

Joseph A. Benigno

Skills

<u>Physics</u>	<u>Programming</u>	<u>Years Exp</u>	<u>Leadership</u>
Experimental Condensed Matter	Java	12	Army
Molecular Beam Epitaxy	Python	5	Maintenance Management
Thin Film Characterization	XML	3	Research Project
Computational Physics	Mathematica	3	Logistics
Electricity and Magnetism	C++	2	Construction Site
Optics: NIR, Visible	MySQL	2	
High Energy Lasers	Octave	1	<u>Engineering</u>
High Power Microwaves	Matlab	1	Electrical
	Fortran 77	1	Computer
<u>Software</u>	P BASIC	1	Software
IntelliJ, Eclipse, Android Studio,	C	1	Network
OneSAF, Arduino IDE, Adobe,			Test and Experiment Planning
Logicworks, Octave, Visual	<u>Tools and Equipment</u>		Augmented Reality
Studio Code, LabView,	PPMS, ARPES, STM, AFM,		
Inkscape, Candle, Adobe	MOKE, wire bonder, CNC		<u>Operating Systems</u>
Premiere Pro	router, milling machine, lathe		Windows, Linux, Android, Mac,
			NettWarrior

Education

Doctor of Philosophy in Physics

Aug 2020 - Present

West Virginia University

Specialization: Experimental Condensed Matter Physics

GPA: 3.45 of a maximum of 4

Projects and Research:

MBE Growth of Fe-Chalcogenide Thin Films PI: Dr. Lian Li Summer 2021 – Spring 2024

- Use Molecular Beam Epitaxy to grow iron-chalcogenide monolayer films (FeSe, FeS)
- Examine film topography using scanning tunnelling microscopy (STM)
- Investigate electronic band structures using Angle-Resolved Photoemission Spectroscopy (ARPES)
- Maintained all ultra-high vacuum (UHV) equipment and train personnel on usage

Patterning Chemically Sensitive Thin Films PI: Dr. Cheng Cen Summer 2021 – Present

- Utilized a tabletop computer numerical control (CNC) machine to pattern chemically sensitive thin films.
- Produced Hall bars less than 1mm in length with repeatable accuracy of 5 microns

Thin Film Characterization PI: Dr. Cheng Cen Summer 2021 – Present

- Utilized a Quantum Design Physical Property Measurement System (QD PPMS) to measure the resistivity and magnetic moment of a variety of unique thin films.
- Performed polar magneto-optical Kerr effect (MOKE) measurements to characterize thin film magnetization.
- Maintained all equipment and trained personnel on usage

Micro-contacts to 2D Materials and Devices PI: Dr. Cheng Cen Fall 2020 – Spring 2021

- Investigated active soldering of gold wires onto thin films for applications in micro-scale devices

Instruments & Measurement Techniques: Scienta Omicron ARPES, Scienta Omicron STM, polar magneto-optical Kerr effect (MOKE) and second harmonic generation (SHG) microscopy, Asylum atomic force microscope, QD PPMS, computer numerical control (CNC) router machine, wedge-wedge wire bonder, ball bonder, auto-ball bonder, plasma asher, milling machine, lathe

Specialization: Computational Physics

GPA: 3.147 of a maximum of 4

Fields of emphasis: Electromagnetic Theory, Fluid Dynamics, Radio Astrophysics, Computer Science

Projects and Research:Fluid Dynamics Research Spring 2014

- Worked with the chair of the Physics Department experimenting with a high-powered Nd:YAG laser, water jets, air jets, and a Particle Image Velocimetry system to study the velocity and vorticity properties of water
- Developed software in Java and Mathematica to study jet stability
- Analyzed the data and related it back to the astrophysics of jets in quasars in a 36-page thesis
- Formally presented results to faculty and fellow students

16-bit Computer Fall 2013

- Designed a working 16-bit computer from the logic gate level with a simple architecture and a small but functionally complete instruction set using Logicworks

Jovian and Solar Research Spring 2011 – Fall 2012

- Built and wired two receivers and a 50'x50' radio telescope as part of NASA's Radio JOVE project
- Researched and collected data on solar radio waves and synchrotron radiation from Jupiter's moon Io
- Presented research and results in Atlanta, GA as part of the American Physical Society meeting of March 2012

Self-Navigating Robot Spring 2012

- Built and programmed a robot to navigate multiple flat, winding courses using mainly photoresistors

Peer-Reviewed Publications

1. Zou, Q.; Oli, B. D.; Zhang, H.; **Benigno, J.**; Li, X.; Li, L. Deciphering Alloy Composition in Superconducting Single-Layer FeSe₁-XS_x on SrTiO₃(001) Substrates by Machine Learning of STM/S Data. *ACS Appl. Mater. Interfaces* 2023. <https://doi.org/10.1021/acsami.2c23324>.

Conference Presentations

1. **J. A. Benigno**, Q. Zou, P. Tavadze, C. Cen and L. Li, "Dry-Patterning Chemically Sensitive Quantum Materials Using a Computer Numerical Control Router Machine," in APS March Meeting 2024, Minneapolis, 2024.
2. P. Tavadze, Q. Zou, B. D. Oli, **J. A. Benigno** and L. Li, "Decoding Chemical Inhomogeneity in Iron Chalcogenides: Insight from Self-Organizing Map Analysis of STM/S Data," in APS March Meeting 2024, Minneapolis, 2024.
3. **J. A. Benigno**, Q. Zou, C. Cen and L. Li, "Dry Patterning Chemically Sensitive Quantum Materials," in AVS 68, Pittsburgh, 2022.
4. Q. Zou, H. Zhang, B. D. Oli, **J. A. Benigno**, C. Cen and L. Li, "Phase-controllable molecular beam epitaxy growth of tetragonal and hexagonal FeTe thin films," in APS March Meeting 2022, Chicago, 2022.
5. **J. A. Benigno** and P. Wiita, "Solar System Radio Astronomy at The College of New Jersey," in APS April Meeting 2012, Atlanta, 2012.

Work Experience

Graduate Research Assistant, *West Virginia University*

May 2021 – Present

Duties:

- Conduct research on iron-based superconductors and unique thin film materials
- Maintain lab equipment (UHV system, ARPES, STM, PPMS, etc.)
- Train personnel on equipment usage and maintenance

Graduate Teaching Assistant, *West Virginia University*

Aug 2020 – May 2021

Duties:

- Teach calculus-level mechanics and dynamics physics labs to undergraduate students in an online setting. Proctor and grade tests, projects, and labs as necessary
- Grade assignments for an undergraduate thermal physics and wave phenomena course

Directed Energy Engineer and Scientist, *Booz Allen Hamilton*

Jan 2019 – Aug 2020

Duties:

- Conduct research, product testing, data analysis, maintain positive relations with customers, and deliver high-quality work products and intellectual capital such as methods, products, and patents to support projects.

Accomplishments:

- Received two internal company awards for my work on technical documents relating to infrared systems
- Won a proposal to improve situational awareness for helicopter pilots wearing night vision goggles
- Designed and tested file-managing software and a searching algorithm to aid in system lifecycle management
- Wrote the majority of the DEWRAP for several DEWs

White Papers Authored:

- METEOR, Intro to High Power Microwaves Brief, The LCMC File Management System

Skills and Knowledge Gained:

- Physics – Infrared, Microwave, Electromagnetism
- Engineering – Test and Experiment Planning, Database, Fault Tree Analysis
- Programming – Python, Octave, Natural Language Processing

Training:

- Test and Evaluation Bootcamp (July 2019)

Projects:

- ORCA Strategic Development, Planning, and Experimentation – High Energy Laser Overspill Safety Analysis, High Power Microwave Beam Pattern Analysis, Directed Energy Weapon Review and Approval Process, LCMC File Management System, Skyraze VR Training Tool

Project Scientist, *BANC3 Inc.*

Aug 2014 – Jun 2017

Duties:

- Conduct research, experiments, develop software and hardware, maintain positive relations with customers, collaborate with subcontractors, present results in formal settings, and lead projects as necessary.

Accomplishments:

- Operated as the lead scientist for four projects
- Wired, assembled, and focused lasers in the visible and near-infrared spectrums.
- Served as the expert in Android programming for four projects, including an augmented reality project.
- Led two projects researching the worldwide production of several infrared-transparent materials
- Led a project researching the regional availability of tactical optics
- Concept tested infrared liquid crystal lenses for electronically switchable focus
- Executed the testing of prisms designed for use in augmented reality hardware.

Skills and Knowledge Gained:

- Physics - Optics, Condensed Matter, Electromagnetism
- Programming - Android OS, NetWarrior, Java, XML, C, MySQL

- Engineering - Electrical, Networking, Hardware, Software
- Leadership - Project leadership, formal demonstration

Projects:

- Warrior Enabling Broad Sensor – Soldier Visual Interface Technology, Optical Augmentation Device, Powered Rail, Pre-shot Threat Detector, IR Materials Studies, Tactical Optics Study, Free-form Prism Eye Piece, Switchable Optics

Captain, New Jersey Army National Guard

Sep 2020 – Jan 2022

Duties: Assistant S4

- Assist in the planning and forecasting of logistics and sustainment support for an infantry brigade
- Lead monthly brigade maintenance meetings

Training:

- STAFFEX 2021: refined skills in military decision making with a focus on brigade-level sustainment
- Warfighter Exercise 2021: Lead night time sustainment and logistics TOC operations for a 3 week exercise

Accomplishments:

- Refined brigade maintenance standard operating procedures and tactical standard operating procedures

Skills and Knowledge Gained:

- Capable of planning and conducting extended sustainment operations for over a thousand personnel
- Improved familiarization with Operational Logistics (OPLOG) Planner

First Lieutenant, New Jersey Army National Guard

Oct 2016 – Sep 2020

Duties: Executive Officer

- Develop fellow lieutenants and execute the commander's intent
- Plan, manage, oversee, and execute F Company's maintenance, training, and operations
- Track the overall logistics and capabilities of F Company

Duties: NMARNG 515th Combat Sustainment Support Battalion SPO Attaché

- Utilize sustainment planning tools to prepare for Operation Northern Strike

Duties: Maintenance Control Officer and Maintenance Platoon Leader

- Develop, assess, and refine the battalion maintenance operating procedures for the 3rd Battalion of the 112th Field Artillery Regiment.
- Lead the 50+ Soldiers in the maintenance platoon of F Company
- Plan and advise the total maintenance effort of the 3-112th FAR
- Teach peers, superiors, and subordinates maintenance management in formal classroom settings

Accomplishments:

- Developed two maintenance standard operating procedures each over 150 pages long
- Wrote a battalion radiation safety SOP and a company-level operations safety SOP
- Wrote a Java program to improve maintenance management, planning, and assessment
- Sep 2018 - F Co. assessed as one of two companies with the best maintenance management in New Jersey
- Responsible for the quality of the repairs and the maintenance program of over \$400 million in vehicles, weapons, and equipment
- Lead and manage over 50 Soldiers
- Responsible for over \$10 million in equipment with zero losses
- Acted as company commander for a severe weather activation

Skills and Knowledge Gained:

- Leadership and management
- Logistics and maintenance forecasting
- Formal presentation
- Standard operating procedure development

Second Lieutenant, New Jersey Army National Guard

May 2014 – Oct 2016

Duties: Assistant Maintenance Control Officer

- Assist the Maintenance Control Officer in her development of the battalion maintenance operating procedures and her leadership of the Maintenance Platoon.

Education:

- Ordnance Basic Officer Leaders Course, US Army Logistics University, Fort Lee, VA - 92.8/100 - (September 2015 – February 2016)

Assistant Facility Manager, Billmar Realty

May 2008 – Aug 2014, Jul 2017 – Jan 2019

Duties:

- Maintenance of machinery and grounds, landscaping, and refurbishing of over 150 apartments

Skills and Knowledge Gained:

- Leadership, power tool and machinery safety, interpersonal and customer service skills

Cadet, Princeton University Army ROTC

Aug 2010 – May 2014

Duties:

- Battalion logistics officer (S4) for Princeton's Tiger Battalion. Ensured the battalion had transportation, food, water, safety equipment, and training aids for daily and weekly training events.

Awards:

- Award of Excellence (2014) – Only recipient from Princeton Army ROTC in over a decade
- Cadre Merit Award (2011, 2014), The Colonel Robert L. McLean '52 Award (2012), TCNJ Alumni Honorarium Award (2013), Excellence in Military History (2013), Exemplary Achievement in Leadership (2013), Alumni and Friends of Princeton University ROTC Honorarium Award (2014), Reserve Officers Association National Defense Award (2014)

Training:

- Leader Development and Assessment Course – Warrior Forge, Ft. Lewis, WA - June 2013
- Cadet Troop Leader Training – C Co, 197th Infantry Brigade, Ft. Benning, GA - May 2013
- Cadet Field Training – United States Military Academy, West Point, NY - June 2012