

**NASA CURRICULUM IMPROVEMENT PARTNERSHIP
AWARD II (CIPA II) PROJECT**
at
Hartnell College
Engineering Program Upgrade with Project Management

**Project Management Institute
Research Symposium**

**September 6, 2008
Hartnell College, Salinas, CA**



NASA-CIPA II Project at Hartnell College ***Engineering Program Upgrade with Project Management***

Hartnell College is one of 10 national recipients of the three-year NASA-sponsored CIPA II program, which is administered by the United Negro College Fund Special Programs Corporation (UNCFSP). This program was officially signed in January, 2006 and initiated in February, 2006. The funding for the Hartnell College award is \$125,000, \$125,000, and \$150,000 for years one, two, and three, respectively, with years two and three contingent on Hartnell College CIPA performance and availability of NASA funding. In July 2007, Hartnell was recognized as the top performing institution in the CIPA II group and received the NASA-CIPA "Award of Excellence".

The CIPA II Project at Hartnell College builds on the success of Hartnell's CIPA I project that significantly upgraded the college's Astronomy program. Both CIPA projects are viewed as benchmarks under the following Hartnell College strategic initiative:

"Hartnell College has made a major commitment to expanding and improving its science, technology, engineering, and mathematics (STEM) programs. . . . Enrolling, retaining, and transferring increased numbers of underrepresented students, particularly Latinos, in engineering majors is one of the college's long-term goals for STEM programs."

(Educational and Facilities Master Plan 1999-2010)

The Hartnell College Engineering Program Upgrade with Project Management supports the above strategic initiative by:

- infusing principles of project management into all current engineering courses;
- making the engineering curriculum more current and relevant to developments in modern technology;
- connecting our underrepresented students to university research early in their development;
- giving STEM students critical skills like project management that will give them an advantage when entering the workforce;
- working with our partners to develop internship support projects as critical platforms to launch our students into universities and the workforce.

The Project Management Institute (PMI)

The Project Management Institute for Hartnell STEM Interns is a training program aimed at infusing project management training into early research experiences for science, technology, engineering, and mathematics (STEM) interns from Hartnell Community College. The Institute consists of three phases of student participation: the Internship Orientation Workshop, the Reflective Research Discussions, and the Research Symposium. As a whole the Institute is intended to support the interns throughout their internships by providing project management training and then asking the students to conduct their internships using the project management model. Ultimately, the interns not only benefit from engaging in a successful early research experience, but learn valuable project management skills as well.

Internship Orientation Workshop

The Internship Orientation Workshop was held on Tuesday, June 18th, 2008 and served as an introduction to Project Management for the student interns. The interns received formal training in Project Management terminology and organization and then immediately applied that information to an engineering competition. The interns were divided into teams and given the task of using ordinary materials to design and build a top with the goal of creating a top with the longest spinning time. The interns were required to work in their teams to write a project plan to guide the various phases of the top competition. An integral part of the day was a final debrief on how well each team followed their project plan and what benefits might have been derived from the project management structure carried out by the teams. Finally, the Workshop laid out the phases and expectations for the whole of the Project Management Institute.

Reflective Research Discussions

The Reflective Research Discussions continued throughout the summer and helped the Hartnell STEM interns, their internship mentors, and the Hartnell CIPA II team remain connected as a group. A Google Group web forum was established and discussion prompts were posted each week throughout the summer. The interns were required to post a response to the web forum by Friday of each week. The June prompts were focused on supporting the interns as they constructed their internship project plans. The July prompts gave the interns regular chances to reflect upon their work and to communicate their progress in their internship projects. The August prompts helped the interns prepare for the conclusion of their projects by asking them to assemble the pieces of their final symposium presentation.

Research Symposium

The Research Symposium will be held on September 6th, 2008 and will serve as a venue for the summer cohort of Hartnell STEM interns to present their work in a professional manner to each other and to representatives from Hartnell College, grant funding representatives, local media and industry and associated research institutions.

Hartnell NASA-CIPA II Team

Dr. Pimol Moth, Astronomy/Physics Faculty, Co-Principal Investigator

Ms. Shannon McCann, MESA Director, Co-Principal Investigator

Mr. Jim Riley, Math Faculty

Mr. Jim Butler, Engineering/Math Faculty

Mr. Joe Welch, Computer Science Faculty

Mr. Andy Newton, Planetarium Director

The members of the Hartnell NASA-CIPA II team would like to extend our sincere thanks to the following people for their commitment to and support of the NASA-CIPA II Project and the 2008 Project Management Institute.

Hartnell NASA-CIPA II Advisory Board

Dr. Michael Isaacson, Acting Dean, Baskin School of Engineering, UC Santa Cruz

Ms. Adrienne Harrell, Director of Undergraduate Affairs, Baskin School of Engineering, UC Santa Cruz

Ms. Barbara Love, Articulation Officer, UC Santa Cruz

Ms Lisa Hunter, Associate Director of Education & Human Resources, Center for Adaptive Optics

Dr. Christopher Brophy, Faculty, Naval Postgraduate School

Dr. Craig Martell, Faculty, Naval Postgraduate School

Dr. Ignacio Pando, Counselor, Hartnell College

Ms. Beverly Grova, Vice President of Advancement, Hartnell College

Mr. Andy Newton, Planetarium Director, Hartnell College (Board Chair)

Dr. Charlie McDowell, Faculty, Baskin School of Engineering, UC Santa Cruz

Mr. Philip Deutschle, Faculty, Salinas High School

Dr. Jesse Cude, Science & Math Institute Director, Hartnell College

Summer 2008 Hartnell Intern Mentors and Advisors

LT Paige Adams, Naval Postgraduate School

Dr. Christopher Brophy, Naval Postgraduate School

Mr. Doug Brown, Fremont Peak Observatory Association

Dr. Timothy Chung, Naval Postgraduate School

Mr. Scott Cote', Naval Postgraduate School

Mr. Ron Dammann, Fremont Peak Observatory Association

Dr. Simson Garfinkel, Naval Postgraduate School

Dr. David Grau, Kennedy Space Flight Center

Mr. Ryan Kinnet, Naval Postgraduate School

Mr. Sean Kragelund, Naval Postgraduate School

Dr. Mathias Kölsch, Naval Postgraduate School

Dr. Craig Martell, Naval Postgraduate School

Mr. Tadd Masek, Naval Postgraduate School

Dr. Knox Millsaps, Naval Postgraduate School

Mr. Aurelio Monarrez, Naval Postgraduate School

Dr. Enrico Ramirez-Ruiz, University of California Santa Cruz

Ms. Jill Naiman, University of California Santa Cruz

Mr. Dave Samuels, Fremont Peak Observatory Association

Dr. Brian Steckler, Naval Postgraduate School

Ms. Marissa Viens, Monterey Bay Aquarium

Dr. Juan Wachs, Naval Postgraduate School

Research Symposium Presentation Schedule

Performing Arts 125

- 4:00 – 4:05 pm **Welcome**
Dr. Pimol Moth & Shannon McCann
NASA-CIPA II grant Principal Investigators
- 4:05 – 4:20 pm **Improvements to Gas Turbine Engine Cell Instrumentation**
Rodrigo Sanchez, *Naval Postgraduate School*
- 4:20 – 4:35 pm **Annotating Technical Chat**
Lawrence Keener, *Naval Postgraduate School*
- 4:35 – 4:50 pm **Fremont Peak Astronomy Team**
Timothy Fuller, Christina Gonzalez, Fabian Hernandez, Miguel Rodriguez, Maria Uribe, Victor Zarate, *Fremont Peak Observatory*
- 4:50 – 5:05 pm **Embedded Video Processing on an FPGA-Based Platform**
Hector Zhu, *Naval Postgraduate School*
- 5:05 – 5:20 pm **Probabilistic Search Methods**
Jose Quezada, *Naval Postgraduate School*
- 5:30 – 7:00 pm
Banquet
Hartnell College Center Steinbeck Hall
- 7:15 – 7:30 pm **Modeling an Air Vitiator with Computational Fluid Dynamics**
Daniel Chairez, *Naval Postgraduate School*
- 7:30 – 7:45 pm **Theoretical Astrophysics at UC Santa Cruz**
Maria Uribe, *University of California Santa Cruz*
- 7:45 – 8:00 pm **Hastily Formed Networks**
Leonel Medrano and Genaro Sanchez, *Naval Postgraduate School*
- 8:15 – 8:30 pm **Aquatic Animal and Sea Otter Research Experience**
Tiana Diaz, *Monterey Bay Aquarium*
- 8:30 – 8:45 pm **Digital Media Imaging and Encryption**
Tim Courrejou, *Naval Postgraduate School*
- 8:45 – 9:00 pm **Sea Fox 1 Control Architecture Overhaul**
Ignacio Maravilla, Justin Jordan, Luciano Cerritos, *Naval Postgraduate School*

Research Symposium Banquet Schedule

Hartnell College Center Steinbeck Hall

5:45 pm

Welcome

Dr. Pimol Moth & Shannon McCann
NASA-CIPA II grant Principal Investigators

6:10 pm

Dinner Speakers

Dr. Phoebe K. Helm
President/Superintendent, Hartnell College

Dr. Craig Martell
Associate Professor, Naval Postgraduate School

Mr. Doug Brown
Board President, Fremont Peak Observatory Association

Honorable Dennis Donohue
Mayor, City of Salinas

Mr. Andy Newton
NASA-CIPA II grant Partnership Coordinator

Dr. Jesse Cude
Science & Math Institute Director, Hartnell College

6:40 pm

Presentation of Interns

Rodrigo Sanchez, *Naval Postgraduate School*
Lawrence Keener, *Naval Postgraduate School*
Timothy Fuller, *Fremont Peak Observatory*
Christina Gonzalez, *Fremont Peak Observatory*
Fabian Hernandez, *Fremont Peak Observatory*
Miguel Rodriguez, *Fremont Peak Observatory*
Maria Uribe, *Fremont Peak Observatory & UC Santa Cruz*
Victor Zarate, *Fremont Peak Observatory*
Hector Zhu, *Naval Postgraduate School*
Jose Quezada, *Naval Postgraduate School*
Daniel Chairez, *Naval Postgraduate School*
Leonel Medrano, *Naval Postgraduate School*
Genaro Sanchez, *Naval Postgraduate School*
Tiana Diaz, *Monterey Bay Aquarium*
Tim Courrejou, *Naval Postgraduate School*
Ignacio Maravilla, *Naval Postgraduate School*
Justin Jordan, *Naval Postgraduate School*
Luciano Cerritos, *Naval Postgraduate School*

7:00 pm

Adjourn to Evening Presentation

Improvements to Gas Turbine Engine Cell Instrumentation

Rodrigo Sanchez

Naval Postgraduate School

Advisor: Knox Millsaps

My project involves the analysis of the airflow throughout an aircraft gas turbine engine. A gas turbine engine has four major parts: the compressor, the combustor, the power turbine, and the gas turbine. The gas turbine engine operates with air and fuel. The air follows a particular flow direction throughout the engine cycle. First, the air flows into the compressor, then the combustor chamber, and finally through the turbines which flush it out through the exhaust. Air is a mixture of gases, and one of them is oxygen, which is used to make a combustion reaction with the fuel. Therefore, a higher oxygen concentration in the gas turbine engine produces a higher output power on the engine. Conversely, lower oxygen concentration produces lower output power. In addition, the amount of oxygen in the air depends on the ambient (weather) conditions. Temperature, pressure, and humidity of the air all play an important role in determining the amount of oxygen in the air. Thus, it is critical to take accurate measurements of air pressure, air mass flow, and output power. Since the measurements are taken by a computer, it is necessary to verify if they are accurate. Consequently, manometers have been set up to measure the air pressure entering in the compressor's engine. Once the results from the manometers are taken, they will be compared with the computer's measurements to confirm that they agree. After the comparison with the measurements is done, data is gathered to find out the efficiency of the engine.



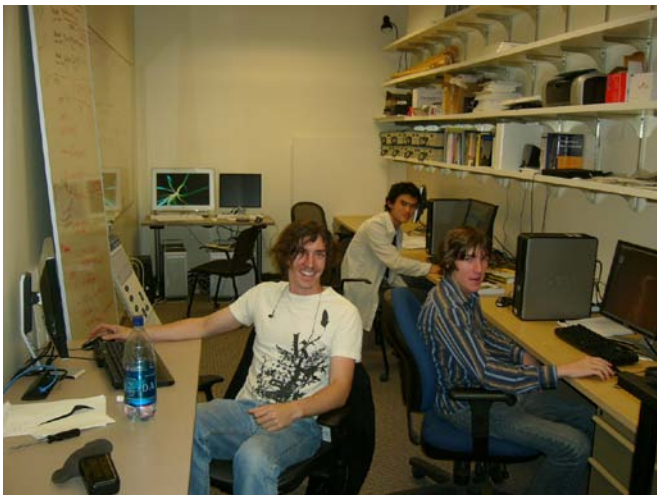
Rodrigo Sanchez plans to continue his education at Hartnell this fall to study Mechanical Engineering. He earned the National Science Foundation Computer Science, Engineering and Mathematics Scholarship in spring 2008. He attended Everett Alvarez High School.

Annotation of Tactical Chat

Lawrence Keener

Naval Postgraduate School
Research Advisor: Dr. Craig Martell
Research Mentor: LT Paige Adams

During this internship, I assisted in a project to use natural language processing techniques to detect conversation threads in text-based chat. My task, along with two other interns, was to hand-annotate a chat corpus by conversation thread and create programs to extract data from these annotated files. For the chat analysis programs, we primarily utilized the Python language along with the Python-based Natural Language Toolkit (NLTK), an open-source collection of APIs and tools designed to accomplish myriad natural-language processing tasks. Some of the tasks that our programs accomplished were to extract user names, thread labels, and timestamp data from raw chat files and convert them to XML format. Another program was used to measure the average length of a conversation given an annotated chat file. The hardest program to write was one that took a file that had more than one annotation and compared the annotations. To make it more accurate and to see what the local agreement was within each file I had to make a program that would accept an input for the desired local difference and then compare files to see if users believed pieces of the conversation were in the same thread, even if they were not in the same thread number. There was a problem getting NLTK to work properly and that has yet to be fixed. This was a problem and altered the way we wrote our programs but we were able to overcome this obstacle. We have our training data and programs to analyze it so we just need to use it to create a prototype. There are a wide range of practical applications for such systems, such as law enforcement tracking sexual predators, surveillance on terrorists, and even creating more user friendly search engines.



Lawrence Keener is continuing his education at Hartnell College studying Computer Engineering this fall. He earned the National Science Foundation Computer Science, Engineering and Mathematics Scholarship in spring 2008. He attended Dickinson High School.

Fremont Peak Astronomy Team

Timothy Fuller, Christian Gonzales, Fabian Hernandez, Miguel Rodriguez, Maria Uribe, and Victor Zarate

Research Advisor: Ron Dammann and Doug Brown

Our team's primary goal was to develop project management skills and learn practical, operative experience in that area. The primary purpose of this project was to provide information on Astronomy to the public through the Fremont Peak Observatory Association (FPOA) Public Nights and special events hosted by FPOA or Hartnell College. By giving presentations on astronomical topics and showing visitors celestial objects through telescopes, we achieved this purpose. In the process of operating the telescopes, we familiarized ourselves with the location of the prominent stars and constellations. By adequately preparing for the astronomy presentations and questions posed by visitors throughout the night, we familiarized ourselves with astronomical facts by researching the objects of interest in the night sky. In order to reach our purpose and goals, we developed a project plan to keep our objectives clear. This project plan also established communication structures, staffing positions for team members with a description of their responsibilities, a schedule of night programs, guidelines for each evening of operation, and crucial procedures to decrease risk in projected situations, thereby increasing quality.

This year Miguel Rodriguez and Fabian Hernandez piloted a research component to the Fremont Peak internship. The goal of this project was to image a Near Earth Asteroid (NEA) with the aid of a digital electronic imaging device called the Charge Coupled Device (CCD). They created a manual outlining the proper procedures and guidelines to be followed when using the CCD on the 30-inch telescope. This project allowed them to gain fundamental knowledge of CCD imaging, image correction, and astronomical data analysis.



Timothy Fuller plans to continue his education at Hartnell College studying Biology and Business Administration. He attended P & T High School. Christina Gonzalez plans to attend a four year university in fall. She attended Salinas High School. Fabian Hernandez is a former Hartnell College student who transferred to UC Santa Cruz in fall of 2007 to study Electrical Engineering. Fabian attended Everett Alvarez High School. Miguel Rodriguez is transferring to UC Santa Cruz this fall to study Biology/PreMed. He attended Salinas High School. Maria Uribe is a former Hartnell College student who transferred to UC Berkeley in fall of 2008 to study Mathematics. Maria attended Salinas High School. Victor Zarate plans to continue his education at Hartnell College this fall. He attended Salinas High School.

Embedded Video Processing on an FPGA-Based Platform

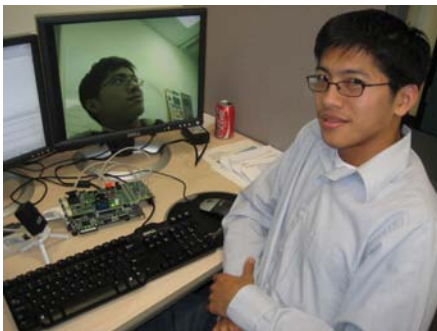
Hector Zhu

Naval Postgraduate School

Research Mentor: Mathias Kölsch

Research Co-Mentor: Juan Wachs

Embedded systems have found their way into in almost all modern appliances, vehicles and devices ranging from toaster ovens, handheld devices, robotic vision, to aircrafts like the Unmanned Aerial Vehicles (UAV). Their core component revolves around a small, efficient, low-power processor capable of handling a few instructions or processor-intensive data. Field Programmable Gate Arrays (FPGAs) are embedded programmable processors that meet many constraints required for some applications. Small vehicles such as UAVs and robots require on-board video processing which FPGAs can help facilitate. The Virtex-4 Video Starter Kit (VSK) by Xilinx contains peripheral hardware for video processing applications and it's built around a high-performance FPGA. The FPGA processes the incoming video data from a colored image sensor camera and outputs it through the Video Input/Output Daughter Card (VIODC). Xilinx's Embedded Development Environment (EDK) allows us to develop FPGA-related applications including video processing. The EDK abstracts most of the difficult hardware level implementation by applying various software techniques. Through the EDK platform, blocks of software logic are connected to interface hardware, complex designs are imported from other tools, C programs manage and facilitate the access of these blocks, and a downloadable file to the FPGA is produced. During our video processing designs, Matlab was a powerful scientific and mathematical tool that allowed us to simplify video logic designs by allowing easy operations such as drag-and-drop. One of the applications that we developed with the VSK is a color threshold application. It compared the red, green, and blue intensity levels of the video signal to a threshold value and either maintained their original color value or set it to zero (dark). The design of video applications for the VSK can be difficult due to many software incompatibilities and lack of up-to-date support. Despite this, significant advantages of the FPGA in portability and efficiency in logic implementation as well as power requirements and heat dissipation make it an obvious choice for many applications. Future embedded vision system research through the FPGA-based Virtex-4 VSK is an object-tracking system where a panning video camera captures live video, the processor identifies and tracks predefined objects, and outputs these results in real-time through a monitor or a data channel.



Hector Zhu is a former Hartnell College student who transferred to Cal Poly SLO in fall of 2006 to study Computer Engineering. He attended Salinas High School.

Probabilistic Search Methods

Jose Quezada

Naval Postgraduate School
Advisor: Dr. Timothy Chung

Different search schemes are often used when a randomly-moving target is in an uncertain location and the severity of the situation requires that an action be taken promptly. Consider the case where the target is stranded in the middle of a forest and a thunder storm approaches quickly. In this situation the searcher attempts to find the target as quickly as possible in an efficient manner. An optimal search strategy might take time to develop; therefore, relying on a preplanned search strategy is important. There are many preplanned search strategies that can be exercised in these moments. Probabilistic search theory is an approach to model and study various search strategies. If information arrives that there is an ambiguous target in an uncertain location, the best preplanned strategy will allow the searcher to begin immediately. Different search strategies are modeled and compared via simulation studies in the presentation.



Jose Quezada plans to continue his education at Hartnell College this fall and will transfer to San Jose State in fall 2009 to study Civil Engineering. He attended Cibola High School.

Modeling an Air Vitiator with Computational Fluid Dynamics

Daniel Chairez

Naval Postgraduate School
Mentor: Christopher Brophy

An air vitiator is used to simulate the most accurate upper atmospheric conditions for testing the combustor of an engine. The “vitiator can” takes high pressure air and then is injected with different fuels such as hydrogen and propane. Propane is utilized for these simulations because its combustion produces less water vapor than that of hydrogen. The fuel is ignited in the vitiator and its geometric design allows for the fuel to continuously keep combusting, using a technique called “flame holding.” Flame holding occurs when air is trapped in a swirling motion in the vitiator. This air is brought to extremely high temperatures, which cause immediate ignition when it comes in contact with the fuel. These scenarios are an integral part of the vitiator’s ability to provide air to the engine’s combustor. The air entering the combustor is about 4000 Kelvin in temperature after it leaves the vitiator. The higher a plane or rocket travels the colder the air becomes and it also contains less water vapor. These engines will be traveling in speeds of upwards to Mach 1 through 5, so up to 5 times the speed of sound. At these high velocities the engines air will be heated by the kinetic energy and momentum of the air particles as they collide with the engine of a plane or rocket. For example an aircraft’s wing experiences high temperatures at the very front of the wing where the air is disrupted the most as the wing passes through the air. Having a properly working air vitiator is essential to providing the most accurate testing of an engine. After modeling the vitiator design using computational fluid dynamics to verify that it is flame holding, actual testing of the vitiator design is conducted in the rocketry lab.



Daniel Chairez is transferring to Cal Poly San Luis Obispo this fall to study Mechanical Engineering. He earned the National Science Foundation Computer Science, Engineering and Mathematics Scholarship and the Matsui Foundation Scholarship in spring 2008. He attended Camelback High School.

Theoretical Astrophysics at UC Santa Cruz

Feeding Intermediate Mass Black Holes (IMBHs)

Maria Uribe

University of California Santa Cruz

Research Advisers: Enrico Ramirez Ruiz and Jill Naiman

Over the last few years evidence has accumulated pointing to the possible presence of a 1000 solar mass black hole in some globular clusters. The question arises: how can we tell which globular clusters contain intermediate mass black holes (IMBHs)? The main issue here resides on whether sufficient mass can be supplied to the black hole by the winds of the stellar members in order for it to accrete efficiently. To this end, I have been working on solving the equations of hydrodynamics that will tell us the critical point at which the winds of the red giant stars will either sink to the center of the cluster and be eaten by the black hole or escape. The injected mass by stars strongly depends on the age of the globular cluster. Massive stars live shorter lives and have the greatest effect on the mass injection. The main goal of the project is to calculate the mass supplied to the black hole during the life of the stellar cluster so that we can accurately determine its expected luminosity.



Maria G. Uribe is a former Hartnell College student who transferred to UC Berkeley in fall of 2008 to study Mathematics. Maria attended Salinas High School.

Hastily Formed Networks (HFN)

Leonel Medrano & Genaro Sanchez

Naval Postgraduate School
Research Advisor: Brian Steckler
Research Mentor: Scott Cote'

The primary goal for this project in the HFN lab was to improve the effectiveness and the efficiency of the U.S. and the International Disaster Relief Operations. A large part of this internship was dedicated to designing and building portable screens made of PVC pipes that will provide visualization of areas that have been affected by any kind of disaster. The screens are durable, easy to set up and lighter than some other material that could be used. The portable screens are going to be implemented on Fly Away Kits (FAK) which include portable communication equipment with a power generating system that uses renewable energy sources such as solar panels and wind turbines. The portable screens were designed in such a way that all pieces fit into a 30 inch kit, so that they can be easily transported to the scene of a disaster. The interns designed two sets of screens, one of which is going to be set up in a new visualization lab at NPS and the other to be included in one of the Fly Away Kits. The visualization lab is a replica of the one at San Diego State University. It includes new software that allows users to hold video conferences. It also includes projectors that are used to display high quality images on the PVC screens. These portable screens are tremendously important during live presentations at disaster zones because they will help the audience to fully visualize the situation with the large and clear images that they produce.



Leonel Medrano is transferring to Cal Poly San Luis Obispo this fall to study Mechanical Engineering. He attended Everett Alvarez High School. Genaro Sanchez is transferring to Cal Poly San Luis Obispo this fall to study Electrical Engineering. He attended Everett Alvarez High School. Both Leonel and Genaro earned the National Science Foundation Computer Science, Engineering and Mathematics Scholarship in spring 2008 and Leonel earned the Matsui Foundation Scholarship as well.



Aquatic Animal and Sea Otter Research Experience

Tiana Dias

Monterey Bay Aquarium

Advisor: Marissa Viens

The internship at the Monterey Bay Aquarium gave me experience with aquatic animals that can be used in my career as a Registered Veterinary Technician (RVT). During the internship, I was trained in the following tasks: anesthesia prep and monitoring, husbandry operations, medical care, data entry, diagnostic procedures, field tracking, and research on sea otters. Animals included were sea otters, river otters, dolphins, fish and marine birds. As a special project, I assisted Michelle Staedler, a researcher with the Sea Otter Research and Conservation (SORAC) program. Weights of sea otter pups from relevant age categories were extracted from a database to analyze growth rates based on two different captive rearing techniques: the Swim Program, in which human caregivers hand-raise pups (a technique no longer in use) and the Surrogate Program, in which pups are raised by adult female sea otters acting as surrogates (current method in use). While there are some trends to the data, the sample size is small and data is still being analyzed. The data will eventually be compiled to develop a growth model which can then be used to predict the growth rate of free-ranging sea otter pups. Sea otter pup growth rates are part of a larger body of research on the reproductive success of free-ranging sea otters. *I would like to thank Michelle Staedler for allowing me to help with her research.*



Tiana Dias plans to continue her education at Hartnell College and study Animal Health Technology this fall. She attended high school in the Santa Cruz County School District.



Digital Media Imaging and Encryption

Tim Courrejou

Naval Postgraduate School
Research Advisor: Simson Garfinkel

Computer forensics is the process of analyzing digital media. The development of computer forensics tools requires real world media, e.g. used USB flash drives, SD cards, hard drives, etc. The goal of this project was to add functionality to existing forensics software, afcrypto, developed by Dr. Garfinkel, and to use existing imaging software, aimage, also developed by Dr. Garfinkel, to image digital media that Dr. Garfinkel has acquired in the past few years. This software is used for the analysis of evidence acquired by law enforcement. By the end of the project I had successfully added new functionality to afcrypto. The new functionality consists of the ability to add asymmetric encryption to an image encrypted with symmetric encryption and vice-versa. I also helped out with the backlog of media that needed to be imaged and wiped.



Tim Courrejou is a former Hartnell College student who transferred to Fresno State University to study Computer Engineering. He attended Salinas High School.

Sea Fox 1 Control Architecture Overhaul

Luciano Cerritos, Justin Jordan, Ignacio Maravilla

Naval Postgraduate School

Research Advisors: Sean Kragelund, Tadd Masek, Aurelio Monarrez, and Ryan Kinnet

The main goals of the project were to install the Honeywell HG-1700 IMU (Inertia Measurement Unit) and the Blueview BV-3000 Sonar head on the Sea Fox 1 USV (Unmanned Surface Vehicle). Sea Fox 1 is used for unmanned surveillance. The addition of the IMU sensor will provide the Naval Postgraduate School researchers with the ability to compensate for changes in the vehicle's attitude, allowing them to stabilize the camera positions, and provide better stability to control Sea Fox 1. The IMU will provide these features by transmitting the change of Sea Fox 1's position to the onboard CPU, in respect to three different axes (x,y,z). The pitch, roll, and yaw of the vehicle define the attitude of Sea Fox 1. The addition of a forward looking Sonar will provide Sea Fox 1 with the capability to perform object detection, and or avoidance by transmitting data to the onboard CPU.



Luciano Cerritos plans on continuing his studies on Computer Science at Hartnell College this fall. He attended Alisal High School. Justin Jordan is studying Electrical Engineering at Hartnell College this fall. Justin attended King City High School. Ignacio Maravilla is continuing his education at Hartnell College studying physics this fall. He attended Salinas High School.

Determining Material Thickness Using Optical Density Analysis of X-rays

Ricardo Fernandez

NASA Kennedy Space Center
Research Advisor: David Grau

The goal of my research project was to determine quantitatively the limits and accuracy of the theoretical x-ray optical density methods which have been used to determine thickness variations in materials (both qualitatively and quantitatively). We planned to do this by examining a stainless steel wedge that was manufactured locally at the KSC prototyping lab, dimensionalized by machine at the KSC failure analysis lab, and x-rayed several times at KSC WYLE labs by varying the x-ray's parameters (i.e. current, voltage, and time). Analysis will be conducted creating several grayscale vs. thickness curves; each curve correlating to specific parameters used. We will examine how varying the parameters affects the curves as well as examining the boundaries of the curve. Analysis will also be conducted on the limitations and accuracy of determining thicknesses via x-ray analysis as x-ray exposure parameters vary. This will be achieved by analytically calculating and comparing the variation in thickness at a certain location with its corresponding difference in grayscale. The thickness to grayscale relationships will allow for an estimated calibration of the x-rays used to make thickness measurements locally and globally to determine the range where optical density analysis is applicable.



Ricky Fernandez is transferring to the University of California Santa Cruz this fall to major in Physics. He has been offered another NASA internship for the summer of 2009. Along with the NASA internships comes a generous scholarship to help him with college tuition and expenses. He has also received the Pister Scholarship from UCSC for fall 2008 and earned the National Science Foundation Computer Science, Engineering and Mathematics Scholarship in spring 2008. Ricky attended Monterey High School.