Hartnell College 11th Annual

STEM

Summer Internship Program

August 19, 2017

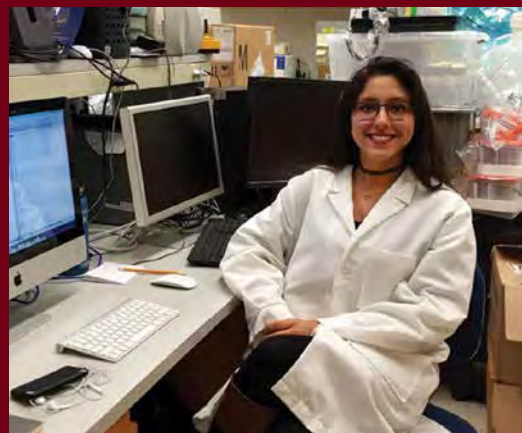




HARTNELL COLLEGE











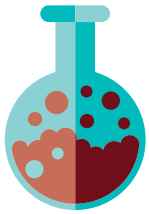


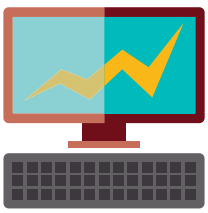
11th Annual Hartnell College

STEM

Internship Symposium

August 19, 2017











The Program



Hartnell STEM Internship Program

The STEM (Science, Technology, Engineering and Math) Internship Program at Hartnell College supports and engages students in undergraduate academic research and/or professional internship experiences. Internships include relevant and innovative projects with regional research institutions, local partners, and national REU (research experience for undergraduates) programs. Internships are guided by experienced mentors who provide authentic STEM research and career exposure, as well as, presentation skills, communication skills, professionalism, and transfer preparation for upper division and graduate studies. Students are provided the opportunity to share their work with academic and professional communities through presentations and publications.

Hartnell College is strengthening diversity in STEM while taking on the challenge of meeting our nation's skilled workforce needs. The program is creating a new legacy of opportunity for the families of the Salinas Valley by producing future generations of bright young scientists through innovative and comprehensive STEM programs and initiatives. For the last 6 years, our unique STEM Internship Program has achieved unprecedented success, matching hundreds of community college students with university researchers and industry experts in prestigious laboratories throughout the Central Coast.

The STEM Internship Program began in 2006 with the placement of 6 student interns. Since then, the program has placed over 800 students in undergraduate research and professional internship opportunities. In addition to program growth over the 12-year period, the program has demonstrated higher success rates than non-participating students. For example, degree attainment for Hartnell interns is dramatically higher than that of non-participants. Of the 2011 cohort, almost 80% transferred to a 4-year university. That trend continues with the recent cohorts. At partner institution UC-Santa Cruz, about 71% of Hartnell students who transferred between 2013 and 2015 are still pursuing their degrees and are expected to complete. Evidence shows that STEM internships have been a valuable resource not only for skill building, but for overall student success and degree completion.

Funding Sources

Hartnell College

Hispanic Serving Institutions STEM Title III grants

Hartnell College Foundation

University of California – Santa Cruz

California State University – Monterey Bay

ACCESS Program (National Institutes of Health)

U.S. Department of Agriculture

National Science Foundation

Center for Dark Energy Biosphere Investigations

Thank you!

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Dr. Steve Moore

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Contents

Welcome	6
Internship Partners/Mentors	7
Program Schedule	8
Student Interns	9
Student Abstracts	10



HARTNELLCOLLEGE

11th Annual Hartnell College STEM Internship Program





Welcome

HARTNELLCOLLEGE

Dear Friends of Hartnell College,

Welcome to the 11th Annual Hartnell STEM Summer Research Internship Symposium. The symposium is the culmination of our STEM Summer Internship program, which is a special opportunity for students to formally demonstrate their summer research results and celebrate their participation in this unique teaching and learning experience. As an important member of our community, Hartnell College welcomes you to this celebration of student achievement and dedication.

Hartnell College is committed to strengthening STEM programs as well as meeting the challenges of providing a well-trained workforce for the Salinas Valley and beyond. This Symposium is only one example of how Hartnell is preparing students to meet those challenges.

Since 2006, this unique program has matched student interns with university researchers and industry experts in prestigious laboratories throughout the Central Coast and beyond. These experiences have provided our interns with very empowering tools, not only for university preparation, but also for real-world success.

This year, the symposium offers poster sessions by all of our student interns, an informational panel of internship alumnus, and formal program recognizing some of our most valued supporters. We thank you for helping us celebrate the incredible achievements of our students and we encourage you to engage in the program by asking our students about their summer research projects.

Thank you for your continued support of our students. Together we can realize Hartnell's vision of growing the next generation of leaders through opportunity, engagement, and achievement.

Enjoy the work of our students!

Willard

Willard Clark Lewallen, Ph.D.
Superintendent/President

Hartnell College Vision

Hartnell College will be nationally recognized for the success of our students by developing leaders who will contribute to the social, cultural, and economic vitality of our region and the global community.

Hartnell College Mission

Focusing on the needs of the Salinas Valley, Hartnell College provides educational opportunities for students to reach academic goals in an environment committed to student learning, achievement and success.



STEM Internship Partners & Mentors



CapRock Geology
Robert Barminski
Chris Hakes

City of Monterey, California

Ecosystem Electronics Lab, California State University Monterey Bay
Dr. Steve Moore

Fremont Peak Observatory Association
Ron Dammann

Hartnell College Research Scholars Institute
Brian Palmer
Dr. Jeffery Hughey
Dr. Sewan Fan

Harvard John A. Paulson School of Engineering and Applied Sciences
Houk Jang, Ph.D.
Donhee Ham, Ph.D (PI)

Health Career Connections
Debra Kaczmar

IBM
Dr. Houk Jang, Ph.D.
Dr. Donhee Ham
Dr. Thomas Zimmerman
Dr. Stephen Boyer
Dr. Rudy Wojtecki
Dr. Alex Friz
Dr. Noel Arellano

Monterey Bay Regional Ocean Science REU
Dr. Rikke Jeppesen

Monterey County Public Health Laboratory
Dr. Donna Ferguson

Monterey Institute for Research in Astronomy
Dr. Bruce Weaver

Naval Postgraduate School Community College Catalyst Program
Dr. Peter Ateshian
Dr. Arijit Das
Dr. Grbovic
Dr. Joseph Hooper
Dr. James Newman
Dr. Jeremy Kozdon
Dr. Neil Rowe

The University of Texas at Austin

University of California at Irvine

University of California at Los Angeles

University of California at Riverside
Dr. Ludwig Bartels

University of California at Santa Cruz
Dr. Michael Isaacson
Dr. Tela Favaloro
Dr. Jaime Hernandez Maldonado
Dr. Ludwig Bartels
Dr. Elektra Robinson
Dr. Longbo Li
Dr. Don Smith
Dr. Chad Saltikov
Dr. Phil Crews
Ashley Byrne
Jacob Lee
Isabel Stumfall

United States Department of Agriculture
Dr. Yong Biao Liu
Dr. Xiangbing Yang
Dr. Gregory Simmons
Mark Moehling

Western Mechanical Solutions
Chris Huff

Whitson Engineers

11th Annual Hartnell College STEM Internship Symposium



Saturday, August 19, 2017
Hartnell College STEM Center

2:00 p.m.
Opening and Introductions

2:30 p.m.
Poster Session

4:00 p.m.
Recognition Ceremony

HARTNELLCOLLEGE

11th Annual Hartnell College STEM Student Interns

Luis Aguilar	10	Jose Lopez	29	Martin Reyes Jr.	48
Jose Arevalo	11	Ricardo Mendez	30	Edgar Rico	49
Olivia Arredondo	12	Javier Mendoza	31	Jessica Rios	50
David Calderon Manriguez	13	Rafael Mendoza	32	Ezequiel A. Rodriguez-Vazquez	51
Jasmin Camba	14	Diana M. Mikhail	33	Louis Paul Romero	52
Ruben Chavarin	15	Jose Orozco	34	Melody Sanchez	53
Neyda Cortes	16	Sergio O. Parra Jr.	35	Arnulfo Soria	54
Jose Diaz	17	Samuel Phillips	36	Diana Tamayo	55
Gabriel Dominguez	18	Conrado Preciado	37	Julio Cesar Tena	56
Edith Gonzalez	19	Jefferson Quiambao	38	Irene Torrecillas	57
Saul Enrique Gonzalez	20	Jose Ramirez	39	Yessica Torrez-Hernandez	58
Justin Grant	21	Jose F. Ramirez	40	Connie Ugalde	59
Pablo Guerrero	22	Maria Ramirez	41	Jean-Paul Varagnat	60
Eduardo Gutierrez	23	Ryan Ramirez	42	Armand Wilson	61
Marvin Gutierrez	24	Juan Ramirez-Chavez	43	Hartnell College Genomics Group	62
Kevin Guzman	25	Oscar Ramirez-Perez	44		
Rene Jaramillo	26	Melissa Ramos	45		
Thomas Jimenez	27	Maribel Ramos Peredia	46		
Evelia A. Leyva	28	Liliana Reyes	47		

Internship in Physical Sciences

Luis Aguilar

Mac Research Experience for Undergraduates Program, University of California Riverside



UNIVERSITY OF CALIFORNIA
UCRIVERSIDE

Mac Research Experience for Undergraduates Program at UC Riverside is funded by the National Science Foundation and provides research experience for undergraduates related to the growth and applications of thin films or monolayer materials. This program engages students from a broad spectrum of backgrounds in the physical sciences and engineering.

Luis Aguilar
Major: Biology

STEM

Summer Internship Program 2017

Dye Sensitized Solar Cells

Jose Arevalo

Mentor: Dr. Sewan Fan

Research Scholars Institute – Hartnell College

HARTNELLCOLLEGE



A dye sensitized solar cell is a low-cost solar cell that belongs to a group of thin film solar cells. It is composed of a semiconductor formed between a photo-sensitized anode and an electrolyte, also known as a photo electrochemical system. During this internship several dyes were used in the cells for the purpose of finding the most efficient solar cell. Several procedures were made to test efficiency and identify what caused each cell reacted differently when one component was altered. Each cell was placed in an optical setup where the voltage output was recorded using various different wavelengths. These results were compared to the light intensity of a constant light source and the absorbance.

Jose Arevalo
Major: Civil Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: Engineering Club



Ecotone plant community zonation and salinity tolerance at Hester Marsh, Elkhorn Slough



Olivia Arredondo

Mentor: Dr. Rikke Jeppesen

Monterey Bay Regional Ocean Science Research Experience for Undergraduates Program

CSUMB REU Monterey Bay Regional Ocean Science Research Experiences for Undergraduates

Elkhorn Slough is an estuary which is home to multitudes of different plant and animal species, some of which threatened or endangered. Due to modern human agriculture, the slough has experienced substantial sediment loss and an invasion of non-native species. An affected habitat is the ecotone, or the transition between two ecological systems: salt marsh and uplands . To prepare for the upcoming Hester Marsh restoration project in Elkhorn Slough, transects must be done to understand the zonation pattern of the upland, ecotone-specific, and marsh plant species found along the ecotone as a baseline. A greenhouse experiment will be conducted with estuary plants to test different management options such as water treatment salinity and the effectiveness of the project's soil. This project will focus on the ability of the various marsh, upland, and non-native plants commonly found in the ecotone to grow in soil available at the restoration site and varying water salinity treatments, one treatment will utilize the water found in a well on the site. We expect native plant diversity to be fairly low throughout the high marsh to low upland and to find an abundance of non-native invaders in those same regions. We expect to see success of all plant growth in the project soil that is receiving the 0 and 1 ppt water treatment. From this summer we can determine the best management methods for the restoration of an estuarine environment, which can be used as a reference for other estuarine reserves.

Olivia Arredondo
Major: Biology
Transfer major: Biology
Intended transfer date: Fall 2017

Investigation of an Indonesian Marine Sponge that Shows Cytotoxic Activity Towards a Solid Tumor Cell Line

David Calderon Manriguez

Mentor: Phil Crews

University of California Santa Cruz



Marine sponges have been shown to harbor a wealth of structurally diverse secondary metabolites with a wide range of bioactivity. An extract from a marine sponge, collected off the coast of Indonesia (coded 92407), exhibited selective cytotoxicity towards a human lung adenocarcinoma (H125) cell line. The overall goal of this research was to purify and identify individual compounds from the sponge complex extract and determine which were responsible for the observed cytotoxicity. Compounds were purified using High-Performance Liquid Chromatography. They were then identified using High Accuracy Mass spectrometry to obtain their molecular formulas, and Nuclear Magnetic Resonance spectroscopy to identify their molecular structures. Once the compounds were identified, they were sent to the Josephine-Ford Cancer Center for further analyses to determine which compounds were responsible for the previously observed cytotoxicity against the H125 cell line. This research could lead to the discovery of a new chemical scaffold that can aid in the development of solid tumor drug leads.

David Calderon Manriguez
Major: Biology
Transfer major: Biology
Intended transfer date: Fall 2017
Hartnell Clubs: Chemistry Club



lncRNSs from LincRnas

Jasmin Camba

Mentor: Dr. Elektra Robinson

University of California Santa Cruz



There are many signals cascading in the innate immune system that must coordinate to maintain protection from infection and control inflammation in the body. The inflammatory genes expressed in the innate immune system are associated with the stimulation of transcription factors that result in the activation of inflammation. They have been found to be regulated by long noncoding RNA (lncRNA) that are long, transcribed RNA molecules (over 200 nucleotides) that do not encode proteins, but can function through the binding with RNA, DNA, and proteins involved in cellular activation, repression, and modification. Evidence shows lncRNAs have a role in the regulation of immune cells and immune-related diseases, although only 1% of annotated lncRNAs have a known function. Our lab is conducting further studies to determine the roles of three specific human lncRNAs that are induced by inflammatory stimulation. We conducted cell culture work to stimulate cells for various experiments, ran time course stimulations to identify gene expression, characterized the cellular localizations of lncRNA, and collected time points of expression using quantitative PCR (qPCR). This research will assist future projects of how lncRNAs affect inflammation in the innate immune system.

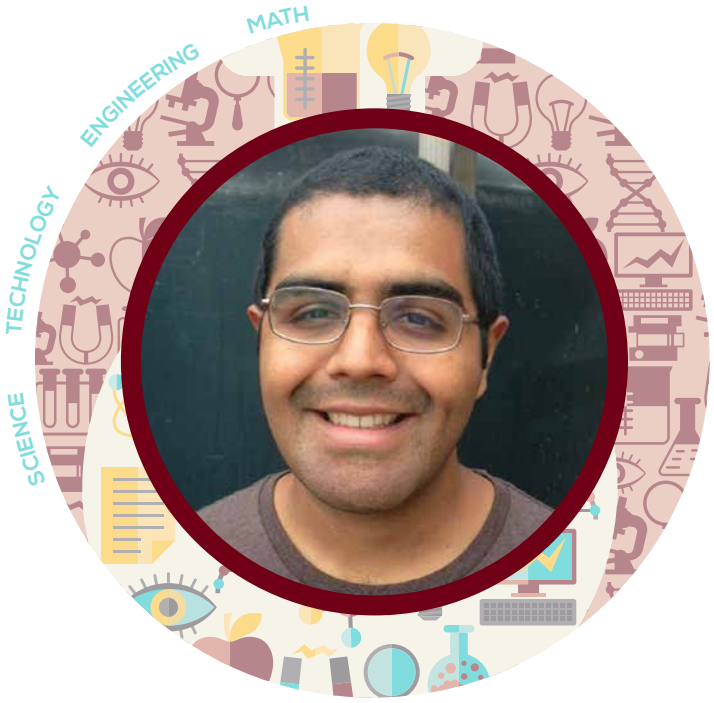
Jasmin Camba
Major: General Education with Natural Science emphasis
Intended transfer date: Fall 2017
Hartnell Clubs: Chemistry Club

A Comparison of Water Testing between IDEXX Colilert TM and Membrane Filtration

Ruben Chavarin

Mentor: Dr. Donna Ferguson

Monterey County Public Health Laboratory



Water quality is an important public health issue. Therefore testing for and quantifying water contaminants are important to ensuring a safe public water supply. Water testing labs can choose different methods to quantify total coliform bacteria in the water to determine the sanitary quality of water. Most labs use IDEXX Colilert or perform membrane filtration using m-ENDO media. Both methods differ in culture techniques, results, ease of use and cost. The objectives of this project are to compare the results regarding total coliform (TC) bacteria counts using both methods and species of TC detected. TC counts using IDEXX Colilert were at least 1 log higher than counts found using membrane filtration. For species diversity, the results for IDEXX Colilert showed a broader diversity of bacteria present in each sample while m-ENDO membrane filtration provided more detailed results. One possible reason is related to the differences in how bacteria are cultured between the methods. The membrane filter allows physical separation of the bacteria in water which are trapped onto the filter and grown on solid media allowing actual counts of bacteria. IDEXX uses a liquid media and the bacterial counts are based on looking for a color change and using statistical charts to estimate, higher diversity of coliform species was found using m-ENDO agar. If testing cost and ease of use is an issue, IDEXX may be the preferred method; however, it is important to keep in mind that the TC counts may be overestimated by up to 1 log.

Ruben Chavarin
Major: Environmental Science
Intended transfer date: Fall 2017
Hartnell Clubs: Chemistry Club



Observing the Night Sky at Fremont Peak Observatory

Neyda Cortes

Mentor: Ron Dammann

Fremont Peak Observatory



In order to assist the resident astronomers at the Fremont Peak Observatory, four student interns and their mentors made weekly trips to the observatory in the part to serve as ambassadors of astronomy. We are able to take our classroom knowledge outside, and present ourselves with our organizations as professional students. Each Hartnell student got a chance to present their PowerPoint, and provide knowledge of space that is unknown to the general public. This can range from Galaxies, the Solar System, The Kuiper Belt, and Constellations. The biggest attraction is the telescopes, and the deep sky objects that are only visible at the Peak with said telescopes. Possibly the best planets to look at with our telescopes are Jupiter and Saturn. Jupiter is the more interesting planet to gaze upon because of its four massive and visible moons. Saturn is easily distinguishable due to its ring belt. Other objects that can only be visible are galaxies and Messier objects. The Andromeda Galaxy, our neighboring galaxy, is only 2.5 light years away. Compare that to Messier 81 and Messier 82, which are both over 11 light years away from us. Messier objects is a name given to other galaxies. Not only do the interns get a chance to connect with the people that attend, but they got a chance inspiring others to learn more about their universe. This internship truly gives the students of Hartnell College a taste of a workplace that is directly involved with the general public.

Neyda Cortes
Major: Sociology
Intended transfer date: Fall 2017

Cosmic Ray Muon Speed

Jose Diaz

Mentor: Dr. Sewan Fan

Research Scholars Institute – Hartnell College



Cosmic rays are highly energetic atomic nuclei mainly originating outside the Solar System. After striking the Earth's atmosphere, cosmic rays are broken into different particles one of which is the muon. Our project's purpose is to determine the speed of the muon particle. In order to fulfill the aforementioned purpose, our experimental apparatus consists of a coincidence setup, a digitizer, and two pairs of cosmic ray detectors. Moreover, to determine the arrival time difference between the two pairs of cosmic ray detectors, we would separate the distance between them. Detailed data analysis was conducted using the CERN software package Physics Analysis Workstation (PAW) in a Linux Operating System. Utilizing the data for the distance and time difference, we were able to determine the speed of the cosmic ray muons.

Jose Diaz
Major: Computer Science
Intended transfer date: Fall 2019
Hartnell Clubs: Chemistry Club



Modification and Analysis of Electric Potential in Microbial Fuel Cells

Gabriel Dominguez

Mentor: Dr. Sewan Fan

Research Scholars Institute – Hartnell College



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Research into fuel cells is critical for the development of new alternative energies. The project focused on the analysis of Microbial Fuel Cells (MFC). By taking a multidisciplinary approach we measured the impact of several general micro and macro control factors on voltage output such as microbiology, soil makeup, temperature, chemistry, and volume on MCFs. Two different MFC systems were used; the first was the Mudwatt kit which uses soil as its fuel source, while the second was a Yeast Cell kit which uses fermenting yeasts. Overall, the addition of substrates to the soil cells produced the highest voltage output while maintaining good system health measured by low internal resistance in the MCF. While in the yeast cells, the using of different mediators significantly varied voltage output.

Gabriel Dominguez
Major: Electrical Engineering
Intended transfer date: Fall 2017
Hartnell Clubs: Engineering Club, MESA

Finding Lexical Links Among Personal Names in Digital Forensic Data

Edith Gonzalez

Mentor: Dr. Neil Rowe

Naval Postgraduate School



Lexical links are connections between people or concepts based on the words they use. The objective of this research is to determine if links can be established among personal names found on multiple drives in the Real Data Corpus. The Real Data Corpus is digital forensic data from a collection of 4000 examples of digital storage devices including hard drives, flash drives, memory cards, and cell phones. To generate more specific test data, we also created our own drive data modeling the activities of a spy. If connections can be established, the methodology can be used to determine associations among and future actions of criminals under investigation and spies.

Using forensic data investigation techniques, can we find links among personal names on the drives in the Real Data Corpus?

This research involves data analysis. To that end, several Python programs were written to compare the personal names contained on every combination of two drives and to determine how similar (or different) the drives were. The programs computed histograms on the names of each drive. They then calculated similarity metrics for each pair of drives using the following formulas:

- cosine distance
- tf-idf
- Sorenson's similarity measure
- Bray-Curtis Distance formula

Gephi, a free graphing software, was used to analyze the similarity or difference measures that were output from the Python programs to determine which formula produced the most meaningful results.

Edith Gonzalez
Major: Computer Science
Intended transfer date: Fall 2017
Hartnell Clubs: Chemistry Club



Observing the Night Sky at Fremont Peak



Saul Enrique Gonzalez

Mentor: Ron Dammann

Fremont Peak Observatory

In order to assist the resident astronomers at the Fremont Peak Observatory, four student interns and their mentors made weekly trips to the observatory in the part to serve as ambassadors of astronomy. We are able to take our classroom knowledge outside, and present ourselves with our organizations as professional students. Each Hartnell student got a chance to present their PowerPoint, and provide knowledge of space that is unknown to the general public. This can range from Galaxies, the Solar System, The Kuiper Belt, and Constellations. The biggest attraction is the telescopes, and the deep sky objects that are only visible at the Peak with said telescopes. Possibly the best planets to look at with our telescopes are Jupiter and Saturn. Jupiter is the more interesting planet to gaze upon because of its four massive and visible moons. Saturn is easily distinguishable due to its ring belt. Other objects that can only be visible are galaxies and Messier objects. The Andromeda Galaxy, our neighboring galaxy, is only 2.5 light years away. Compare that to Messier 81 and Messier 82, which are both over 11 light years away from us. Messier objects is a name given to other galaxies. Not only do the interns get a chance to connect with the people that attend, but they got a chance inspiring others to learn more about their universe. This internship truly gives the students of Hartnell College a taste of a workplace that is directly involved with the general public.

Saul Enrique Gonzalez
Major: Mathematics and Physics
Intended transfer date: Spring 2017
Hartnell Clubs: Engineering Club, MESA

Observing the Night Sky at Fremont Peak

Justin Grant

Mentor: Ron Dammann

Fremont Peak Observatory



In order to assist the resident astronomers at the Fremont Peak Observatory, four student interns and their mentors made weekly trips to the observatory in the part to serve as ambassadors of astronomy. We are able to take our classroom knowledge outside, and present ourselves with our organizations as professional students. Each Hartnell student got a chance to present their PowerPoint, and provide knowledge of space that is unknown to the general public. This can range from Galaxies, the Solar System, The Kuiper Belt, and Constellations. The biggest attraction is the telescopes, and the deep sky objects that are only visible at the Peak with said telescopes. Possibly the best planets to look at with our telescopes are Jupiter and Saturn. Jupiter is the more interesting planet to gaze upon because of its four massive and visible moons. Saturn is easily distinguishable due to its ring belt. Other objects that can only be visible are galaxies and Messier objects. The Andromeda Galaxy, our neighboring galaxy, is only 2.5 light years away. Compare that to Messier 81 and Messier 82, which are both over 11 light years away from us. Messier objects is a name given to other galaxies. Not only do the interns get a chance to connect with the people that attend, but they got a chance inspiring others to learn more about their universe. This internship truly gives the students of Hartnell College a taste of a workplace that is directly involved with the general public.

Justin Grant
Major: Astronomy
Hartnell Clubs: Chemistry Club



The Remote Controlled Kayak Put into Action

Pablo Guerrero

Mentor: Dr. Steve Moore

Ecosystem Electronics Lab, CSUMB

California State University Monterey Bay



Researchers have always find it difficult to study the depths of the enormous ocean. They tend to encounter many challenges while studying it which makes it more difficult for them to collect data. Some of these challenges could be; the wind being too strong, strong storms, the waves destabilizing the floating vehicle, or the fact that these areas of research are not studied frequently. We aim to reduce the probabilities of encountering these challenges by creating a remote controlled Kayak (RCK). The purpose of this Kayak is to go to the ocean and take with it a Remotely Operated Vehicle (ROV) which will be in charge of studying the depths of the ocean. We can go to a maximum depth of 100 meters using the RCK and ROV. The RCK will only be suitable for near-shore work in fairly calm conditions. We will be able to control this kayak from shore using a Wi-Fi link with a range of roughly one kilometer away from us. Some of the benefits of this RCK are as follow: no person will have to go to the ocean to control the ROV which reduces the probability of them being at risk in the water; we can take it to any beach and do the research there since we do not need a port for this kayak; and we can study more sites more frequently with this accessible kayak and improve the speed of data collection.

Pablo Guerrero
Major: Mechanical Engineering
Intended transfer date: Fall 2019

Electromagnetic Force and Railgan Technology

Eduardo Gutierrez

Mentor: Dr. Andres Larraza

Naval Postgraduate School



We currently spend more on our military than the next 20 countries combined. The pentagon has expressed that it wants to start finding ways to roll back military expenses and reduce its budget by 20%. Through the use of electromagnetic force and circumventing the need for missile defense systems dependent on fuel or gunpowder, railguns are a cost effective way of maintaining or surpassing weapons currently used today. Railgun projectiles can reach speeds of up to Mach 7 and can exceed ranges of up to 200 miles. Currently the science behind converting electromagnetic force into raw, destructive kinetic energy is settled but questions still exist on what materials can best sustain the intense amounts of energy and heat that are given off when shot and on finding the most efficient projectiles that can take advantage of speed and force of what could be the most powerful armor piercing weapons. This project will build and maintain a railgun in an attempt to aid in answering some of these questions.

Eduardo Gutierrez
Major: Computer Science & Information Systems
Intended transfer date: Fall 2017
Hartnell Clubs: Math Club, Engineering Club



Groundwater Monitoring of Hexavalent Chromium at Moss Landing Site

Marvin Gutierrez

Mentors: Robert Barminsky, Chris Hakes

CapRock Geology



Hexavalent Chromium (Cr VI) occurs naturally in groundwater from the oxidation of Trivalent Chromium (Cr III). It can also be produced during industrial activities. Anthropogenic Cr VI can migrate into groundwater, thereby creating a contaminated zone or plume. Moss Landing Commercial Park, Dynegy Moss Landing Power Plant as well as the PG&E plant are three possible sources of anthropogenic chromium VI groundwater impact in the Moss Landing area. Cr VI is a known human carcinogen with an industrial Maximum Contamination Level (MCL) of 1.00 ug/L (micrograms/Liter). The California Groundwater monitoring well data on the Commercial Park were collected and reviewed by the researcher. Three chromium VI concentration maps for the years 2015, 2016 and 2017 were made based on the monitoring well data. The maps show the movement of the contamination plume along with the groundwater flow direction. The groundwater flow direction in Moss Landing is from the Northeast to the Southwest. The areas of concern had concentrations above 2.65 µg/L. The researcher recommends groundwater remediation.

Marvin Gutierrez
Major: Geology
Intended transfer date: Spring 2018
Hartnell Clubs: Earth Science and Sustainability Club

Regression Model Predictions of Quality Scores for High Value Crops



Kevin Guzman

Mentor: Brian Palmer

Research Scholars Institute – Hartnell College

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Food-Origins hosted three Hartnell College students, Kevin Guzman, Melody Sanchez, and Sergio Parra, as interns under Professor Brian Palmer's mentorship to work on their flagship platform. The company's platform works by enlisting harvesters to collect data through a hand-held scanner. Each scan collects a geographical point that registers the exact field location of the completed harvest along with date, time, and other relevant information. The team's objective was to create a regression model that utilizes harvest data, and tracks the quality of crops as a function of time since they were last harvested. To do this, the team had to first develop tools for handling the geometry of fields, using a mathematical tool called a cubic B-splines. Once the geometry of the fields is established, the field is split into smaller cells, which formed variables to be used in the regression model. The team received a crash course in harvesting strawberries, statistical analysis, and various programing languages such as node.JS and R to put together its project. Food-Origins will be expanding on the team's code in order to address real world challenges of produce quality, labor shortages, and consumer engagement.

Kevin Guzman
Major: Computer Science
Intended transfer date: Spring 2018
Hartnell Clubs: Computer Science Club



Impacts of Early Postnatal Manganese Exposure on Dopamine Transporter Levels and Reactive Astrocyte Activation in the Prefrontal Cortex



Rene Jaramillo

Mentor: Dr. Don Smith

University of California Santa Cruz

Elevated manganese (Mn) exposure during neurodevelopment has been shown to cause deficits in attention and impulse control in animal models, and to be associated with attention and learning deficits in children; however, the mechanisms underlying these neurotoxic effects are not well known. Both the dopamine transporter (DAT) and glial fibrillary acidic protein (GFAP) are important proteins expressed in the central nervous system. The DAT is responsible for removing dopamine released by neurons from the synaptic cleft, and is found on both axon terminals of neurons and astrocyte processes. Alternatively, GFAP is expressed by astrocytes and contributes to the cytoskeletal filaments which play a role in the inflammatory response mediated by reactive astrocytes. The effects of elevated early postnatal Mn exposure were examined within the prefrontal cortex of rats, with a focus on quantifying changes in protein levels of the DAT and GFAP. We hypothesize that GFAP protein levels will increase as a sign of neuroinflammation, whereas DAT protein levels will decrease within the prefrontal cortex, possibly in response to reductions in dopamine and norepinephrine release caused by elevated Mn exposure. Tissue levels of these two proteins are being measured and quantified using immunohistochemistry techniques with protein antigen-specific antibodies, labeled with specific fluorophores, visualized by fluorescence microscopy, and quantified using Imaris software. Preliminary results have identified antibody titration levels, along with imaging and quantification parameters. Ultimately, these findings may lead to improved pharmaceutical therapies for children with Mn-based attentional deficits.

Rene Jaramillo
Major: Biology/Chemistry
Intended transfer date: Fall 2018
Hartnell Clubs: Chemistry Club

Light Brown Apple Moth Lure Attraction Study

Thomas Jimenez

Mentor: Dr. Gregory Simmons

USDA



Light Brown Apple Moth (LBAM), Epiphyas postvittana, an invasive species from New Zealand and Australia, has had a heavy economic impact on both apple and citrus industries since their discovery in California in the early 2000's. Various types of lure traps have been tested to measure their efficacy in attracting and capturing LBAM. Although pheromone lures have been proven to be an effective method in capturing male LBAM, kairomone lures are currently being studied to measure their effectiveness in capturing both male and female LBAM. Using a randomized block design, we recorded the capture rate of kairomone lures in seven treatments (3 different treatments of kairomones, 2 treatments of pheromones, 1 blank acetic acid lure, 1 blank control trap) and five replications, 10 meters apart, in distinct plant host groups. As expected, the pheromone lures caught male LBAM, whereas the kairomone lures showed an insignificant overall LBAM attraction. The study is ongoing to determine kairomone lures as an effective method for capturing LBAM.

Thomas Jimenez
Major: Microbiology
Intended transfer date: Fall 2018
Hartnell Clubs: Astronomy Club, Physics Club, Chemistry Club, Engineering Club



Re-Design of Power Supply for HA-HA Button System

Evelia A. Leyva

Mentor: Jacob Lee

University of California Santa Cruz



The elderly have always been in need of proper care and protection; this was the motivation behind the design of the HA-HA button system. However, the original project is still being developed and its power system needed to be revised and redesigned in order to meet standard power regulatory guidelines. In order to accomplish such a task, the existing printed circuit board (PCB) was redesigned to implement an approved 120V AC-to-DC power regulator. Moreover, an LED floodlight was also integrated in order to provide substantial lighting using the new power supply. This new design incorporated a 60 Watt DC power supply to provide power for the LED floodlight and speaker, as well as 5V and 3.3V voltage sources for other components in the system. The board was created using KiCad EDA tools and assembled by hand soldering. Once tested, a successful prototype power board was integrated into the final potential product. Now that the power system has been further optimized, the next possible route to improve the entire HA-HA system would involve integrating a Linux-enabled microcontroller. This would allow the cost to be further reduced as well as increase potential for product growth. Although this project was out of my specific field of study, I was able to learn concepts dealing with electromagnetism and circuit theory and apply them to the design of the power supply.

Evelia A. Leyva
Major: Mechanical Engineering
Intended transfer date: Fall 2017
Hartnell Clubs: Physics Club, Engineering Club, EOPS, MESA

Library preparation of B cells derived from adult stem cell populations



Jose Lopez
Mentor: Ashley Byrne

University of California Santa Cruz

B-cells are a specialized immune cell type that is part of our adaptive immune system. B-cells are unique in their capability to produce antibody proteins that specifically target any pathogen that an individual will encounter in their lifetime. In this study I focused on B1a cells, which are innate-like in that they have both innate and adaptive capabilities, and B2 cells, which have only adaptive capabilities. B1a cells appear predominantly during early stages of development and are thought to derive mainly from fetal stem cell populations. However, B2 cells predominantly appear in later stages of development and are thought to derive mainly from adult stem cell populations. This shows that different B cell populations derive from different stem cells and appear at different stages. In order to determine how these populations differ, I performed library RNA sequencing preparations on B1a, B2, and peripheral blood B-cells derived from the adult stem cell population. These libraries will then be sequenced using the Illumina platform sequencing technology. This data will help us understand the relationship between B cells derived from adult and fetal stem cell populations. Understanding B cell development can give us insight into how our immune system works and as well as how it relates to disease.

Jose Lopez
Major: Biology
Intended transfer date: Fall 2017
Hartnell Clubs: SIMA, DREAM, Physics



Computer Curation of Patents and Scientific Literature for Machine Learning

Ricardo Mendez

Mentor: Dr. Stephen Boyer

IBM



Until recently the vast amount of pharmacological relationships linking chemical structure to biological activity was not available in computationally accessible formats. While a significant part of the screening data is publicly disclosed in patents or journal articles, it is not easily accessible for large-scale machine learning. As such, numerous efforts to analyze text, extract molecules and their biological relationships have been developed. In order to mine the wealth of biological and chemical information that is present in patents and the scientific literature, we develop systematic procedures that incorporate extraction, standardization, normalization and cross-validation of this information. Our methods utilize KNIME, python, web services, and a PostgreSQL database for normalization of the overall chemical content derived from both text and image curation processes; followed by mapping a network of relationships between entities, we more rapidly arrive at a better understanding of the fundamentals of chosen biological systems. Our protocols are then extendable to other material systems and entities of general interest.

Ricardo Mendez

Major: Chemistry, Physics and Mathematics

Intended transfer date: Fall 2018

Hartnell Clubs: Chemistry Club, Physics Club

Dye-Sensitized Solar Cells

Javier Mendoza

Mentor: Dr. Sewan Fan

Research Scholars Institute – Hartnell College



A dye sensitized solar cell is a low-cost solar cell that belongs to a group of thin film solar cells. It is composed of a semiconductor formed between a photo-sensitized anode and an electrolyte, also known as a photo electrochemical system. During this internship several dyes were used in the cells for the purpose of finding the most efficient solar cell. Several procedures were made to test efficiency and identify what caused each cell reacted differently when one component was altered. Each cell was placed in an optical setup where the voltage output was recorded using various different wavelengths. These results were compared to the light intensity of a constant light source and the absorbance.

Javier Mendoza
Major: Civil Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: Engineering Club



Modification and Analysis of the Energy Potential in Microbial Fuel Cell

Rafael Mendoza

Mentor: Dr. Sewan Fan

Research Scholars Institute – Hartnell College



HARTNELLCOLLEGE

Research into fuel cells is critical for the development of new alternative energies. The project focused on the analysis of Microbial Fuel Cells(MFC). By taking a multidisciplinary approach we measured the impact of several general micro and macro control factors on voltage output such as microbiology, soil makeup, temperature, chemistry, and volume on MCFs. Two different MFC systems were used; the first was the Mudwatt kit which uses soil as its fuel source, while the second was a Yeast Cell kit which uses fermenting yeasts. Overall, the addition of substrates to the soil cells produced the highest voltage output while maintaining good system health measured by low internal resistance in the MCF. While in the yeast cells, the use of different mediators significantly varied voltage output.

Rafael Mendoza
Major: Chemical Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: Engineering Club, Physics Club, MESA

Atomic Layer Deposition for Next Generation Electronics

Diana M Mikhail

Mentors: Dr. Rudy Wojtecki, Dr. Alex Friz, and Dr. Noel Arellano

IBM



The generation of integrated circuits relies heavily on lithography to produce patterned surfaces, a process involving ultraviolet light to expose materials that generate images enabling pattern transfer onto substrates. As miniaturization of feature sizes in the generation of microelectronics continues, conventional lithography faces numerous challenges such as pattern alignment and resolution. This project is focused on the utilization of selective area atomic layer deposition (ALD) with self-assembling monolayers (SAMs) as blocking layers to enable simpler pattern formation. In ALD, one atomic layer is generated from a cycle where each cycle consists of sequential surface reactions where one gas is pumped to create an organometallic layer that can be subsequentially activated for the next layer by a second gas. The SAMs can block these surface reactions which results in selectivity of deposition. An occurring issue is that many SAMs degrade at higher temperatures. This is why various tests were run with octadecylphosphonic acid (ODPA) to find optimal conditions. Previous literature reports indicate that ODPA can be used as an effective blocking layer for up to (~200-300 cycles) when ZnO is deposited. It was found that despite the methods of characterization (AFM & contact angles) little difference was observed in ODPA surfaces from 15 seconds vs. 72 hrs. However, longer immersion times appear to enable blocking layers that withstand a dramatically increased number of cycles (1000). The tests conclude that the octadecylphosphonic acid makes a good blocking layer and can last through many cycles meaning that can work in industrious manufacturing.

Diana M Mikhail
Major: Engineering
Intended transfer date: Fall 2017
Hartnell Clubs: Engineering Club, Physics Club, MESA



Atomic Layer Deposition for Next Generation Electronics

Jose Orozco

Mentors: Dr. Rudy Wojtecki, Dr. Alex Friz, and Dr. Noel Arellano

IBM



The generation of integrated circuits relies heavily on lithography to produce patterned surfaces, a process involving ultraviolet light to expose materials that generate images enabling pattern transfer onto substrates. As miniaturization of feature sizes in the generation of microelectronics continues, conventional lithography faces numerous challenges such as pattern alignment and resolution. This project is focused on the utilization of selective area atomic layer deposition (ALD) with self-assembling monolayers (SAMs) as blocking layers to enable simpler pattern formation. In ALD, one atomic layer is generated from a cycle where each cycle consists of sequential surface reactions where one gas is pumped to create an organometallic layer that can be subsequentially activated for the next layer by a second gas. The SAMs can block these surface reactions which results in selectivity of deposition. An occurring issue is that many SAMs degrade at higher temperatures. This is why various tests were run with octadecylphosphonic acid (ODPA) to find optimal conditions. Previous literature reports indicate that ODPA can be used as an effective blocking layer for up to (~200-300 cycles) when ZnO is deposited. It was found that despite the methods of characterization (AFM & contact angles) little difference was observed in ODPA surfaces from 15 seconds vs. 72 hrs. However, longer immersion times appear to enable blocking layers that withstand a dramatically increased number of cycles (1000). The tests conclude that the octadecylphosphonic acid makes a good blocking layer and can last through many cycles meaning that can work in industrious manufacturing.

Jose Orozco
Major: Electrical Engineering
Intended transfer date: Fall 2017
Hartnell Clubs: MESA, Physics Club, Computer Science Club, Engineering Club

Regression Model Predictions of Quality Scores for High Value Crops



Sergio O Parra Jr.

Mentor: Brian Palmer

Research Scholars Institute – Hartnell College

HARTNELLCOLLEGE

Food-Origins hosted three Hartnell College students, Kevin Guzman, Melody Sanchez, and Sergio Parra, as interns under Professor Brian Palmer's mentorship to work on their flagship platform. The company's platform works by enlisting harvesters to collect data through a hand-held scanner. Each scan collects a geographical point that registers the exact field location of the completed harvest along with date, time, and other relevant information. The team's objective was to create a regression model that utilizes harvest data, and tracks the quality of crops as a function of time since they were last harvested. To do this, the team had to first develop tools for handling the geometry of fields, using a mathematical tool called a cubic B-splines. Once the geometry of the fields is established, the field is split into smaller cells, which formed variables to be used in the regression model. The team received a crash course in harvesting strawberries, statistical analysis, and various programing languages such as node.JS and R to put together its project. Food-Origins will be expanding on the team's code in order to address real world challenges of produce quality, labor shortages, and consumer engagement.

Sergio O Parra Jr.
Major: Engineering
Intended transfer date: Fall 2019
Hartnell Clubs: Math Club, Engineering Club



Internship in Mechanical Engineering

Samuel Phillips

Mentors: Chris Huff

Western Mechanical Solutions, LLC — Denver, CO

Western Mechanical Solutions
SUSTAINABLE HEATING COOLING



Western Mechanical Solutions LLC is located in Denver, Colorado. They specialize in engineering, installing and supporting high quality, energy efficient HVAC systems to minimize energy use and costs for clients.

Samuel Phillips
Major: Mechanical Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: SHPE Engineering Club

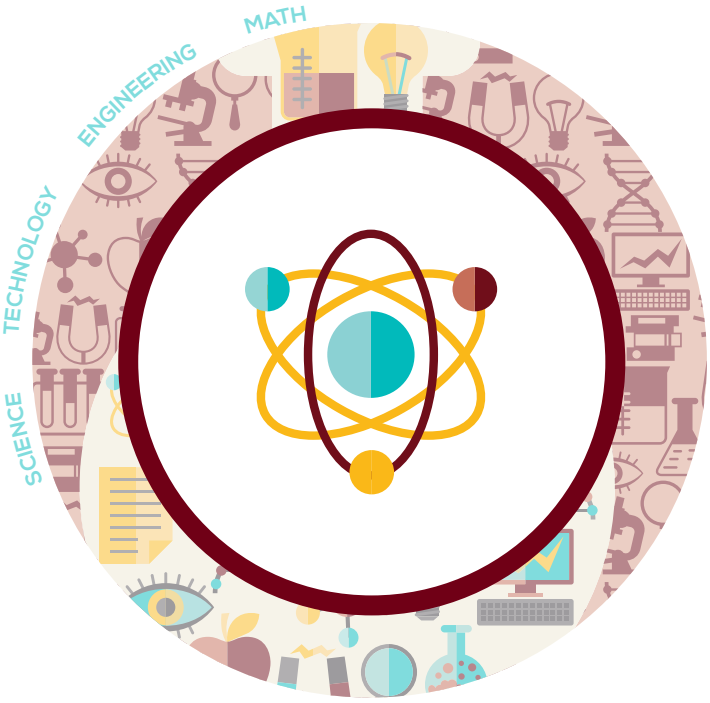
STEM

Summer Internship Program 2017

Internship in Biomedical Research

Conrado Preciado

Bridge to Baccalaureate Program, UC Irvine



The Bridges to Baccalaureate program at UC Irvine is supported by the National Institutes of Health and is a Minority Science Program. It provides comprehensive research training to participants and provides research experience, faculty seminar series and an introduction to current biomedical literature. It also provides intensive workshops on the principals instrumentation and techniques used in biomedical research.

Conrado Preciado
Major: Biology
Intended transfer date: Fall 2017
Hartnell Clubs: MESA, SIMA, Physics Club



Cosmic Ray Moon Speed

Jefferson Quiambao

Mentor: Dr. Sewan Fan

Research Scholars Institute – Hartnell College

HARTNELLCOLLEGE



Cosmic rays are highly energetic atomic nuclei mainly originating outside the Solar System. After striking the Earth's atmosphere, cosmic rays are broken into different particles one of which is the muon. Our project's purpose is to determine the speed of the muon particle. In order to fulfill the aforementioned purpose, our experimental apparatus consists of a coincidence setup, a digitizer, and two pairs of cosmic ray detectors. Moreover, to determine the arrival time difference between the two pairs of cosmic ray detectors, we would separate the distance between them. Detailed data analysis was conducted using the CERN software package Physics Analysis Workstation (PAW) in a Linux Operating System. Utilizing the data for the distance and time difference, we were able to determine the speed of the cosmic ray muons.

Jefferson Quiambao
Major: Computer Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: Engineering Club

Plasticization of Azide-Functionalized PVC by Covalently Linking Pendant Triazoles Using a Thermal "Click" Reaction

Jose J Ramirez

Mentor: Dr. Longbo Li

University of California Santa Cruz



Polyvinyl chloride (PVC) is a widely used plastic such as for electric wire coating, blood bags, clothing, and construction and automotive materials. However, pure PVC plastic is brittle: in order to attain the durability and flexibility desired, it is mixed with plasticizers. Phthalates are common plasticizers; unfortunately, phthalates are not linked to the PVC backbone, so they leach into the environment and come into human contact, metabolizing into endocrine disruptors. The Braslau lab is developing internal plasticizers to maintain the desired durability and flexibility but will be covalently linked to the PVC backbone as to not leach out of the polymer matrix. An acetylenedicarboxamide reacted with azide groups on 15% PVC-azide via a thermal Huigsen 1,3-dipolar cycloaddition reaction (colloquially called a "click" reaction), forming a triazole covalently linked to the PVC backbone. The synthesis of the electron-poor alkyne bisamides bearing highly branched substituents will be presented. This approach to improved plasticizers should provide a viable alternative to the use of phthalates, thus mitigating dangers to human health and the environment.

Jose J Ramirez
Major: Chemistry
Intended transfer date: Fall 2017
Hartnell Clubs: Chemistry, Physics



Residue Analysis of Nitric Oxide Fumigation on Stored Products

Jose F Ramirez

Mentor: Dr. Yong-Biao Liu and
Dr. Xiangbing Yang

USDA



The United States is one of the largest exporters of farm products in the world. However most of exported farm products are required to control quarantine pests before exportation from USA. Currently, there is an urgent need for postharvest pest management due to the phase-out of methyl bromide, and other fumigants like phosphine is causing phytotoxic to postharvest products. Recently, nitric oxide (NO) has been discovered as an effective fumigant against a wide range of insect pests at various life stages, and NO fumigation had no residue effect on postharvest fresh vegetables and fruits. However, no previous study has reported the residue analysis of NO fumigation of stored products to explain the safety of NO fumigation. Therefore, in this study, small scale laboratory fumigation treatments were carried out to determine the residue effect of 2% NO fumigation for 24 h at 20 C on a series of stored products, such as wheat, pecan, pinto beans, and garbanzo beans. Three treatments were applied to each product, including control, treatment terminated by N2 flush (NO-N2), and treatment terminated by air flush (NO-Air). The results showed that the levels of NO2 residue of the control were higher than those of the NO-N2 and NO-Air treatments during the first three days after fumigation. However, no significant difference was found among all treatments in 6 days after NO fumigation. In addition, no significant difference was found on the nitrate (NO3-) and nitrite (NO2-) concentrations among all treated products in 2 weeks after fumigation, except that higher concentrations were found in those of the NO-Air treated products. To conclude, the results of the present study showed that NO fumigation is safe to postharvest products when terminated properly, and can be a promising alternative to methyl bromide for postharvest pest management.

Jose F Ramirez
Major: Biology
Intended transfer date: Fall 2017
Hartnell Clubs: Physics Club

Santa Lucia Conservancy Access Roads Restoration Project



Maria Ramirez

Mentor: Mark Moehling

USDA

Access roads are a travel-way for vehicles and other equipment built as part of a conservation plan. Their purpose is to provide a fast route for vehicles for resource activities that involve management of agriculture, wildlife habitat and other conservation activities ensuring the protection of the soil, water, air, fish, and wildlife. Santa Lucia Conservancy is a 942 acres' ranch located in Carmel Valley. Some of the access roads that get to an important well of the ranch are not in good conditions which represent a hazard for public use. To try to come up with a solution, factors such as precipitation, soil types, vegetation, watershed area, purpose of the road, and costs must be considered. After gathering all the data and entering all the values into the EFH2, program that estimates runoff and peak discharges, some solutions came up. Three of the four roads must be closed to prevent accidents and excess costs. The best solution is to keep the remaining road that could be reshaped and on which: two rolling dips will be constructed, existing water bars will be removed, and road out-sloping will be done. The road will be good for public use as a hiking trail but mainly to have access to the well.

Maria Ramirez
Major: Civil Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: Physics Club



High Altitude Balloon Satellite Technology Research for Aerospace Teaching Opportunities (HAB STRATO)



Ryan Ramirez

Mentor: Dr. James Newman

Naval Postgraduate School

For the Summer 2017 intern project at the Naval Postgraduate School's Small Satellites Lab, nine interns have worked on designing, building, flying, and retrieving a high altitude balloon (HAB) equipped with a CubeSat payload. Each intern contributed his or her knowledge of electrical, mechanical, or software engineering to the project. The objectives of the HAB mission included transmitting and receiving data from sensors onboard the HAB (including pressure, radiation, magnetism, GPS, etc.), utilizing the CubeSat standard 2U size chassis to house electronics, powering each instrument through batteries and solar panels, and developing a radio communications network in which commands to release the payload from the balloon and deploy a parachute could be given. The HAB was launched on July 26th and stayed in flight for 105 minutes. The payload was detached from the balloon and retrieved in one piece along with video footage to document the flight. Data from each of the sensors can now be analyzed by grad students at the Naval Postgraduate School, and will add to the expansion of HAB and small satellites research for the United States Navy.

Ryan Ramirez
Major: Computer Science & Information Systems
Intended transfer date: Spring 2018
Hartnell Clubs: Physics Club

Advanced Networking Technology Utilization in Research Applications

Juan Ramirez-Chavez

Mentor: Dr. Arijit Das

Naval Postgraduate School



In this period of the technological era, ongoing research has been devoted to adapting and utilizing advanced networking tools and software for the purpose of allowing greater connectivity between various, independently-run hardware components to achieve the tasks of a unified system. Such systems are capable of collecting and processing information regardless of scripting involved if practical network frameworks are established to communicate effectively. Throughout this investigation, two projects were conducted to validate questions regarding distributive data analysis. First, research was done on Simrad 4G radar and RTI IntegRadar XIR3000 radar system integration using Robotic Operating System (ROS) as a method of processing navigational information to a database with TCP and JavaScript web sockets. Second, research was also done on a 3-server setup running Red Hat Enterprise Linux with Cloudera's Manager Hadoop configuration software which allows for high-performance computing based on powerful data distribution. Regarding the ROS research, our results indicate that enabling communication between the two components is possible using TCP/IP and web socket protocols in order to transfer data to be analyzed. In addition, the results from the Hadoop server aspect of this project will be provided upon completion of the ongoing research being conducted at this time.

Juan Ramirez-Chavez
Major: Computer Science
Intended transfer date: Fall 2018
Hartnell Clubs: Computer Science Club, Math Club



Compiling and Profiling Comet Debris Trails

Oscar Ramirez-Perez

Mentor: Dr. Bruce Weaver

Monterey Institute for Research in Astronomy (MIRA)



For decades, comets have been thought to lose most of their mass through their two tails that get pushed away in the current of solar radiation. One tail is composed of ionized gases and the other is composed of thin smoke-like dust, both get blown away from the sun by solar wind. However, based on observations, a hypothesis has been formed that asserts comets lose a portion of their mass through debris trails that follow along in their orbit. This project is composed of compiling infrared images captured by the WISE (Wide-Field Infrared Survey Explorer) Telescope in long wavelengths to observe very dim comet trails as compared to the background noise. This process consists of using a combination of programming code and manual adjustments in the IDL (Interactive Data Visualization) platform to remove stars from the backgrounds of image frames and stacking these image frames on top of one another to improve signal to noise ratio. After the trails are compiled, a profile is taken to measure the brightness of the trail as compared to the background. From there, we may be able to begin analyzing the structure and composition of these trails to learn more information about them. The end goal of this research is to establish a better understanding of the composition of comet trails and possibly increase our general understanding of comets.

Oscar Ramirez-Perez
Major: Astronomy
Intended transfer date: Fall 2019

Growth and Transfer of MoS2 on Graphene onto TEM Grids

Melissa Ramos

Mentor: Dr. Ludwig Bartels

University of California Riverside



Mac Research Experience for Undergraduates Program at UC Riverside is funded by the National Science Foundation and provides research experience for undergraduates related to the growth and applications of thin films or monolayer materials. This program engages students from a broad spectrum of backgrounds in the physical sciences and engineering.

Melissa Ramos
Major: Biochemistry
Intended transfer date: Fall 2017
Hartnell Clubs: Physics Club



Civil Engineering Internship

Maribel Ramos Peredia

Whitson Engineers



Whitson Engineers is a civil engineering and land surveying firm. They provide civil engineering, land surveying, land development engineering, computer services and project management applied to multiple projects including public and institutional infrastructure, residential planning, recreational planning, estate site planning and design, commercial development and more.

Maribel Ramos Peredia

Major: Civil Engineering
Intended transfer date: Fall 2017
Hartnell Clubs: Computer Science Club, Math Club

Analyzing the Performance of Thermoelectric Generator Arrays For Thermal Energy Harvesting

Liliana Reyes

Mentor: Dr. Grbovic

Naval Postgraduate School



Navy ships contain systems that range from engines to computer systems that produce excess thermal energy through their normal operations. In this study, we will look at thermoelectric generators and their use for harvesting wasted thermal energy from ship systems. We plan to find ways to collect the energy and turn it into electricity through the use of thermoelectric generators eventually storing it in power sensors and charging batteries. We will be using commercially available TEG modules to experimentally substantiate the output of them individually and furthermore simulate on COMSOL Multiphysics Modeling Software. We plan to combine the modules through simulation and differentiate the potential output to match powering a cellular device or laptop. Once a model is created, we will find the feasibility of harvesting energy from diesel engines, electronic warfare and other naval equipment and to which degree is this possible when multitudes of these modules are attached to ship equipment with the largest output of heat energy.

Liliana Reyes
Major: Electrical Engineering
Intended transfer date: Fall 2017



Cosmic Ray Water Cherenkov Detector

Martin Reyes Jr.

Mentor: Dr. Sewan Fan

Research Scholars Institute – Hartnell College



Cosmic rays are high energy particles that travel through space and shower Earth. Cherenkov radiation consists of electromagnetic radiation that is produced when remnants of scattering cosmic rays travel through earth's atmosphere and surpass the speed of light in a material medium. The equation, cos(theta) = 1/Bn indicates the cone shaped light effect where is equal to the velocity of the particle divided by velocity of light through a vacuum and being the refractive index of the medium. The objective of the project was to create a Cherenkov detector with available resources. In our project, we used distilled water in two thermos bottles as the medium to produce Cherenkov radiation. To observe the Cherenkov radiation from cosmic rays, two Photomultiplier detectors (PMT) were used and submerged in a thermos bottle covered with light tight foils. Two tests were done by placing both thermos close together and moving them away from each other in vertical and horizontal directions while testing coincidence. For the third test, a single thermos was placed between two scintillator paddles that have been proven to work by previous internships and coincidences were tested again. Results from the tests confirmed that the Cherenkov detectors were detecting Cherenkov radiation produced by cosmic particles.

Martin Reyes Jr.
Major: Mechanical Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: Engineering Club

Military and Civilian Applications for Internet of Things Boards

Edgar Rico

Mentor: Dr. Peter Ateshian

Naval Postgraduate School



For our Summer Internship we are working on three Projects that involved IoT (Internet of things) Boards. The three projects were: Audio Activated Security System (Alexa), Radar Sensors, and Femto Satellite Energy Harvester. In the Alexa Project, we are trying make a personal artificial intelligent assistant to be able to notify people whenever there may be an intruder alert within the confinements of peoples own homes and or assigned area. Then for the Femto Satellite Project we are trying to design a device that will harvest natural energy, and convert it into electrical energy to power up devices outdoors. Finally, the Radar Sensors Project we are trying to modify Sensors that can detect objects through radar frequencies to go from being able to detect objects in 2D to being able to detect objects in 3D objects .Questions that we are trying to answer are for our projects are: How can an IoT boards help improve civilian's daily lives? Can IoT boards help make civilians lives more safe? How can we take IoT boards into energy less environments and still be able to use them? There have been some obstacles that encumber our progress such as the lack of time so we didn't get to finish any project. However since we are still in the process of answering these questions, we are looking forward to all of the future work that we will continue working on.

Edgar Rico
Major: Computer Science
Intended transfer date: Spring 2018



Reproducible Floating Point Summation

Jessica Rios

Mentor: Dr. Jeremy Kozdon

Naval Postgraduate School



This project researches floating numbers to find out why the numerical order of numbers affects the outcome of their summation. Though computers can add non-floating numbers to achieve consistent mathematical results, when it comes to adding floating numbers, the computer produces round-off error. For example, each time we add the same 3 floating numbers in different order, the summation differs each time. Thus, the goal of this project is to add arithmetic formula into the code so that the order will not affect the addition process of floating numbers.

Jessica Rios
Major: Computer Science
Intended transfer date: Summer 2018
Hartnell Clubs: Computer Science Club

Modification and Analysis of the Energy Potential in Microbial Fuel Cell (MFCs)

Ezequiel A Rodriguez-Vazquez

Mentor: Dr. Sewan Fan

Research Scholars Institute – Hartnell College



HARTNELLCOLLEGE

Research into fuel cells is critical for the development of new alternative energies. The project focused on the analysis of Microbial Fuel Cells(MFC). By taking a multidisciplinary approach we measured the impact of several general micro and macro control factors on voltage output such as microbiology, soil makeup, temperature, chemistry, and volume on MCFs. Two different MFC systems were used; the first was the Mudwatt kit which uses soil as its fuel source, while the second was a Yeast Cell kit which uses fermenting yeasts. Overall, the addition of substrates to the soil cells produced the highest voltage output while maintaining good system health measured by low internal resistance in the MCF. While in the yeast cells, the use of different mediators significantly varied voltage output.

Ezequiel A Rodriguez-Vazquez
Major: Civil Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: Engineering Club



Controlling Contact Properties of a Monolayer MoS2 Transistor by Electrostatic Doping



Louis Paul Romero

Mentors: Houk Jang, Ph.D. and
Donhee Ham, Ph.D (PI)

Harvard John A. Paulson School of Engineering and Applied Sciences: Department of Applied Physics and Electrical Engineering

HARVARD
John A. Paulson
School of Engineering
and Applied Sciences

Transition-metal dichalcogenides (TMDCs) are a subject of intensive investigation because of their physical and intrinsic properties. Various two-dimensional (2D) TMDCs are atomically thin and exhibit properties that have flexible electronic and optoelectronic device applications. The inability to control doping concentration in thin-film transistors (TFTs), with a 2D TMDC semiconducting layer, has posed a challenge inhibiting development of new devices with low contact resistance (Rc). Doping by physical implantation has caused damage and defects to 2D TMDCs and chemical doping has resulted in instability due to unstable physisorption. Enabling electrostatic doping by the addition of gate electrodes at the contact region of a TFT may enable controllable carrier density and show a decrease in Rc. We have fabricated TFTs with a monolayer of metal-organic chemical vapor deposition molybdenum disulfide as the semiconducting layer and added two gate electrodes at the contact region via conventional photolithography and deposition processes. To generate and collect data, the carrier density in each device is modulated by applying voltage to the gate electrodes using a Signatone probe station. Four parameters of our devices, Rc, sheet resistance, transfer length and contact resistivity are then determined using Python, so that Rc in our non-dopable and dopable devices can be compared. Our research shows that electrostatically doping a TFT significantly decreases Rc. Creating an electrostatically dopable thin-film transistor with negligible Rc can potentially advance electronics innovating current state of the art technologies, which may lead to a higher quality of life ultimately benefiting mankind.

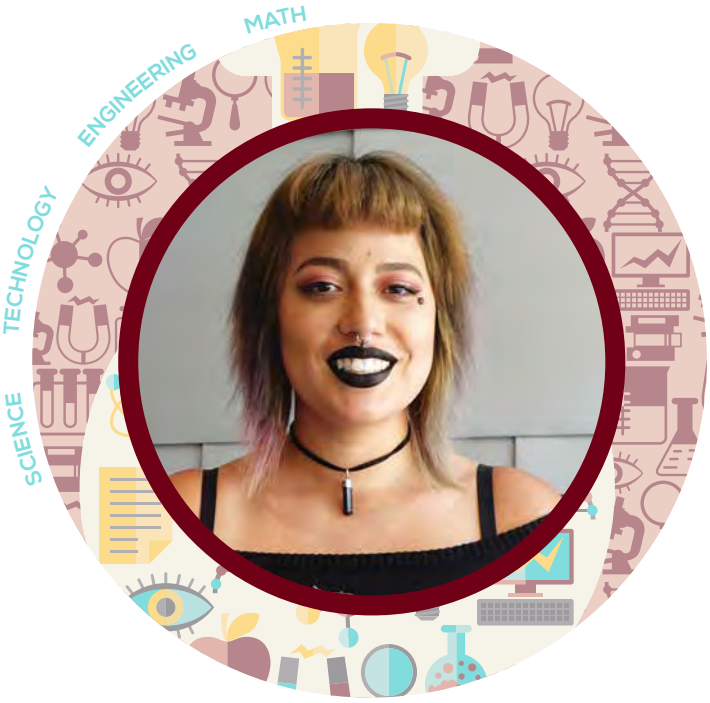
Louis Paul Romero
Major:Computer and Software Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: Hartnell College Math Club

Regression Model Predictions of Quality Scores for High Value Crops

Melody Sanchez

Mentor: Brian Palmer

Research Scholars Institute – Hartnell College



Food-Origins hosted three Hartnell College students, Kevin Guzman, Melody Sanchez, and Sergio Parra, as interns under Professor Brian Palmer's mentorship to work on their flagship platform. The company's platform works by enlisting harvesters to collect data through a hand-held scanner. Each scan collects a geographical point that registers the exact field location of the completed harvest along with date, time, and other relevant information. The team's objective was to create a regression model that utilizes harvest data, and tracks the quality of crops as a function of time since they were last harvested. To do this, the team had to first develop tools for handling the geometry of fields, using a mathematical tool called a cubic B-splines. Once the geometry of the fields is established, the field is split into smaller cells, which formed variables to be used in the regression model. The team received a crash course in harvesting strawberries, statistical analysis, and various programing languages such as node.JS and R to put together its project. Food-Origins will be expanding on the team's code in order to address real world challenges of produce quality, labor shortages, and consumer engagement.

Melody Sanchez
Major: Engineering & Computer Science
Intended transfer date: Fall 2018
Hartnell Clubs: Engineering Club



Identifying a Unique Bacterial Arsenic Metabolism from a Baterium from a Termite's Gut

Arnulfo Soria

Mentor: Dr. Chad Saltikov

University of California Santa Cruz



Arsenic in its inorganic form is a highly toxic element which can contaminate soils, ground water, and crops. Arsenic poisoning causes certain cancers, skin lesions, and hemolysis. Microbes can alter the environmental chemistry and toxicity of arsenic through oxidation and reduction pathways. These reactions have been observed in the environment in areas such as neutral pH aquatic systems, soils, and extreme environments. Less is known about microbial arsenic metabolisms in microflora within the gut. Previous work led to the isolation of an arsenate reducing microbe, Citrobacter TSA-1, from the hindgut of termites. This microbe lacks the commonly known arsenate reductase gene, arrA, that enzymatically transforms arsenate to arsenite during anaerobic growth on arsenate. We hypothesize that there is a unique arsenate reduction pathway in Citrobacter TSA-1 in the intestinal tract. For this reason TSA-1 is being investigated as a possible genetic model system to study arsenate reduction. A promising reductase gene homolog found in Archaea, ttrA, has previously been identified in Citrobacter. ttrA was tested and analyzed for gene expression during anaerobic arsenate respiration. To determine the optimal parameters for growth, we tested temperature, salinity and arsenate concentrations. In order to pursue genetic studies, a Kirby Bauer antibiotic profile was performed to identify possible counter selectable markers. This work will open the door to genetic manipulations in Citrobacter in order to test other genes involved in arsenate respiration. Results will allow us to better understand arsenic toxicity in the intestinal tract caused by arsenate reducing microbes.

Arnulfo Soria
Major: Biology
Intended transfer date: Fall 2018
Hartnell Clubs: Physics Club, Robotics Club, Students Interested in Medicine, Chemistry Club

Fighting MRSA through education — A case study and simulation

Diana Tamayo

Mentor: Debra Kaczmar

Health Care Connections



Methicillin Resistant Staphyloccocus aureus (MRSA) is becoming a huge epidemic, causing serious harm around the world. In the United States, it affects more than 90,000 people each year; about 20,000 of those people die, most of which are children. It is important for future health providers to understand the spreading of this organism and teach its significance to their patients. Here, we presented a lecture to prospective Licensed Vocational Nurses (LVNs) about MRSA, its significance in healthcare, antibiotic resistance, and prevention of the spreading of this infectious organism. We were able to present a case simulation that tested the LVNs understanding of MRSA. The case focused on 26-year old Linda Arroyo whom was confirmed positive for MRSA after an appendectomy. The LVNs assessed principles of correct Personal Protective Equipment (PPE) for prevention of infection as well as put emphasis on patient education. It is important for future healthcare providers to have hands-on experiences like these simulations in order for them to have experience before interacting with human patients. Not only so, it is also critical to stress patient education so that it may reduce the number of incidents that occur every year.

Diana Tamayo
Major: Biology
Intended transfer date: Fall 2018
Hartnell Clubs: SIMA

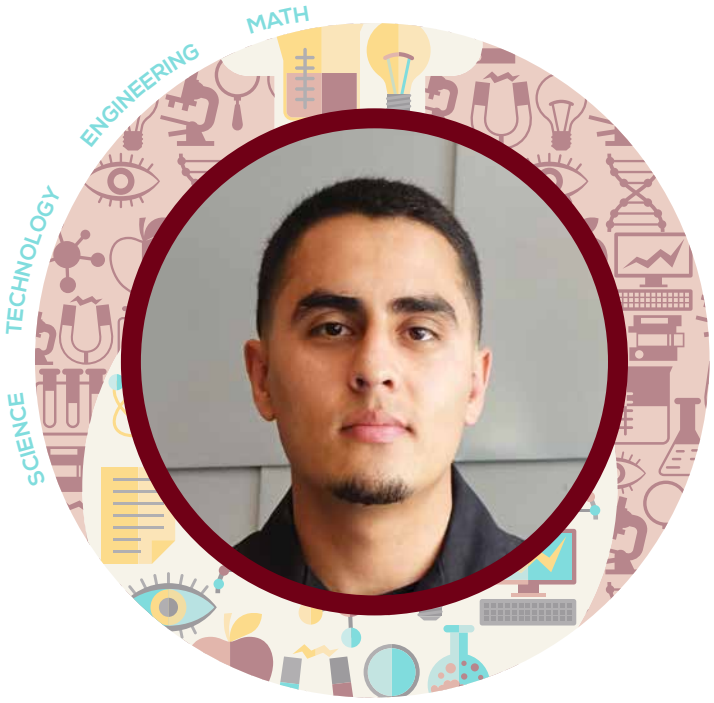


Building Microscopes to image plankton for high throughput testing of chemical sensitivity

Julio Cesar Tena

Mentor: Dr. Thomas Zimmerman

IBM



Plankton are microorganisms that are essential for life on Earth. They provide over half of the world's oxygen through photosynthesis and are the first link in the food chain, providing nutrition for practically every species of fish. In this project we are using a novel microscope and computer vision software to determine the health of plankton. We are also exploring the possibility of using plankton as chemical sensors. If we are able to detect anomalies in the behavior of these microorganisms in real-time, we can use them as sensors to monitor the health of the environment. Collecting water samples and bringing them back to the lab for manual analysis with conventional microscopes is just not practical for wide scale monitoring. In our work we are using a lensless microscope and software that can automatically track and analyze the behavior of plankton. The microscope uses an LED light source to project shadows of the microorganisms on an image sensor from a digital camera. We use image processing algorithms to track and measure plankton travel direction, velocity and body angle. We use this data to determine the health of the plankton. For example, one group of plankton we are studying called Stentor, retracts and swims backwards when they detect a source of danger.

Julio Cesar Tena
Major: Computer Engineering
Intended transfer date: Fall 2018
Hartnell Clubs: Math Club, Engineering Club

Observing the Night Sky at Fremont Peak Observatory

Irene Torrecillas

Mentor: Ron Dammann

Fremont Peak Observatory



In order to assist the resident astronomers at the Fremont Peak Observatory, four student interns and their mentors made weekly trips to the observatory in the part to serve as ambassadors of astronomy. We are able to take our classroom knowledge outside, and present ourselves with our organizations as professional students. Each Hartnell student got a chance to present their PowerPoint, and provide knowledge of space that is unknown to the general public. This can range from Galaxies, the Solar System, The Kuiper Belt, and Constellations. The biggest attraction is the telescopes, and the deep sky objects that are only visible at the Peak with said telescopes. Possibly the best planets to look at with our telescopes are Jupiter and Saturn. Jupiter is the more interesting planet to gaze upon because of its four massive and visible moons. Saturn is easily distinguishable due to its ring belt. Other objects that can only be visible are galaxies and Messier objects. The Andromeda Galaxy, our neighboring galaxy, is only 2.5 light years away. Compare that to Messier 81 and Messier 82, which are both over 11 light years away from us. Messier objects is a name given to other galaxies. Not only do the interns get a chance to connect with the people that attend, but they got a chance inspiring others to learn more about their universe. This internship truly gives the students of Hartnell College a taste of a workplace that is directly involved with the general public.

Irene Torrecillas
Major: Astronomy
Hartnell Clubs: SIMA



Cosmic Ray Water Cherenkov Detector

Yessica Torrez-Hernandez

Mentor: Dr. Sewan Fan

Research Scholars Institute – Hartnell College



Cosmic rays are high energy particles that travel through space and shower Earth. Cherenkov radiation consists of electromagnetic radiation that is produced when remnants of scattering cosmic rays travel through earth's atmosphere and surpass the speed of light in a material medium. The equation, cos=1, dictates the cone shaped light effect where is equal to the velocity of the particle divided by velocity of light through a vacuum and being the refractive index of the medium. The objective of the project was to create a Cherenkov detector with available resources. In our project, we used distilled water in two thermos bottles as the medium to produce Cherenkov radiation. To observe the Cherenkov radiation from cosmic rays, two Photomultiplier detectors (PMT) were used and submerged in a thermos bottle covered with light tight foils. Two tests were done by placing both thermos close together and moving them away from each other in vertical and horizontal directions while testing coincidence. For the third test, a single thermos was placed between two scintillator paddles that have been proven to work by previous internships and coincidences were tested again. Results from the tests confirmed that the Cherenkov detectors were detecting Cherenkov radiation produced by cosmic particles.

Yessica Torrez-Hernandez
Major: Computer Science
Intended transfer date: Fall 2019
Hartnell Clubs: Robotics Club, Computer Science Club, Engineering Club

Biology Internship

Connie Ugalde

Center for Translational Applications of Nanoscale Multiferroic Systems Research Experience for Undergraduates, University of California, Los Angeles



The Center for Translational Applications of Nanoscale Multiferroic Systems Research Experience for Undergraduates, University of California, Los Angeles provides research experience and training in cutting-edge multiferroic technology and provides education on industry and entre/intrapreneurship.

Connie Ugalde
Major: Biology
Intended transfer date: Fall 2017
Hartnell Clubs: MESA, Engineering Club, Hartnell SHEPS



Redesign of Closed Environmental Modular Aeroponic System for Improved Automation Efficiency

Jean-Paul Varagnat

Mentor: Isabel Stumfall

University of California Santa Cruz



Improving aeroponic efficiency was needed because the high demand for organic sustenance production and minimizing resource waste are essential considerations for expanding populations in water-critical zones. The aeroponic advantage of nutrient-laden mist delivery systems to suspended root structures in a controlled soil-less environment, has been found to be at least 97% more water efficient than traditional agriculture. This research expands upon an automated aeroponics system developed for the expressed purpose of making a home unit available to low-income families with little to no knowledge of in-home plant propagation. Three broad topics shaped the approach to ensuring successful growth: the air composition, the hydrologic profile being implemented, and the light characterization. This occurred in a modular "grow box" where the primary research and redesign is taking place. The total system power consumption was reduced through replacement of spray mechanism with a piezoelectric transducer. Carbon Dioxide delivery to plants has been improved with the air intake for the mist generation. The previous cylindrical housing for the growing medium was not encouraging dendritic root growth, but the new design has increased available rooting areas by 125%. With each aspect, the root growth structures correlate to overall plant growth, the measurement of root length and thickness were mapped and compared to existing research on healthy root structures for each in order to determine successful integration of the research assertions put forth. Developing this nutrient delivery system reduced the projected cost and increased the overall yield of the current system.

Jean-Paul Varagnat
Major: Engineering
Intended transfer date: Spring 2018
Hartnell Clubs: Robotics Club, Engineering Club, Earth Science and Sustainability Club, Astronomy Club

Computer Science Internship

Armand Wilson

Extensible Undergraduate Research in Communications Applications, University of Texas, Austin



Extensible Undergraduate Research in Communications Applications at University of Texas, Austin is a Research Experience for Undergraduates Program sponsored by the National Science Foundation. Research is focused on applications of Communications, Networks and Systems.

Armand Wilson
Major: Computer Science
Intended transfer date: Fall 2017
Hartnell Clubs: MESA, EOPS





The complete mitochondrial genome of Xiphister atropurpureus (Perciformes: Stichaeidae)

Hartnell College Genomics Group

Mentor: Dr. Jeffery Hughey

Hartnell College

Hartnell College Genomics Group:

Laura Ayala, Joseph Becerra, Ga Hun Boo, David Calderon, Angelo DiMarco, Armando Garcia, Reuben Gonzales, Jeffery R. Hughey, Gustavo A. Jimenez, Thomas A. Jimenez, Jose Lopez, Natalia I. Marquez, Ana I. Meza, Pedro Ortega, Roberta K. Overman, Conrado Pena, Michael Porras, Danielle E. Rodriguez, Juan Solorio, Arnulfo Soria, Gabriel Suarez, Diana A. Tamayo & Frances L. Wong

Analysis of the marine black prickleback Xiphister atropurpureus Kittlitz using 76 bp paired-end Illumina sequences resulted in the assembly of its complete mitogenome. The mitogenome is 16,518 bp in length and contains an origin of light strand replication, control region, 22 tRNA, 2 rRNA, and 13 protein-coding genes. Content and organization of the X. atropurpureus mitogenome is consistent with other teleost. Phylogenetic analysis of X. atropurpureus resolves it in a clade with another member of the Stichaeidae, Chirolophis japonicus Herzenstein.

We thank our STEM PARTNERS

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Monterey Institute for Research in Astronomy MIRA

CSUMB REU Monterey Bay Regional Ocean Science Research Experiences for Undergraduates

NPS Praestantia per Scientiam

UC Riverside University of California

University of California Santa Cruz

TEXAS The University of Texas at Austin

The University of California Irvine

The University of California UCLA

USDA

USDA NRCS Natural Resources Conservation Service

WE

Western Mechanical Solutions SUSTAINABLE HEATING COOLING

For more information about the
Hartnell College STEM Summer Internship Program visit
www.hartnell.edu/steminternship



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