Curriculum Vitae

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Name: Xilin Zhang

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Address: Physics Research Building, 191 West Woodruff Avenue, Columbus, Ohio 43210

Education:

Degree	*Institution*	*Date*
Ph. D.	Indiana University, Bloomington, IN, USA	2007–08,
	Thesis: *Electroweak interactions and the Delta resonance in a Chiral effective field theory for nuclei*	2010–12
	Advisors: Brian D. Serot and Jinfeng Liao	
M. S.	Indiana University, Bloomington, IN, USA	2005–07

Academic Positions:

Position	*Institution*	*Date*
Postdoc Research Associate	Physics Department The Ohio State Univ., Columbus, OH, USA	2018–
Postdoc Research Associate	Physics Department University of Washington, Seattle, WA, USA	2015–2018
Intensity Frontier Fellow	Fermi National Accelerator Laboratory Batavia, IL, USA	2014
Postdoc Research Associate	Physics Department Ohio University, Athens, OH, USA	2012–14

Position	*Institution*	*Date*
Research Assistant	Nuclear Theory Center Indiana University, Bloomington, IN, USA	2007–08, 2010–11
Teaching Assistant and Associate Instructor	Physics Department Indiana University, Bloomington, IN, USA	2005–08

Awards and Honors:

1. Intensity Frontier Fellowship, Fermi National Accelerator Laboratory, Batavia, IL, 2014.
2. Outstanding Graduate Student in Theoretical Research, Physics Department, Indiana University, 2011.
3. Outstanding Student Award, Department of Modern Physics, University of Science and Technolgy of China, 2001, 2002, 2003, and 2004.

Research Interests:

- Light nuclei: (1) effective field theory (EFT) approach for studying low-energy reactions with astrophysical relevance; (2) factorization of long- and short-distance physics and its usage in studying higher-energy reactions; (3) *ab initio* reaction calculation by merging EFT with *ab initio* structure calculation; (4) Bayesian-inference-based uncertainty estimation for treating experimental and computational data.
- Nuclear many-body systems: (1) neutrino–nucleus reactions with relevance to neutrino oscillation experiments; (2) factorization of long- and short-distance physics in describing GeV-lepton–nucleus reactions; (3) dense matter properties and neutron star physics; (4) quantum hadrodynamics (QHD), its loop expansion, and its relation with Chiral EFT.
- Nucleon properties: (1) Weak-Compton scattering (the basic kernel for studying radiative correction in nucleon's weak interaction processes), and its dispersion relation analysis; (2) nucleon's elastic and inelastic electroweak form factors in the framework of light-front quark models.
- Statistic analysis: application of Bayesian inference in nuclear physics
- Ongoing exploration of a novel idea to reduce the so-called neutrino-floor, i.e., background due to solar and atmospheric neutrinos, in direct dark-matter detection experiment (collaborating with Professor Jason Detwiler, an experimentalist at University of Washington)
- Relativistic heavy-ion collisions: (1) jet-quenching phenomenology and strong electromagnetic field; (2) jet-quenching enhancement at near-T_c temperature.

Professional Service:

Referee for: Physics Review C, Physics Review D, Physics Letters B, Nuclear Physics A, Journal of Physics G: Nuclear and Particle Physics, International Journal of Modern Physics E, International Journal of Modern Physics A,

Teaching:

Between 2006 and 2008, at Indiana University–Bloomington, I taught as an associate instructor, General Physics I and II (P201 and P202) labs and Physics I and II (P221 and P222) labs

Between 2012 and 2014, I helped Professor Daniel Phillips at Ohio University teach graduate student courses including Quantum Field Theory and Mathematical Physics on a few occasions

Presentations:

Invited Conference Talks:

1. "Electroweak processes in nuclei," invited talk, INT workshop: "From nucleons to nuclei: enabling discovery for neutrinos, dark matter and more," Institute for Nuclear Theory, Seattle, WA, June 2018

2. "Connecting scattering with structure calculation through Improved Busch formula," invited talk, FRIB-Theory Alliance workshop: "From bound states to the continuum: Connecting bound state calculations with scattering and reaction theory," FRIB, East Lansing, MI, June 2018

3. "Low-energy nuclear reaction in the effective field theory approach," invited talk, American Physics Society **(APS) April meeting**, Columbus, Ohio, April 2018.

4. "Improved Busch formula and look for a unified calculation of nuclear scattering and structure," invited talk, TRIUMF theory workshop: "Progress in Ab Initio Techniques in Nuclear Physics", TRIUMF, Vancouver BC, Feb 2018

5. "Beryllium-8 nuclear theory predictions," invited talk, U.S. Cosmic Visions: New Ideas in Dark Matter, University of Maryland, College Park, MD, March 2017.

6. "Neutrino-Nucleon (Nucleus) Reaction: The case of Neutral Current induced Photon Production," invited talk, The 12th Conference on the Intersections of Particle and Nuclear Physics (CIPANP 2015), Vail, CO, May 2015.

7. "Neutrino-Nucleon (Nucleus) Scattering for non-Neutrino Physics: The case of Neutral Current induced Photon Production," invited talk, American Physics Society **(APS) April meeting**, Baltimore, MD, April 2015.

8. "Neutral Current Induced Photon Production: Nuclear Models and Pion Electro- and Photo-production," invited talk, INT Workshop on Neutrino-Nucleus Interactions for Current and Next Generation Neutrino Oscillation Experiments, Institute for Nuclear Theory, Seattle, WA, December 2013.

9. "Electroweak Pion and Photon emission in a Chiral Effective Field Theory for Nuclei and Beyond," invited talk, International Workshop on Neutrino Factories, Super beams and Beta Beams (NuFact), Institute of High Energy Physics, Beijing, China, August 2013.

10. "Harmonic Jet Tomography at RHIC+LHC, " invited talk, Jet Quenching Workshop, RIKEN BNL Research Center, Brookhaven National Laboratory, Upton, NY, April 2013.

Conference Talks:

1. "Bayesian analysis of Beryllium-7+proton $\rightarrow$ Boron-8+photon based on halo effective field theory" American Physics Society (APS) April meeting, Washington, DC, January 2017

2. "Can nuclear physics explain the anomaly observed in the internal pair creation in Beryllium-8 nucleus?" American Physics Society (APS) April meeting, Washington, DC, January 2017

3. "Hot and dense matter beyond relativistic mean field theory", INT Program INT-16-2b on "The Phases of Dense Matter", Institute for Nuclear Theory, Seattle, WA, August, 2016

4. "Bayesian analysis for Beryllium-7+proton $\rightarrow$ Boron-8+photon based on effective field theory", INT Program INT-16-2a on "Bayesian Methods in Nuclear Physics", Institute for Nuclear Theory, Seattle, WA, June, 2016

5. "How well do we know about Beryllium-7+proton $\rightarrow$ Boron-8+photon? An effective field theory perspective," talk, 21st International Conference on Few-Body Problems in Physics, Chicago, IL, May 2015.

6. "Combining *ab initio* calculations and EFT for loosely bounded systems: ^{7}Li(n, γ)^{8}Li and ^{7}Be(p, γ)^{8}B," talk, INT Program on "Universality in few-body systems", Institute for Nuclear Theory, Seattle, WA, April 2014.

7. "Marrying *ab initio* Calculations and Halo-EFT: ^{7}Li(n, γ)^{8}Li and ^{7}Be(p, γ)^{8}B," talk, Fall Meeting of the American Physics Society (APS) Division of Nuclear Physics, Newport News, VA, October 2013.

8. "Jet Quenching at RHIC+LHC: Near Tc enhancement?" talk, JET Summer School, Ohio State University, Columbus, OH, June 2013.

9. "Marrying *ab initio* Calculations and Halo-EFT: the case of $^7\mathrm{Li} + n \rightarrow {}^8\mathrm{Li} + \gamma$," talk, American Physics Society (APS) meeting (Ohio region), Institute of Particle and Nuclear Physics, Ohio University, Athens, OH, March 2013.

10. "Hard Probe at RHIC and LHC," talk, Mid-West Theory Get Together, Argonne National Laboratory, Argonne, IL, September 2012.

11. "Jet Tomography of Harmonic Fluctuations in the Initial Condition of Heavy Ion Collisions," talk, School of Collective Dynamics in High Energy Collisions, Lawrence Berkeley National Laboratory, Berkeley, CA, May 2012.

12. "Photon Events at MiniBooNE Experiment," talk, American Physics Society (APS) meeting, Atlanta, GA, April 2012.

13. "A Photon-Event Analysis for MiniBooNE," talk, XXIV Midwest Theory Get-Together, Argonne National Laboratory, IL, September 2011.

14. "Weak Pion and Photon Production from Nuclei in a Chiral Effective Field Theory (Update)," talk, American Physics Society (APS) April meeting, Anaheim, CA, April 2011.

Seminars and Colloquiums:

1. "Can nuclear physics explain the anomaly observed in the internal pair creation in Beryllium-8 nucleus?" high energy physics seminar, Purdue University, West Lafayette, IN, Winter 2017. *(Invitation received)*

2. "Weak-Compton scattering and nucleon axial form factors," Online Seminar, Jefferson Lab theory center, Seattle, WA, January 2017

3. "Hot and dense matter beyond relativistic mean field theory", Online Seminar, Joint Institute for Nuclear Astrophysics - Center for the Evolution of the Elements (JINA-CEE), Seattle, WA, May 2016

4. "Halo effective field theory constrains the solar Beryllium-7 + proton $\rightarrow$ Boron-8 + photon rate", nuclear physics seminar, Department of Physics, University of Notre Dame, Notre Dame, IN, April 2016

5. "From Fermilab to the Sun to FRIB and JLab: Nuclear Reactions for Particle Physics, Astrophysics, and their own sake", colloquium, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, LA, March 2016

6. "How well do we know about Beryllium-7+proton → Boron-8+photon? A Bayesian analysis based on effective field theory," nuclear theory seminar, TRIUMF, Vancouver, British Colombia, May 2015.

7. "Can Neutrino-induced Photon Production Explain the Low Energy Excess in MiniBooNE?" high energy physics seminar, Northwestern University, Evanston, IL, October 2014.

8. "Radiative capture study by combining EFT with ab initio calculations: ^{7}Li(n, γ)^{8}Li and ^{7}Be(p, γ)^{8}B," seminar, Nuclear Theory Group, Michigan State University, East Lansing, MI, February 2014.

9. "Marrying *ab initio* calculations and Halo-EFT: ^{7}Li(n, γ)^{8}Li and ^{7}Be(p, γ)^{8}B," seminar, Institute of Nuclear and Particle Physics, Ohio University, Athens, OH, February 2014.

10. "Radiative capture study in a EFT plus *ab initio* calculations approach: ^{7}Li(n, γ)^{8}Li and ^{7}Be(p, γ)^{8}B," seminar, Nuclear Theory Group, Argonne National Laboratory, Lemont, IL, January 2014.

11. "Radiative capture study by combining EFT with *ab initio* calculations: ^{7}Li(n, γ)^{8}Li and ^{7}Be(p, γ)^{8}B," seminar, Nuclear Theory Group, Los Alamos National Laboratory, Los Alamos, NM, January 2014.

12. "Hard Probe of Geometry and Fluctuations from RHIC to LHC," seminar, Nuclear Theory Center, Indiana University, Bloomington, IN, February 2013.

13. "Can Neutrino-induced Photon Production Explain the Low Energy Excess in MiniBooNE?" seminar, Institute of Nuclear Physics, University of Mainz, Mainz, Germany, Janurary 2013.

14. "The Azimuthal Anisotropy of High P_t Hadrons in RHIC and LHC," Nuclear Theory/RIKEN Seminar, Brookhaven National Laboratory, Upton, NY, July 2012.

15. "Electroweak Interactions in a Chiral Effective Field Theory for Nuclei," seminar, nuclear theory group, Ohio University, Athens, OH, February 2012.

Posters:

1. "(In)coherent Weak Pion and Photon Production at Low and Medium Energy," poster, National Nuclear Physics Summer School, University of North Carolina, NC, June 2011.

2. "Electroweak Pion and Photon Production off Nucleon and Nuclei at Low Energy Region," poster, International Nuclear Physics Conference, Vancouver, British Columbia, July 2010.

Publications List: (Published 20; Preprint 3; Draft being prepared 2)

Interdisciplinary works: astrophysics, beyond standard model physics

1. **X. Zhang**, K. M. Nollett and D. R. Phillips, "S-factor and scattering-parameter extractions from ^{3}He $+^4$ He $\rightarrow^7$ Be $+ \gamma$," *preprint to appear online soon.*
2. M. Battaglieri *et al.* (including **X. Zhang**), "US Cosmic Visions: New Ideas in Dark Matter 2017: Community Report," arXiv:1707.04591 [hep-ph].
3. **X. Zhang** and G. A. Miller, "Can nuclear physics explain the anomaly observed in the internal pair production in the Beryllium-8 nucleus?," Phys. Lett. B **773**, 159 (2017).
4. **X. Zhang**, K. M. Nollett and D. R. Phillips, "Halo effective field theory constrains the solar ^{7}Be + p $\rightarrow$ ^{8}B + γ rate," Phys. Lett. B **751**, 535 (2015).
5. **X. Zhang** and B. D. Serot, "Can neutrino-induced photon production explain the low energy excess in MiniBooNE?," Phys. Lett. B **719**, 409 (2013).

Nucleon properties

1. **X. Zhang**, G. A. Miller, and T. Hobbs, "Nucleon axial current form factor in a quark model with pion cloud and its impact on neutrino oscillation experiment," *preprint to appear online soon.*
2. M. Gorchtein, H. Spiesberger and **X. Zhang**, "How strange is pion electroproduction?" Phys. Lett. B **752**, 135 (2016).
3. M. Gorchtein and **X. Zhang**, "Forward Compton Scattering with weak neutral current: constraints from sum rules," Phys. Lett. B **747**, 305 (2015).

Nuclear few-body system: structure and low energy reaction, Bayesian uncertainty analysis

1. **X. Zhang**, K. M. Nollett and D. R. Phillips, "S-factor and scattering parameters from ^{3}He + ^{4}He $\to$ ^{7}Be + γ data," arXiv:1811.07611. *Submitted to the proceedings of the 22nd International Conference on Few-body Problems in Physics, Caen, France, July, 2018*

2. **X. Zhang**, K. M. Nollett and D. R. Phillips, "Models, measurements, and effective field theory: Proton capture on ^7Be at next-to-leading order," Phys. Rev. C **98**, no. 3, 034616 (2018).

3. **X. Zhang**, K. M. Nollett and D. R. Phillips, "How well do we understand Beryllium-7 + proton $\to$ Boron-8 + photon? An Effective Field Theory perspective," Proceedings of the 21st International Conference on Few-Body Problems in Physics (2015), arXiv:1508.06935.

4. **X. Zhang**, K. M. Nollett and D. R. Phillips, "Combining ab initio calculations and low-energy effective field theory for halo nuclear systems: the case of ^{7}Be+$p \to {}^8$B+γ," Phys. Rev. C **89**, 051602(R) (2014).

5. **X. Zhang**, K. M. Nollett and D. R. Phillips, "Combining *ab initio* calculations and low-energy effective field theory for halo nuclear systems: the case of ^{7}Li+$n \to {}^8$Li+γ," Phys. Rev. C **89**, 024613 (2014).

Nuclear many-body system: neutrino–nucleus reactions and dense matter properties

1. **X. Zhang** and M. Prakash, "Hot and dense matter beyond relativistic mean field theory," Phys. Rev. C **93**, 055805 (2016).

2. **X. Zhang**, "Photon neutrino-production in a chiral EFT for nuclei and extrapolation to $E_\nu \sim 1$ GeV region," Proceedings of the International Workshop on Neutrino Factories, Super beams and Beta Beams (NUFACT 2013), arXiv:1310.7294.

3. **X. Zhang** and B. D. Serot, "Coherent Neutrinoproduction of Photons and Pions in a Chiral Effective Field Theory for Nuclei," Phys. Rev. C **86**, 035504 (2012).

4. **X. Zhang** and B. D. Serot, "Incoherent Neutrinoproduction of Photons and Pions in a Chiral Effective Field Theory for Nuclei," Phys. Rev. C **86**, 035502 (2012).

5. B. D. Serot and **X. Zhang**, "Neutrinoproduction of Photons and Pions From Nucleons in a Chiral Effective Field Theory for Nuclei," Phys. Rev. C **86**, 015501 (2012).

6. B. D. Serot and **X. Zhang**, "Electroweak Interactions in a Chiral Effective Lagrangian for Nuclei," Advances in Quantum Field Theory, ed. by Sergey Ketov (Intech, Rijeka, Croatia, 2012), arXiv:1110.2760.

Relativistic heavy-ion collision

1. J. Bloczynski, X. G. Huang, **X. Zhang** and J. Liao, "Charge-dependent azimuthal correlations from AuAu to UU collisions," Nucl. Phys. A **939**, 85 (2015).

2. **X. Zhang** and J. Liao, "Hard Probe of Geometry and Fluctuations from RHIC to LHC," Phys. Rev. C **89**, 014907 (2014).

3. **X. Zhang** and J. Liao, "Jet Quenching and Its Azimuthal Anisotropy in AA and possibly pA Collisions at LHC," arXiv:1311.5463.

4. **X. Zhang** and J. Liao, "Event-by-event azimuthal anisotropy of jet quenching in relativistic heavy ion collisions," Phys. Rev. C **87**, 044910 (2013).

5. J. Bloczynski, X. -G. Huang, **X. Zhang** and J. Liao, "Azimuthally fluctuating magnetic field and its impacts on observables in heavy-ion collisions," Phys. Lett. B **718**, 1529 (2013).

6. **X. Zhang** and J. -F. Liao, "Jet Tomography of Harmonic Fluctuations in the Initial Condition of Heavy Ion Collisions," Phys. Lett. B **713**, 35 (2012).