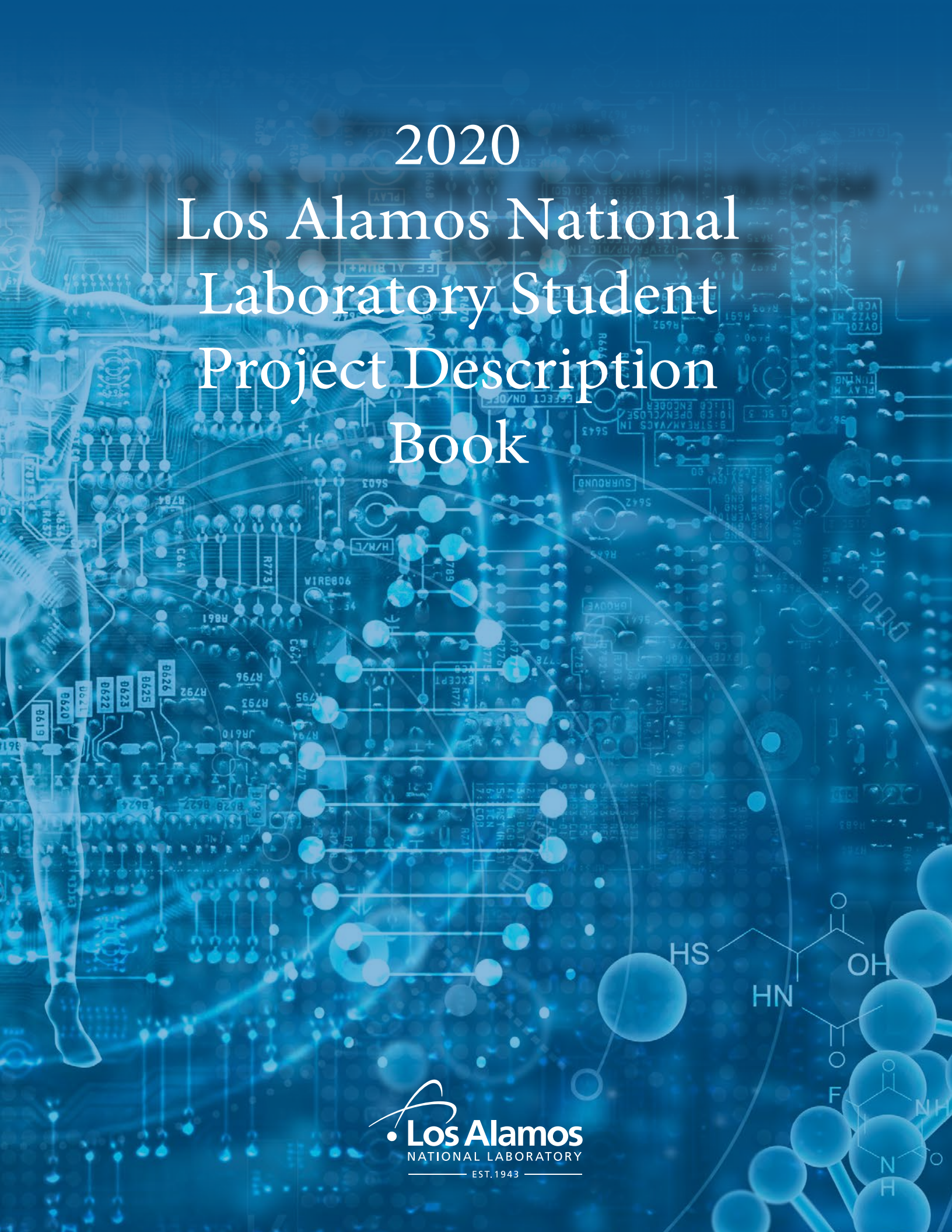
2020 Los Alamos National Laboratory Student Project Description Book



Los Alamos
NATIONAL LABORATORY
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Earth and Space Sciences

Engineering

BIOSCIENCES

Quinn Abfalterer

Program: Undergraduate
School: New Mexico Institute of Mining and Technology
Group: B-10
Mentor: Migun Shakya
Category: Biological Science
Type: Individual
LA-UR-20-25488

Mining Omics Data to find Homologs of Viral Tail Fiber Genes

With the rapid rise of antibiotic resistance, many bacterial infections that have historically been treated with antibiotics now have strains that cannot be treated with traditional antibiotics. This poses a major challenge to public health. Antibiotic resistant infections are set to be a leading cause of death in the near future as traditional antibiotics become increasingly obsolete. Moreover, the discovery and development of antibiotics is a slow process and cannot effectively keep up with emerging antibiotic resistant pathogens. Bacteria, however, have a natural enemy called bacteriophages or viruses that infect and kill bacteria. Using bacteriophages to control bacterial infections in a clinical setting is called phage therapy. Although the technology has not well been adopted for phage therapy, there has been some notable successes and potential to be a viable solution to control infection from antibiotic resistance pathogens. However, there are challenges, specifically because bacteriophages are highly specific and can usually only infect one bacterial host species. The specificity is due to tail fiber proteins of bacteriophages that attach to their bacterial target as a first step of infection, just as a key is specific to a lock. One of the first steps towards using bacteriophages to combat antibiotic resistant bacteria is cataloguing this very specific relationship. Here, in this project we use bioinformatic techniques to find homologs of bacterial tail fiber genes in publicly available genomes and metagenomes. Specifically, we acquired all tail fiber genes that were found in viral RefSeq (a curated genomic database), and used them as queries against all bacterial genomes from GenBank and few interesting metagenomes from Sequence Read Archive database. Upon finding the homologs, we reconstructed their phylogenetic history to better understand their diversity and evolution.

Watch presentation: https://www.youtube.com/watch?v=XgUiW1jV1Ow

Type: Group
Category: Biological Sciences
LA-UR-20-25925

Lauryn Anaya

Program: Undergraduate
School: University of New Mexico
Group: B-10
Mentor: Nileena Velappan

Nicole Aldaz

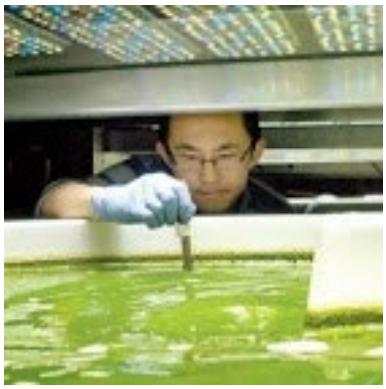
Program: Undergraduate
School: New Mexico State University
Group: B-10
Mentor: Nileena Velappan

RETRO Rx

RETRO Rx is a web-based, epidemiological tool that combines the complementary tools AIDO and RED-Alert. Our work this summer concentrated on broadening/enhancing these epidemiological analytics to include dengue, measles and COVID-19 outbreaks.

Watch presentation: https://www.youtube.com/watch?v=o1Kmmwt_Gtg

Peter Chen



Program: Graduate
School: Colorado State University
Group: B-11
Mentor: Shawn Starkenburg
Category: Biological Science
Type: Individual
LA-UR-20-25821

Mixotrophic algae cultivation: Economics and life-cycle sustainability

The LEAF project at LANL studies mixotrophic algae for biofuels and co-products. An engineering model was developed to quantify possible sustainability improvements. Results set up the direction for the project's near- and distant-future.

Watch presentation: https://www.youtube.com/watch?v=mL9XClQjx-I

Elisa Cirigliano

Program: Undergraduate
School: University of British Columbia
Group: B-10
Mentor: Sofiya Micheva-Viteva
Category: Biological Science
Type: Individual
LA-UR-20-25485

The role of ACE2 in SARS-CoV-2 pathologies

We are studying the effects of SARS-CoV-2 viral binding on human lung cells. We hope to discover a mechanism behind severe COVID-19 symptoms and identify a non-virus specific therapy that can work against SARS-CoV-2.

Watch presentation: https://www.youtube.com/watch?v=JsRtQpztYLI

Samantha Courtney

Program: Post Bachelors
School: University of Tampa
Group: C-PCS
Mentor: Jessica Kubicek-Sutherland
Category: Biological Science
Type: Individual
LA-UR-20-25710

Beacons and Biosensors: An Approach to Influenza Diagnostics

Our influenza diagnostic approach consists of designing the "Fast Evaluation of Emerging Risks" algorithm for molecular beacons, characterizing the thermodynamics of the beacons, and applying the beacons to a waveguide-based optical biosensor.

Watch presentation: https://www.youtube.com/watch?v=PS0cwEqPsR4&t=12s

Jazmyn Gutierrez

Program: Undergraduate
School: Northern New Mexico College
Group: B-10
Mentor: Armand Dichosa
Category: Biological Science
Type: Individual
LA-UR-20-26031

Differences in Gut Microbiome Diversity Between Sister Species of Pupfish

We amplified the 16S rRNA bacterial gene from fecal samples of three Cyprinodon fish species from the Bahamas. Our results show bacterial diversity is preserved in the wild compared to the lab, while some bacteria are retained or lost.

Watch presentation: https://youtu.be/P3GRfK1BaPk

Beauty Kolade

Program: Undergraduate
School: CUNY- Lehman College
Group: B-11/T-CNLS
Mentor: Jacob Miner
Category: Biological Science
Type: Individual
LA-UR-20-25834

Validating Toxin Structures using Cheminformatics and Quantum Chemistry

This project is focused on developing a computational pipeline for identifying toxins by generating conformers for validation with experimental results.This pipeline involves the use of RDKit and psi4 software and is being tested on Digitoxin.

Watch presentation: https://vimeo.com/444510270

Shepard Moore

Program: Post Masters
School: University of New Mexico
Group: C-PCS
Mentor: Laura Lilley
Category: Biological Science
Type: Individual
LA-UR-20-25765

Sabotaging Iron Metabolism: How we can use siderophores as radiotherapeutics

Using siderophores as radiotheraeutics against emerging pathogenic threats.

Watch presentation: http://youtu.be/IXZz-kkxf9c?hd=1

Sara Pacheco

Program: Undergraduate
School: NNMC
Group: B-11
Mentor: Claire Sanders
Category: Biological Science
Type: Individual
LA-UR-20-25587

Chlorella Salinity Tolerance Test

Plant-based biofuels are superior to fossil fuels in many ways, including being renewal and carbon neutral. Algae as a source of biofuels has all of the benefits of plant-based biofuels without the disadvantage of competition for resources such as arable land and fresh water because it can be grown in locations where other organisms cannot habituate. Salt water as a media for algal growth is a promising avenue of research because the large majority of the Earth's water contains varying degrees of salinity. Our research aims to determine which algal strains can grow well in a variety of salinity concentrations while also accomplishing our goals of improved biomass production and increased carbon storage molecules. In our study, we examined four different strains of the algae genus *Chlorella*; *C. sorokiniana* 1228, *C. sorokiniana* LANL, *C. desiccata* 2437, and *C. desicatta* 2526. Both of the *C. desiccata* strains, in addition to *C. sorokiniana* LANL, have proven to grow at all salinity concentrations studied, from 17.5 ppt to 52.5 ppt. Further growth and analysis will determine the strain productivity and whether these strains will be able to meet our goals of increased biomass accumulation and increased carbon storage accumulation.

Watch presentation: https://youtu.be/9U5uyy6UMNA

CHEMISTRY

Amelia Kirkland

Program: Undergraduate
School: Oklahoma State University
Group: C-NR
Mentor: Jeremy Inglis
Category: Chemistry
Type: Individual
LA-UR-20-25390

Utilizing Beehive Materials as an Environmental Uranium Monitor

Honey bees products are commonly used monitors for environmental contamination. We believe beehives collect uranium and its isotopic ratio to a measurable extent. We analyzed two hive materials and found that the $^{235}U/^{258}U$ ratio was depleted in both.

Watch presentation: https://youtu.be/BmHP_322rXs

Sarah Chong

Program: Undergraduate
School: Dartmouth College
Group: C-NR
Mentor: Michael R. James
Category: Chemistry
Type: Individual
LA-UR-20-25372

Gamma Spectroscopy Library Update

The Nuclear and Radiochemistry Countroom facility employs many HPGe detectors in order to identify and quantify radioactive isotopes for multiple missions and customers. An automated system gathers and analyzes and archives the data.

Watch presentation: https://www.youtube.com/watch?v=W4Vq_ZBLikE&feature=youtu.be&hd=1

Derek Kober

Program: Undergraduate
School: University of Utah
Group: CAAC
Mentor: David Fox
Category: Chemistry
Type: Individual
LA-UR-20-25538

Assessing Chromophores in Common Foods using UV-Vis Spectroscopy

Chromophores are commonly utilized in food products to create vibrant colors that attract customers. In this project, I used common spectrophotometry techniques to determine the dye components and concentrations in popular candies with bright colors.

Watch presentation: https://youtu.be/LgGISzfovJo

Type: Group
Category: Chemistry
LA-UR-20-25508

Amanda Trevino

Program: Graduate
School: University of Texas at San Antonio
Group: NEN-1
Mentor: Ann Junghans, Rollin Lakis

Jacob Piper

Program: Graduate
School: New Mexico State University
Group: NEN-1
Mentor: Ann Junghans, Rollin Lakis

LIBS Process Monitoring of Composition of Glass Forming Compounds

This project used LIBS to develop an industrial process monitoring technique for the Hanford DFLAW VIT Plant. Experimental and simulated LIBS spectra were analyzed together with Raman spectroscopy with the intent of data fusion of Raman and LIBS.

Watch presentation: https://youtu.be/zUwqg4p9tKM

COMPUTING

Type: Group
Category: Computing
LA-UR-20-25493

Ben Burnett

Program: Graduate
School: University of Massachusetts Dartmouth
Group: CCS-7
Mentor: David Rich

Andres Quan

Program: Graduate
School: University of New Mexico
Group: CCS-7
Mentor: David Rich

Containerizing Darwin

Darwin is a heterogeneous cluster and with it comes the challenge of maintaining software both for administrative tasks and for users doing their research across multiple architectures. Containers have the potential to assist with both of these.

Watch presentation: https://youtu.be/cnvrI0hHLPk

Zachary DeStefano

Program: Undergraduate
School: Villanova University
Group: A-4
Mentor: Michael Dixon
Category: Computing
Type: Individual
LA-UR-20-25976

Distributed and Verifiable Machine Learning using Zero-Knowledge Proofs

We construct efficient PCD zk-SNARKs for verifiable AI/ML training and execution using recursive zero-knowledge proof composition. Applications of this research include nuclear treaty verification, data integrity, and supply chain security.

Watch presentation: https://youtu.be/4Lh_R3d-PTA

Maksim Eren

Program: Undergraduate
School: University of Maryland Baltimore County
Group: A-4
Mentor: Juston Moore
Category: Computing
Type: Individual
LA-UR-20-26093

Anomalous Event Detection using Non-Negative Poisson Tensor Factorization

An integrated multidimensional anomaly scoring method based on tensors and Poisson recommender systems is proposed. We build a higher-order model that can detect the accounts compromised by red-team.

Watch presentation: https://youtu.be/_z7yCd4vqrc

Nathan Hayes-Rich

Program: Undergraduate
School: Carleton College
Group: EES-16
Mentor: Philip Stauffer
Category: Computing
Type: Individual
LA-UR-20-25423, 20-25317

Analysis and Numerical Verification of a Slice of a Geologic Framework Model

Verification and analysis of meshes used as precursors for the analysis of a full-scale model of the Mimbres basin in Southwest New Mexico. The eventual goal of the project is to verify suitability of the location for spent-fuel long-term storage.

Watch presentation: https://youtu.be/jp8OJlEM2Hc

Brett Layman

Program: Post Bachelors
School: Montana State University
Group: HPC-ENV
Mentor: Joseph Fullop
Category: Computing
Type: Individual
LA-UR-20-25333 LA-UR-20-25349

Generating Job Profiles and Expectations for HPC Workloads

We developed an application for dynamically generating HPC job profiles and workload expectations from time series data. It establishes a basis for live job monitoring and enables various methods for detecting aberrant job performance.

Watch presentation: https://www.youtube.com/watch?v=Kie58_vpsZU

Oisin O'Connell

Program: Undergraduate
School: New Mexico Tech
Group: ISR-1
Mentor: Mark Galassi
Category: Computing
Type: Individual
LA-UR-20-25374

Introduction to Physics Modeling in Geant4

Geant4 is a particle physics simulator useful for modeling nuclear particles. This project demonstrates a Geant4 application and introduces students to using Geant4 with code examples and explanations.

Watch presentation: https://www.youtube.com/watch?v=8Md-YKKQeoY

Thaddeus White

Program: Undergraduate
School: University of Denver
Group: ISR-3
Mentor: Keith Morgan
Category: Computing
Type: Individual
LA-UR-20-25446

A Modern User Interface for the LANL Neutron Pulse Simulator (NPS)

Designing a modern web interface, using ReactJS and GO, for the LANL-developed Neutron Pulse Simulator (NPS).

Watch presentation: https://vimeo.com/442760182

EARTH & SPACE SCIENCES

Alyre Blazon-Brown

Program: Post Bachelors
School: University of Massachusetts, Lowell
Group: ISR-2
Mentor: Roger Wiens
Category: Earth and Space Sciences
Type: Individual
LA-UR-20-25607

Distance Effects in the Quantitative Predictions of ChemCam Measurements

ChemCam's elemental abundance calibration shows spurious trends that correlate with the distance to the target. Results from the Murray formation in Gale crater on Mars were investigated to empirically correct for these effects.

Watch presentation: https://youtu.be/vdtJ5Jv7jHo

Type: Group
Category: Earth and Space Sciences
LA-UR-20-25644

Jade Comellas

Program: Post Bachelors
School: University of New Mexico
Group: ISR-2
Mentor: Bradly Cooke

Ari Essunfeld

Program: Undergraduate
School: Yale University
Group: ISR-3
Mentor: Nina Lanza, Patrick Gasda

Geologic Patterns of Elevated Manganese Deposits on Curiosity Rover's Traverse

The Curiosity Rover's ChemCam instrument has identified elevated Manganese deposits in rock targets along its traverse on Mars. We present geologic patterns among these high-Mn targets thus classifying them to lay the foundation for interpretation.

Watch presentation: https://youtu.be/ZGK5ngd7S_8

Ryan Herring

Program: Graduate
School: Yonsei University
Group: EES-14
Mentor: Anastasia Piliouras
Category: Earth and Space Sciences
Type: Individual
LA-UR-20-25871

Automated Identification of Arctic River Ice via Sentinel-1 SAR

Through the development of a moving window Otsu image segmentation method, a process was formulated by which to automatically classify ice cover in the Kolyma Delta via the employment of vertically polarised Sentinel-1 Interferometric Wide SAR data.

Watch presentation: https://drive.google.com/drive/folders/166utt8yyyZShCPhDNdVY4DD5xxiPGdBh?usp=sharing

Emma Lathrop

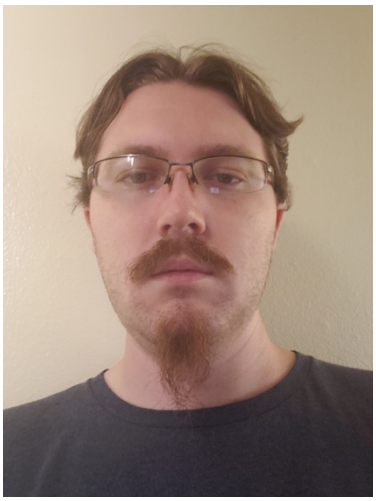
Program: Graduate
School: New Mexico Tech
Group: EES-14
Mentor: Katrina Bennett
Category: Earth and Space Sciences
Type: Individual
LA-UR-20-25945

Variability in soil porewater geochemistry in a degrading permafrost landscape

We analyzed soil porewater from two permafrost watersheds in the Seward Peninsula of Alaska to determine the dominant environmental factors controlling hydrogeochemistry.

Watch presentation: https://vimeo.com/445038164

Matthew Nellessen



Program: Graduate
School: University of New Mexico
Group: ISR-2
Mentor: Patrick Gasda
Category: Earth and Space Sciences
Type: Individual
LA-UR-20-25598

Boron Adsorption In Clay Minerals: Borate speciation modeling

Speciation modeling of boron in aqueous solutions to understand processes for adsorption of boron onto Mars analog clays.

Watch presentation: https://www.youtube.com/watch?v=LSp0VkCoXKg&feature=youtu.be

Joseph Sarrao

Program: Undergraduate
School: University of California, Berkeley
Group: ISR-2
Mentor: Roger Wiens
Category: Earth and Space Sciences
Type: Individual
LA-UR-20-25600

Characterizing Instrument Response for SuperCam

SuperCam is a spectral instrument on the Perseverance rover. However, as an optical instrument, the data it collects is subject to vignetting. By characterizing Supercam's response, we can correct for this vignetting and ensure our data is accurate.

Watch presentation: https://youtu.be/s1tuAdPQAAo

ENGINEERING

Type: Group
Category: Engineering
LA-UR-20-25389

Stanley Afonta

Program: Graduate
School: University of Southern California
Group: ALDCP-IA
Mentor: Elshan Akhadov

Jacob Torrez

Program: Undergraduate
School: Baylor University
Group: PIO-SU
Mentor: Matt Foster

Tannis Breure

Program: Undergraduate
School: Arizona State University
Group: ALDCP-IA
Mentor: Terril Lemke

Brian Roman

Program: Graduate
School: Arizona State University
Group: TA-55
Mentor: Rex Myrick

Amabilis Baca

Program: Undergraduate
School: University of New Mexico
Group: ALDCP-IA
Mentor: Jill Ryan

2020 Smart Labs Project

The 2020 Smart Labs project at Los Alamos National Laboratory aims to incorporate seven key principles of Smart Lab designs and incorporate them into different buildings at Los Alamos National Laboratory in the form of four major project areas.

Watch presentation: https://www.youtube.com/watch?v=lzE7sThFNf4&feature=youtu.be

Matthew Balcer

Program: Graduate
School: The University of Texas at San Antonio
Group: XCP-7
Mentor: Jeffrey Favorite
Category: Engineering
Type: Individual
LA-UR-20-26017

Multidual Sensitivity Method in Ray-Tracing Transport Simulations

The multidual differentiation method has been implemented in a ray-tracing transport code called SENSPG to calculate arbitrary-order uncollided particle leakage sensitivities.

Watch presentation: https://youtu.be/9q9uTE936ec

Serena Birnbaum

Program: Undergraduate
School: Case Western Reserve University
Group: MPA-MAG
Mentor: John Singleton
Category: Engineering
Type: Individual
LA-UR-20-25402

Simple transport models for the temperature-dependent linear magnetoresistance

Models of magnetoresistance that deal with inhomogeneities are used to determine if linear magnetoresistance in "strange metals" is caused by disorder or more exotic physics. Variations in disorder and magnetoresistance curve shapes are studied.

Watch presentation: https://youtu.be/c5Ym0vzNwyY

Zachary Brounstein

Program: Graduate
School: University of New Mexico
Group: C-CDE
Mentor: Andrea Labouriau
Category: Engineering
Type: Individual
LA-UR-20-25720

Developing filament feedstock of polymer composites for additive manufacturing

Common 3D-printing polymers, acrylonitrile butadiene styrene and polylactic acid, were combined with metal, polymer, and ceramic fillers via a solvent treatment to fabricate multifunctional composite materials for advanced manufacturing.

Watch presentation: https://youtu.be/FJOFsPw1v_k

Bridget Daughton

Program: Post Bachelors
School: New Mexico Institute of Mining and Technology
Group: B-11
Mentor: Carol Carr
Category: Engineering
Type: Individual
LA-UR-20-25586

Varying Nitrogen Sources to Reduce Algae Production Costs

The purpose of this experiment is to compare algal growth in media when using either nitrate or ammonium as the nitrogen source. Transitioning to ammonium as the primary nitrogen source would reduce overall production costs for algal biofuels.

Watch presentation: https://youtu.be/ldG1CpxsEOk

Megan Hickman Fulp

Program: Post Bachelors
School: Clemson University
Group: CCS7
Mentor: Ayan Biswas
Category: Engineering
Type: Individual
LA-UR-20-25447

Utilizing Temporal Similarities for Improved Data Reduction

This research investigates of the combination of spatial and temporal sampling to reduce data size such that a higher reconstruction quality is reached without increasing the storage needed, compared to original techniques.

Watch presentation: https://www.youtube.com/watch?v=rUF1NGpNwQw&feature=youtu.be

Xeph Ivankovich

Program: Post Bachelors
School: University of Colorado at Boulder
Group: B-11
Mentor: Claire Sanders
Category: Engineering
Type: Individual
LA-UR-20-25585

UV Mutagenesis and Screening of Green Microalga Picochlorum soloecismus

UV mutagenesis, Fluorescence-Activated Cell Sorting (FACS), and screening of green microalgae Picochlorum soloecismus clones to increase lipid accumulation for biofuel applications.

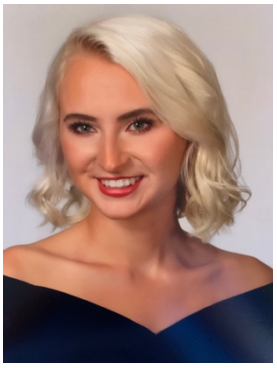
Watch presentation: https://youtu.be/wJIc9-2f5zQ

Type: Group
Category: Engineering
LA-UR-20-25492

Kilkee Flynn

Program: Undergraduate
School: New Mexico Institute of Mining and Technology
Group: ALDCP-IA
Mentor: Steven Renfro

Hannah Van Gerpen



Program: Undergraduate
School: Arizona State University
Group: ALDCP-IA
Mentor: Steven Renfro

Austin Selley

Program: Undergraduate
School: North Carolina State University
Group: ALDCP-IA
Mentor: Steven Renfro

Justin Kim

Program: Undergraduate
School: Texas A&M University
Group: ALDCP-IA
Mentor: Steven Renfro

Theo Dardia

Program: Undergraduate
School: Carnegie Mellon University
Group: ALDCP-IA
Mentor: Steven Renfro

ALDCP Construction Technology Project

This project aims to improve the visualizations and accuracy of penetration operations by integrating augmented reality platforms and subsurface scanning devices with the ultimate goal being to increase the workers safety and productivity.

Watch presentation: https://youtu.be/sDzB-p2umSA

Paul Lathrop

Program: Graduate
School: University of California San Diego
Group: E-3
Mentor: Beth Boardman
Category: Engineering
Type: Individual
LA-UR-20-25405

Chance Constrained Rapidly Exploring Random Trees CC-RRT*

Chance Constrained Rapidly Exploring Random Trees* (CC-RRT*) is a random sampling path planner that ensures probabilistic feasibility of a path through an obstacle environment by using Gaussian state and noise modeling.

Watch presentation: https://youtu.be/7CHUsnnwKTw

Grace Long

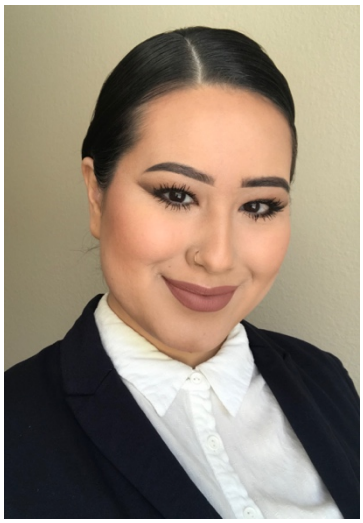
Program: Undergraduate
School: Texas A&M University
Group: NEN-1
Mentor: Alexis Trahan
Category: Engineering
Type: Individual
LA-UR-20-25780

Parameters Affecting Coincident Neutron Rates Detected from Spent Nuclear Fuel

Comparisons between fuel assembly models were used to examine how variations in control rod insertion, depletion percentage, and cooling time produced different coincident neutron detection rates in assemblies with similar total fissile mass content.

Watch presentation: https://youtu.be/R3GcFccl-Kg

Elizabeth Martinez



Program: Post Bachelors
School: The University of Texas at El Paso
Group: E-1
Mentor: Howard Rathbun
Category: Engineering
Type: Individual
LA-UR-20-25336

Characterizing AM Lattice Structures Using FEA Modeling

Lattice structures were modeled such that their continuum model was constructed by isolating a single lattice unit cell within quasi-static conditions using Abaqus CAE. Trends from the extracted elastic moduli were then plotted on the Ashby chart.

Watch presentation: https://www.youtube.com/watch?v=XNPPboJE4Ts

Andrew Montalbano

Program: Post Masters
School: Clemson University
Group: E-1
Mentor: Howard Rathbun
Category: Engineering
Type: Individual
LA-UR-20-26050

Replicating Fiber Reinforced 3D Printed Composites in FEA

Additively manufactured carbon fiber reinforced polymer structures possess increased strength and design versatility at the cost of modeling accuracy. Over this summer an FEA model was developed and validated that accurately predicts their behavior.

Watch presentation: https://www.youtube.com/watch?v=6lHoBksZysM&feature=youtu.be

Type: Group
Category: Engineering
LA-UR-20-25441

Michael Narum

Program: Undergraduate
School: New Mexico Tech
Group: ES-55
Mentor: Eric MacFarlane

Florian McLelland

Program: Undergraduate
School: University of Nevada Reno
Group: ES-55
Mentor: Eric MacFarlane

Designer Earthquakes

The goal was to create a program that could generate a random signal in the time domain with an equivalent frequency-domain response spectra that matches a PF-4 In-Structure Response Spectra. This procedure supports equipment seismic qualification.

Watch presentation: https://www.youtube.com/watch?v=bX02GhP6zcE&feature=youtu.be

Thomas Roberts

Program: Graduate
School: University of Utah
Group: E-13
Mentor: Scott Ouellette
Category: Engineering
Type: Individual
LA-UR-20-25375

Dynamic Effect of Life-Cycle Model-Form Uncertainty in Hyperelastic Foam Systems

Engineering analysts have a need to understand the effects of model-form uncertainty on the dynamic response of suspended-mass and closed-cell foam systems. Here, we discuss the effects of uncertainties in the system's entire engineering life-cycle.

Watch presentation: https://youtu.be/hhLTBSKqX0s

Robert Schloen

Program: Post Bachelors
School: Northwestern University
Group: E-3
Mentor: Beth Boardman
Category: Engineering
Type: Individual
LA-UR-20-25540

Vision Guided Automation and Assistance

The safety and efficiency of robotic automation and assistance can be improved using robot vision. The vision pipeline I am developing processes point clouds to extract the location of objects and classifies the objects using a deep neural network.

Watch presentation: https://youtu.be/tT4Y2cLHPyU

Joshua Tempelman

Program: Graduate
School: University of Illinois
Group: NSEC-EI
Mentor: Adam Wachtor
Category: Engineering
Type: Individual
LA-UR-20-25464

Sensor Fusion for Keyhole Pore Identification in Additive Manufacturing

We devise a method to detect and localize keyhole pores in laser powder bed fusion by jointly analyzing thermal and acoustic signals.

Watch presentation: https://www.youtube.com/watch?v=mQP5pC20qzM

Michael Teti

Program: Graduate
School: Florida Atlantic University
Group: A-4
Mentor: Juston Moore
Category: Engineering
Type: Individual
LA-UR-20-26083

Synthesizing Neutron Pulse Trains

Due to the cost and availability of tools and material, there is a need for realistic simulation data to train nuclear facility inspectors. Here, for the first time, we observe the ability of data-driven deep learning models at simulating PSMC data.

Watch presentation: https://www.youtube.com/watch?v=hmlj1VhQY_c

Kezia Tripp

Program: Undergraduate
School: Brigham Young University - Provo
Group: ISR-4
Mentor: Robert Merl
Category: Engineering
Type: Individual
LA-UR-20-25718

Riding the Bus: Modifying and Configuring Space-Based Electronics

I2C is an intra-board communication bus that is used in many day-to-day devices including cellphones. We in ISR are using the bus for communicating to ROMs and sensors on a board to assist in start-up and state of health review on space satellites.

Watch presentation: https://youtu.be/W9yyMhNDJn8

Matthew Vigil

Program: Undergraduate
School: University of New Mexico
Group: MPA-11
Mentor: Alp Findikoglu
Category: Engineering
Type: Individual
LA-UR-20-25403

Development of Electrochemical Methods for In Situ Diagnostics of Fluids

We are developing electrochemical methods used for characterizing a fluid during a process in terms of conductivity and permittivity while also being able to distinguish electrolytes from one another non-destructively.

Watch presentation: https://www.youtube.com/watch?v=4gE8iOejQkA

Jianchao Zhao

Program: Post Bachelors
School: University of Louisville
Group: C-CDE
Mentor: Kwan-Soo Lee, Andrea Labouriau
Category: Engineering
Type: Individual
LA-UR-20-25762

Silicate Sequestration for Water Treatment

This work investigates the use of four different molecular weights of PEG and determines the optimal concentration for each in deionized and tap water which provides a foundation for increasing the number of allowable cycles used in cooling systems.

Watch presentation: https://youtu.be/KKkKpb5duBE

MATERIALS SCIENCES

Jessica LaLonde

Program: Graduate
School: Duke University
Group: B-11
Mentor: Babetta Marrone
Category: Materials Science
Type: Individual
LA-UR-20-25724

Applications of Machine Learning to Degradation Prediction of PHAs

This project involves the construction of a machine learning algorithm in Python to assist with the design of poly(hydroxyalkanoate) biopolymers by generating a database and random forest model for prediction environmental degradation.

Watch presentation: https://vimeo.com/444570413

Lauren Naatz

Program: Post Bachelors
School: University of Oregon
Group: MST-7
Mentor: Jillian Adams
Category: Materials Science
Type: Individual
LA-UR-20-25482

Optocouplers: Their Polymer Components, Current Applications and My LANL Project

My project at LANL includes conducting thermal and mechanical tests on three different cure profiles of epoxy to collect data about shrinkage, coefficient of thermal expansion, and degree of cure for a group wanting to produce their own optocoupler.

Watch presentation: https://www.youtube.com/watch?v=n8m6OpBLqsw

Natasha Story

Program: Graduate
School: University of Oregon
Group: MST-7
Mentor: Joseph Torres
Category: Materials Science
Type: Individual
LA-UR-20-25761

Experimental Optimization to Determine Heat Capacity of SX358 by MDSC

The parameters of a quasi-isothermal MDSC experiment were optimized, focusing on calibration and the appropriate selection of modulation period. 90 seconds was identified as an ideal modulation period for measuring the heat capacity of SX358 at 0°C.

Watch presentation: https://youtu.be/70h6C65T3jw

Camille Wong

Program: Graduate
School: University of Oregon
Group: MST-7
Mentor: Alexander Edgar, Dali Yang
Category: Materials Science
Type: Individual
LA-UR-20-25731

Method development: LC-MS/MS of eutectic bis(2,2-dinitropropyl) acetal/formal

This presentation reviews LC-MS/MS instrumentation and discusses the methodology development for the characterization of a mixture of bis (2, 2-dinitropropl) acetal/formal nitroplasticizer.

Watch presentation: https://youtu.be/Y8v_rlTCQTg

MATHEMATICS

Grant Hutchings

Program: Graduate
School: UC Santa Cruz
Group: CCS-6
Mentor: James Gattiker
Category: Mathematics
Type: Individual
LA-UR-20-25520, 20-25455, 20-25489

Bayesian Model Calibration using Physics-Informed Machine Learning

We illustrate Sepia, an open-source python code for physics-informed machine learning. A simple physics example is presented to illustrate parameter calibration and prediction capabilities. Additionally, we validate Sepia against recent literature.

Watch presentation: https://www.youtube.com/watch?v=VeulIC8_hSY&feature=youtu.be

Samuel Myren

Program: Post Bachelors
School: Virginia Tech
Group: CCS-6
Mentor: Earl Lawrence
Category: Mathematics
Type: Individual
LA-UR-20-25683

In-situ Inference for Exascale Computing

High performance computing simulations create more data than can be stored. We are developing statistical tools to analyze the data while the simulation runs. This project seeks to determine the needed statistical complexity before analysis begins.

Watch presentation: https://youtu.be/MreSy8n-WvE

OTHER (NON-TECHNICAL)

Gabriela Baca

Program: Undergraduate
School: University of New Mexico
Group: HR-FCS
Mentor: Sandra Morello
Category: Other (Non-Technical)
Type: Individual
LA-UR-20-25916

Non-lab Contingent Workers

Gabriela Baca is an intern at LANL this summer and she helps approve functions within the field and Central Services group in the human resources division for non-contingent workers as well as other tasks.

Watch presentation: https://youtu.be/weV7BaGWMCs

Thomas Chadwick

Program: Undergraduate
School: University of California, Berkeley
Group: WRS-SIS
Mentor: Alan Carr
Category: Other (Non-Technical)
Type: Individual
LA-UR-20-25759

Who Invented the Christy Gadget?

This project outlines and resolves the ongoing dispute over who deserves credit for the invention of the Christy Gadget, drawing upon unique evidence from the National Security Research Center.

Watch presentation: https://youtu.be/w3jj9P2rjjk

PHYSICS

Charles Coleman

Program: Undergraduate
School: Morehouse College
Group: C-CDE
Mentor: Joseph Dumont
Category: Physics
Type: Individual
LA-UR-20-25407

Investigating the degradation of PHA biopolymers and their derivatives

Polyhydroxyalkanoates (PHA) are a family of polyesters that can be produced by microorganisms such as cyanobacteria. In this work, we investigated the accelerated thermal degradation at 90°C of two commercially available PHA-based bioplastics.

Watch presentation: https://youtu.be/q2V4vC4GPH8

Abigail Louise Ferris

Program: Undergraduate
School: Duquesne University
Group: P-24
Mentor: Paul Keiter
Category: Physics
Type: Individual
LA-UR-20-25350

CT Analysis of Double Shell Targets

Double shell experiments are being performed to measure symmetry of Al outer shells. We have been using MATLAB routines to analyze target CT data to determine the initial asymmetry in the capsule.

Watch presentation: https://vimeo.com/444266648

Keng Lin

Program: Post Bachelors
School: Columbia University
Group: P-25
Mentor: William Louis, Richard Van De Water
Category: Physics
Type: Individual
LA-UR-20-26082

Study Neutrinos using MiniBooNE Detector

We study the most current MiniBooNE data set of 18.75 POT and have gained more understanding of the observed electron neutrino-like excess. The radial spectrum disfavors the interpretation that the excess is purely neutral pions or dirt background.

Watch presentation: http://youtu.be/uNV7w-aG0WA?hd=1

Bricker Ostler

Program: Post Bachelors
School: Lawrence University
Group: AOT-AE
Mentor: Quinn Marksteiner, Nikolai Yampolsky
Category: Physics
Type: Individual
LA-UR-20-25642, 20-25633, 20-25643

Developing a longitudinal charge density diagnostic for electron bunches

We present the development of a novel diagnostic that uses coherent off-axis undulator radiation to measure the longitudinal charge density of a highly relativistic electron bunch nondestructively with femtosecond resolution in a single shot.

Watch presentation: https://youtu.be/g5SbJaonC7g

Liam Pocher

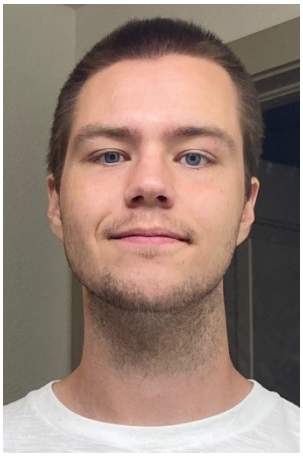
Program: Graduate
School: University of Maryland
Group: W-10
Mentor: Jonathan Mace
Category: Physics
Type: Individual
LA-UR-20-25743

Implications of Numerical Operator Mutation on Differential Forms

The entropy producing effects of viscosity and heat conduction are physical dissipative mechanisms that are not always calculated. It is shown that these effects can lead to locally negative contributions to global entropy in fluid flow.

Watch presentation: https://youtu.be/dpMcKmkop-8

Chandler Smith



Program: Post Bachelors
School: Occidental College
Group: NEN-1
Mentor: Katrina Koehler
Category: Physics
Type: Individual
LA-UR-20-25769

Quantitative Analysis of U and Pu using Decay Energy Spectroscopy

Decay energy spectroscopy is a novel radiometric measurement technology under development for its potential to increase analysis sensitivity and throughput in safeguards laboratories. Isotope ratios were determined to within 1.6σ of certified values.

Watch presentation: https://youtu.be/mIHl27_PFrw