

## Thomas Mehen

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### EDUCATION

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**M.A., Ph.D. Physics** (1998) Johns Hopkins University, Baltimore, MD  
Thesis: Phenomenology of Heavy Quarks and Quarkonium  
Advisor: Adam Falk

**B.S. Physics** (1992) University of Virginia, Charlottesville, VA

### EMPLOYMENT

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2002-present	Assistant Professor	Department of Physics Duke University, Durham, NC
2000-2001	Research Associate	Department of Physics The Ohio State University, Columbus, OH
1997-2000	Research Associate	Division of Mathematics, Physics and Astronomy California Institute of Technology, Pasadena CA

### AWARDS

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Outstanding Junior Investigator Award, Department of Energy, Nuclear Physics (2005)  
University Postdoctoral Fellow, The Ohio State University (2000)  
John A. McCone Postdoctoral Scholar, California Institute of Technology (1997-2000)

### TEACHING

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2007	Instructor, "Electricity and Magnetism"
2005-2006	Instructor, "Advanced Quantum Mechanics"
2004	Instructor, "Quantum Field Theory I"
2002-2004	Instructor, "Fundamentals of Quantum Mechanics"
1992-1997	Teaching Assistant for Undergraduate Courses, Johns Hopkins U. (Introductory Physics, Quantum Mechanics, Special Relativity and Waves)

### GRADUATE STUDENTS AND POSTDOCTORAL ADVISEES

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#### Past Advisees

*Postdoctoral (2)*: Carlos Schat (Research Faculty, TANDAR Lab.-CNEA, Buenos Aires, Argentina), Brian Tiburzi (Postdoc, U. of Md.)

#### Current Advisees

*Postdoctoral (2)*: Ahmad Idilbi, Chul Kim

*Graduate Students (1)*: Jie Hu

## PUBLISHED ARTICLES

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1. “On Non-Relativistic Conformal Field Theory and Trapped Atoms: Virial theorems and the State-Operator Correspondence”, T. Mehen, submitted to Phys. Rev. A.
2. “Equivalence of soft and zero-bin subtractions at two loops”, A. Idilbi and T. Mehen, Phys. Rev. D **76**, 094015 (2007).
3. “Pion Interactions in the  $X(3872)$ ”, S. Fleming, M. Kusunoki, T. Mehen, and U. van Kolck, Phys. Rev. D **76**, 034006 (2007).
4. “On the equivalence of soft and zero-bin subtractions”, A. Idilbi and T. Mehen, Phys. Rev. D **75**, 114017 (2007).
5. “Doubly Heavy Baryons and Quark-Diquark Symmetry in Quenched and Partially Quenched Chiral Perturbation Theory”, T. Mehen and B. C. Tiburzi, Phys. Rev. D **74**, 054505 (2006).
6. “Resummation of Large Endpoint Corrections to Color-Octet  $J/\psi$  Photoproduction”, S. Fleming, A. Leibovich and T. Mehen, Phys. Rev. D **74**, 114004 (2006).
7. “Chiral Lagrangian with Heavy Quark-Diquark Symmetry”, J. Hu and T. Mehen, Phys. Rev. D **73**, 054003 (2006).
8. “Doubly Heavy Baryons, Heavy Quark-Diquark Symmetry and NRQCD”, S. Fleming and T. Mehen, Phys. Rev. D **73**, 034502 (2006).
9. “Quarks with Twisted Boundary Conditions in the  $\epsilon$ -Regime”, T. Mehen and B. C. Tiburzi, Phys. Rev. D **72** (2005).
10. “Even- and odd-parity charmed meson masses in heavy hadron chiral perturbation theory,” T. Mehen and R. P. Springer, Phys. Rev. D **72**, 034006 (2005).
11. “Heavy-Quark Symmetry and the Electromagnetic Decays of Excited Charmed Strange Mesons”, T. Mehen and R. P. Springer, Phys. Rev. D **70**, 074014 (2004).
12. “Determining Pentaquark Quantum Numbers from Strong Decays”, T. Mehen and C. Schat, Phys. Lett. B **588**, 67 (2004).
13. “Resumming the Color Octet Contribution to  $e^+e^- \rightarrow J/\psi + X$ ”, S. Fleming, A. Leibovich and T. Mehen, Phys. Rev. D **68**, 094011 (2003).
14. “ $\Lambda_c^+/\Lambda_c^-$  Asymmetry in Hadroproduction from Heavy-Quark Recombination”, E. Braaten, M. Kusunoki, Yu Jia and T. Mehen, Phys. Rev. D **70**, 054021 (2004).
15. “Isospin Violation in  $e^+e^- \rightarrow B\bar{B}$ ”, R. Kaiser, A. V. Manohar and T. Mehen, Phys. Rev. Lett. **90**, 142001 (2003).
16. “Gauge Fields and Scalars in Rolling Tachyon Backgrounds”, T. Mehen and B. Wecht, J. High Energy Phys. **02**, 058 (2003).
17. “The Leading Particle Effect From Heavy-Quark Recombination”, E. Braaten, Yu Jia and T. Mehen, Phys. Rev. Lett. **89**, 122002 (2002).

18. “Reparametrization Invariance for Collinear Operators”, A. V. Manohar, T. Mehen, D. Pirjol and I. W. Stewart, Phys. Lett. B **539**, 59 (2002).
19. “Charm Anti-Charm Asymmetries in Photoproduction from Heavy-Quark Recombination”, E. Braaten, Yu Jia and T. Mehen, Phys. Rev. D **66**, 014003 (2002).
20. “B Production Asymmetries in Perturbative QCD”, E. Braaten, Yu Jia and T. Mehen, Phys. Rev. D **66**, 034003 (2002).
21. “Dilute Bose-Einstein Condensates with Large Scattering Lengths”, E. Braaten, H.-W. Hammer and T. Mehen, Phys. Rev. Lett. **88**, 040401 (2002).
22. “Range Corrections to Doublet S-Wave Neutron-Deuteron Scattering”, H.W. Hammer and T. Mehen, Phys. Lett. B **516**, 353 (2001).
23. “A Renormalized Equation for the Three-Body System with Short-Range Interactions”, H.W. Hammer and T. Mehen, Nucl. Phys. **A690**, 535 (2001).
24. “Generalized \*-Products, Wilson Lines and the Solution of the Seiberg-Witten Equations”, T. Mehen and M. B. Wise, J. High Energy Phys. **12**, 008 (2000).
25. “On Theories with Lightlike Noncommutativity”, O. Aharony, J. Gomis and T. Mehen, J. High Energy Phys. **09**, 023 (2000).
26. “Quantum Field Theories with Compact Noncommutative Extra Dimensions”, J. Gomis, T. Mehen and M. B. Wise, J. High Energy Phys. **08**, 029 (2000).
27. “Space-Time Noncommutative Field Theories and Unitarity”, J. Gomis and T. Mehen, Nucl. Phys. **B591**, 265 (2000).
28. “Noncommutative Gauge Dynamics from the String World Sheet”, J. Gomis, M. Kleban, T. Mehen, M. Rangamani and S. Shenker, J. High Energy Phys. **08**, 011 (2000).
29. “NNLO Corrections to Nucleon-Nucleon Scattering and Perturbative Pions”, S. Fleming, T. Mehen and I. W. Stewart, Nucl. Phys. **A677**, 313 (2000).
30. “Conformal Invariance for Non-Relativistic Field Theory”, T. Mehen, I. W. Stewart and M.B. Wise, Phys. Lett. B **474**, 145 (2000).
31. “The NN Scattering  $^3S_1 - ^3D_1$  Mixing Angle at NNLO”, S. Fleming, T. Mehen and I. W. Stewart, Phys. Rev. C **61** (2000) 044005.
32. “Wigner Symmetry in the Limit of Large Scattering Lengths”, T. Mehen, I. W. Stewart and M.B. Wise, Phys. Rev. Lett. **83**, 931 (1999).
33. “Radiation Pions in Two Nucleon Effective Field Theory”, T. Mehen and I. W. Stewart, Nucl. Phys. **A665**, 164 (2000).
34. “Renormalization Schemes and the Range of Two Nucleon Effective Field Theory”, T. Mehen and I. W. Stewart, Phys. Rev. C **59**, 2365 (1999).
35. “A Momentum Subtraction Scheme for Two Nucleon Effective Field Theory”, T. Mehen and I. W. Stewart, Phys. Lett. B **445**, 378 (1999).

36. “Photoproduction of  $h_c$ ”, S. Fleming and T. Mehen, Phys. Rev. D **58**, 037503 (1998).
37. “Summing  $O(\beta_0^n \alpha_s^{n+1})$  Corrections To Top Quark Decays”, T. Mehen, Phys. Lett. B **417**, 353 (1998).
38. “Leptoproduction of  $J/\psi$ ”, S. Fleming and T. Mehen, Phys. Rev. D **57**, 1846 (1998).
39. “Testing Quarkonium Production with Photoproduced  $J/\psi + \gamma$ ”, T. Mehen, Phys. Rev. D **55**, 4338 (1997).
40. “Scale Setting in Top Quark Decays”, T. Mehen, Phys. Lett. B **382**, 267 (1996).
41. “Excited Heavy Mesons Beyond Leading Order in the Heavy Quark Expansion”, A. F. Falk and T. Mehen, Phys. Rev. D **53**, 231 (1996).

## PUBLISHED PROCEEDINGS

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1. S. Fleming, A. Leibovich and T. Mehen, “ $J/\psi$  Photoproduction at Large  $z$  in Soft-Collinear Effective Theory”, Proceedings of the Ringberg Workshop on New Trends in HERA Physics 2005, Ringberg Castle, Tegernsee, Germany, 2-7 Oct 2005 World Scientific, (2006).
2. T. Mehen, “Excited  $D_s$  (and Pentaquarks) in Chiral Perturbation Theory”, Krakow Epiphany Conference on Hadron Spectroscopy, Krakow, Poland, January 8, 2005. *Acta Phys. Polon.* **B 36** (2005).
3. “Recent Developments in Heavy Quark and Quarkonium Production”, T. Mehen, Presented at the 23rd International Symposium on Multiparticle Dynamics (ISMD 2003) Krakow, Poland, Sep. 5-11, 2003, *Acta Phys. Polon.* B35 (2004) 121.
4. “Charm Production Asymmetries from Heavy Quark Recombination”, T. Mehen, Proceedings of CIPANP 2003: 8th Conference on the Intersections of Particle and Nuclear Physics, New York, NY, May 19-24, 2003, AIP Conf. Proc. **698**, 508 (2004).
5. “Charm Production Asymmetries from Heavy Quark Recombination”, T. Mehen, Proceedings of the 7th International Conference on Strangeness in Quark Matter (SQM 2003), Atlantic Beach, North Carolina, Mar. 12-17, 2003, *J. Phys. G* 30 (2004) S295.
6. “Nucleon-Nucleon Effective Field Theory at NNLO: Radiation Pions and  $^1S_0$  Phase Shift”, T. Mehen and I. W. Stewart, Proceedings of the INT Workshop on Nuclear Physics with Effective Field Theory II, University of Washington, Seattle, WA, Feb. 25-26, 1999, published by World Scientific, Singapore, 2000.
7. “Perturbative Pions in effective field theory for nucleon interactions”, Proceedings of the 3rd Workshop on Chiral Dynamics - Chiral Dynamics 2000: Theory and Experiment, Newport News, Virginia, 17-22 Jul (2000), Published in \*Newport News 2000, Chiral dynamics\* 434-435.
8. “Leptoproduction of  $J/\psi$ ”, T. Mehen, Proceedings of the 29th International Conference on High Energy Physics, TRIUMF, Vancouver, Canada, July 23-29, 1998, published by World Scientific, Singapore, 1999.

## SELECTED INVITED TALKS AND SEMINARS

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1. “Non-Relativistic Conformal Field Theory and Trapped Cold Atoms at Unitarity”, North Carolina State University, Raleigh, NC, December 7, 2007.
2. “Effective Field Theories for Strongly Interacting Particles: from Charmed Hadrons to Cold Atoms” Physics Colloquium, University of North Carolina at Wilmington, Wilmington, NC, November 30, 2007.
3. “New Applications of Non-Relativistic EFT’s: X(3872) and Trapped Cold Atoms”, University of Maryland, College Park, MD, October 24, 2007.
4. “Pion Interactions in the X(3872)”, Plenary Talk, International Workshop on Heavy Quarkonium 2007, October 19, 2007, DESY, Hamburg, Germany.

5. "Pion Interactions in the  $X(3872)$ ," Massachusetts Institute of Technology, Boston, MA, April 4, 2007.
6. "On the Equivalence of Soft and Zero-Bin Subtractions," Massachusetts Institute of Technology, Boston, MA, March 14, 2007.
7. "New Charmed Resonances and Effective Field Theory," Massachusetts Institute of Technology, Boston, MA, February 28, 2007.
8. "New Charmed Resonances and Effective Field Theory," Caltech, Pasadena, CA, January 8, 2007.
9. "Heavy Quark-Diquark Symmetry and  $\chi$ PT for Doubly Heavy Baryons", Yale University, New Haven, CT, December 12, 2006.
10. "QCD, Effective Field Theory, and Charmed Hadrons", Physics Colloquium, Virginia Tech, Blacksburg, VA, November 17, 2006.
11. "Heavy Quark-Diquark Symmetry and  $\chi$ PT for Doubly Heavy Baryons", Joint Meeting of the Pacific Region Particle Physics Communities, Honolulu, HI, October 30, 2006.
12. "Heavy Quark-Diquark Symmetry and  $\chi$ PT for Doubly Heavy Baryons", 5th International Workshop on Chiral Dynamics, Chapel Hill, NC, September 21, 2006.
13. "Endpoint Resummation in Quarkonium Production", SCET Workshop 2006, University of Arizona, Tucson, AZ, March 30, 2006.
14. "Doubly Heavy Baryons and Heavy Quark-Diquark Symmetry", U. of Arizona, Tucson, AZ, January 12, 2006.
15. "Doubly Heavy Baryons and Heavy Quark-Diquark Symmetry", Ohio State U., Columbus, OH, December 9, 2005.
16. "Doubly Heavy Baryons and Heavy Quark-Diquark Symmetry", U. of Maryland., College Park, MD, November 16, 2005.
17. "Doubly Heavy Baryons and Heavy Quark-Diquark Symmetry", Jefferson Lab, Newport News, VA, November 7, 2005.
18. "Excited Charmed Mesons and Chiral Perturbation Theory", U. of Milan, Milan, Italy, July 19, 2005.
19. "Excited Charmed Mesons and Chiral Perturbation Theory", ECT\* Workshop: Resonances in QCD, Trento, Italy, July 14, 2005.
20. "Excited Charmed Mesons and Chiral Perturbation Theory", Ohio Center for Technology and Science Workshop: Effective Theories in Physics from Nana to Tera, Columbus, OH, June 17, 2005.
21. "Excited Charmed Mesons and Chiral Perturbation Theory", Institute for Nuclear Theory Workshop: Effective Field Theories, QCD and Heavy Hadrons, Seattle WA, April 7, 2005.
22. "Excited  $D_s$  (and Pentaquarks) in Chiral Perturbation Theory", Krakow Epiphany Conference on Hadron Spectroscopy, Krakow, Poland, January 8, 2005.

23. "Endpoint Resummation in Quarkonium Production", Quarkonium Working Group International Workshop on Heavy Quarkonium, IHEP Beijing, China, October 12-15, 2004.
24. "Resummation for Quarkonium Production in  $e^+e^-$  Colliders", DIS 2004 XII International Workshop on Deep Inelastic Scattering, Strbske Pleso, High Tatras, Slovakia, April 14-18, 2004.
25. "Recent Developments in Heavy Quark and Quarkonium Production", 33rd International Symposium on Multiparticle Dynamics", Krakow, Poland, September 5-11, 2003.
26. "Soft-Collinear Effective Theory and Resummation for Quarkonium Production", Effective Summer in Berkeley Meeting, Lawrence-Berkeley National Laboratory Workshop, Berkeley, CA, July 24, 2003.
27. "Charm Production Asymmetries from Heavy Quark Recombination", Conference on the Intersections of Particle and Nuclear Physics 2003, New York, NY, May 19-24, 2003.
28. "Charm Production Asymmetries from Heavy Quark Recombination", 7th International Conference on Strangeness in Quark Matter, Atlantic Beach, NC, March 12-17, 2003.
29. "SCET: Reparametrization Invariance and Resummation for Quarkonium Production", Caltech, Pasadena, March 3, 2003.
30. "Reparametrization Invariance in SCET", Benasque Center for Science Workshop: Pushing the Limits of QCD, Benasque, Spain, July 19, 2002.
31. "Heavy Quark Recombination and Charm Production Asymmetries", 5th International Conference on Hyperons, Beauty and Charm Hadrons, Vancouver, BC, Canada, June 25-29, 2002.
32. "Heavy Quark Recombination and Charm Production Asymmetries", American Physical Society, 2002 Meeting of the Division of Particles and Fields, College of William and Mary, Williamsburg, VA, May 24-28, 2002.
33. "Soft-Collinear Effective Theory", Mini-Symposium on QCD, Brookhaven National Laboratory, Upton, NY, May 7, 2002.
34. "Heavy Quark Recombination and Charm Production Asymmetries", Fermilab, Batavia, IL, May, 2002.
35. "Field Theory on Noncommutative Spaces", Ohio State U., Columbus, OH, April 3, 2001.
36. "Field Theory on Noncommutative Spaces", Massachusetts Institute of Technology, Boston, MA, March 20, 2001.
37. "Effective Field Theory for Nuclear Physics", Effective Field Theories and Effective Interactions, Institute for Nuclear Theory, University of Washington, Seattle, WA, July 6, 2000.
38. "Effective Field Theory for Two Nucleons", TRIUMF, Vancouver, B.C. Canada, January 18, 2000.

39. “Nucleon-Nucleon Effective Field Theory at NNLO: Radiation Pions and  $^1S_0$  Phase Shift”, Nuclear Physics with Effective Field Theory II, Institute for Nuclear Theory, University of Washington, Seattle, WA, Feb. 25–26, 1999.
40. “Renormalization Schemes and Radiation Pions in Effective Field Theory of Nuclei”, UCSD, San Diego, CA, January 25, 1999.
41. “Renormalization Schemes and the Range of the Nucleon-Nucleon Effective Theory”, Physics of Strangeness, Institute for Nuclear Theory, University of Washington, Seattle, WA, Nov. 4, 1998.
42. “Leptoproduction of  $J/\psi$ ”, 29th International Conference of High Energy Physics, TRIUMF Laboratory, Vancouver, B.C. Canada, July 23–29, 1998.
43. “Color-Octet Mechanisms in Photo- and Electroproduction of  $J/\psi$ ”, Pheno 1997 Symposium: Recent Developments in Phenomenology, University of Wisconsin, Madison, WI, March, 17-19, 1997.
44. “Excited Heavy Mesons Beyond Leading Order in the Heavy Quark Expansion”, U. of Maryland, College Park, MD September, 1995.
45. “Excited Heavy Mesons Beyond Leading Order in the Heavy Quark Expansion”, Visiting Scientist Summer Program, Brookhaven National Laboratory, Upton, NY, July, 1995.

## SERVICE

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- Departmental Activities

1. *Physics Department Webmaster* (2002-present)
2. *High Energy Experimentalist Search Committee* (2003) (Chair: Prof. Seog Oh)
3. *Graduate Qualifying Exam* (2003) (Chair: Prof. Henry Weller)
4. *Quantum Mechanics Placement Exams* (2002 - 2003) (with Prof. Roxanne Springer)
5. *Preliminary Exam Committees* (2003-2006)  
Bryon Neufeld (Advisor: Prof. Berndt Mueller)  
Qiang Ye (Advisor: Prof. Haiyan Gao)  
Xing Zong (Advisor: Prof. Haiyan Gao)  
D. J. Cecile (Advisor: Prof. Shailesh Chandrasekharan)  
Jianrong Deng (Advisor: Prof. Al Goshaw)  
Staci Hemmer (Advisor: Prof. John Thomas)  
Brian Bunton (Advisor: Prof. Roxanne Springer)
6. *Honors Thesis Committee* (2003)  
Jacob Foster (Advisor: Prof. Berndt Mueller).
7. *Executive Committee* (2003-present)
8. *Nuclear/Particle Theory Group Seminar Organizer* (2002-present)

- Professional Activities

1. *Journal Referee* (2002-present)  
Physical Review D  
Nuclear Physics A  
Journal of High Energy Physics  
Journal of Physics G: Nuclear and Particle Physics
2. *Textbook Reviewer* (2002)  
*Quantum Mechanics*, by Ernest S. Abers, Prentice Hall, New Jersey, 2004.
3. *INT Workshop Organizer* with Prof. Iain Stewart, MIT  
“Effective Field Theory, QCD, and Heavy Hadrons” at the Institute for Nuclear Theory (INT), University of Washington, Seattle, WA, March 21 - June 10, 2005.  
<http://int.phys.washington.edu/PROGRAMS/05-1.html>

4. *ECT\* Workshop Organizer* with Profs. Nora Brambilla (Milan), Antonio Vairo (Milan) and Prof. Joan Soto (Barcelona)

“Heavy Quarkonium and Related Heavy Quark States” at the European Center for Theoretical Studies in Nuclear Physics and Related Areas (ECT\*), Trento, Italy, August 17 - 31, 2006.

<http://www.ect.it/>