

Patrick McChesney, Ph.D.

CONTACT INFORMATION	1801 Gibson Blvd Apt 1105 Albuquerque, New Mexico 87106	<i>Phone:</i> 847-340-0673 <i>E-mail:</i> pmcchesn@gmail.com
EDUCATION	Indiana University , Bloomington, Indiana Ph.D. in Physics (Accelerator Physics Concentration) Minor in Computer Science	May 2015
	Indiana University , Bloomington, Indiana Master of Science in Physics	August 2012
	Indiana University , Bloomington, Indiana Bachelor of Science in Physics with Honors Bachelor of Science in Mathematics Minor in Biology	December 2009
WORK EXPERIENCE	University of Chicago Biological Sciences Division , Chicago, Illinois Senior Research Professional - Cobey Lab <ul style="list-style-type: none">Develops models of the longitudinal dynamics of individual-level trends and vaccine effectiveness in influenza and SARS-CoV-2Performs detailed data analysis on infectious disease cohort studiesProvides experimental designs for epidemiological panel studies	May 2022 - present
	Ball Aerospace , Albuquerque, New Mexico Senior Computational Physicist <ul style="list-style-type: none">Served as Computational Modeling Team Lead in charge of providing direction, analysis, and physical interpretation of modeling results for complex high-power laser systemsMaintained and upgraded a world-class suite of laser source simulation softwareGenerated systems-level designs for laser subsystems	February 2021 - May 2022
	Sem-Sol , Albuquerque, New Mexico Senior Scientist <ul style="list-style-type: none">Principal Investigator for an Air Force Research Laboratory high-power microwave contract with a funding ceiling of around \$8MLed experiment and design efforts focused on the optimization and integration of a novel high-power microwave weapons systemRevitalized the data analysis capabilities of an established physics laboratory through the development of improved data processing algorithms and software tools	June 2020 - January 2021
	Raytheon Missile Systems , Albuquerque, New Mexico Scientist - Directed Energy Division <ul style="list-style-type: none">Key researcher within Raytheon's premier R&D division focusing on charged particle and x-ray beams, radiation effects, accelerator system design, high-power microwaves, and plasma physicsPrincipal Investigator and Project Manager on 3 major research programs with a combined funding ceiling around \$5MExperimental Team Lead on 7 efforts involving radiation effects testing, electron beam diagnostic development, and atmospheric plasma jet researchSimulation Team Lead on 5 efforts involving the propagation and shielding of ionizing radiation, the design of novel high-power microwave sources, and the development and modeling of innovative missions and concepts of operations	June 2015 - June 2020

- Theory Team Lead on 4 efforts involving ionizing radiation effects modeling, the propagation of charged particle beams and short-pulse lasers, the generation and transport of atmospheric plasmas, and the stability of electron motion within microwave sources
- Planned and led 18 radiation effects and electron beam diagnostic test campaigns at remote accelerator facilities
- Played a major role in 4 proposal efforts which led to successful capture

Indiana University Physics Department, Bloomington, Indiana

Research Assistant - Accelerator Physics Group

August 2011 - May 2015

- Developed novel techniques for the acceleration and storage of low energy neutrons in magnetic fields through direct analogies to charged particle accelerator physics

Indiana University School of Optometry, Bloomington, Indiana

Programmer - Ophthalmic Imaging Laboratory

December 2012 - May 2014

- Designed and implemented adaptive optics control software and the associated user interface

IU Center for the Exploration of Energy and Matter, Bloomington, Indiana

Staff Physicist

August 2009 - August 2011

- Led physics operations and commissioning of a 25 MeV electron storage ring
- Designed and implemented electron accelerator diagnostics and control systems
- Simulated and optimized electron and proton beam targets for x-ray and neutron generation

Indiana University Cyclotron Facility, Bloomington, Indiana

Undergraduate Researcher

March 2006 - August 2009

- Participated in the design and modeling of the accelerator lattice of an electron storage ring designed for radiation effects testing
- Designed accelerator diagnostic systems including beam position monitors and a Faraday cups for measuring beam current
- Used Monte Carlo particle transport simulations to optimize the design of neutron target and moderator systems
- Created extensive instrumentation and control system software for ultracold neutron generation experiments conducted at Los Alamos National Laboratory

Indiana University Biology Department, Bloomington, Indiana

Undergraduate Researcher

April 2005 - February 2008

- Utilized many molecular biology techniques including DNA extraction, PCR, gene sequencing, and agarose gel electrophoresis
- Maintained and cataloged several hundred ant colonies
- Developed and implemented new methods of sorting plant seeds to feed research insects

SELECTED PUBLICATIONS

- G. S. Sarkisov, P. D. McChesney, et al., "High-sensitive multi-pass imaging interferometry of a gas/plasma jet", *Review of Scientific Instruments* **90**, 023504 (2019).
- R. B. Miller, P. D. McChesney, J. R. Harris, and N. Myers, "Evolution of the micropulse structure of an electron beam propagating in air", *Journal of Applied Physics* **125**, 034902 (2019).
- P. D. McChesney, et al., "Multi-plate interceptive electron beam energy diagnostic - implementation and experimental validation", *AIP Advances* **8**, 125117 (2018).
- J. R. Harris, R. B. Miller, P. D. McChesney, and J. W. Lewellen, "Observation of multipath effects in the detection of RF-modulated x-rays", *Journal of Applied Physics* **124**, 174901 (2018).
- B. D. Schaefer, et al., "Radiation Damage of F8 Lead Glass with 20 MeV Electrons", *Nuclear Instruments and Methods* **B274**, 111 (2012)
- J. Doskow, et al., "The ALPHA Project at IU CEEM", *Proceedings of IPAC* (2010).
- C. M. Lavelle, et al., "Ultracold-neutron Production in a Pulsed-neutron Beam", *Physical Review C82*, 015502 (2010).

TEACHING EXPERIENCE	US Particle Accelerator School , organized by Fermilab, Batavia, Illinois	
	USPAS Accelerator Physics (TA)	January 2014
	USPAS Classical Mechanics and Electromagnetism for Accelerators (TA)	June 2013
	USPAS Fundamentals of Accelerator Physics (TA)	January 2013
Indiana University Physics Department , Bloomington, Indiana		
	PHYS-P109 Introductory Acoustics Lab (TA)	August 2012 - December 2012
	PHYS-P108 Audio Technology Acoustics Lab (TA)	August 2012 - December 2012
	PHYS-P221-222 Honors Physics I-II (TA)	August 2006 - May 2007
Indiana University Cyclotron Facility , Bloomington, Indiana		
	Introduction to Geant4 and Object-Oriented Programming	March 2011 - April 2011
	Practical Introduction to Geant4	September 2010 - December 2010
COMPETENCY AREAS	<ul style="list-style-type: none"> • Statistical modeling and inference, Bayesian methods in data analysis and optimization, and the design of experiments • Modern software design, object-oriented programming, and algorithm development • All aspects of charged particle beam generation, propagation, and effects • Accelerator diagnostic design and radiation detection • High-power microwave source design and testing • High-energy laser source modeling and propagation in atmosphere • Plasma physics including non-neutral plasmas and atmospheric plasmas 	
SKILLS	<ul style="list-style-type: none"> • Technical leadership in a fast-paced environment focused on complex and innovative technologies • Building customer relationships through effective communication and superior performance • Mentoring peers and fostering a team-oriented work culture • Software development, numerical analysis, and simulation programming • Mechanical and electrical design of prototype hardware systems • Mission and concept of operations analysis • Experimental design and execution across a wide variety of physics disciplines • Machine shop operations and fabrication processes 	
SOFTWARE EXPERIENCE	<ul style="list-style-type: none"> • Electromagnetic modeling codes: Amperes 3D, Ansys HFSS, and Poisson Superfish • Particle-in-cell simulation codes: Chicago and ICEPIC • Particle transport simulation codes: Geant4, ITS, and MCNP • Accelerator simulation codes: elegant, MAD-X, and Parmela • Design software codes: Autodesk AutoCAD, Autodesk Inventor, and SolidWorks • Programming language proficiencies: C, C++, Java, LabVIEW, Mathematica, MATLAB/Octave, Python, R, and shell scripting 	