennedy Memorial Trust, London, England.)
- 1999 John Geddes Prize, Queen's University, Belfast
(best undergraduate physics research project)
- Chairman and chief organizer of 1999 Irish Physics Students Association Conference; President of Queen's University Physics Society, 1998

Departmental Colloquia

- *Searching for Extra Dimensions at the Large Hadron Collider*
 - University of Cincinnati Physics Department, May 2021.
- *Searching for Extra Dimensions at the Large Hadron Collider with the CMS Experiment*
 - University of South Alabama Physics Department, 6 February 2020.
- *'Hunting the Higgs Boson'*
 - University of Alabama-Birmingham Physics Department, 21 September 2012.
- *'Searching for Physics beyond the Standard Model at the Large Hadron Collider'*
 - University of Alabama-Huntsville Physics Department, 11 October 2011.
- *'Searching for New Physics at the Large Hadron Collider'*
 - University of Alabama Physics Department, 29 March 2010

Research Seminars

- *'Searching for Extra Dimensions at the LHC with CMS'*
 - The Ohio State University, 15 October 2018
- *'Recent Results from CMS'*
 - University of Alabama, 8 April 2011
- *'Searching for New Physics with Photons at the Large Hadron Collider'*
 - University of Bristol, 29 July 2010
- *'Global Search for Physics Beyond the Standard Model'*

- Glasgow University Physics Department, 7 January 2009
- ‘*Results of a Global Search for New Physics with 2 fb⁻¹ at CDF*’
 - Fermilab ‘Wine and Cheese’ Seminar, 30 May 2008
 - MIT, 13 May 2008
 - Harvard University, 30 April 2008
 - University of Illinois, Urbana-Champaign, 14 April 2008
- ‘*Results of a Global Search for New Physics with 1 fb⁻¹ at CDF*’
 - Argonne National Laboratory, 5 December 2007
 - University of Pennsylvania, 13 November 2007
 - Duke University, 30 October 2007
 - University of Wisconsin, Madison, 22 October 2007
- ‘*Vista and Sleuth: Searching for New Physics at the Tevatron*’
 - Penn State University, 15 November 2006

Conference Talks

- *Future Physics Prospects with the CMS Detector at the High-Luminosity LHC*
XXVIII International Workshop on Deep-Inelastic Scattering and Related Subjects (DIS 2021), April 2021, Stony Brook University, NY.
- *Recent Higgs Boson Physics Results from CMS*
Invited talk at 2019 Annual meeting of the Southeastern Section of the American Physical Society (SESAPS 2019), 7-9 November 2019, Wrightsville Beach, NC.
- ‘*Search for nonresonant new phenomena in final states with leptons, photons and jets at CMS*’
Parallel talk at Pheno 2018, 7 May 2018, Pittsburgh, PA.
- ‘*Search for high mass resonances in diphoton final states in CMS*’
Parallel talk at SUSY 2015, 28 August 2015, UC Davis/Lake Tahoe, CA.
- ‘*Recent Exotic Search Results from CMS*’
Plenary Talk at La Thuile 2015, 6 March 2015, La Thuile, Italy.
- ‘*Results of a Global Search for New Physics at CDF*’
Plenary talk at Moriond QCD 2008, 10 March 2008, La Thuile, Italy.
- ‘*Sleuth: Results of a Quasi-Model-Independent Search for New Physics in 1 fb⁻¹ at CDF*’
Parallel talk at PHENO 2007, 7 May 2007, Madison, WI.
- ‘*Vista: A New Method for an Inclusive Search of Tevatron Run II Data*’
Parallel talk at PHENO 2006, 15 May 2006, Madison, WI.

- ‘*Charged Hadron p_T Spectra from Au+Au Collisions at 62.4 GeV*’
Parallel talk at Division of Nuclear Physics Meeting, 29 October 2004, Chicago, IL.
- ‘*Charged Hadron Spectra from PHOBOS*’
Participant presentation at 16th Summer School in Nuclear Physics
13-25 June 2004, College of the Atlantic, Bar Harbor, ME.
- ‘*Strangeness Production in PHOBOS*’
Plenary talk at RHIC/AGS Users’ Meeting Workshop on ‘Strangeness and Exotica at RHIC’
14 May 2004, Brookhaven National Laboratory, NY.
- ‘*Charged Hadron Transverse Momentum Distributions at High p_T in Au+Au collisions at 200 GeV*’
Parallel talk at Division of Nuclear Physics Meeting, 10 October 2002, Lansing, MI.
- ‘*Measurement Of Charged Antiparticle To Particle Ratios by the PHOBOS Detector at RHIC*’
Parallel talk at American Physical Society April Meeting, 30 April 2001, Washington DC.

Publications as Primary Author

Journal publications:

- *Search for physics beyond the standard model in high-mass diphoton events from proton-proton collisions at $\sqrt{s}=13$ TeV*
CMS Collaboration, arXiv:1809.00327, Phys. Rev. D 98, 092001 (2018)
- “*Search for high-mass diphoton resonances in proton–proton collisions at 13 TeV and combination with 8 TeV search,*”
CMS Collaboration, Phys. Lett. B **767**, 147-170 (2017); doi:10.1016/j.physletb.2017.01.027; [arXiv:1609.02507 [hep-ex]].
- *Search for Signatures of Extra Dimensions in the Diphoton Mass Spectrum at the Large Hadron Collider*
S. Chatrchyan et al (CMS Collaboration), Phys. Rev. Lett. 108, 111801 (2012).
- *Global Search for New Physics with 2.0/fb at CDF*
T Aaltonen et al (CDF Collaboration), Phys. Rev. D 79, 011101 (2009)
This paper was selected by Nature Physics as one of its 5 featured papers across all of physics for February 2009 (Nature Physics 5, 85 (2009)).
- *Model-Independent and Quasi-Model-Independent Search for New Physics at CDF*
T Aaltonen et al (CDF Collaboration), Phys. Rev. D 78, 012002 (2008)
This novel approach to searching for beyond-Standard Model physics was featured in a number of articles in the science press, including Nature News (“Particle physicists hunt for the unexpected”, 8 May 2007) and Scientific American (“Colliding Philosophies”, April 2009).
- *Identified Hadron Transverse Momentum Spectra in Au+Au Collisions at $\sqrt{s_{NN}} = 62.4$ GeV*
BB Back et al (PHOBOS Collaboration), Phys. Rev. C 75, 024910 (2007)

- *Centrality Dependence of Charged Hadron Transverse Momentum Spectra in Au+Au Collisions from $\sqrt{s_{NN}} = 62.4$ to 200 GeV*
BB Back et al (PHOBOS Collaboration), Phys. Rev. Lett. 94, 082304 (2005)
- *Charged Hadron Transverse Momentum Distributions in Au+Au Collisions at $\sqrt{s_{NN}} = 200$ GeV*
BB Back et al (PHOBOS Collaboration), Phys. Lett. B578, 297 (2004)
- *Centrality Dependence of the Charged Hadron Transverse Momentum Spectra in d+Au Collisions at $\sqrt{s_{NN}}=200$ GeV*
BB Back et al (PHOBOS Collaboration), Phys. Rev. Lett. 91, 072302 (2003)
- *Ratios of Charged Particles to Antiparticles near Mid-rapidity in Au+Au Collisions at $\sqrt{s_{NN}} = 130$ GeV*
BB Back et al (PHOBOS Collaboration), Phys. Rev. Lett. 87, 102301 (2001)

Preliminary public results:

- *Search for physics beyond the standard model in the high-mass diphoton spectrum at 13 TeV*
CMS Collaboration, Physics Analysis Summary EXO-17-017, <http://cds.cern.ch/record/2316245>, May 2018.
- *Search for new physics in high mass diphoton events in proton-proton collisions at $\sqrt{s}=13$ TeV*
CMS Collaboration, Physics Analysis Summary EXO-15-004, <http://cds.cern.ch/record/2114808>, December 2015.
- *Search for High-Mass Diphoton Resonances in pp Collisions at $\sqrt{s}=8$ TeV with the CMS Detector*
CMS Collaboration, Physics Analysis Summary EXO-12-045, <http://cds.cern.ch/record/2017806>, May 2015.
- *Search for Randall-Sundrum Gravitons Decaying into Two Photons in 7 TeV p-p Collisions with the CMS Detector*
CMS Collaboration, Physics Analysis Summary EXO-10-019, <http://cdsweb.cern.ch/record/1350261/>, May 2011.

Workshop and conference proceedings:

- *Future Physics Prospects with the CMS Detector at the High-Luminosity LHC*
C. Henderson on behalf of the CMS Collaboration, Proceedings of XXVIII International Workshop on Deep-Inelastic Scattering and Related Subjects (DIS 2021), CMS CR-2021/077, arXiv:2107.09835, to appear in SciPost Proceedings.
- *Recent Exotic Search Results from CMS*
C. Henderson on behalf of the CMS Collaboration, Proceedings of Les Rencontres de Physique de la Vallée D'Aoste, La Thuile 2015, CMS-CR-2015-098, <http://cds.cern.ch/record/2021760/>, Il Nuovo Cimento 38 C (2015) 151, DOI: 10.1393/ncc/i2015-15151-9.

- *An Exotic Photon Cloud Trigger for CMS*
C. Henderson, Proceedings of the 2009 Les Houches Workshop on New Physics at the LHC, arXiv:1005.1229
- *Results Of A Model-Independent Global Search For New Physics At CDF*
C. Henderson for the CDF Collaboration, arXiv:0805.0742, Proceedings of the XLIIIth Rencontres de Moriond: QCD and High-Energy Interactions 2008

In addition, I am a co-author on:

- 1060 peer-reviewed publications by the CMS collaboration since 2010, with over 100,000 citations
- 145 peer-reviewed publications by the CDF Collaboration (2006-2009)
- 42 peer-reviewed publications by the PHOBOS Collaboration since 2000