

REBECCA Coles  
Curriculum Vitae  
08/09/2019

Brookhaven National Laboratory  
National Synchrotron Light Source II (NSLSII)  
Upton, NY 11973 USA

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## EDUCATION

- 2016      Ph.D. Physics  
            Department of Physics and Astronomy  
            Wayne State University
- 2012      M.S. Physics  
            Department of Physics and Astronomy  
            Wayne State University
- 2007      B.S. Physics  
            Department of Physics and Astronomy  
            Wayne State University

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## RELEVANT PUBLICATIONS

- 2018      R. Coles; M. Derwent; P. Martini; T. O'Brien; A. Ross; S. Tie. DESI Commissioning Instrument Metrology. Proc. SPIE 10706, Advances in Optical and Mechanical Technologies for Telescopes and Instrumentation III, 107061L (July 10 2018);  
            <https://arxiv.org/abs/1807.09283>.
- 2017      R. Coles; J. Chiang; D. Cinabro; J. Haupt; H. Neal; A. Nomerotski; P. Takacs. An automated system to measure the quantum efficiency of CCDs for astronomy. Journal of Instrumentation, 12.04 C04014 (April 18, 2017);  
            <http://dx.doi.org/10.1088/1748-0221/12/04/C04014>.
- 2012      C. J. Bebek ; R. A. Coles ; P. Denes ; F. Dion ; J. H. Emes ; R. Frost ; D. E. Groom ; R. Groulx ; S. Haque ; S. E. Holland ; A. Karcher ; W. F. Kolbe ; J. S. Lee ; N. P. Palaio ; N. A. Roe ; C. H. Tran ; G. Wang; CCD research and development at Lawrence Berkeley National Laboratory . Proc. SPIE 8453, High Energy, Optical, and Infrared Detectors for Astronomy V, 845305 (September 25, 2012);  
            <http://dx.doi.org/10.1117/12.926606>.

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## GRANTS AND AWARDS

- 2015 Department of Energy Grant: Office of Science Graduate Student Research (SCGSR)  
Brookhaven National Laboratory  
Award: \$36,000 + \$4000 for travel  
Term length: 12 months
- 2014 American Association of Physics Teachers Award (Gustafson Memorial)  
Wayne State University  
Award: \$750

## RESEARCH EXPERIENCE

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- 2019 Simulations of X-ray Scattering (NSLSII)  
Brookhaven National Laboratory (BNL), Upton NY  
Post-Doc (Current Position):
- Created machine learning algorithm to automatically select propagation parameters for a user input of a beamline sample for the Synchrotron Radiation Workshop software (SVM, but also attempted instance based kNN).
  - Wrote software to access HDF5 x-ray scattering data from beamlines at NSLSII. The software handled: data acquisition from the beamline servers, displaying images and beamline data, adding scaling and image cropping functions (h5py).
  - Created simulations of samples for the NSLSII CHX beamline to prepare beamline scientists for future experiments, as well as to verify experimental data (C++ and Python).
- Sirepo Simulations (Web App): <https://beta.sirepo.com/srw#/simulations>  
Synchrotron Radiation Workshop: <https://github.com/ochubar/SRW>  
CHX image tools: <https://github.com/racoles/NSLSII-CHX-image-tools>
- 2018-2019 Sloan Digital Sky Survey (SDSS-V)  
Ohio State University Imaging Science Laboratory, Columbus OH  
Post-Doc:
- Created mechanical and software apparatus for thermometry testing of computer system cold temperature survivability (C++, Python, wagoIO).
- 2017-2018 Dark Energy Spectroscopic Instrument (DESI)  
Ohio State University Imaging Science Laboratory, Columbus OH  
Post-Doc :
- Analyze DESI Commissioning Instrument images using my custom deep learning metrology software (R and PyTorch).

- Aligned and focused the DESI Commissioning Instrument for use on the DESI telescope by writing and implementing metrology software and procedures (Python with Tkinter GUI).

Metrology software: [https://github.com/racoles/DESI\\_CI\\_MET](https://github.com/racoles/DESI_CI_MET)

Centroiding (machine learning) software: <https://github.com/racoles/centroiding>

Imaging software: [https://github.com/racoles/general\\_image\\_processing\\_functions](https://github.com/racoles/general_image_processing_functions)

2015-2017 Large Synoptic Survey Telescope (LSST)

Brookhaven National Laboratory (BNL), Upton NY

Graduate Researcher:

- Construction of camera LSST camera (CCD sensor installation, electronics, and testing systems).
- Installing and imaging X-ray sources.
- Testing camera readout electronics.
- Focal plane metrology using SmartScope metrology measurements and analysis.
- Develop and maintain LSST Camera Control Software (CCS).
- Construction of backside illuminated CCD camera (CCD sensor installation, electronics, and testing systems).
- Construction of quantum efficiency testing apparatus for LSST CCDs.
- Mechanical design and construction of electro-optical hardware, and programming.
- CCD handling.
- General clean room and CCD handling experience.
- Perform residual gas analysis (RGA) on LSST cryostats.
- Frequently use vacuum and cryo systems, and have experience in designing systems that use such equipment.

Metrology software: [https://github.com/racoles/RSA\\_Metrology](https://github.com/racoles/RSA_Metrology)

CCD surface debris detection software: <https://github.com/racoles/lint>

2011-2013 Baryon Oscillation Spectroscopic Survey (BigBOSS)

Lawrence Berkeley National Laboratory (LBNL), Berkeley CA

Graduate Researcher:

- Identified limitations and redesigned quantum efficiency testing apparatus to fit BigBOSS CCDs.
- Design and installation of X-ray sources for system calibration.
- Construction of quantum efficiency testing apparatus for LSST CCDs.
- Experience in vacuum, optics, electronics, and cryo systems, and frequent CCD handling.

- On programming team for the quantum efficiency testing apparatus automation,
- Developed a program to map the quantum efficiency of BigBoss CCDs (IDL).

2008-2011 Wayne State University  
Detroit MI  
Scientific Analyst:

- Supernova data analysis.
- Wrote programs that use principle component analysis to reduce supernova data (R).
- Built and maintained a Beowulf scientific server to provide computing resources for the university's physics department.

Software: <https://sites.google.com/site/sdsspca/>

2008 Tevatron Particle Accelerator  
Fermilab, Batavia IL  
Particle Accelerator Technician:

- Performed stabilization measurements on quadruple and dipole magnets in the Tevatron Particle Accelerator.

2007 Supernova Acceleration Probe (SNAP)  
Fermilab, Batavia IL  
Science Associate:

- Programmed and tested voltage regulating board prototype FRIC0 (Fermilab Regulator Integrated Circuit).

2006 Sloan Digital Sky Survey (SDSS)  
Fermilab, Batavia IL  
National Science Foundation (NSF) Student Associate:

- Organized spectroscopic data on supernova candidates.
- Created a mysql database and web application to host supernova candidate data.

## PROGRAMING LANGUAGES

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Frequently used programming languages:  
Python, Java, C++, MATLAB

General experience programming languages:  
IDL, R, C, Mathematica, SQL, PHP

Documenting languages:

YAML,  $\text{\LaTeX}$ , Sphinx, SLAC eTraveler, Confluence, JIRA, Jupyter Notebook

## RELATED PROFESSIONAL SKILLS

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Autodesk Inventor:

Experience with mechanical design and documentation

SolidWorks:

Experience with mechanical design and documentation

3D printers:

Frequent experience with Fablicator, Makerbot, MakerGear, and Anet A8

## CONFERENCE ACTIVITY AND SYMPOSIUMS

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| 2019 | Gordon Research Conferences for X-Ray Science<br>Stonehill College: Easton, Massachusetts<br>Presenter (poster)                     |
| 2019 | NSLS-II Seminar<br>Brookhaven National Laboratory (BNL): Upton, New York<br>Guest Presenter (talk)                                  |
| 2018 | Particle, Astro, and Nuclear Physics Seminar (PAN)<br>Wayne State University: Detroit, Michigan<br>Guest Presenter (talk)           |
| 2018 | SPIE Astronomical Telescopes + Instrumentation<br>Austin, Texas<br>Presenter (talk)   |
| 2016 | Precision Astronomy with Fully Depleted CCDs (PACCD)<br>Brookhaven National Laboratory (BNL): Upton, New York<br>Presenter (poster) |
| 2016 | American Astronomical Society (AAS) 227th Conference<br>Kissimmee, Florida<br>Presenter (poster)                                    |
| 2015 | LSST Project and Community Workshop<br>Bremerton, Washington  |
| 2008 | Baryon Acoustic Oscillations (BAO) Telescope Conference<br>Fermilab: Batavia, Illinois<br>Host (assistant)                          |

2007      Gravitations Lensing Conference  
            Fermilab: Batavia, Illinois  
            Host (assistant)

## TEACHING EXPERIENCE

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2014      Astronomy: Graduate Teaching Assistant  
2013      Electrodynamics: Graduate Teaching Assistant  
2009-2010 Electrodynamics: Graduate Teaching Assistant

## SERVICE TO PROFESSION

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2019      Science Undergraduate Laboratory Internship (Brookhaven National Laboratory)  
            Hosted two wonderful undergraduate interns during their summer term.  
2017      STEM-Prep Summer Institute (Brookhaven National Laboratory)  
            Presentation Title: LSST and the History of Dark Energy and Dark Matter  
2016      Girls Inc. (Brookhaven National Laboratory)  
            Presentation Title: LSST and the Universe  
2016      Science National Laboratory Day (Washington DC)  
            Presentation Title: Big Data for LSST  
2015      PubSci: The Dark Universe (Brewology Pub in Long Island, New York)  
            Presentation Title: The Dark Universe  
2015      Custer Observatory (Long Island, New York)  
            Presentation Title: Dark Matter and Dark Energy

## AFFILIATIONS

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LSST Dark Energy Science Collaboration (DESC): Member  
American Astronomical Society (AAS): Member