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CURRICULUM VITAE

Areas of academic interest:

- Research and development of new software/hardware technologies and their applications on energy distribution, economic development, healthcare, and cryptography.

Education:

Oregon State University, Corvallis Oregon
Degree(s):
Undergraduate: Physics
Post-bacc: Computer Science (Pending Computer Science: Spring 2021)

Physics Thesis Title:
"Contact resistance: the return of the Cox and Strack method for heterojunction solar cells"

Computer Science Capstone Project:
"Bitbrane: because social distancing should not keep creative people from collaborating with each other and customers from their products."

Sample Courses:
Junior year upper division physics courses:
Contemporary Challenges in
Physics; Observational Astronomy; Analog and Digital Circuits; Astrophysics; Techniques in Theoretical Mechanics; Computer Interfacing and Instrumentation.
Computational Physics Labs with Python 1, 2, and 3;
Physics Paradigms: Quantum Fundamentals; Energy and Entropy; Oscillations and Waves; Periodic Systems; Static Fields; Central Forces, Quantum Capstone.
Junior year upper division math courses: Differential Equations; Linear Algebra 1 and 2, Science Writing, Introduction to Differential Geometry; General Relativity.
Engineering and science courses: Electrical and Computer Engineering 112, Sustainable Engineering 350, Chemistry for Engineers I & II.

Sample Courses in Computer Science:

Intro to computer science I & II, Assembly Language and Architecture, Discrete Mathematics, Web Development, Data Structures, Databases, Analysis of Algorithms.

Research Papers Completed at Oregon State University:

"On Generating Sustainable Energy." WR 362 Science Writing, Spring 2017.

"Asymmetry of Time." WR 362 Science Writing, Spring 2017.

"A short review of ways to reduce CO2 emissions." GEO 308 Global Change and Earth Science, Fall 2018.

"The Future of Nuclear Fusion." PH 315 Physics of Contemporary Challenges, Winter 2016.

Web development projects:

https://bitbrane.com: Social Distancing Collaboration Project	Fall 2020
RWkarts.com: Art gallery	Summer 2020
Allinonetattooandbarberstudio.com: Business Landing Page	Summer 2020

Research Presentations

"Contact Resistivity of A-Si(i) contacts." Research Mentor: Zachary Holman. Undergraduate Research Symposium Poster Session, Arizona State University, July 26, 2018.

"Contact Resistance: The Cox and Strack Method on A-Si(i)." Research Mentor: Ethan Minot. Oregon State University Thesis Presentation, Corvallis, OR, June 6, 2019.

Past Research:

Physics Research: Quantum Energy and Sustainable Solar Technologies
Physics Advisor: Dr. Ethan Minot, Assistant Professors of Physics, Oregon State University
Area: Sustainable Energy Research
Hypothesis/Objective:
Renewable energy research in accordance to the NSF and their goal of meeting the terawatt challenge.
Design, build, test, and analyze a new method for measuring the Contact resistance in amorphous silicon heterojunction solar cells.

Thesis Abstract: Solar photovoltaics are becoming a source of renewable energy for cities where sunlight is abundant. The efforts to increase the efficiency of solar photovoltaics ranges from increasing the number of P-N junctions, to new methods for decreasing electrical resistance between semiconductors and metals. In this work, we focus on methods to characterize contact resistance with semiconductors of thickness between 200-150 μm. The long-term goal will be to reliably apply one of the methods, Cox and Strack (C/S), to semiconductor materials of less than 150 μm. Cox and Strack, were researchers in the sixties whose method for measuring contact resistance in transistors paved the way for figuring out how to make transistors more efficient. Since then, no one has attempted this method for solar cells. In my paper, I developed and tested a revised version of their method for solar cells. My method was tested in parallel with the standard method for measuring contact resistance in solar cells to test if the C/S method was reliable in solar cells. The C/S method measures contact resistance through the cell, whereas the transfer length method (TLM) relies on a lateral measurement. The results indicated a potential application for the transparent conductive oxide indium tin oxide. The TLM data was inconclusive and thus wasn't of use to compare it to the C/S data. However, previous experiments have shown contact resistance to be within the range of the measured contact resistance with the C/S method from this new method. This experiment lays groundwork for future applications in successfully building cheaper and less contact resistive heterojunction solar cells which could be up to 24% efficient. It promises to be in direction for increasing efficiency of solar cell technology.

Physics Research: Computational Physics

Physics Mentor: Dr. Davide Lazzatti, Assistant Professors of Physics, Oregon State University
Area: Astrophysics
Objective: Computational simulation of Coriolis and Centrifugal forces for a Binary black hole system in a non-inertial reference frame.

Volunteer Work: Python computational program for two Black Holes (BH) in circular orbit around each other. It computes the orbit of a test particle subject to the two BHs gravities. All the calculations were performed in the reference frame in which the two BHs are not moving. This is a non-inertial reference frame and so centrifugal and Coriolis forces have to be included. Initial conditions are given in a non-inertial frame.

Computer Programs, IDEs, Languages, and Computer Lab Experience:

Microsoft Office Suite (PowerPoint, Excel, Word); C++ (proficient); Python (advanced); Mathematica (advanced); LaTex (learning); HTML (fluent); CSS (proficient); JavaScript (proficient) Github (proficient); Github Pages (learning); Pycharm (IDE for computer science classes); Atom (IDE); Visual Studio Code (preferred IDE); Machine Assembly Language MASM (proficient);

Electrical and Computer Engineering 112: Basic electrical and computer engineering concepts, problem solving and hands-on laboratory project. Topics include electronic circuit and device models, digital logic, circuit analysis, and simulation tools.

PH 411, Analog and Digital Electronics, Fall 2017: Labs included resistance (DC circuits, Kirchoff's laws, resistors, ohmic behavior, the I-V curve, voltage divider); Thevenin equivalents, capacitors and time dependent signals (AC circuits, capacitors, oscilloscope/function generator, RC circuits, RC integrators, Fourier analysis); inductors and time dependent signals (RL circuits); and op amps (negative feedback, non-inverting amplifier, inverting amplifier, transimpedance amplifier, summing amplifier, positive feedback, and RC oscillator).

PH 415, Computer Interfacing and Instrumentation, Spring 2018: LabView used in conjunction with circuits, oscilloscopes, and function generators for computer interfacing.

PH 365, Computational Physics Lab 1, Fall 2017. Project driven lab, focusing on using basic mathematical and numerical techniques in computer calculations to solve typical physical problems specifically relating to classical mechanics and electromagnetism. Programs are written in Python, and matplotlib is used to plot data.

PH 366, Computational Physics Lab 2, Winter 2018. A project-driven laboratory experience in Computational Physics at an advanced level. Includes the use of basic mathematical and numerical techniques in computer calculations leading to solutions for typical physical problems. Topics to be covered Schrödinger's equation and the energy eigenvalue equation.

PH 367, Computational Physics Lab 3, Spring 2018. A project-driven laboratory experience in Computational Physics at an advanced level. Includes the use of basic mathematical and numerical techniques in computer calculations leading to solutions for typical physical problems. Topics to be covered include statistical mechanics and the Ising model.

Robotics I & II: Microcontroller programming using PBASIC and electrical assembly of Boe-Bot.

Work Experience:

CAMP, Oregon State University **Jan. 2018 - June 2019**

- College Assistance Migrant Program is designed to help first-generation college students from migrant families. As a CAMP Alumni, I experienced this program's usefulness because of how they provided opportunities for students like tutoring assistance, study-hours, and overall cultural assimilation to college life. For that reason, I became a CAMP tutor where I worked on establishing a professional tutoring relation with CAMP students to give back to the program by assisting incoming students on their academic journey of completing calculus I, II, and Chemistry for engineering.

QESST, Arizona State University **May 2018 – August 2018**
Research and development advisors: Dr. Kate Fisher and Dr. Zachary Holman

- As an environmentally conscious undergraduate physics student, I decided to partake in renewable energy research as a way of giving back to the community in the only way I knew how, research. Along with a student from Puerto Rico's Polytechnic University, we worked on developing a new method for measuring contact resistance in high efficiency heterojunction solar cells, under the guidance of one of the leading researchers in the field Dr. Zackary Holman from Arizona State University. My responsibility during the project, was to adapt an old method for measuring contact resistance in transistors from the 1960's to heterojunction solar cells. This included semiconductor processing from silicon wafer, to full functioning solar cell, and finally to testing completed samples using the transistor technique. My adaptation of the contact resistance method was transcribed into my undergraduate physics thesis titled "Contact resistance: the return of the Cox and Strack method for heterojunction solar cells", which I delivered in partial fulfillment of the requirements for my Bachelor of Science at OSU.

College Dreams, Oregon State nonprofit **June. 2015 - Sep 2015**
Manufacturing Engineer Mentor: Rob Fields

- Before freshman year of college, I interned with one of the associates of College Dreams Rob Fields. Rob is a small manufacturing business owner in Southern Oregon who trained me to use manufacturing tools such as milling, CNC machine, drill press, bandsaws, lathes, by designing and building a reusable cart for a temperature chamber for a client. Most importantly, he taught me one of the most valuable lessons I've ever come across; engineering isn't just about designing and building, it's about designing and building for people.

Awards and Honors:

Scholar Athlete in Skyline Conference, Attaining Excellence Both Academic and Athletically, 2015
President's Education Awards Program, Outstanding Academic Excellence, 2015
AP Scholar Award, Exemplary College-level achievement on AP Examinations, 2015
TRIO Honor Roll, Oregon State University
CAMP scholar, Oregon State University
Academia Latina Junior volunteer, Southern Oregon University
Certificate of Achievement, Northwest CAMP Consortium 2016
Certificate of Completion, College Assistance Migrant Program Oregon State University 2016
Certificate of Completion, Quantum Energy & Sustainable Solar Technologies, Arizona State University 2018
ASANTE Junior Volunteer, ASANTE Rogue Valley Hospital

Scholarships Awarded:

Oregon State College of Science, $3,000
Becas Unete IME Scholarship, $1000
Wattenberg Fund Scholarship, $2,500
Pell Grant, $3,000 annually
Schneider Scholarship, $2,000
Amy's Kitchen Scholarship for Employees' Children (2015/16/17/18/19), $1,500