RESEARCH REPORT

Name:	**Affiliation (University):**
Leslie D. Almberg	University of Alaska Fairbanks
Research Advisor:	**Host Institution:**
HOSHIZUMI, Hideo	Geological Survey of Japan (AIST)
Research Subject:	
Volcanology	

1. Research Description:

Our project is part of an on-going research project at Unzen volcano, Kyushu Island, Japan. The Unzen Scientific Drilling Project (USDP) commenced in April 1999 with the aim to drill to the conduit, still hot from the 1990-'95 eruption, in addition to revealing much about Unzen's eruptive history. By examining samples from the drill core, we aspire to unravel the mysteries of more than 500 ka of activity at this volatile volcanic center.

The specific aim of our project was to quantify variations in the vesicularity of products erupted from Unzen over the past 500 ka. Previous, qualitative assessments of Unzen products have revealed decreasing vesicularity of products with decreasing age/depth. Researchers believe there is a direct relationship between the proportion of vesicles preserved in a sample and the explosivity of the eruptive behavior. From this it follows that eruptions at Unzen have become more effusive over time.

We initially hoped to measure the vesicularity directly using point counting and imaging software methods. It became clear, however, that such methods were far more time consuming than the constraints of this project would allow. Alternatively, we looked at bulk density and connected void space as proxies for vesicularity. We were also able to ascertain the viability of several other methods that could be used in future work.

We calculated the bulk density of 104 samples from USDP-2 and 58 USDP-1 samples. Of these, we were able to calculate the connected void space volumes for 34 samples from each drill core. Bulk density was calculated from mass and volume measurements. Volume was measured using a graduated cylinder filled with water. We determined the percent of connected void space in each sample by measuring both the wet and dry masses of samples and dividing the difference by the total sample volume. The general trend for both drill cores matches that of the qualitative reports, an inverse relationship between density and depth, approximating a decrease in vesicularity over time.

3. Perspective of Research after this Program:

Working with the Japanese geologists was far LESS different from work in the U.S. than I was prepared for. My group was generally very warm and congenial to me and receptive to the approach I proposed to our research problems. As I had expected, I learned a lot about volcanic systems and how to design a research project to test the question at hand. I was also able to learn a new image analysis program and to make use of skills I have developed for using a scanning electron microscope (SEM).

I was very fortunate to work with a group that was comfortable speaking English. Although I didn't learn as much Japanese as I may have otherwise, it made communicating about daily things and solving problems related to our work much smoother.

My experience working in Japan convinced me that I am ready to embark on a PhD program in volcanology. Prior to coming to Japan I was unsure as to whether or not I would really be interested in further

pursuing research in this discipline. Being involved with a large-scale research project and feeling that I had something to contribute to it, however, made me realize that I am ready for such a challenge.

4. Instructor's Comments:

Leslie-san stayed in our lab for about two months. She came from the University of Alaska Fairbanks, with which our institute has a cooperative research project on "Unzen Science Drilling Project" aimed understanding eruption mechanisms and magmatic activity since 1999. Her study in Japan, therefore, is a small part of our project. She performed measurement of density (vesicularity) variations and descriptions of shape of magmatic pores during her short stay. I was surprised and encouraged by her forward-looking and inventive approaches. I think this program is very excellent and I appreciated the opportunity to meet her. I expect that she will come back to Japan in the future.

RESEARCH REPORT

Name:	**Affiliation (University):**
Jason Beverage	West Virginia University
Research Advisor:	**Host Institution:**
Atsushi Yashima	Gifu University
Research Subject:	
3D Mesh Registration and Integration & 2D Mesh Input File Creation	

1. Research Description:

Currently, a system is in place to capture two calibrated images of cliffs and other landforms. These images are then used to create three dimensional meshes of the objects to be used for analysis. Some of the rock faces and other objects of interest are too large to be effectively captured by only two pictures. A system is needed that can take multiple overlapping models and properly align them and combine them into one single mesh. There is software available to do this task, but an in-house solution would be much more cost effective and specialized than purchasing this extremely expensive software.

Also, a system has been developed in Gifu to analyze the interactions between soil, rigid body and air. Given an input mesh along with specific parameters, this system can predict the behavior and interactions of the elements in the mesh. A system is needed to quickly and easily make input files for this program.

2. Research Activities:

At first, my task at Gifu University focused on the registration and integration system. This system is quite complex and requires much research, development and testing to be effective. An initial review of current techniques and technologies was conducted and an initial interface was developed in Visual Basic and Direct X.

Towards the end of the research experience in Gifu, my task was changed to the creation of the mesh input generation software. This software was written in Microsoft Visual C++ with MFC and OpenGL. The system is able to generate two-dimensional meshes and the user is able to draw the objects (soil, rigid body, and air) using various tools similar to a paint program. The user can also specify certain parameters such as the density and sound speed of the elements in the mesh.

3. Perspective of Research after this Program:

After speaking to my research advisor in the United States, it was determined that the registration and integration problem is common between WVU and Gifu. So, I will continue to work on this project as my master's project for graduation from WVU. Also, some additional features need to be added to the 2D mesh input system (such as the ability to view the result files, etc) and I will continue to develop this software in the United States. I also hope to return to Japan at some point to collaborate on future projects and to continue the wonderful experience I have had during my time in Japan.

4. Advisor's Remarks:

As he describes already, he tried to work on two projects. He ha been working very hard during his stay in Gifu University. Both projects are, however, very difficult to be finished in a short period of time. We realize that WVU and Gifu University have a common interest in these projects. I hope he will continue to these software in the United States during his master's period and will come back to Japan to collaborate on future projects.

RESEARCH REPORT

Name:	**Affiliation (University):**
Helen Boucher	University of California, Berkeley
Research Advisor:	**Host Institution:**
Dr. Susumu Yamaguchi	Tokyo University
Research Subject:	
Social psychology (cross-cultural psychology)	

1. Research Description: Self-enhancement, which is defined as seeing oneself more positively than is justified given objective criteria, is a ubiquitous phenomenon in North American culture. People in North America believe that their good qualities are relatively unique and their bad qualities are relatively common (inflated positive views), believe that good things are more likely to happen to them and bad things are more likely to happen to other people (unrealistic optimism), and attribute their successes to ability and their failures to situational factors such as luck (self-serving attributional biases). For a long time, it was believed that these biases are universal and contribute to good psychological functioning. However, cross-cultural psychologists have debated about whether self-enhancement bias truly is a human universal. Specifically, they argue that self-enhancement is less likely in East Asian cultures where interpersonal harmony is valued and group interests take precedence over the needs of individuals. In East Asian cultures, extolling one's personal virtues could disrupt smooth interpersonal functioning. The debate has not been resolved yet, and evidence is mixed. Some researchers have found that East Asians actually self-efface, or attend more to negative aspects of themselves, while others have found that East Asians self-enhance on the kinds of communal characteristics that could be of use to fellow group members (e.g., cooperative).

The problem with much of the previous research on inflated positive views is that it is difficult to know whether participants were actually self-enhancing or self-effacing, because participants' self-evaluations were collected without an objective criterion of the participant's true standing on the characteristics in question. For example, if a participant says they have above average intelligence, this is labeled self-enhancement, when the truth could be that the person truly has above average intelligence. Thus, to truly understand whether East Asians self-enhance or self-efface, it is necessary to compare their self-evaluations against an objective standard. This is the purpose of my present research.

2. Research Activities: This summer, I planned my dissertation research which will compare self-evaluations among Japanese and Americans, by using the Social Relations Model (Kenny, 1994). This model is useful in looking at self-perception in an intergroup context. Participants interact and then rate themselves and everyone else on characteristics of interest to the researcher. The researcher can then statistically decompose the ratings to obtain a pure measure of self-enhancement (or self-effacement). I learned about the Social Relations Model and read a great deal of research about self-evaluation in general, and culture and self-evaluation. I also profited from discussions in Dr. Yamaguchi's laboratory regarding the kinds of characteristics that are important to Japanese people in an intergroup context, which will serve as experimental stimuli, and regarding the best method for conducting the research that will make sense in both an American and Japanese cultural context.

3. Perspective of Research after this Program: After this program, I have become more convinced than ever of the need to understand the role that culture plays not only in self-evaluation but in most other aspects of human functioning. I also am happy to have interacted with researchers in Japan who are also committed to understanding how culture and self are mutually constituted, and hope to have extended collaboration with them now and well in the future.

RESEARCH REPORT

Name:	**Affiliation (University):**
Jed-Sian Cheng	University of Texas at Houston Medical School
Research Advisor:	**Host Institution:**
Hidenori Kawashima, MD, PhD	Osaka City University Medical School
Research Subject: The Effects of Anti-Estrogens, Androgen Receptor Mutations, and Steroid Receptor Coactivator Protein (SRAP) on Androgen Receptor Activation.	

1. **Research Description:**

Most prostate cancer can initially be controlled by hormone treatment. However, over time, the cancer will progress to a hormone insensitive state in which it will grow regardless of the treatment. The current understanding of the hormone insensitive phenomenon indicates the malfunction of the androgen receptor (AR) and/or the downstream signaling as the main culprit. One possible gene involved in progression is Steroid Receptor Coactivator Protein (SRAP). SRAP is a relatively recent finding and little is known. The research performed involved three different aspects with the goal of increasing treatment options, elucidating the mechanism of the hormone refractory state, and understanding proteins involved in AR activation.

2. **Research Activities:**

The research of AR and prostate cancer was approached in three ways. First, preparation was done for producing an EGFP (fluorescent marker) linked AR plasmid, which can be used to visualize the localization of the protein and indicate levels of expression. Also known mutations fragments were prepared by PCR and will be added to the completed EGFP-AR plasmid in different combinations. In this way the mechanism of progression can be investigated. Second, various concentrations of human SRAP along with AR was transfected into cancer cell lines and the AR activation was determined by Dual Luciferase Assay via the AR specific MMTV reporter gene. Thus the interaction of SRAP with the AR signaling pathway can be better understood. Finally, the effects of Tamoxifen, Faslodex, and Toremifen (anti-estrogen drugs) on AR signaling pathway was studied using once again a Dual Luciferase Assay model with MMTV as reporter. Various concentrations of the drugs were used and their effects compared to the anti-androgen Flutamide. If the treatments are successful, it may change the current concepts and procedures of treating prostate cancer.

3. **Perspective of Research after this Program:**

A clinical and scientific mindset is essential if progress is to be made in treating prostate cancer. Excellence in science must focused on benefiting the patient. Some of the data generated was easy to interpret and produced excitement. However, some data can be extremely confusing. It is necessary at that time to take things one piece at a time. To generate reliable and unquestionable data takes time. The work done promises to contribute to publications from my host in the near future.

I had a wonderful time doing research in Japan and enjoying the country. My only regret is that I cannot finish the work I took part in. My sincerest hope is to build on the research ties created by my stay. As I strive to become a doctor in academic medicine, I will remember this experience.

4. **Advisor's Remarks:**

Since Mr. Jed-Sian Cheng has an excellent background and expertise in molecular and cellular biology, he has immediately joined us and participated in the research project on prostate cancer investigating the effects of anti-estrogens on the androgen receptor activity and cell proliferation. He devoted himself enthusiastically to the project and we got important results that some of anti-estrogens have inhibitory effects on the androgen receptor activity and on cell proliferation in prostate cancer cells. He has also performed the experiment on SRAP, a steroid receptor co-activator, and obtained a preliminary but an important information. He has also been a good influence on our graduate students. I think he enjoyed staying in Osaka and traveling in Kansai, a most important area of Japanese cultural background, and learned a lot about our country. I am really pleased and proud of having worked with him this summer.

Hidenori Kawashima, MD, PhD

RESEARCH REPORT

Name: Carol Choi Affiliation (University): UC Berkeley, USA	
Research Advisor: Kazuhiko Kawashima **Host Institution: Tokyo Institute of Technology**	
Research Subject: Seismic performance of Reinforced Concrete Columns Under Bilateral Excitation based on a Hybrid Loading Test	

1. Research Description:

In Japan's current seismic design practice, bridge columns are required to clear both design force and allowable residual displacement. Major change of design code from elastic design to ductility design after the 1995 Kobe earthquake is to incorporate the effect of nonlinear deformation of structural members under earthquake excitation.

However, in the current design code of Japan and United States, empirical expressions and parameters used to calculate capacities of reinforced concrete columns, such as plastic hinge length, are determined from data gathered through past unilateral cyclic loading experiments. There is a possibility that capacity of columns designed per code is overestimated because, in actuality, earthquakes excite structures in three directions: vertical and bilateral. This research aims to gain better understanding in the differences in behavior of columns unilateral and bilateral loading. Results of this study might be useful in evaluating the sufficiency of current seismic design code and assessing the need for future improvements.

2. Research Activities:

In this experiment, six square columns designed per 1996 Specifications for Highway Bridges are loaded with several earthquake records through hybrid loading tests. Damage patterns on specimens resulted from the two loading schemes are observed. Differences in columns strength and residual displacements are recorded. My involvement of this project includes construction of specimens, testing of the specimens, data collection, and analysis.

3. Perspective of Research after this Program:

Current seismic design codes, in California and Japan alike, are formed on the basis of experimental researches. It is important for me, as a United States bridge design practitioner, to understand the rationale behind our designs created to ensure public safety. From this research, I have gained a better understanding in methods of testing, the assumptions made in our analysis, accuracy of test results based on tolerance of experiment instrumentations and devices, capacities and limitations of analytical tools, interpretation of data collected, and incorporation of test results into our seismic codes. It is also interesting to learn about the similarity and difference in Japanese and American bridge design philosophies and methodologies.

The test results suggest that an interaction of loadings in two directions causes faster deterioration of column capacity in comparison to loading in one direction. Because bilateral loading effects are not yet extensively researched, the study reveals many possibilities for future investigation. One of the interesting topics for further study would be the need to redefine the ultimate states in column design, since interaction of bilateral loading causes faster deterioration of column capacity in comparison to unilateral loading.

4. **Advisor's Remarks:**

Ms. Carol S. Choi was involved in an experimental and analytical study for the effect of bilateral loading to reinforced concrete bridge columns. She conducted a hybrid loading tests for 6 specimens with support of her colleagues in my research group. Although she could not be involved in the construction of these specimens because of her short stay, she experienced how to construct specimens which was built for other researcher. I was impressed by her hard work for making wood forms and casting concrete. She found that there is a large difference in the flexural strength and ductility capacities between the unilateral and bilateral excitations. She studied and conducted the fiber element analysis to simulate the test data. I found that this is an interesting and important study for the improvement of seismic design of bridges in both US and Japan. She joined various activities in our research group.

RESEARCH REPORT

Name: Corey A. Cohn **Affiliation (University): Stony Brook University**	
Research Advisor: Kensei Kobayashi **Host Institution: Yokohama National University**	
Research Subject: Mineral-Based Constraints on the Organic Composition During the Emergence of Life	

1. Research Description:

A basic understanding of the organic composition on the early Earth is necessary for determining how and from what life arose. Very little is known, except that a few of the building blocks of life such as amino acids and nucleic acid bases have been detected in the interstellar media, in meteorites and from simple prebiotic synthesis experiments suggesting their potential utilization during the emergence of life. However, environmental constraints could have challenged their geologic accumulation. The mineral, pyrite (FeS2) has been recently shown to react with water to form very reactive hydroxyl radicals (.OH). All of the organic molecules utilized in life and evoked by origin of life hypotheses are organic species susceptible to destruction by .OH. Given the ubiquitous presence of pyrite on the early Earth, its reaction with water may have limited the stability of prebiotic building blocks for life.

2. Research Activities:

In Kensei Kobayashi's lab, I performed experiments to determine the stability of nucleic acid bases in the presence and absence of pyrite at 30, 60 and 90 degrees Celsius. A mixture of nucleic acid bases was mixed with crushed pyrite in a vial set in a water-bath. Samples were taken via syringe hourly and analyzed with high performance liquid chromatography. Results reveal a rapid loss of all the biotic nucleic acid bases in the presence of pyrite. The bases' fate can be attributed to either adsorption to the pyrite surface or destruction. FTIR Diffuse Reflectance will be performed on the post-experimental pyrite, back in the U.S., to probe the surface and determine if the loss of bases is due to adsorption. The determination of adsorption or destruction is quite important. Sorption could mean that the organic building blocks are concentrated and protected on the surface of pyrite from hydrolysis.

3. Perspective of Research after this Program:

Conducting research in Japan has been terrific. Joining a foreign lab and discovering all of their unique methods and ways about science and research will be beneficial in my future studies. I plan to continue collaborating with my lab-mates and host.

4. **Advisor's Remarks:**

Mr. Corey Cohn performed experiments on the reaction of bioorganic compounds with the presence of pyrite. It is a quite new approach to chemical evolution in submarine hydrothermal systems. During his stay in my lab, he had two seminars, where he introduced new topics in U.S. concerning the origin of life. He also made a travel to Nagaoka to discuss hydrothermal syntheses with Prof. K. Matsuno, Nagaoka Univ. of Science and Technology. I believe that these activities are useful for his future studies.

RESEARCH REPORT

Name: Benoit Cordoba **Affiliation (University):** University of Wyoming	
Research Advisor: Susumu Kono, Ph.D. **Host Institution:** Kyoto University	
Research Subject: Interface shear transfer in concrete by shear friction	

1. Research Description:

My research involved the study of the Universal Shear Transfer Model (UST Model), which predicts the transfer of shear through the concrete interface, as described by Professor Maekawa in his book "nonlinear mechanics of reinforced concrete".
I developed a concise methodology for using the model to predict concrete shear capacity at a crack interface. I then gave a report on the research that had been conducted here at the University of Kyoto over the last four years.

2. Research Activities:

I studied the theory and methodology involved in the determination of shear capacity as per the UST Model and gained an understanding of its operation.
I then read through the research results of the last four years, discussed them with my host professor Dr. Kono and wrote a description of the testing apparatus and results.

3. Perspective of Research after this Program:

The work I did this summer is part of an ongoing cooperation between my host professor Dr. Susumu Kono and my advisor Dr. David Mukai. As for me, I will continue my research in the area of self-consolidating concrete for the completion of my Master's degree and then I plan on joining a consulting engineering firm and work as a practicing engineer.

4. Advisor's Remarks:

I am pleased with the work Mr. Cordoba performed this summer in our research lab. He made a report on a shear transfer model, which is indispensable to simulate the behavior of precast concrete structures.

The report will help programming the model into the FEM code later in our research lab. I also enjoyed his involvement with the other graduate students and his desire to develop relationships and learn from others. Our research group is very glad that he decided to come to our University and wish him the best in his future endeavors.

RESEARCH REPORT

Name:	**Affiliation (University):**
Charles Sayo DaSalla	The City College of New York
Research Advisor:	**Host Institution:**
Yasuharu Koike	Tokyo Institute of Technology
Research Subject: EMG Based AIBO-Robot Control using Wrist and Forearm Movement	

1. Research Description:

The aim of this project was to design a Human-Interface system using EMG signals elicited by wrist / forearm movement in 3-DOF to control a Sony Corporation of Japan AIBO robot. Using a JR3 Force-Moment sensor, direct torque measurements were taken to design a torque estimation model based on muscle activation and calculated moment arm. Kinematics were captured in 3D space using an OPTOTRAK position sensing system, from which joint angle was calculated. A three-layer neural network was used to identify EMG "signatures" for each posture, allowing the subject to control movement of the AIBO robot in real time.

2. Research Activities:

The locations of ten different muscles in the forearm responsible for wrist / forearm movement (flexion, extension, abduction, adduction, pronation, and supination) were identified. Adhesive electrodes were attached to the surface of each muscle location, in addition to a reference ground on the subject's ear. Muscle activation and torque were simultaneously measured as the subject performed isometric contractions for all 6 movements. Following this, hand position and muscle activation were simultaneously measured as the subject assumed specific joint angle postures. Joint torque was successfully estimated from muscle activation, using calculated moment arm. Joint postures were estimated from muscle co-activation levels using a three-layer neural network. After inputting training data and determining appropriate weights for the neural network, the subject was able to control the AIBO robot using wrist and forearm movement.

3. Perspective of Research after this Program:

My visit to Japan and Tokyo Institute of Technology has been one of the most rewarding experiences I have ever had the pleasure of participating in. During my short stay, I was fortunate enough to partake in fascinating research, while at the same time, gain treasured colleagues and friends. I was extremely impressed by the research being conducted at Sato-Koike Laboratory. However, I was even more impressed by the dedication, generosity, and kindness shown to me by all of its members. For this, I am eternally grateful.

4. Advisor's Remarks:

Mr. DaSalla worked very hard at his research during his short stay in my laboratory. Being a very polite and frank person, he spoke quite freely with the other lab members. He learned how to estimate joint torque, or posture, using surface EMG (Electromyogram) signals. He succeeded in controlling the AIBO robot with wrist posture, using this technique. I believe he had a good experience while conducting research at my laboratory. I would like to cooperate with him again in the near future.

RESEARCH REPORT

Name: Warren Davis	**Affiliation (University): Florida State**	
Research Advisor:	**Host Institution:**	
Watanabe, Jun-ichi	**National Astronomical Observatory of Japan**	
Research Subject:		
Trans-Neptunian Objects/CCD Image Processing		

1. Research Description:

My task while at the National Astronomical Observatory of Japan (NAOJ) was to refine the image processing software used in their search for Trans-Neptunian Objects (TNOs). The Observatory collects a great deal of image data daily, and processing this data to a useable format can take several days, thus resulting in loss of data over time.

2. Research Activities:

My first activity was learning a brief amount about the subject area, TNOs. After that, I familiarized myself with the current image-processing methods. Then, I designed the new model for the system, familiarized myself with the intended programming language (C++), and began work on implementation. After the module was implemented, it was tested and modified repeatedly until a satisfactory version was attained.

3. Perspective of Research after this Program:

I really enjoyed my research at NAOJ. I always wanted to pursue a research career in Japan, and the wonderful experience at the Observatory confirmed this for me. I look forward to a career of international, interdisciplinary work in Japan.

4. Advisor's Remarks:

Mr. Warren Davis did a great job during his stay in our Observatory. He learned topics of our group researches, and understood well in a short time. Then, he concentrated in the main work on revision of our automated-search program for unknown objects from the imaging data taken by the telescope. Based on his specialty in the computer science he is studying now in his university, he implemented effective algorithm in our program, and it works well. This work will definitely help us for further researches. Moreover, this work will definitely contribute to make his self-confidence in his high ability.

He also enjoyed talking and communicating with people in our group, and in our observatory. I believe that such experience should give the wider point of view in his life in the future, especially in understanding other culture.

RESEARCH REPORT

Name:	Affiliation (University):
Matthew James Donahue	**Oregon State University**
Research Advisors:	**Host Institution:**
Dr. Susumu Iai	**Kyoto University**
Dr. Tetsuo Tobita	**Disaster Prevention Research Institute Geomechanics Division**
Research Subject:	
Experimental validation of the FLIP model for lateral pile displacement	

1. Research Description:

Recent analytical work using the constitutive soil modeling program FLIP has been performed to describe single and group pile behavior under lateral loading. The FLIP program is an effective stress model based on multiple shear mechanisms. Drained and undrained soil conditions were modeled with results showing behavior similar to that of a stress-strain relationship for soil in the drained case and a strain hardening spring stress-strain soil relationship for the undrained case. Modeled soil displacement vector fields were also generated for each scenario. The drained case shows soil displacement predominantly in the direction of pile displacement and decreasing with increasing distance from the pile center. The undrained case shows a vortex type result with soil "filling in" behind the pile as it displaces; this is similar to the behavior of a high viscosity, plastic fluid.

The displacement results of the numerical soil-pile model were the focus of this experimental program with the intention of validation of numerical results. A model pile and soil test bed were implemented to gather visual data on soil displacement. The resulting photographic data was then analyzed using the Surfer (v8.0) software package to generate vector displacement fields as a result of lateral displacement of the modeled pile.

2. Research Activities:

General Experimental Set-up - An aluminum test bed was constructed to have inner dimensions of eighty centimeters (80 cm) by fifty centimeters (50 cm) by four centimeters (4 cm). An opening was drilled at one end of the test bed and fitted with a rubber bushing to allow for passage of the stainless steel wire rope used to induce a lateral load on the model pile. An acrylic plate cover was fabricated to fit over the aluminum test bed and provide containment of the model pile and soil. Seal of the test bed and acrylic cover system was provided by a foam rubber gasket. The model pile was constructed from Teflon and has the dimensions of five centimeters (5 cm) diameter by four centimeters (4 cm) in full height. The model pile was constructed in a two part modular fashion with foam rubber gaskets to fit between each component allowing for height adjustment and moderate compressibility. The pile height was specifically designed to be greater than the overall test bed depth which, when combined with the compressible gaskets, allows for intimate contact between the pile top and cover bottom. This system prevents soil from covering the pile top during lateral displacement. The pile was marked with orthogonal lines and hash marks of one half centimeter (0.5 cm) increments. Lateral load was induced on the model pile by use of an electric motor powered screw device.

A stainless steel wire rope was attached to the lateral load tray of this device and then to the model pile.

Visual data was gathered by use of a Sony DCR-TRV950 video camera utilizing it's digital still, digital video, and magnetic tape video functions as well as with use of a Keynce x25 magnification digital microscope. The camera was placed over the test bed by mounting a standard aluminum tripod on the soil placement hopper frame. The digital microscope however was simply placed over the model pile on the acrylic cover.

Drained Case Experimental Set-up and Results - Dry silica sand having a D_{50} value of point one three millimeters (0.13 mm) was used to model the drained case. Sand was placed in the test bed by using a stainless steel hopper mounted on a rolling frame and placed directly over the test bed. A typical drop height of ten centimeters (10 cm) was used and corresponds to the distance from the hopper opening to the test bed bottom. Placed dry sand was then smoothed and leveled to the height of the model pile by use of a one hundred centimeter (100 cm) aluminum ruler. Aluminum L-brackets were placed along the edge of the test bed and used as runners to rest the aluminum ruler on while grading the dry sand. After the model soil was leveled a grid of red colored silica sand was placed around the pile using a plastic guide frame. The colored sand grid spacing was approximately two point five centimeters (2.5 cm). The system was then sealed with the acrylic plate cover and loaded laterally with a load motor speed of approximately one thousand revolutions per minute (1000 rpm). Visual data was then gathered by taking before and after photos with the digital still function and filming of the pile displacement with the video camera or by capturing photos of the model pile as it displaced using the x25 digital microscope.

The Surfer program was used to create an aggregate image comprised of all photos gathered during pile displacement for a given test. By turning the different photos of the compiled image on and off vectors corresponding to the displacement of grid nodes or individual soil particles were manually drawn. The intention of this methodology was to compare experimental results with displacement vector field results generated by FLIP analysis. Large zoom visual data has shown vector displacement fields consistent with those generated by numerical analysis. Close zoom visual data gathered with the digital microscope has shown an interesting formation of vortices as the model pile displaces past a region of soil located between pile tangents that are parallel and orthogonal to the direction of pile motion. Plotting of horizontal displacement of soil particles as a function of distance from the pile center has also given results consistent with numerical data.

Undrained Case Experimental Set-up and Results - Sand was combined with a liquid mixture of water and an organic cellulose compound called Metlose. Metlose is used with the intention of increasing fluid viscosity and thereby preventing "bleeding" of fluid from the mixture. Prevention of this phenomenon is essential to maintaining the undrained condition of the soil throughout the course of a given test. Water and Metlose mixtures with viscosities of forty (40), eighty (80), and one hundred twenty (120) times the viscosity of water have been implemented with the later giving the best results. For forty (40) and eighty (80) times that of water the fluid viscosity was not high enough to prevent bleeding from the mixture due to

a soil self weight induced increase in pore water pressure. Methods of placement have included pouring of the water and Metlose mixture into the test bed with subsequent placement of sand using the frame mounted hopper and premixing of the silica sand and water Metlose mixture to create a high viscosity slurry. The resulting slurry in both cases was then leveled and smoothed by use of a hand-held flexible rubber palet. As with the drained case the entire test system was then sealed with the acrylic plate cover. The pile was then loaded and visual data was gathered with either a digital video camera or the x25 digital microscope.

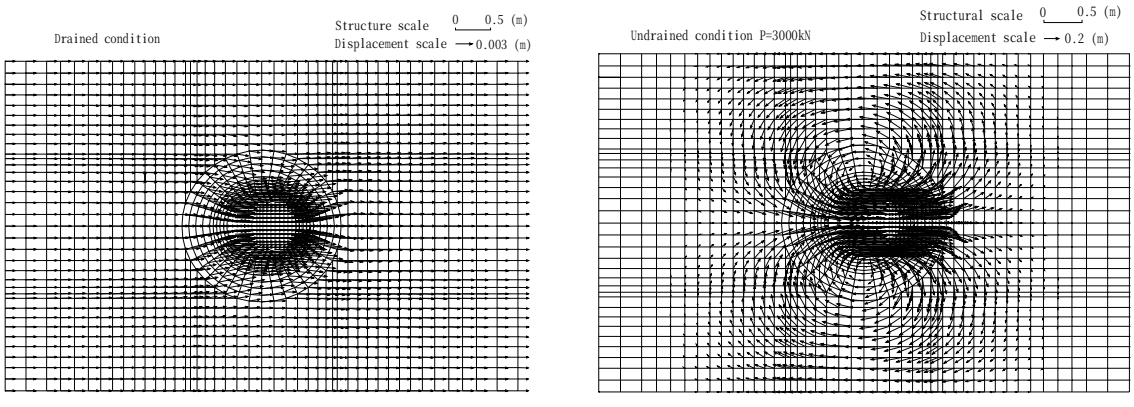
FLIP analysis has indicated that vortices are formed behind the displaced pile for the undrained case. Experimental results for the undrained case have confirmed the occurrence of vortices and have also indicated localized vortices such as those shown for the drained case. The vector displacement fields shown below represent pile displacement on the order of fifteen percent (15%) of the model pile diameter.

Conclusions - Major conclusions from the experimental program described above are summarized with the following statements:

1. Use of the model Teflon pile and sealed soil test bed system are a useful method of experimental validation of FLIP numerical analyses for the drained and undrained cases.
2. Results are consistent between FLIP analysis and experimentation for the drained and undrained case.
3. Vortices are shown to occur on a localized scale for the drained and undrained case and on a more global scale for the undrained case via experimentation.
4. Although labor intensive, the Surfer program can be adequately used to generate vector displacement fields from raw visual data.

On going work to further refine the experimental and data analysis techniques described herein include the following:

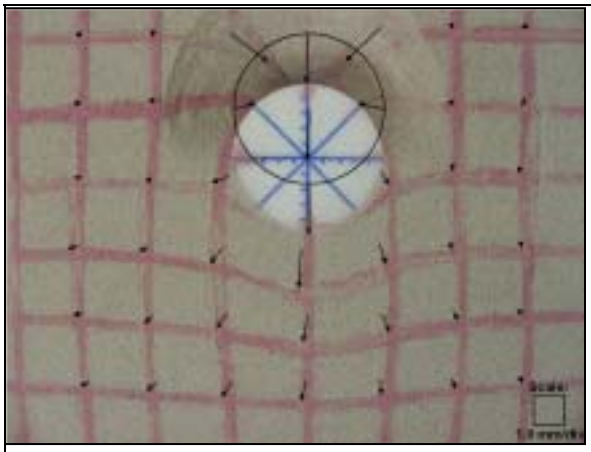
1. Continued refinement of experimental techniques used for the undrained case.
2. Implementation of software that will automatically track soil particle displacement from raw visual data and generate a corresponding vector displacement field.



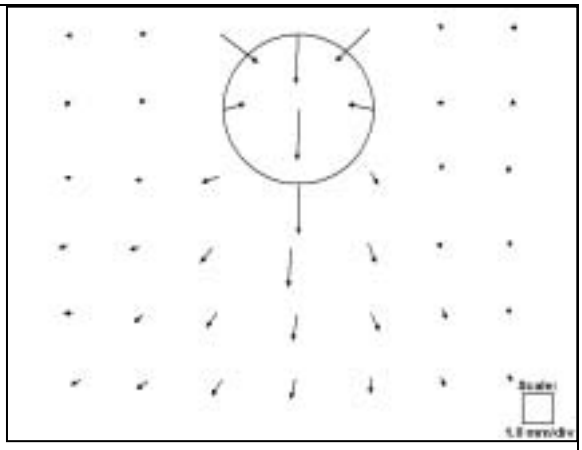
a) Drained case

b) Undrained case

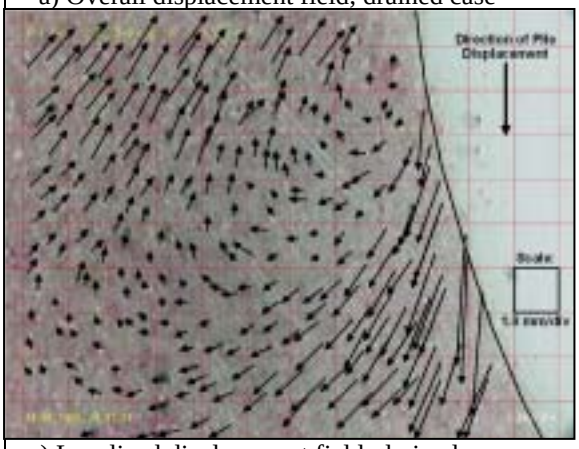
Figure 1 – FLIP analysis results; vector displacement fields



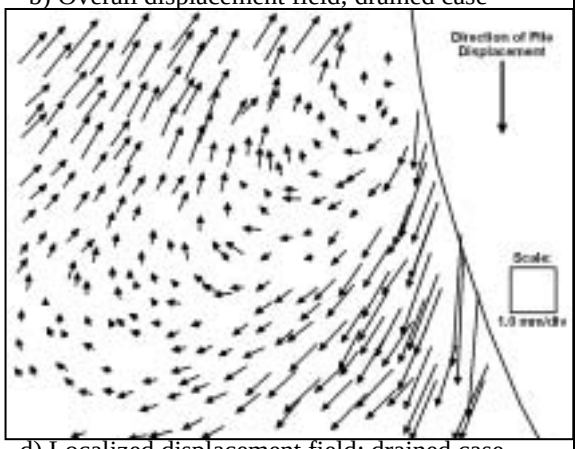
a) Overall displacement field; drained case



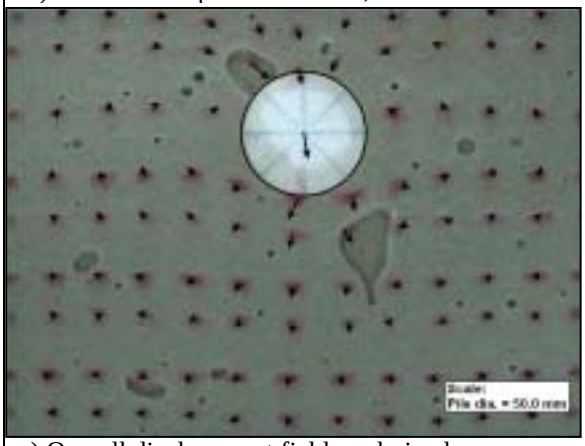
b) Overall displacement field; drained case



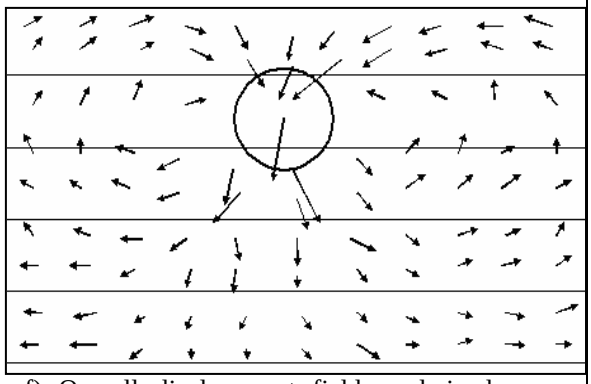
c) Localized displacement field; drained case



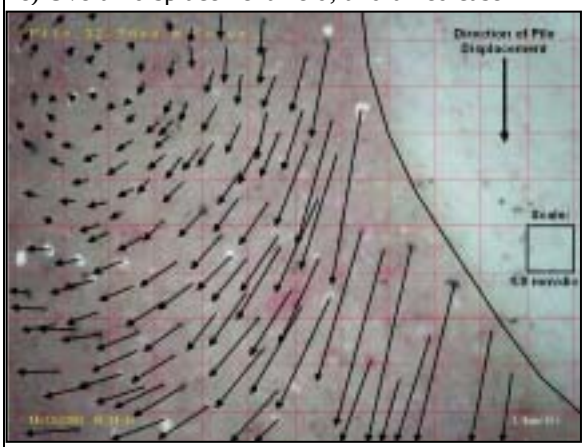
d) Localized displacement field; drained case



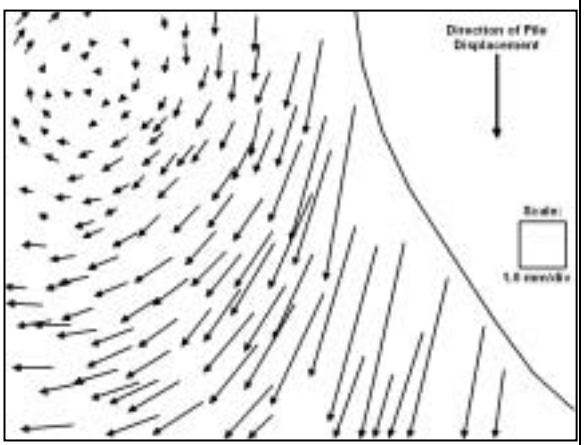
e) Overall displacement field; undrained case



f) Overall displacement field; undrained case; vectors scaled by a factor of 3 for illustration



g) Localized displacement field; undrained case



h) Localized displacement field; undrained case

Figure 2 – Vector displacement fields from experimental results

3. **Perspective of Research after this Program:**

I thoroughly enjoyed the research I participated in during the JSPS Summer 2003 program. My research focus at Oregon State had primarily dealt with analytical modeling where as the JSPS program gave me the perfect opportunity to participate in a meaningful and rewarding experimental program.

4. **Advisor's Remarks:**

The research activities taken by Mr. Donahue were at the initial phase of a three year project. The first stage of dry sand condition includes establishing the experimental setup and procedures, including digital processing of data from microscope and video cameras. The second stage, using saturated sand, needed a lot of trial and error procedures to establish a methodology for the remainder of the testing program. Despite the difficulty of this stage Mr. Donahue was full of new ideas to solve the problems and an eagerness to discuss the matter with the advisors and students. Mr. Donahue has successfully completed all activities as originally set up for the summer program by my colleagues and I. His achievement will certainly benefit the three year project of the Disaster Prevention Research Institute Geomechanics Division at Kyoto University as well as his own personal career as a geotechnical and structural port and harbor engineer at Oregon State University.

RESEARCH REPORT

Name: Terence J Fagan Affiliation (University): UNC Charlotte	
Research Advisor: Wei Gao Host Institution: Tohoku Daigaku	
Research Subject: Precision Engineering and Mechatronics	

1. Research Description:

To develop an algorithm for a 2 D scanning probe for a silicon wafer. The 2D scanning probe measures the flatness of a silicon wafer. The research was to develop a quicker scanning algorithm, because the current algorithm is to slow and causes a bottleneck in the system.

2. Research Activities:

My research activities include:

- Gather information about current algorithm
- Develop the algorithm offline
- Write software for algorithm
- To test the algorithm in a simulation
- To test the algorithm in a real world application

3. Perspective of Research after this Program:

My perspectives have developed into more worldly view. I have learned a great deal including how different system work, how different people interact with one another and how to develop a more efficient system.

An example of a different system at work is the lab structure I was exposed to in Dr. Gao's lab. I thought the lab was very conducive to learning. Everyone helped each other a great deal. Compared to where I work my lab is very isolated.

An example of how different people interact with one another is very interesting. I was exposed to a lot of structure in and out of the lab. I noticed people react very differently to on another once the people knew the age and status of the other person. This is more of a structure then in the US.

Through watching and asking questions I learned how to develop a more efficient structure. I learned to question my theories in a different way to manufacture a better system.

All and all I have learned a great deal and I had a lot of fun in doing so. I got a chance to see the world in a new and exciting way, this I am thankful for.

4. Advisor's Remarks:

Mr. Fagan is a very hardworking student. He has done a lot of work in my lab on the new algorithm for the wafer flatness measurement within such a short term. He is very good at software, which was important for the algorithm development.

He also has a good personality. He was modest to learn new things here and had a very good relationship with people in the lab. Anyway, I evaluate him as a very good studen.

RESEARCH REPORT

Name: **Laura Forlano** **Affiliation (University):** **Columbia University**	
Research Advisor: **Dr. Motohiro Tsuchiya** **Host Institution:** **Center for Global Communications (GLOCOM) International University of Japan, Tokyo**	
Research Subject: **The Social Impact of Wireless Technology in Japan**	

1. Research Description:

My research is on the social impact of wireless technology with a specific focus on the changing relationship between time, space and context while comparing the US and Japan. In the past two months, I have observed first-hand, the powerful social effects of widespread adoption of cell phones with advanced features such as embedded-cameras. Some of these effects include dynamic and flexible adjustment of schedules, navigation in complex urban environments and people viewing the world through the lens of keitai-cameras. My goal is not to determine whether these effects are negative or positive but to better understand people and their use of wireless technology in order to improve policy, business models, technology-design and society overall.

2. Research Activities:

My research activities included the following:
-attending several conferences (First International Moblogging Conference, Wireless Japan 2003, Siemens Mobile Futures Roundtable, Smart Mobile Workshop, Institute for HyperNetwork Society Beppu Bay Conference), wrote summary of Siemens Mobile Futures Roundtable event for GLOCOM publication and served as a rapporteur for HyperNetwork Society Conference ;
-participating in activities of several technology organizations (Japan Bloggers, Digital Eve Japan), writing for the Digital Eve Japan newsletter and planning their Summer meeting;
-going on site visits to Keio University's Shonan Fujisawa Campus DoCoMo House Lab with Professor Mizuko Ito and to the International University of Japan in Niigata to visit Professors Philip Sidel and Glenn Mayhew;
-meetings with Tracey Northcott of mobile wireless content provider TangoTown, Marco Koeder of CyberMedia Japan, and Dr. Frank Baldwin and Takuya Toda of the Social Science Research Council Japan office;
-sitting in on a session of the Japanese translation of Howard Rheingold's Smart Mobs (publish in Japanese, August 2003), a meeting with Hewlett Packard computer scientist Gene Becker and assisting Izumi Aizu (GLOCOM) in the English translation and dissemination of the Smart Mobile Workshop announcement to a list of approximately 30 personal contacts;
-assisting Dr. Tsuchiya with summaries of eight papers on US spectrum policy and interviewing a DC-based telecom policy expert for a paper which will be presented at Telecommunications Policy Research Conference 2003 on September 19 - 21;
-reading academic papers and mainstream news on the social impact of wireless technology;
-taking approximately 100 digital photos of the social impact of wireless technology (locations include Roppongi, Harajuku, Shibuya, Shinjuku), the lives of Japanese teenagers and the relationship between technology and culture in Japan;
-using a new NTT DoCoMo D505i camera-phone to experience the technology first-hand;
-collecting cultural artifacts related to cell phones including numerous cell phone straps and holders.

My research resulted in the following:
-two articles published in Gotham Gazette ("Blogging and the City," "Hi-tech Blackout");
-one twenty-page paper based on my research and observations of the social impact of wireless

technology in Japan to be presented at the Digital Media Conference at the University of Pennsylvania Annenberg School of Communication on October 31 – November 1;
-a revised and annotated version of this paper will be submitted to the GLOCOM Review for publication in late Fall 2003;
-numerous ideas for my dissertation proposal and future research projects.

3. Perspective of Research after this Program:

My research this Summer confirmed my desire to pursue a comparative project on the United States and Japan for my dissertation. This Fall, I will begin writing my dissertation proposal and literature review based on the research and observations gained from my Summer research in Tokyo. I will also put together an interdisciplinary dissertation committee best suited to guide and evaluate me on my proposed research now that I have decided on my research topic. During Spring 2004, I will take written and oral comprehensive examinations based on my dissertation proposal and literature review. I will also conduct research on the social impact of wireless technology in Germany for one month next Spring with the generous assistance of a grant from the American Council on Germany. This opportunity will allow me to find out whether some of my observations are unique to Japan or if similar patterns are occurring in the United States and Europe. During the course of my dissertation research, I hope to secure additional funding to return to Japan for more in-depth fieldwork.

4. Advisor's Remarks:

Ms. Laura Forlano spent a good research time at my institution in two ways. First, she met many people in person and exchanged e-mail with many people to get ideas and information related to her research. Especially meeting people is important even in the Internet age, because additional information not expressed in text sometimes help understand what people are thinking and feeling. She was so energetic in finding people who knew her research field that I believe she had enough inputs for her analysis on the social impact of wireless technology in Japan. Second, she not only met and talked with people, but also wrote down her understanding during her stay. That helps her shape ideas more clearly and develop them quickly.

She was also helpful for me and other colleagues at my institution. She assisted several research projects which I and my colleagues were doing. We could exchange facts, information, views, and ideas, and it made possible for us to understand what was happening in the U.S. and Japan. In addition she tried to communicate and socialize with the colleagues in Japanese. Then, both of us could feel we had a good relationship. I appreciate we had her here with us.

Dr. Motohiro Tsuchiya, GLOCOM

RESEARCH REPORT

Name:	Affiliation (University):
Kirsten Larson Genson	Iowa State University
Research Advisor:	**Host Institution:**
Prof. Atsushi Takahara	Kyushu University
Research Subject: Selective immobilization of branched molecules on micropatterned surfaces	

Research Description:

Selective immobilization and deposition of low molecular weight organic molecules on inorganic surfaces would advance the use of tailored synthetic materials in many biomedical, aeronautical and advanced uses. My research is branched into two categories. The first is the selective deposition of azobenzene containing molecules to study the molecular switching capabilities of the photochromic molecules on a solid support. The second category is focused on the selective adsorption of hyperbranched molecules with numerous chemically different endgroups to observe the effect of the chemical nature of the endgroups on the adsorption of bulky, branched molecules.

Research Activities:

My research activities centered on learning the process of micropatterning organosilane monolayers on silicon substrates. Prof. Takahara's group has developed a useful technique to pattern a silicon substrate with two types of organosilane monolayers in five-micron stripes using a photomask in combination with a VUV lamp similar to the process used in microchip processing. ESCA data confirmed the molecules adsorbed on the micropatterned surfaces as desired. We used a set of reference monolayers to confirm the molecules were attracted to only one monolayer type. AFM data from the patterned monolayers and reference samples also confirmed the molecules adsorbed on the desired surfaces. Confirmation of this came from height differences of the adsorbed layers and nonadsorbed layers. The hyperbranched molecule system proved more successful with two molecules containing unprotected endgroups selectively adsorb to the desired surface while the one molecule with protected endgroups prove unable to successfully adsorb to either area of the patterned substrate. The azobenzene containing molecules proved more difficult to successfully adsorb, however limited success was seen with both molecules.

Perspective of Research after this Program:

My time at Kyushu University has allowed me to develop sample preparation and characterization techniques. Both preparation and characterization techniques will be useful in the continuation of my doctoral research. I hope to continue collaboration with Prof. Takahara's group as well as develop organosilane monolayer micropatterning techniques at my home institution. Many discussions with students in the group have brought new focus on several aspects of my research at my home institution that I hope to begin on when I return. I enjoyed the social aspects of the group and learned about the different dynamics of research groups outside of the United States.

Advisor's Remarks:

Ms. Genson worked in our group for two months on micropatterned surfaces. The experiments had been carried out successfully and some interesting results were obtained.

RESEARCH REPORT

Name: Jason S. Goldstein **Affiliation（University）:** Old Dominion University, Department of Biological Sciences, Norfolk, Virginia, USA.

Research Advisor: Hirokazu Matsuda (松田　浩一) **Host Institution:** Fisheries Research Division, Mie Prefectural Science and Technology Center, 3564-3 Hamajima, Shima, Mie 517-0404.

三重県科学技術振興センター水産研究部
〒517-0404　三重県志摩郡浜島町浜島3564-3

Research Subject: Dynamics of Japanese spiny lobster *(Panulirus japonicus)* aquaculture, and the application for lab-based ecological studies.
イセエビ(*Panulirus japonicus*)飼育技術の発展と，その生態研究への応用について

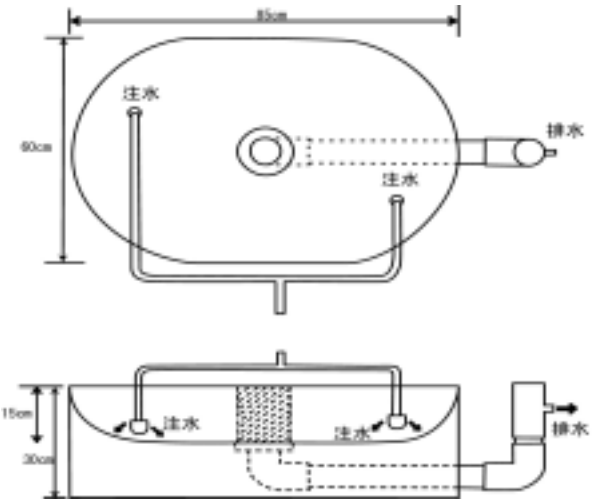
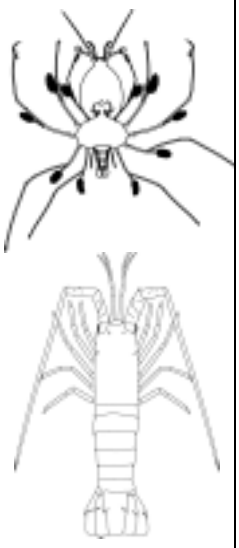


Figure 1: A new culture tank design for Japanese spiny lobster.



1．Research Description:

Background and scientific basis

Spiny lobsters are highly valued seafood items and comprise some of the most intensive and productive fisheries throughout the world. In Japan, spiny lobster (Ise-ebi) exemplifies one of the most prized and culturally important species. In 1998, domestic fisheries production for spiny lobster and shrimp in Japan exceeded 8,000,000 t (~ 6,000 ¥ / kg) while imported lobster/shrimp constituted an additional 5,000,000 t valued at approximately 3,000 ¥ / kg) (Tokyo Central Wholesale Market, 1999). Like all spiny lobsters worldwide, the Japanese spiny lobster (*Panulirus japonicus*) has an extended and complex larval period that exceeds 8 months (Kittaka, 1997, Matsuda *et. al*, 2001). During this prolonged larval stage, oceanic larvae that are produced in one locality may ride currents of the open ocean, disperse throughout the Western Pacific, and later settle in far-flung locations to grow and eventually support fisheries in their new home. However, methodological difficulties limit our ability to address this issue scientifically, so this view is based primarily on logic and limited genetic information. Consequently, trying to understand various aspects of larval behavior and growth (e.g. nutrition, vertical migration, swimming speeds and depth regulation) and their associated ecological implications with regards to the commercial fishery is limited. In addition, trying to work with wild caught spiny lobster larvae is nearly impossible.

Research strategy and goals

For more than 50 years, Japan has showcased a long and innovative history in the design, technology, and implementation of new and creative ways of culturing spiny lobster larvae and the production of cultured juvenile lobsters (please see figure 2). Given the unique opportunity to work with spiny lobster larvae (phyllosomas) in Japan, I developed a research plan to begin examining, quantifying, and modeling particular lobster behaviors and responses using cultured animals. More specifically, my research goals and projects included: (1) learning and practicing rudimentary techniques for individual and mass larval lobster culture. (2) utilizing lobsters of known ages and sizes for use in a light chamber lab experiment to ascertain whether there are differences in spectral sensitivity or movement among larval stages (instars) of various ages and their capacity to disperse (3) observing and surveying critical japanese spiny lobster habitats in the field using SCUBA methods to compare with other habitats and (4) testing the performance of three formulated artificial feeds for monitoring the growth and health of cultured early stage juvenile lobsters.

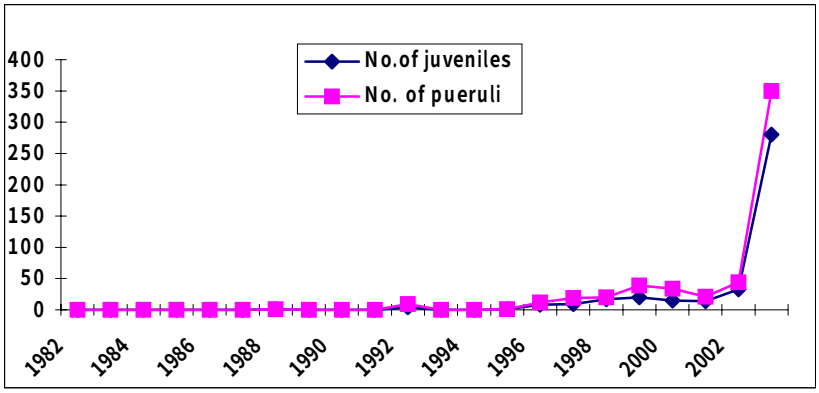


Figure 2: Japanese spiny lobster production at Mie Prefectural Fisheries Research Division over 20 years.

2. Research Activities:

My host institution provided a reliable and consistent resource for cultured spiny lobster larvae and juveniles of known ages, and sizes almost year-round. Due to the long and intricate methods for culturing lobsters, many of my experiments that I started here will continue for several more months. Preliminary and initial data from other experiments I carried out however have provided me with ample information to begin to quantify some basic behavioral and nutritional aspects of spiny lobster development. A brief summary to date is listed below:

1) ***Light experiments:*** larval lobsters were cultured both individually and by mass culturing techniques (please see figure 1) to test sensitivity to light and swimming speed for of varying ages and sizes. Typically, I used larvae that ranged between 1 day old and 380 days old. Larvae were subjected to artificial oceanic light using a custom-made glass filter at a wavelength of 470nm and a constructed acrylic light box containing filtered seawater. Individual larvae were tested every couple of weeks in a repeated design (for later ANOVA analysis). Mass cultured animals were also used for testing to enhance total numbers. Larvae were also measured and assessed for injury or disease. Preliminary data suggest that responses to light are highly driven by age and nutritional condition (i.e. starved or fed, please see figure 3) that in turn has major consequences for their dispersal across vast areas of oceanic water.

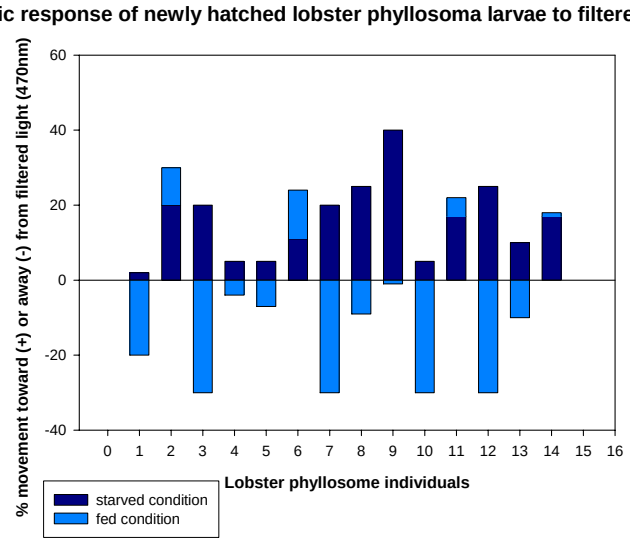


Figure 3: Preliminary graphic data.

2) ***Field surveys:*** several field surveys via SCUBA and research vessel were conducted around the Mie area, historically known for its abundant lobster settlement habitat. I documented and surveyed several areas using underwater digital photography (Sony P-8 Cybershot® with Marine Pak®) for later comparison with Florida Keys, USA spiny lobster habitat.

3) ***Performance of formulated feeds:*** My colleagues and I wished to attempt a feeding study for recently metamorphosed cultured juvenile lobster to understand further some of the nutritional requirements necessary for good growth, molting, and disease-free conditions. Traditionally the use of fresh muscle gonad is used since it yields good growth. We formulated three test diets (mussel gonad, *Artemia* (brine shrimp), and muscle gonad plus *Artemia*, all diets bound with agar and some other dry ingredients). All lobsters were initially weighed and measured (n=42) and kept in separate containers. We fed lobsters every other day and monitored feeding behavior and molting frequency (this study is also still continuing).

Literature Cited

Kittaka, J. (1997). Culture of larval spiny lobsters: a review of work done in northern Japan. *Marine and Freshwater Research* 48:923-930.

Matsuda, H., T. Takenouchi, and T. Yamakawa. (2001). Effects of temperature on pigmentation and duration of the puerulus stage in *Panulirus japonicus* metamorphosed from cultured phyllosomas, with reference to wild pueruli. *Marine and Freshwater Research* 52:1451-1457.

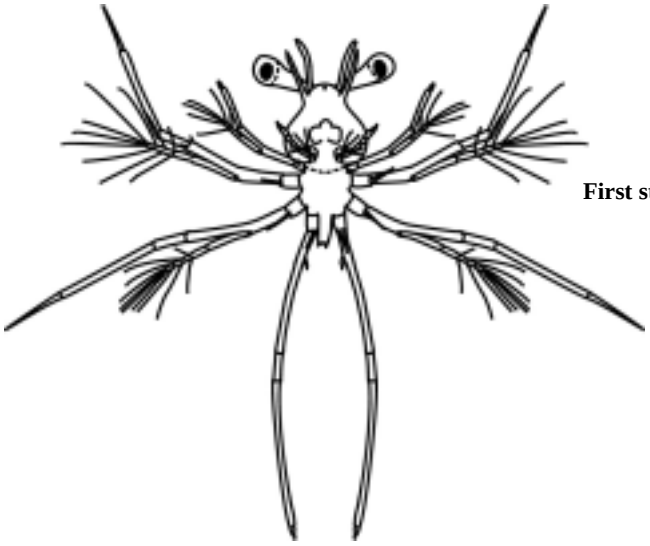
Tokyo Central Wholesale Market (1999). Annual Report of the Tokyo Wholesale Market in 1998 (Part: Marine Products), Tokyo Metropolitan Government, Tokyo, Japan 495p.

3. Perspective of Research after this Program:

The research I conducted is original and will be highly useful for disseminating in the future. One of the major obstacles in understanding the fishery and population dynamics of spiny lobster is a general lack of information for early life history stages. Some of the information I was able to gather here will be of significant value in further designing and understanding such processes. My choice of host laboratory combined with my particular research focus resulted in a very productive and meaningful experience for me in Japan. My colleagues and I are excited and pleased with the research and the many informational exchanges we shared. This experience allowed me to capitalize on the presence of various stages of lobster larvae, the excellent facilities, and the opportunity to learn in one of the only places in the world where warm-water spiny lobster have been reared and grown to completion. I do expect that some publication will be eminent, and we will make efforts to collaborate on more research in the future. I believe that I also offered a fresh and new perspective to doing marine biological research in the United States. Some of my colleagues have applied some of my methods and techniques also for their own research and this was really great to see.

4. Advisor's Remarks:

Mr. Jason Goldstein conducted with great enthusiasm several experimental studies on Japanese larval lobster culture, behavior, artificial and nutritional food development, and egg development in my lab. Jason also participated and observed Japanese lobster habitat in the field using SCUBA diving with us to compare with that of Florida lobsters. Jason introduced and shared many of his ideas and techniques to my lobster research. His attitude to the scientific research and other ordinary works was serious. Jason became familiar soon with many of my colleagues and lab staff. I spent the days delightfully with him for the fulfillment of the experiments and many discussions on lobster research.



First stage Japanese spiny lobster phyllosome

RESEARCH REPORT

Name:	Affiliation (University):
Mark P. Gunderson	**University of Florida**
Research Advisor:	**Host Institution:**
Dr. Taisen Iguchi	**Okazaki National Research Institutes** **Center for Integrative Bioscience**
Research Subject: **Regulation of hepatic enzymes and nuclear receptors by environmental contaminants in American alligators**	

1. Research Description:

Alligators inhabiting contaminated lakes in Florida are known to exhibit lower testosterone concentrations than alligators living in relatively clean sites. My present study examines the role that pesticides and pharmaceutical drugs play during development and juvenile stages in regulating hepatic enzymes involved in metabolizing testosterone in American alligators. Hepatic enzymes tend to have broad substrate specificities and the enzyme CYP3A is involved in the metabolism of testosterone along with a vast array of toxicants in other vertebrates. My hypothesis is that alligators inhabiting contaminated sites have altered CYP3A patterns that are conducive to the clearing toxicants from the body but also metabolize testosterone, leading to the observed differences in hormones among lakes in Florida.

2. Research Activities.

My research in Japan focused on examining the regulation of the CYP3A gene in alligators by classical inducers and pesticides. I used quantitative real time PCR to measure the relative mRNA message in livers collected from animals in Florida that were exposed either during development or as juveniles to chemicals. I also measured the relative mRNA message for 6 nuclear receptors to determine whether there was a correlation between one or more receptors and CYP3A message, which would suggest a regulatory relationship between the enzyme and receptor(s).

3. Perspective of Research after this Program:

This past summer's research was extremely productive for me. The resources made available for my use in Dr. Iguchi's laboratory facilitated this productivity and I hope to be able to collaborate with his laboratory in the future. Dr. Iguchi's laboratory is unique in that RNA isolation, nucleic acid quantification, gene sequencing, reverse transcription PCR, and real time PCR can all be conducted in the same room which enabled me to complete several publishable projects in the 7 weeks that I spent in Japan.

4. Advisor's Remarks:

Mark Gunderson successfully completed several publishable projects in 2 months. He worked very hard and finished the analyses of gene expression in the American alligator tissues he brought with him from Florida. We now have a partial sequence of an American alligator CYP3A gene and hope to have the full-length sequence of the gene in the near future. In addition to the above mentioned results we finished cloning the alligator estrogen receptor. This data has been submitted for publication.

Mark was a good influence on people working in my laboratory. Several of the people climbed Mt. Fuji for the first time with Mark. I am sure that our collaboration with Mark and Professor Guillette, University of Florida, will be continued in the future and more experiments are being planned.

RESEARCH REPORT

Name:	**Affiliation（University）:**
Creighton Hager	Virginia Polytechnic Institute and State University
Research Advisor:	**Host Institution:**
Drs. Aoyama and Morikawa	University of Tokyo
Research Subject: Security in Wireless Networks	

1．Research Description:

At my home institution my dissertation research involves a framework for securing wireless networks. A general approach to security for any type of wireless network has many limitations. Finding an optimized security scheme for one wireless network application, would minimize the performance and energy impact on the system. My research would provide an approach for securing certain wireless networks.

The research performed this summer at my host institution concerned securing service migrations within one communication session. The system worked on affects session layer mobility support for service migration. This model assumes the user interacts with a server device to update his keys and a user device that performs all the cryptographic operations during any time period on his own. The public device with a proper key can perform the cryptographic operation for the permitted period. The secret key used on the insecure device for decryption is refreshed at discrete time periods via interaction with a key generation device.

2．Research Activities:

The primary activity for this research consisted of implementing the cryptographic system needed for secure service migration. I have collaborated with Dr. Jonathan Katz from the University of Maryland, since his work is the base for our security implementation. The service migration system is software implemented; therefore, the cryptographic system is effectively an extension to the current software implementation. The security mechanism gave me more insight on how public-key cryptosystems operate.

I have also participated in other research activities this summer. I attended the Aoyama-Morikawa Lab Gasshuku in Shizuoka, which included focused group discussions about various lab related research topics. I also visited the Communications Research Laboratory, NTT Docomo, and NTT at Yokosuka Research Park on a business trip. Finally, I presented my dissertation research as a guest lecturer at the Advanced Telecommunications Research Institute International in Kyoto.

3．Perspective of Research after this Program:

I have come to realize how even more necessary policies are to security and securing services and applications. Through this research I have also dealt with tradeoffs between security and usability. Essentially, users will more likely employ security mechanisms if they are straightforward in operation.

A more detailed evaluation of the security system implementation could be used as a subtopic in my dissertation. The potential importance of this research makes it appealing and amenable for further investigation. I plan to continue research on this subject and communication with the Aoyama-Morikawa Laboratory. The possibility for future cooperative research is promising considering my common interest with people from this lab about mobile networks and wireless security.

4. **Advisor's Remarks:**

My formal host professor was Aoyama-sensei, but I was working at the laboratory under the guidance of Morikawa-sensei (below are his comments):

Creighton Hager has engaged in the research of service migration security for wireless networks. He has worked with students in the lab in developing the cryptographic system needed for securing service migrations. In addition, he established good communication and relations with other members in our laboratory. I am sure that he had good experiences not only in security and mobile computing, but also in understanding Japanese culture and life. Even though his stay in Japan was short, it was a pleasure to host him.

RESEARCH REPORT

Name: Baruch Harris **Affiliation (University):** UCSF

Research Advisor: Hiroyuki Hanzawa, Ph.D.
Host Institution: Sankyo Co., Ltd.

Research Subject: Use of NMR Screening in Drug Discovery

1. Research Description:

My summer research involved the development of techniques for drug screening using Nuclear Magnetic Resonance (NMR) spectroscopy. In the drug development process a time-limiting step is often the discovery of a promising lead compound that has desired activity against a target (usually a protein of therapeutic interest). A number of different techniques are currently available, but an ideal method would give a researcher the ability to screen through large numbers of prospective small molecules for a desired activity, after which promising molecules ("hits") could be further optimized using medicinal chemistry. NMR is a non-invasive method that has the potential for providing a large amount of information about a target in a high-throughput fashion.

2. Research Activities:

My project involved purifying a protein of interest to Sankyo (a potential drug target) and using it as a model system for development of NMR-based screening techniques. A number of lead compounds of varying affinities were already available, and we made use of these to test 3 different NMR methods on this protein. After purifying the protein my work consisted of preparing samples with lead compounds or combinations of compounds, and measuring the behavior of the prepared samples under different NMR conditions. The overall goal was to evaluate different methods and compounds for their suitability in a screening program. Eventually, such a screening program would be used on a novel target, or a target for which minimal information (and only a few or no leads) is available.

(Specific details of the research – i.e. which proteins, compounds, techniques, etc. are confidential and intellectual property of Sankyo Co., Ltd.)

3. Perspective of Research after this Program:

I enjoyed my research at Sanyko very much and found the whole experience very rewarding. Although I did not have much experience with NMR before the research started, my colleagues were extremely helpful and taught me the fundamentals of using the machinery, LINUX-based operating systems, etc. Dr. Hanzawa in particular was extremely understanding and patient given my relative lack of experience. There were also practical aspects of working in a pharmaceutical company that I became somewhat familiar with over the course of the summer. I was able to learn not only methods and techniques used by successful pharmaceutical research divisions, but also about Japanese language and culture. I hope that there are future opportunities for foreign students to come to Sankyo for the summer as I did.

4. Advisor's Remarks:

Dr.Harris was willing to learn new things and worked well regardless of the fact that NMR is a new field for him. In spite of the short term, the significant contribution to understanding the applicability of NMR screening has been made. Furthermore, his friendly attitude and background expertise were stimulating especially young scientists in Sankyo as well. I hope that we will have a guest researcher in this program again in the future.

RESEARCH REPORT

Name: **Joseph P. Hooper**	**Affiliation（University）:** **Tulane University**
Research Advisor: **Prof. Yoshiteru Maeno**	**Host Institution:** **Kyoto University**
Research Subject: **Superconductivity / Materials Research**	

1．Research Description:

The layered perovskite Sr_2RuO_4, which is isostructural to high-T_c superconductors, displays unique properties that indicate it has an unconventional, spin-triplet pairing mechanism. However, there is still controversy over several aspects of the Cooper pair wavefunction and the nature of the superconducting gap. The phase sensitive experiments based on the Josephson effect that provided convincing evidence for *d*-wave symmetry in the high-T_c cuprates have so far been impossible to perform with Sr_2RuO_4. However, it is now well established that tunneling experiments provide an extremely useful way to probe the nature of the pair wavefunction and can provide phase-sensitive information.

Tunneling measurements are sensitive to the quasiparticle density of states on the surface of a superconductor; quasiparticles can undergo a series of specular and Andreev reflections such that a kind of standing wave is formed on the interface between a superconductor and a normal metal. These give rise to very distinctive behavior in measurements of the tunneling conductance. However, there is also difficulty in performing these measurements on bulk Sr_2RuO_4, as there is a non-superconducting layer on the interface due to a structural distortion.

Recently two methods have been found to bypass this non-superconducting surface layer, both involving eutectic systems. By altering the growth conditions of Sr_2RuO_4, microscopic lammelar domains of elemental ruthenium appear, interspersed in the bulk material. In the thin region around these inclusions, the T_c is doubled and quasiparticle states are present even on the surface. The second system is a euctetic of $Sr_3Ru_2O_7$ with minor phase Sr_2RuO_4 present; though detailed structural analysis still needs to be performed, it appears that there is no structural distortion in this phase of Sr_2RuO_4, so quasiparticle tunneling studies are possible.

The superconductivity of Sr_2RuO_4 is extremely sensitive to impurities, and thus considerable effort has gone into growing ultra-pure samples. The floating zone method of crystal growth is currently the most effective way to produce high purity samples of the ruthenates; in this technique, the crystal is grown without any contact to a crucible, seemingly “floating” in mid-air. Crystal growth of the two eutectic systems above, using the floating zone method, was the focus of my work during the summer program at Kyoto University. If successful, these crystals would then ideally be used for phase-sensitive tunneling studies of Sr_2RuO_4.

2．Research Activities:

During the course of the summer institutes, I performed 13 floating zone growths of the eutectic systems and, where appropriate, materials characterization of the grown crystal. All growth conditions were kept as similar as possible, and only the starting ruthenium composition was altered. Beginning with a stochiometric mixture close to pure Sr_2RuO_4, the ruthenium composition was increased until it was close to the ideal amount for $Sr_3Ru_2O_7$. Mixtures falling between these two extremes generally resulted in Ru-Sr_2RuO_4 or $Sr_3Ru_2O_7$-Sr_2RuO_4 eutectic systems. In each case, a small sample of the crystal was ground and an x-ray diffraction was performed on the powder. Where appropriate, susceptibility measurements of the crystal were performed to test the superconducting transition temperature T_c. Crystals that appeared to be promising for further study were cut with a diamond saw, aligned using a Laue picture, and polished along various crystallographic directions.

3．**Perspective of Research after this Program:**

The research program was successful in growing quality samples of the eutectic systems for further study. In addition, the systematic method of only altering a single growth condition will hopefully provide useful data for developing a more quantitative approach to growing the strontium ruthenates. The facilities at Kyoto University were ideal for this project, and there was ample access to necessary equipment for materials preparation, growth, and characterization. The crystals grown for this study will be used for low-temperature experiments over the coming months, and should lead to increased collaboration between my home lab and my host laboratory at Kyoto University. In addition, the nature of the $Sr_3Ru_2O_7$-Sr_2RuO_4 eutectic system has not been well characterized; with the grown crystals, we hope to have further collaboration with other laboratories to determine the structure of this material (using techniques such as scanning/transmission electron microscopy).

4．**Advisor's Remarks:**

After Mr. Hooper settled in Kyoto, he quickly started his new activity as a member our research group. He demonstrated his competence and achieved his research goal during his short stay in Kyoto by growing single crystals of the metal-superconductor system. He collaborated very well with our graduate students and staff members.

The eutectic system Ru-Sr_2RuO_4 was found to exhibit extraordinary superconducting properties by our group at Kyoto: its superconducting transition temperature $T_c \approx$ 3 K is significantly higher than that of either of its constituents, T_c = 0.5 K for Ru metal and 1.5 K for Sr_2RuO_4. Although the mechanism of such enhancement in T_c is not well understood yet, it is already serving as an important system to reveal unconventional properties of superconductivity in Sr_2RuO_4, especially by tunneling experiments performed by Prof. Mao's group, to which Mr. Hooper belongs. Thus, his new project based on the idea to investigate whether or not another eutectic system Sr3Ru2O7-Sr2RuO4 also exhibits similar properties may well provide vital information on the mechanism of enhanced superconductivity, as well as on the mechanism of unconventional superconductivity of Sr_2RuO_4 itself.

He presented on his research activities in our group seminar. He also actively participated in social activities of our group, such as an excursion to a beach, going to festivals and attending parties. I am sure these activities helped him to be exposed well to some aspects of Japanese culture.

I hope that the experience and the expertise he gained here will prove useful in pursuing his research for his doctorate degree. I also expect that his visit here will greatly help expanding the collaboration between Tulane University and Kyoto University groups in the future.

RESEARCH REPORT

Name:	Affiliation (University):
Noah Jacobsen	University of California at Santa Barbara
Research Advisor:	**Host Institution:**
Professor Ryuji Kohno	Yokohama National University
Research Subject: Coding for the UWB Channel	

1. Research Description:

My research with Kohno Laboratory at Yokohama National University has dealt with optimal error control coding techniques for the extremely dispersive nature of an Ultra Wide Band (UWB) channel. Irregular low density parity check codes (LDPC) are known to approach the Shannon capacity on a variety of memoryless channels. A powerful *density evolution* algorithm, invented by Richardson and Urbanke [IT Feb 01], has enabled the discovery of these capacity approaching degree distributions (parameters of the irregular LDPC codes).

We propose to extend the density evolution algorithm to the case of a UWB channel, where channel memory is very long with respect to signaling rate. A first step has been to approximate inter symbol interference (ISI) affecting the desired symbol as i.i.d Gaussian noise. The Gaussian approximation was shown to be accurate by simulation, and has the advantage of transforming the UWB channel to a classical AWGN channel. Optimal irregular LDPC codes are well known for the AWGN channel, and can be applied directly.

Efficient communication over multipath channels ultimately requires some form of equalization. As such, a Gaussian approximation for ISI is not an end solution for UWB communication. However, since no prior knowledge of the transmitted symbols is required with this approach, the Gaussian approximation method would work well as the first stage in an iterative ISI cancellation and decoding receiver. Bootstrapping techniques are important to facilitate such iterative receiver methods.

2. Research Activities:

I have implemented the encoder and decoder for LDPC codes. I have also developed code to randomly generate an instance of an irregular LDPC code based on its degree distribution. The IEEE 802.15.3a UWB channel model was investigated. Simulations were performed with 16QAM and 4PSK signaling, and an irregular LDPC code optimized for the AWGN channel.

3. Perspective of Research after this Program:

My summer internship at Kohno Laboratory has proved to be an invaluable part of my graduate education. I've been able to pursue research at the very forefront of communication technology. Professor Kohno has been an extremely gracious host, showning me the academic as well as industrial sides of communication research and development in Japan. Indeed, his breadth of knowledge and diverse activity in the international wireless communication research community have made this summer a truly rewarding experience. The NSF/JSPS summer program has thus facilitated future research collaboration between our institutions.

4. **Advisor's Remarks:**

The internship applicant Mr. Noah Jacobsen has been researching several latest important subjects in wireless communications so hard that he could find a new research issue such as an irregular LDPC applied for a UWB transmission. The internship period is too short comparing with a scale of our joint project to have completed every issue in a field of optimum channel coding and decoding in UWB transmission over a practical channel. However, he has pursued a case of extending the density evolution algorithm for UWB transmission in AWGN channel. Even after the internship we will keep collaborating to obtain successive results. Finally I would like to appreciate the NSF/JSPS very much for us to have a great opportunity for our current and future collaboration.

RESEARCH REPORT

Name: **Jeremy Johansen**	**Affiliation (University):** **University of California at Santa Barbara**
Research Advisor: Osamu Matsumoto, Dr.Eng.	**Host Institution:** Intelligent Systems Institute, AIST
Research Subject: Robotics	

1. Research Description:

The aim of the research I conducted was to develop the technology necessary for a helicopter to fly without human pilot control. In particular, I investigated sensor systems that would provide the necessary aeronautical data for autonomous flight and researched the method by which an on-board computer would process this data using filtering and neural network techniques.

2. Research Activities:

My research activities included
*Research sensor systems for a helicopter UAV
*Analyze GPS and ARHS sensor product specifications
*Research neural network architecture

3. Perspective of Research after this Program:

My research in Japan has broadened my perspective on how research in the Engineering field is conducted. Additionally, I have advanced my understanding of robot design through my study and observation of other researchers this summer.

4. Advisor's Remarks:

Comment from host researcher:
Mr. Jeremy Johansen studied about automatic control architecture for autonomous helicopter using neural network system in Intelligent Systems Institute, AIST. He had a research potential for accurate estimation of flying vehicle's state from various sensor data, which is important for attitude and position estimation of a helicopter, so he made fruitful research results during staying in our institute. In our internal meeting, he introduced many related works and his idea about control architecture for autonomous helicopter. The presentation was very fruitful for us. We would like to do cooperation work with him in the future.

RESEARCH REPORT

Name: Tamie J. Jovanelly
Affiliation (University): Kent State University

Research Advisor: Dr. Yoshinobu Tsuji
Host Institution: University of Tokyo, Earthquake Research Institute

Research Subject: Tsunami Deposits

Research Description:

An inherent difficulty of trying to identify relationships between modern and ancient tsunami events is the absence of information on the preservation process of tsunami deposits. For modern day tsunamis, such as those generate by the 1923 Kanto earthquake event, 1933 Sanriku earthquake event, and 1993 South west Hokkaido earthquake event, the wave height and run-up were observed and measured. For ancient tsunami events, however, all that remains is the sheets of sand commonly deposited by tsunamis. The sediment left by a tsunami event records the initial acceleration of the waves, followed by long deceleration, that allows for landward sorting of sediment. Grain-size analysis of sand sheets is often used to identify ancient tsunami deposits based on this landward fining. At present, there is little knowledge of what changes occur to a tsunami deposit from the time of deposition to the time it is discovered, which can be thousands of years after deposition. Questions arise as to whether fine-scale sedimentary structures (*e.g.* cross bedding, laminations), as well as vertical and horizontal grading present at the moment of deposition, can be preserved through time and burial.

Research Activities:

July 12, 2003 marked the tenth anniversary of a devastating tsunami event occurring on Okushiri Island. It was here, ten years ago 230 people lost there lives on the southern tip of the island. As it was a recent day event, Japanese tsunami researchers clearly documented the damage done by the tsunami event. I was able to visit this island and attend ceremonies to commemorate the July 12, 1993 event. Comparing aerial photography taken just after the July 12, 1993 event to present day, it is easy to see that the city has monetarily rebounded from its loss and was able to rebuild the community. From field comparison, it becomes apparent that the sand layer and debris deposited in 1993 had been completely excavated from the area and was used in elevating ground surfaces rebuilt upon. Thus, this modern day tsunami sand layer was not preserved due to modern day practices.

Historical documentation from area shrines help to provide evidence that tsunami events commonly occur in the area of Boso Peninsula. In a 4 m tall outcrop near Genroku, I was able to identify seven tsunami sand layers (layers will be progressively older from top to bottom). The oldest of these layers dates to 8160-8020 ^{14}Cages (cal BP) as identified by Fujiwara *et al.* (1999) and Fujiwara and Kamataki (2003). The 1923 Kanto earthquake event was the most difficult to distinguish due to intense tree rooting from the surface, slumping, and burrowing by insects and animals. The other ancient tsunami events recorded by the presence of sand layers were well persevered. Commonly, these layers were bound on top and bottom by thick units of tidal mud; thus indicating a lack of change in environment. As is the case, these layers were not altered or contaminated. Sedimentary structures such as cross bedding, lamination, and fining upward sequences remained preserved in the ancient deposits. Upon close examination, preservation appeared to be linked to 1) the amount of sediment deposited and 2) to the environment of deposition confining the sand layer.

In addition, my activities in Japan included weekly seminar and lecture attendance, visitation to tsunami researchers at the Active Fault Research Center at the Geological Survey of Japan,

participation at the International Union of Geophysicists and Geodesy conference in Sapporo, Hokkaido, visitation and annual maintenance at University of Tokyo Tsunami Observation Center near Sendai, presentation of my dissertation research, piston core assembly and sampling in Lake Aokiko for purposes of active fault research.

Perspective of Research after this Program:

Having the opportunity to look at numerous tsunami deposits throughout Japan with the accompaniment of other tsunami researchers has strengthened my ability to identify sedimentary structures in outcrop. I have learned that tsunami deposits are not created equal; there is much more variety in tsunami deposit composition in Japan than in the United States!

This experience has been extremely valuable to my dissertation research. I have been able to converse directly with many Japanese tsunami researchers who have written research articles that are important to my dissertation project at Kent State University. In addition, I have obtained Japanese research articles that are simply unobtainable in America.

Attending the memorial services to remember those who died in the 1993 Okushiri Island tsunami event was a somber experience. Hearing the names read of 230 tsunami victims has left an impression on me and provided me with true insight as to why the study of natural disasters are important.

Advisor's Remarks:

Ms. Tamie J.Jovanelly stayed in our laboratory from the beginning of July to 20th August, 2003. During her stay, from 7th to 12th July, the IUGG meeting was held at Sapporo, in which she had a chance participate. More than seventy papers on tsunami problems were discussed there. After the meeting, she jointed to the members of the excursion to Okushiri Island, where she saw the damaged villages of the 1993 Hokkaido SW Earthquake-Tsunami, and participated the 10th anniversary mourning ceremony. On the way to return to Tokyo we visited Washinoki coast of Mori Town, Hokkaido, where we see the outcrop of lamination of thin sand layers and volcanic ash, which shows the trace of the historical tsunami caused by the eruption of Komagateke Volcano in 1640. She observed the construction of the lamination in detail for a long time more eagerly than any other members.

We, I, Tamie-san, and two of my students, visited in a small valley near the south top of the Boso Peninsula, where several eminent thin sand layers formed by pre-historical tsunamis appear on the surface of a cliff. She showed us the geological interpretation which was very educational for the Japanese side members.

From 15th to 18th August, we tried to get core samples of the bed layers at Aokiko Lake, Nagano Prefecture where three active faults run parallel in the north-south direction. This was the first attempt for our laboratory to make such a work by using our own materials. The work went not always smoothly, small troubles appeared many times, and moreover the weather condition was bad during our four day work. But finally we successfully obtained one sample, and we all shouted for joy.

I consider that she obtained many things which help her to be an excellent tsunami scientist in future.

I wish to express my thanks deeply to the officers of JSPS, who gave us such a fruitful chance both for her and for the members of our laboratory.

RESEARCH REPORT

Name:	**Affiliation (University):**
Gary A. Lamberton, Jr.	Clemson University
Research Advisor:	**Host Institution:**
Prof. Kunihito Koumoto	Nagoya University
Research Subject:	
Oxide Materials as High Temperature Thermoelectric Materials	

1. Research Description:

Layered oxide materials have been under significant scrutiny in recent years as potential thermoelectric materials. The majority of the research being carried out on these material systems is carried out in Japan, due to the potential energy harvesting capabilities of such materials. Sodium-Cobalt oxides and Zinc-Indium oxides are two of the most prevalent materials under investigation. Both materials exhibit potential rivaling that of current state of the art materials in the high temperature regimes. Oxides provide additional benefit in that they do not contain harmful elements and they are chemically stable in air at elevated temperatures. As a result, and due to the increased interest in 'green' materials, these materials have an advantage over current materials.

2. Research Activities:

As a part of Prof. Koumoto's laboratory this summer, I have been able to participate in group discussions and work with students and post-doctoral researchers on their current research. I have participated in high temperature measurement of electrical resistivity using the Van der Pauw technique. At Clemson, we do not utilize this technique, so it was a valuable experience for me. I also learned a bit about synthesis and self-assembled structures. In addition to the day to day in lab activities, I was able to participate in three conferences. I attended the national thermoelectrics meeting, a ceramics conference, and an on site CREST meeting. These meetings provided me with the opportunity to talk with many of Japan's most prominent scientists and get a better understanding of the research currently underway in Japan and the strategies for future work.

3. Perspective of Research after this Program:

I have learned a great deal this summer about research in Japan. Everyone I've interacted with during this research program left me with a positive view of Japan and it's scientists. There is a comradery present in the interactions between researchers that I think is much less prevalent in the US. I think this attitude of friendship is more suitable for collaborative research than the often fierce competitive nature of US researchers. I don't mean to say that all US researchers are unfriendly, but the atmosphere of meetings and conferences is certainly different. I think the Japanese are much more gracious hosts than US scientists. The approach to research in Japan is also quite different from the US, though I think both have their merits. It has certainly been a learning experience working in Japan for the summer. I hope to employ what I've learned here in my future research. I am very glad I had this opportunity and I will certainly encourage other US students to participate in this program.

4. Advisor's Remarks:

It has been very nice to have Gary Lamberton with us in my lab though for a short period. He has learned a lot, I believe, from staying in Japan. He has widened his view towards the scientific research, especially the current status of thermoelectric research which is closely related to his Ph.D. thesis through attending some conferences and meetings and getting acquainted with some outstanding Japanese scientists and students. He spent some time with my students making some experiments and discussing the research results, stimulating and advising them. It was also a good experience for my students. He also tried to learn a lot about the Japanese culture and civilization, and very much enjoyed living in Nagoya.

We would like to express our appreciation to JSPS and NSF for sending us a very nice young man from Clemson, and we will never fail to continue such a good relationship with him, his supervisor, and the related people.

RESEARCH REPORT

Name: Pui Yuen Lee Affiliation (University): University of Florida	
Research Advisor: Shizuo Akira, M.D., Ph.D **Host Institution: Osaka University**	
Research Subject: Immunology and Molecular Biology	

1. **Research Description:** Professional antigen presenting cells (APCs) such as dendritic cells and macrophages are essential links between innate and adaptive immunity. Utilizing a family of microbial recognition receptors known as Toll-like Receptors (TLRs), APCs detect invading pathogens and orchestrate immune responses by instructing effector cells (i.e. B and T cells). In the colon where a variety of microbes reside, however, such potent APC activity would lead to continuous activation of the immune system in response to normal intestinal flora. Since constant inflammation does not occur under physiological conditions, lamina propria APCs may have distinct molecular mechanisms that result in colonic hyporesponsiveness. In our study, we isolated and characterized colonic dendritic cells and macrophages from mice. Preliminary data has shown that despite of MAPKs activation, colonic APCs do not produce any inflammatory cytokines. Further research will be needed to elucidate the mechanism responsible for these findings.

2. **Research Activities:** In Dr.Akira's lab, I learned to isolate colonic and splenic APCs from mice. Responses from both cell types in terms of cytokine production and signal transduction were compared following stimulation with various TLR-ligands. The production of cytokines (IL-12p40, TNF-α, and IL-10) was measured by Enzyme-Linked Immunosorbant Assay (ELISA). Signal transduction was assessed by immunoblotting for the mitogen-activated protein kinases (MAPKs) p38, JNK, and ERK. To examine the role of IL-10 in colonic hyporesponsiveness, analysis was also performed for colonic APCs obtained from IL-10 as well as Stat-3 knock-out mice.

3. **Perspective of Research after this Program:** In Dr.Akira's lab, I learned to isolate colonic and splenic APCs from mice. Responses from both cell types in terms of cytokine production and signal transduction were compared following stimulation with various TLR-ligands. The production of cytokines (IL-12p40, TNF-α, and IL-10) was measured by Enzyme-Linked Immunosorbant Assay (ELISA). Signal transduction was assessed by immunoblotting for the mitogen-activated protein kinases (MAPKs) p38, JNK, and ERK. To examine the role of IL-10 in colonic hyporesponsiveness, analysis was also performed for colonic APCs obtained from IL-10 as well as Stat-3 knock-out mice.

4. Advisor's Remarks: Pui tried to establish a protocol to isolate colonic lamina proprial macrophages. Everyone finds difficulty in performing this experiment. However, he elegantly performed the experiments, and successfully isolated and characterized these cells. The data he obtained are remarkable. I believe that no one else could obtain such quantity and quality of results within two months. In addition, He is a good-natured person and had a favorable influence on our students.

RESEARCH REPORT

Name:	Affiliation (University):
Kevin Mackie	University of California Berkeley
Research Advisor:	**Host Institution:**
Kazuhiko Kawashima	Tokyo Institute of Technology
Research Subject: Performance-based evaluation of a Japanese isolated bridge	

1. Research Description:

Japan is one of the most seismically active regions in the world, with numerous large and well documented events in the last 100 years. The most influential and devastating of these include the Great Kanto earthquake in 1923 and the Hyogo-ken Nanbu (Kobe) earthquake in 1995. Lessons learned from previous earthquakes have led to the improvement of bridge design codes and a better understanding of structural response under extreme loading. In order to limit damage, many highway bridges in Japan are now designed and built using the Menshin design concept. This entails reducing response of bridges through period elongation made possible by isolation systems and increased energy dissipation through the use of dampers. Several documents exist for engineers to design such bridges, including the "Design Specifications for Highway Bridges" updated after the 1995 Kobe earthquake. Several prototype structures are designed and analyzed in an accompanying example manual. With the advent of greater computational power, more complex numerical analysis tools can be used to model the seismic response of bridge structures with isolation systems included. Results can be used to evaluate the expected response of prototype bridges under near-field or other large magnitude events. Specifically, nonlinear response and residual displacement of the piers were investigated.

2. Research Activities:

A specific application of Menshin design to a prototype reinforced concrete bridge presented in the Design specifications was used to evaluate seismic response under numerous Japanese and US ground motions. To accomplish this, a numerical finite element model of the bridge was developed. A two-span segment of the bridge with two piers and an abutment was selected for three-dimensional modeling using fiberized beam-column elements. Lead rubber bearing isolators are located in a transverse array at the abutment and piers. Menshin design attempts to limit the period elongation of the structure by using stiffer isolators, however, they may cause the substructure to experience damage during large events. Response was computed under a collection of California earthquake ground motion bins, a near-field bin of California records, and several motions used in research and design in Japan. These included JMA Kobe, JR Takatori, Chi Chi Sun Moon Lake, and several design spectrum fitted time histories used as design motions. The isolators are effective at dissipating energy and limiting the shear transmitted to the piers in most of the records. Some nonlinear behaviour can be observed in the piers under JR Takatori and Sun Moon Lake, both in a flexural mechanism and in shear if confinement of the reinforced concrete piers is insufficient. A probability distribution of response can be developed from the aleatory uncertainty inherent in ground motions. This distribution was developed for system displacement response, pier and abutment curvature response, isolator response, and residual deformations in the structure which may limit it's post-earthquake functionality. The results can be used to assess whether the design code sufficiently addresses the demand on piers, isolators, expansion joints, etc in future earthquake events.

3. Perspective of Research after this Program:

The design philosophy in the US and Japan are markedly different, so it was interesting to learn about different approaches to the same natural phenomenon. Even by restricting the period elongation in Menshin design, nonlinear response and damage in the piers was still limited. Unfortunately, most of my research has to do with damage prediction and loss modeling in highway bridges that undergo significant inelastic excursions (most non-isolated highway bridges). Therefore, this proves the usefulness of isolation systems in limiting damage, but does not help for evaluation of post-earthquake functionality using my current research direction. The analytical model developed during this program

may be helpful in the future for investigating a new method for such loss modeling. I wish to thank Professor Kawashima and all of his students for allowing us to join them in their lab this summer.

4. Advisor's Remarks:

Mr. Kevin R. Mackie was involved in a research to evaluate the seismic performance of a Japanese isolated bridge based on a numerical simulation. This research was jointly conducted with another summer student, Gordon P. Warn. A US computer software called “Opensees” was used for this purpose. The analysis revealed an interesting difference as well as similarity between US and Japan in the seismic performance of the isolated bridge. Major difference was the large relative deck displacement. This is inherent in the difference of design concept between two countries. I found that this is an interesting research for evaluating the seismic response of isolated bridges in both US and Japan. Mr. Kevin R. Mackie worked enthusiastically to get an interesting result within a short period of stay. He also joined several research activities in our research group. He was always friendly to other members. It is my surprise that he climbed Mt. Fuji with Gordon P. Warn.

RESEARCH REPORT

Name:	Affiliation (University):
Chad Mair	University of Florida
Research Advisor:	**Host Institution:**
Dr. Jun Takeda	Yokohama National University
Research Subject: Measurement of ultrafast photophysical processes	

Research Description:

The primary focus of the research performed by Dr. Takeda's group in centered on developing an understanding of the basic physics of optical excitations exhibited by solid state materials, which include ZnO and a family of 1D materials. Using the output of a solid state, tunable, amplified laser system with a repetition rate of 1KHz and an optical Kerr gating technique allows his students to collect the time resolved luminescence in the sub-picosecond time regime.

Other projects currently ongoing in the Takeda laboratory include the development of a transient imaging optical setup which should, allow transient absorption measurements to be collected from materials that are easily photofatigued. The group is also attempting to collect the third order nonlinear response exhibited by ZnO using transient grating, degenerate four wave mixing spectroscopy.

Research Activities:

During my stay in professor Takeda's laboratory I have been exposed to experiments involving both the collection of time resolved luminescence of the 1D material and the transient imaging of beta carotene. The measurement of the time resolved luminescence was difficult due to the very small luminescence intensity from the material and the Kerr signal was not visible under the current experimental conditions. Transient imaging experiments however were more successful, preliminary data evaluation seems to indicate that the results obtained from an imaging data set follow the trend for the known absorption decay collected using conventional pump-probe spectroscopic techniques.

I have also attempted to measure both the time resolved luminescence of a hyperbranched polythiophene using the optical Kerr gating technique, and the excitation energy dependence of the time integrated luminescence. Due to limited time and sample, the time resolved luminescence data was not obtained for the polymer sample. A weak, Kerr signal, however was visible for the material and optimization of experimental conditions, such as reducing the scattered light, and increasing the optical density of the sample should allow the time resolved luminescence data to be collected. It was possible to take one set of data for the excitation energy power dependence of the time integrated luminescence for the polymer. The luminescence appears to shift toward higher energy after a threshold power of about 300nJ.

Perspective of Research after this Program:

One of the goals for my visit to Dr. Takeda's laboratory was to further foster the possibility for collaboration between my research group at the University of Florida and his at Yokohama National University. Since our research is very closely related differing only in the choice of materials for investigation it is only logical to engage in an exchange of knowledge concerning experimental design and data analysis techniques. I also hope to use the knowledge I have obtained about the Kerr shutter measurements to incorporate this technique at my home laboratory.

Advisor's Remarks:

Chad Mair has participated the research on femtosecond optical Kerr shutter and pump-probe imaging experiments during his stay in my lab. Although we could not observe the time-resolved luminescence from a hyperbranched polythiophene polymer using the optical Kerr shutter technique, we observed a new strong luminescence of the polymer for the first time which emerges only when the pump intensity is high enough. We have also developed a real-time pump-probe imaging spectroscopy and obtained preliminary pump-probe data of beta-carotene.

He made a significant contribution to the above experiments especially on the imaging experiment. His stay also stimulates and encourages my students to further efforts on research. For these reasons, I hope further collaboration on the ultrafast laser spectroscopy experiments with his group at UF.

RESEARCH REPORT

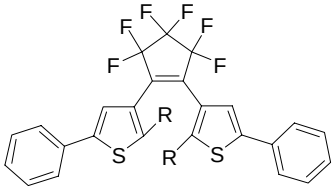
Name:	Affiliation (University):
Matthew M. Meyer	**University of California, Riverside**
Research Advisor:	**Host Institution:**
Dr. Masahiro Irie	**Kyushu University**
Research Subject: Single Crystal Photochromism	

1. Research Description:

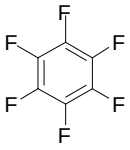
The concept of photochromism, the reversible change in the color of a compound upon irradiation with light of the appropriate wavelength, in diarylethenes and their potential uses in optical memory devices have been well established in the literature. During the course of my stay in Japan, I sought to probe photochromism of diarylethenes in single crystal by the use of supramolecular synthetic modifications of these known systems. The modification of the supramolecular arrangement in the crystalline state will shift their optical propriety and give a new photochromic system with enhanced properties. Herein we attempt the co-crystallization diarylethenes with flouoroaromatic compounds, pentacenes, and other diarylethenes.

2. Research Activities:

The project began with completing the three step synthesis of **1a** according to the method described in the literature.



1a R=Me
1b R=Et



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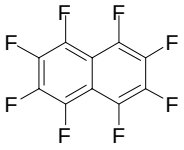

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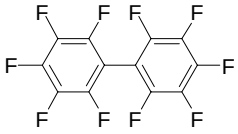

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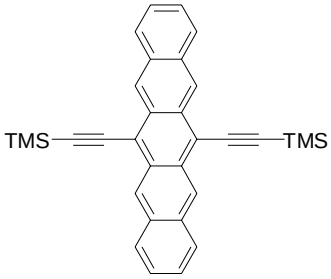
After a reasonable amount of **1a** was obtained a variety of conditions were used in order to attempt the co-crystallization of **1a** with **2-4**. Though a large number of single crystals were obtained, none showed any change in the optical property over the pure crystals. This suggests that **2-4** were not being intercalated into the crystal structure. As a possible solution to overcome the high crystalinity of compound **1a**, a previously prepared sample of **1b** was used to repeat this set of experiments but yielded the same results. In an effort to afford some type of co-crystal with new optical properties, compound **5** was prepared according to the literature, and co-crystallization with **1a,b** was attempted. These attempts yielded only pure crystal of each compound. Lastly using a prepared sample of **6** and co-crystallizing them with **1a,b** several new photochromic crystals were obtained which produce different optical propriety than either pure crystal. To date full characterization of these crystals is still underway.



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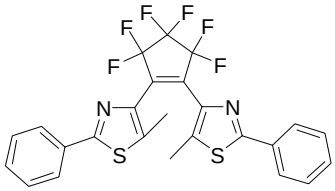

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3. Perspective of Research after this Program:

At the onset of this program two months seemed like plenty of time to secure the desired results for the summer. Once research began it became quickly apparent that it would be a harder task than it initially appeared. While there is an adjustment period whenever you begin research in a new laboratory, the undertaking of this in a foreign country seems greater. The synthesis is similar to that of my dissertation research, the techniques, in which it is accomplished varies greatly from my home lab. During the first few weeks of fumbling around in the lab, a lot of exchange of techniques was necessary before any result could be obtained. While this process was extremely time consuming, I feel that it was mutually beneficial to both me and my lab mates, in that even if we continue to use our same, we at least considered that there is other approaches. My experiences in Japan, leaves me with a great appreciation for the space and safety concerns of an American laboratory. I also take from this time a new awareness of different, more efficient approaches toward chemistry. I am deeply indebted to Irie Sensei; Dr. Kawai, Dr. Matsuda, Dr. Kobatake and Dr. Takami and the rest of the Irie Group for there on going willingness to answer my endless questions and there many insightful conversations that have left me with a new appreciation for difference and similarity of the fielid of chemistry with a world wide prospective.

4. Advisor's Remarks:

Mr. Meyer spent a really active 6 weeks in our laboratory. He succeeded to synthesize two photochromic and host compounds and prepared several photoactive single crystals. The properties of these crystals were analyzed by AFM and other techniques. He is also now familiar with several methods and techniques developed in our laboratory. This program is very helpful to initiate mutual collaboration. We decided to communicate with each other and continue the collaboration. In addition to the above scientific activity, he enjoyed Japanese style student life and his stay also activated Japanese student in our laboratory. From both sides this program was fruitful.

RESEARCH REPORT

Name: Ion Moraru Affiliation : Michigan State University	
Research Advisor: H. Ohno Host Institution: Tohoku University	
Research Subject: Semiconductor Electronics	

1. Research Description:

With tremendous improvement in film growth technology in the last few years, great advances have been made in the study of a new class of semiconductor materials, namely ferromagnetic semiconductors. Specifically, III-V diluted magnetic semiconductor (DMS) materials have been shown to exhibit ferromagnetism due to the introduction of a sizable amount of magnetic ions, thus providing new degrees of freedom to extend device functionality. In this manner, the role of electronic spin as well as charge can be combined, resulting in the emergence of a new class of materials for potential application. My aim this summer was to gain familiarity in the fabrication of mesoscopic devices using GaAs-based magnetic semiconductors and understanding of the mechanisms governing various magnetic and transport properties.

2. Research Activities:

The main method for fabricating ferromagnetic semiconductors has been molecular beam epitaxy (MBE) in an ultra-high vacuum (UHV) environment, which gives the capability for controlled growth with thickness down to a single molecular layer and optimal for heterostructures with sharp interfaces. One of the important features of MBE is the availability of *in situ* surface monitoring and characterization. This is typically done in the form of reflection high energy electron diffraction (RHEED) by which crystal perfection, surface flatness and surface reconstruction is monitored. This method utilizes a primary electron beam which is incident on the crystal substrate surface at a grazing angle and produces a surface-dependent diffraction pattern. Oscillations in the RHEED intensity, which occur immediately after initiation of growth, provide information on surface migration, growth rate and alloy composition. These factors along with substrate temperature and material partial pressures are critical in the successful growth of good quality ferromagnetic semiconductors. Low temperature MBE has allowed the successful introduction of a large amount of magnetic elements (such as Mn) beyond the solubility limit in III-V semiconductors as well as overcoming difficulties with second phase formation and segregation.

Once grown, the magnetic properties of III-V DMSs can be probed directly by magnetization measurements as well as by magnetotransport measurements. Using standard SQUID techniques one can observe a hysteretic magnetic field response below the Curie temperature, a behavior which is standard for ferromagnetic materials. Various growth parameters as well as the introduction of strain causes the material to exhibit very different magnetic behavior. Furthermore, magnetotransport measurements provide complementary information relating to carrier behavior within the material.

Device patterning is accomplished by several methods, which depend on the type of measurement under consideration. These range from mechanical masks for mm-size sample lengths, down to micron and sub-micron scales utilizing optical and electron beam lithography with various surface treatments and etching techniques. Typically, sample processing requires a clean room environment for the prevention of contamination with unwanted elements. Successful fabrication of magnetic semiconductors has opened the doors to a wide variety of topics for study relating to spin injection and relaxation, as well as spin-dependent transport and coherence in multilayer structures.

3. Perspective of Research after this Program:

My participation in the laboratory of Prof. Ohno through this summer program has allowed me to gain better insight into growth and characterization techniques used for magnetic semiconductors as well as understanding the mechanisms behind many interesting phenomena associated with these materials. The resources and personal expertise available to me have facilitated my gaining additional knowledge of the relevant parameters involved in device fabrication and thin film growth (particularly with respect to magnetic semiconductors), which is critical in conducting any experimental work in mesoscopic physics. Specifically, insight into material analysis tools used *in situ* and post growth have nicely complemented skills developed through the course of my PhD work.

4. Advisor's Remarks:

Very intelligent and enthusiastic student who left a great impression to the group members. With Dr. Kita, a postdoc in my group, Ion has gone through the preparation processes for fabrication of nanoscale semiconductor magnets. His stay was too short to complete a full research cycle but I am sure he learned much from the ongoing research work in my group. Dr. Kita also has gained a lot from interacting with Ion. I hope he still had time to expose himself to the Japanese culture and landscape. I wish him a great success not only on his Ph D but his scientific career.

RESEARCH REPORT

Name:	**Affiliation (University):**
Abby Whittington Morgan	University of Illinois at Urbana-Champaign
Research Advisor:	**Host Institution:**
Dr. Yasuhiko Tabata	Kyoto University
Research Subject: The use of gelatin microspheres for the delivery of growth factors to aid in the healing of critical sized defects in bone.	

1. **Research Description:** In drug delivery devices, several factors play key roles in how the material releases a drug overtime. In the case of microspheres, extent of crosslinking, size, size distribution, and chemical composition are important factors to consider. Until now, investigations into the effects of size and size distributions were limited by the capabilities to produce uniform microspheres. A new technique developed by Drs. Kevin Kim and Hyungsoo Choi at the University of Illinois at Urbana - Champaign makes fabricating uniform microspheres of a desired size possible. Using this technology, uniform gelatin microspheres of three distinct sizes were created. *In vivo* investigations were carried out on the effects of size on microsphere degradation, protein release, and ectopic bone formation. It is hypothesized that the smaller microspheres will degrade and release faster than the largest microspheres. It is also thought that by creating a uniform distribution of microspheres, the burst release (>50% released in the first 24 hr) will decrease.

2. **Research Activities:** To investigate how size affects gelatin microspheres; I performed several *in vivo* experiments. The first investigated how degradation is affected. Gelatin microspheres of three different sizes (25±4, 50±3, and 77±6 μm) were radio-labeled with Hunter-Bolton reagent. Two milligrams of these radio-labeled microspheres were injected intramuscularly into the thigh of the mouse. The degradation was determined by measuring the radioactivity of the remaining microspheres at days 1, 3, 7, 10, 14, and 21.

The second experiment studied the release profile of recombinant human bone morphogenetic protein – 2 (rhBMP-2) from gelatin microspheres. Recombinant human BMP-2 binds to the gelatin through ionic interactions and Prof. Tabata's laboratory has shown that the release of the protein coincides with the degradation of the gelatin. By radio-labeling the rhBMP-2 with ^{125}I, the release profile can be measured. The radio-labeled rhBMP-2 was then incorporated into 2.0 mg of gelatin microspheres and injected intramuscularly into the thigh of the mouse. The release profile was determined by measuring the radioactivity of the protein remaining in the microspheres at days 1, 3, 7, 10, 14, and 21.

The last *in vivo* experiment was to determine the efficacy of the microspheres in the delivery of rhBMP-2 and the induction of ectopic bone formation. BMP-2 is a strong growth factor able to induce the formation of bone in sites where it does not naturally occur. One microgram rhBMP-2 was incorporated into 2.0 mg gelatin microspheres of three different sizes and injected intramuscularly into the thigh of the mouse. Tissues were evaluated at 1, 2, and 4 weeks after injection. Presence of ectopic bone was determined by x-ray, histology, and alkaline phosphatase (ALP) and calcium assays.

Along with the above experiments, I was able to learn several techniques from the students in the lab. Several of these techniques include: how to harvest rat mesenchymal stem cells, embed and stain tissues for histology, perform various assays (ALP, Ca^{2+}, trinitrobenzene sulfonic acid (TNBSA)), suture skin, and some basic cell culture techniques.

3．**Perspective of Research after this Program:** The delivery of various growth factors to aid in bone healing requires the knowledge of many different fields, from biology to engineering. Collaborations between scientists and medical professionals are necessary to fully understand the problems and opportunities encountered in this industry. In Prof. Tabata's laboratory, both medical and scientific doctors can be found working side-by-side. This gave me a unique opportunity to share and discuss ideas from different perspectives and backgrounds. By being in his laboratory, I have been able to establish connections that I hope to keep throughout my research career. My discussions with Prof. Tabata and his students were very informative and helpful. I thoroughly enjoyed working with his research group in Kyoto University. I would like to thank Prof. Tabata for all of his help and generosity during my stay, and his research group for making my time in Japan always interesting.

4．**Advisor's Remarks:**

During her short stay in my lab, Abby Morgan effectively completed more experiments than I expected. She learned many new techniques and proved to be a fast learner. Even though there were some problems in the beginning with her material, she overcame these difficulties and produced some interesting results. She fit in well with my students and actively discussed with them. She was happy to help out in group activities and always willing to help out the other students. Her staying in my lab gave our students and collaborators good and valuable chances to talk and discuss in English. I always think that it is very important for them to get use to English conversation. Abby Morgan understands this idea and has tried to encourage the shy Japanese to use English everyday. I believe that even though a very short stay, this JSPS program brought about various fruitful results for both our group and Abby Morgan. I am sure that we will continue our collaboration after Mrs. Morgan returns to the United States.

RESEARCH REPORT

Name:	Affiliation (University):
Jeffrey Mosenkis	University of Chicago
Research Advisor:	**Host Institution:**
Shinobu Kitayama	Kyoto University
Research Subject: Culture and Relational Styles: Beyond Language	

1. Research Description:

Recent research in cultural psychology has highlighted differences in the ways people from different cultural backgrounds communicate, beyond simple linguistic differences. These can include such factors as directness (i.e. Ambady, Koo, Lee, & Rosenthal, 1996), and emotion content (i.e. Sanchez-Burks, Lee, Choi, Nisbett, Zhao, & Koo, 2003). These differences have been investigated in the workplace, where communication can be particularly important and miscommunication can have real consequences. This study seeks to investigate the consequences of workers being put into a new cultural context, and tries to understand what barriers other than linguistic, might be involved in cross-cultural communication in the workplace. The findings of this research will be used to compare to studies of foreign workers in the US.

2. Research Activities:

At the time of this writing, data collection is still ongoing, and consists of surveys and focused interviews of American workers in Japanese companies and their Japanese co-workers. These focus on implicit ideals of employee behavior to compare the American's ideas with their Japanese co-workers'. In addition, the interviews tried to understand specific examples of miscommunication, its antecedents, and consequents, and the extent to which workers themselves were aware of them.

3. Perspective of Research after this Program:

Significant advances in cultural psychology have been made in the last decade by teams of American and East Asian researchers, each performing studies in their own country and comparing results. While these studies have shed light on cultural universals and differences in thinking, actually living in a completely foreign culture adds an immense amount of understanding, far more than reading research about the culture. I've benefited significantly from being immersed in Japanese culture and having regular interaction with real live Japanese people.

In addition, being able to visit and communicate with my colleagues here has led to many new observations and in turn, ideas for further research.

4. Advisor's Remarks:

While in Japan, Jeff Mosenkis initiated his research on cross-cultural communications in business settings. He has so far found contacts in business communities in Japan and finalized a interview scheme. I think this is a great accomplishment given the short duration of the stay made possible by the JSPS program. In addition, I am very pleased to see him interest with a number of students in my lab. They benefited a lot from his presence. I hope that he also benefited from the stay in my lab. Overall, I believe that his visit to Kyoto was a great success.

RESEARCH REPORT

Name:	**Affiliation (University):**
James D. Newell	Oregon State University
Research Advisor:	**Host Institution:**
Prof. Kazuhiko Kasai	Structural Engineering Research Center Tokyo Institute of Technology
Research Subject:	
Input Energy Equivalent Velocity Response Spectra for Seismic Design	

1. Research Description:

For design purposes structural engineers utilize response spectra to characterize structural behavior when subjected to seismic excitation. Current design methods in both Japan and the United States utilize displacement-based response spectra in which the period of vibration of the structure is related to a design displacement, velocity, and acceleration of the structure resulting from the design earthquake.

Researchers in Japan and the United States are becoming increasingly interested in development of energy-based design methods in which the seismic energy demand on the structure is used as a design parameter. Additionally it is desired to estimate nonlinear structural response using simplified methods of linear analysis.

Analysis has been conducted to characterize displacement and energy-based design parameters for linear and nonlinear single degree of freedom (SDOF) systems subjected to a suite of earthquake ground motions. Absolute input energy has been investigated as a design parameter. Possible relationships between absolute input energy and maximum displacement have also been analyzed.

2. Research Activities:

To investigate the use of absolute input energy for energy-based seismic design a number of response spectra were constructed over a period range of 0.1 - 3.0 sec. for six earthquake records, four ductility values (μ = 1.0, 2.0, 4.0, 6.0), and three post-yield stiffnesses (p = 0.0, 0.2, 0.5). For the linear spectra (μ = 1.0) six different viscous damping ratios (h = 0%, 2%. 5%, 10%, 20%, 40%) were analyzed. Viscous damping for nonlinear cases was equal to 2% of critical. The computer program NONSPEC (Mahin and Lin, 1983) was used to calculate response of the SDOF system for the input ground motions. The non-scaled earthquake records used were: 1952 Kern County Taft 111° and Taft 021°, 1940 Imperial Valley El Centro NS and El Centro EW, 1995 Kobe JMA NS, and 1999 Chichi TCU065 EW.

Results indicate that a linear input energy equivalent velocity response spectra with 10% viscous damping provides a reasonable representation of a nonlinear input energy equivalent velocity spectra. Therefore it may be possible to estimate nonlinear energy demand using simplified linear analysis techniques. Determining displacement-based design parameters from energy-based design parameters is an important step for transition between the two design philosophies. Analysis has shown that refinement of a “Japanese Rule” has the potential to facilitate accurate determination of maximum displacement from total absolute input energy. Further analysis of additional earthquake records will help to further quantify these preliminary findings.

3. Perspective of Research after this Program:

This research will be continued by both Japanese and U.S. counterparts to develop new techniques for energy-based seismic design of structures. Observations made during this research project will be combined with observations from analysis of additional strong ground motion events. Additional methods to relate energy and displacement-based design parameters will be determined so that the design community can transition between the two methods of seismic design.

4. Advisor's Remarks:

The concept of the energy method was originally developed in 1950's by Prof Housner of California Institute of Technology. Interestingly, it was not American but Japanese researchers who extended this concept. The concept is about to be added to the current building seismic design code in Japan. At this point, however, they have encountered many questions/problems regarding accuracy of the energy method.

This research aimed to explore solutions to some of such problems. Within this short duration, Mr. Newell worked very well, and produced fine results that may become important for improvement of the energy method. I enjoyed very much working with Mr. Newell, and look forward to expanding our findings possibly with him in the near future.

RESEARCH REPORT

Name: Thaddeus Norman
Affiliation (University): University of California, Santa Cruz (UCSC)

Research Advisor: Dr. Ryoichi Akimoto
Host Institution:
National Institute of Advanced Industrial Science and Technology (AIST)

Research Subject: The Study of the Intersubband transitions in ZnSe/BeTe and (CdS/ZnSe)/BeTe Quantum Wells

1. **Research Description:**

The research consisted of extensive study of the ZnSe/BeTe and (CdS/ZnSe)/BeTe quantum well systems, and the growth of this system using molecular beam epitaxy (MBE). An attempt was made to collect the infrared emission spectrum of the (CdS/ZnSe)/BeTe quantum wells.

2. **Research Activities:**

Research activities included the assisting is sample preparation, laser alignment, and the collection of emission spectra. Visits to Chiba University and Tokyo University, where magneto-optical measurements on similar semiconductor heterostructure systems are underway, were arranged. Also the synchrotron radiation facilities of SPring-8 were toured.

3. **Perspective of Research after this Program:**

After my stay here in Japan I have a deeper since that scientific research is an international effort, and much can be gained by developing collaboration and contacts on an international level.

4. **Advisor's Remarks:**

Mr. Norman acted as part of a team that has made a significant contribution to the development of new materials for high-speed optical communication. He also contributed to widening the international atmosphere of the laboratory.

RESEARCH REPORT

Name:	**Affiliation (University):**
Jeffrey S. Oishi	University of Virginia/American Museum of Natural History
Research Advisor:	**Host Institution:**
Dr. Kohji Tomisaka	National Astronomical Observatory
Research Subject:	
Numerical Studies of Protostellar Core Collapse	

1. Research Description:

Outflows from protostellar cores are essential to our understanding of the star formation process. We consider the outflows from a magnetized, rotating hydrostatic core as it collapses under self gravity. The outflows that arise from such situations are thought to transport angular momentum out of the forming proto-star, a necessary ingredient in forming stars, which are known to rotate slowly, from rapidly rotating interstellar molecular clouds where stars are known to form. Our studies are carried out using computer simulations of magnetohydrodynamics, the physics of magnetized plasmas.

2. Research Activities:

Building on the previous hydrodynamic studies of Dr. K. Saigo, we performed a number of 2-dimensional magnetohydrodynamical computer simulations. In order to do so, we converted the Dr. Saigo's data for use with a computer simulation program written by Dr. K. Tomisaka.

3. Perspective of Research after this Program:

In participating in the 2003 JSPS Summer Program, I have gained considerable insight, both physical and practical, into the processes of numerical computation as it applies to star formation. Dr. Tomisaka guided me in a most thoughtful manner through the often complex route one must take in order to yield physically meaningful simulations and intellectually robust theories.

4. Advisor's Remarks:

Jeff tried to attack a problem on binary star formation, which is one of the major problems attracting many interests now. He updated my MHD code and studied the contraction of a magnetized molecular cloud core. Although he studied hard, one and a half month is too short to reach final result. (Exchange of applicants' background and their hope in research before the arrival would be helpful for efficient collaboration.) However, I am sure he has studied a lot on the research process of numerical simulations.

RESEARCH REPORT

Name:	Affiliation (University):
Michael Prowse	University of Washington
Research Advisor:	**Host Institution:**
Dr. Toyohiro Chikyow	National Institute For Materials Science (NIMS)
Research Subject: Titanium oxides for thermoelectric conversion	

1. Research Description:

A thermoelectric material is a material that generates an electrical potential when subject to a temperature gradient. Thermocouples operate on the same basis. Of thermoelectric materials, oxides have recently received great interest as candidate materials for thermoelectric conversion as a result of recent discoveries. Metals and semiconductors have dominated the field of thermoelectrics due their high conversion efficiencies, but they are limited in applications because of oxidation and/or low melting temperatures. Therefore, oxides have a number of advantages. They are more chemically and thermally stable allowing oxide based thermoelectrics to operate under a wider range of environmental conditions. Current research on thermoelectric oxides has focused on 3d transition metal oxides, mainly Co but also oxides of Ti, Ni, and Mn have been investigated. These oxides are relatively abundant, cheap to produce and far more environmentally friendly then thermoelectric materials utilizing heavy metals, such as Pb, Bi, and Te.

In particular oxides of titanium of the perovskite structure have large Seebeck coefficients and are good electrical conductors. These two parameters rival those of more traditional thermoelectric materials based on heavy metals. However, thermal conduction in these oxides is high. As the figure of merit for thermoelectric conversion Z, $ZT=(S^2\sigma T)/\kappa$ where S is the Seebeck coefficient, σ is the electrical conductivity, κ is thermal conductivity and T is the absolute temperature. The research in these titanium oxide(s) as thermoelectric materials is in the beginning phases and much work is required to optimize both the electrical and thermal properties in order to maximize the thermoelectric conversion efficiency.

2. Research Activities:

Pulsed laser deposition (PLD) was used to deposit thin metal oxide films on to doped SrTi03 (STO) substrates. The films were deposited in such a way to yield binary compositional spreads, representing 2 component oxide systems. The Seebeck coefficient and electrical conductivity measurements were performed on the binary thin films using a computer controlled electrical probe and x-y stage. The results of which can be represented graphically, resulting in a complete conductivity or Seebeck coefficient map of all compositions represented in the binary composition spread, analogues to a phase diagram. High temperature measurements were performed on a specially designed apparatus capable of reaching temperatures of 800C.

A binary $SrTiO_3$ to $LaTiO_3$ (LTO) composition spread was created using PLD with a thickness of 400nm. The electrical properties of the STO-LTO binary was mapped using the previously describe mapping method at room temperature with the effects of the substrate carefully subtracted out.

The electrical properties of both substrates of Nb doped STO and La doped STO were measured separately from room temperature up to temperatures of 800C, in order to determine the affects of the substrates on the measurements of the films.
The system of measurement using the binary compositional profiles was new and many bugs had to be fixed in the LabVIEW software throughout the summer.

3. Perspective of Research after this Program:

Participation in this program was very advantageous. I was able to get a head start on my research that I will finish over the next year as I will continue my stay at NIMS. Outside of this aspect, the program provided insight into the Japanese culture and the many facilities afforded to a national lab that a university cannot match. The research complex at NIMS has many facilities not available at my home university.

RESEARCH REPORT

Name: Andrew Randles **Affiliation (University):** Rochester Institute of Technology

Research Advisor: Dr. Tanaka **Host Institution:** Tohoku University

Research Subject: The Fabrication and Testing of a Lithium Niobate Actuator/Sensor

1. Research Description:

During this summer I worked on the fabrication and testing of a lithium niobate ($LiNbO_3$) piezoelectric actuator/sensor. A $LiNbO_3$ actuator/sensor would have applications is harsh environments such as car engines, in jet engines or in Venus' atmosphere. This is because $LiNbO_3$'s high curie temperature (the temperature that it loses its piezoelectric properties) and because $LiNbO_3$ is not attacked by most chemical solutions.

2. Research Activities:

To complete this research it required me to work in a clean room to do all most all of the fabrication. Various procedures were used for the fabrication of this actuator/sensor. A short list follows, photolithography, wet etch processes, sputtering, polishing, wire bonding, electroplating and reactive ion etching. Also as a service to the lab I would correct papers for people submitting to journals and conferences. For the research done here and over my past trips to Japan an abstract was written up and sent off to MEMS2004, where I will hopefully be able to present the results of the work that I completed here.

3. Perspective of Research after this Program:

One of the unique perspective that my work in japan has given me is exposure to a different lab where things are done differently than the lab in the United States. The work here has given me a great chance to work with a group of people whose attitude towards research is different than that of the lab that I work at in the US. Most of these are good things but some are bad, however you learn to take the good with the bad and work your way through.

4. Advisor's Remarks:

Our research is mainly the design, fabrication and evaluation of MEMSs (micro-electromechanical systems). To prototype a MEMS, hard working are required especially if time is limited, because we have to use many special machines to complete it. Although his stay is only 2 months, he has completed almost all he planed to do; the design, fabrication and evaluation of a novel $LiNbO_3$ actuator for use in harsh environments. This evidences not only his industriousness but also his good ability to plan and perform research. Also, I believe that he has established international friendship with our students and researchers and understood Japanese culture.

He visits us twice a year and stay for 2 months in each visit. Judging from his achievements, I can look forward to further progress in the next visit.

RESEARCH REPORT

Name:	**Affiliation（University）:**
Neal M. Rao	University of Colorado, School of Medicine
Research Advisor:	**Host Institution:**
Shinichi Nishikawa	RIKEN Center for Developmental Biology
Research Subject:	
Analysis of AML1 to elucidate the initiation of cellular commitment to definitive hematopoietic cell lineages in an in vitro mouse embryonic stem cell system	

1．Research Description:

Under the main theme of Stem Cell biology, the Nishikawa lab investigates a variety of stem cell systems from melanocytes to pancreatic beta cells. This was an especially good lab to work in since, due to its size and scope, I could gain exposure to a wide range of topics within stem cell biology. My project in particular dealt with the maturation of hematopoietic (blood-forming) stem cells. More specifically, my project focused on the involvement of AML1 in definitive hematopoiesis. AML1 (Runx1) is a runt-domain transcription factor which is involved in some forms of acute myeloid leukemia. AML1 recognizes the promoter regions of many hematopoietic genes, and thus controls the expression of many of the factors involved in the formation of blood cells. In addition, mice lacking this factor die due to complete lack of definitive hematopoietic progenitors and also due to failure to properly form blood vessels. Thus, Igor Samokhavlov, a visiting JSPS fellow in the Nishikawa lab, chose the AML1 system to study the origin of definitive hematopoietic progenitors in developing embryos. In order to track the cells expressing AML1, Igor made an AML1-Venus targeting construct and created knock-in mouse embryonic stem (ES) cell lines which would express Venus (a fluorescent marker) under the control of the endogenous AML1 promoter. These ES cell lines can be differentiated in vitro on OP9 cell layers, and the AML1 expressing cells would fluoresce which would allow them to be selectively sorted by FACS. My duty was to conduct a small portion of the study, as outlined below.

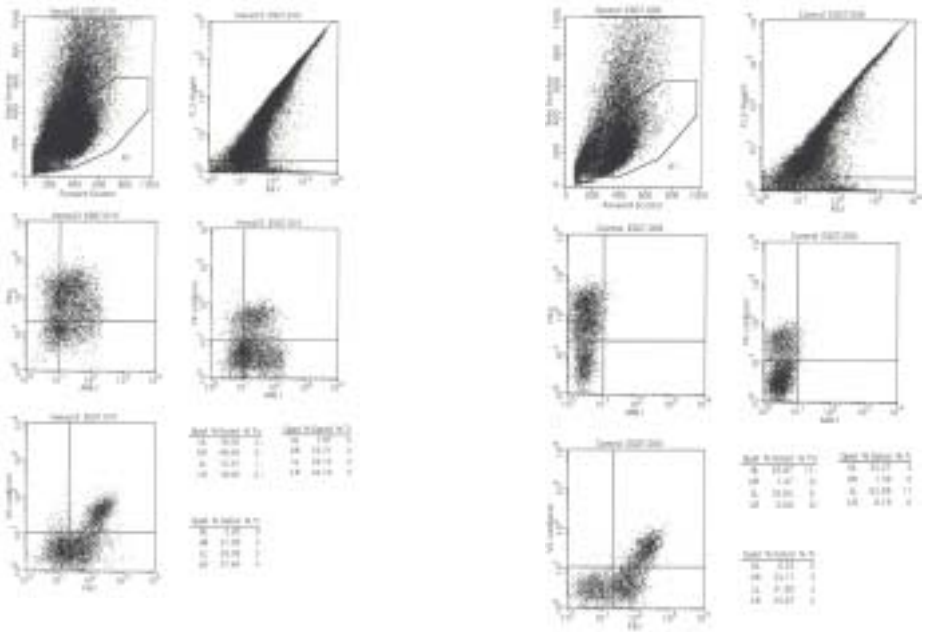
2．Research Activities:

My first task was to learn the necessary tissue-culture techniques, such as passage of mouse ES cells, passage of OP9 feeder cells, and seeding of the ES cells onto an OP9 culture. Next, the following experiments were carried out.

Choosing the Appropriate Cell Line:

Several ES cell lines which contained the AML1-Venus knocked-in construct were cultured separately by seeding them on a 3-day OP9 culture flask and incubating for 6 days at 37^0C in a CO_2 incubator. A normal CCE cell line was also incubated under the same conditions and used for calibration of the FACS analysis. At the end of 6 days, differentiated cells were stained with antibodies to VE-cadherin (vascular endothelia marker) and Flk-1 (mesodermal marker) and analyzed by FACS Calibur. It was found that cell line #53 showed the greatest expression of AML1.

CCE cells, day 7 of differentiation on OP9



Notice the high expression of AML1 in the Flk1 and VE-cadherin positive cell populations in the Venus 53 cell line.

Testing Collagen IV:

It has been shown that ES cells can differentiate into hematopoietic cells on a bed of collagen IV. Since this would save time (as the OP9 cells would not need to be cultured prior to seeding), plates coated with collagen IV were tested via FACS analysis as mentioned above. However, the ES cells did not show a high expression of AML1 on the collagen bed, and this idea was abandoned.

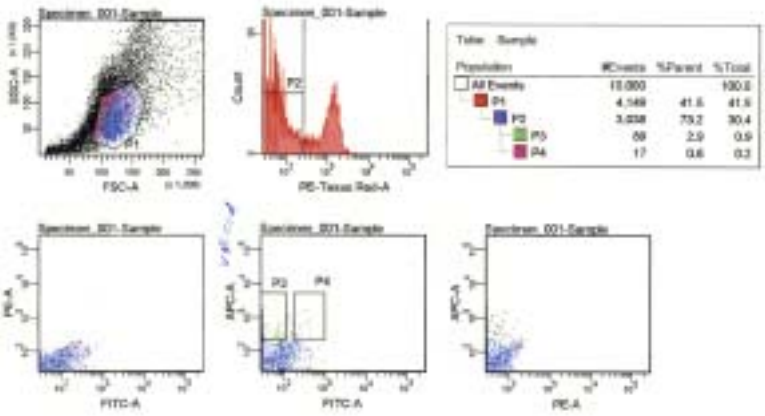
Sorting AML1 Positive Cells

The ES cells were incubated on OP9, stained and analyzed as mentioned above. If expression of AML1 was high enough, the VE cadherin+/AML1- and VE cadherin+/AML1+ cells were sorted for use in the following experiments:

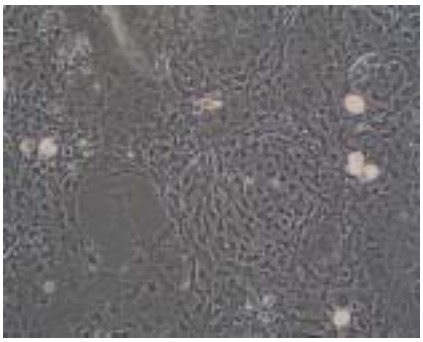
Re-culturing AML1 Positive Cells

Sorted AML1 positive and AML1 negative, VE-cadherin positive cells were re-cultured on OP9 cells for an additional 9 days to look for differentiation into hematopoietic cell lineages. After 9 days incubation, the cells were stained with antibodies to hematopoietic lineage markers (Mac1, c-Kit, CD45, Ter119, Gr1, CD31, and CD34) and reanalyzed by FACS Calibur. It was confirmed that cells which differentiated from the AML1 positive population showed high expression of hematopoietic cell lineage markers, whereas the AML1 negative cells did not. These results demonstrate that AML1 is selectively expressed in hemogenic endothelial cells.

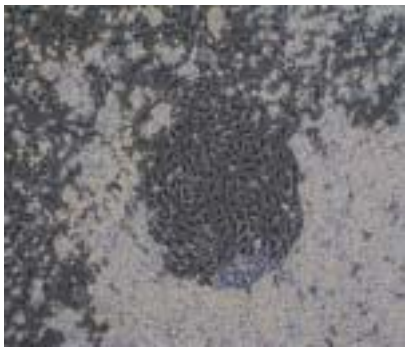
Fractionation of VE-cadherin^{+} ES cell - derived endothelial cells based on *Venus* expression.
Clone CCEV53 was differentiated for 6 days on OP9 cell layers without mLif.



VE-cadherin^{+}Venus^{-} cells
grown on OP9 for 7 days



VE-cadherin^{+}Venus^{+} cells
grown on OP9 for 7 days

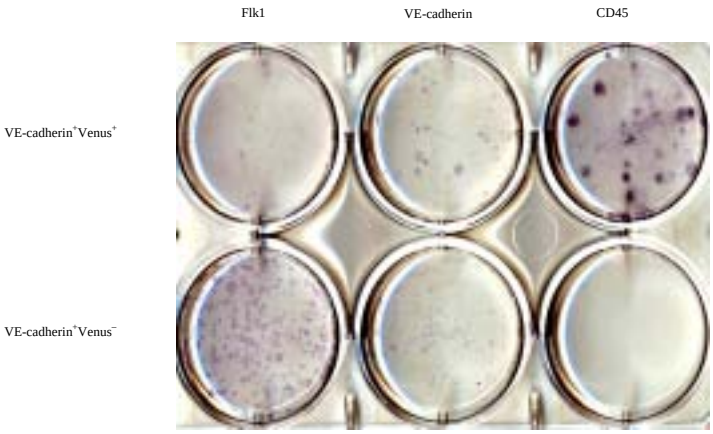


In the FACS analysis above, the P1 gate selects our ES cell population based on cell size. The P2 gate selects for living cells based on expulsion of PI dye. From the remaining cells, the P3 (VE-cadherin+ AML1-) and P4 (VE-cadherin+ AML1+) cell populations were selected and sorted. The two cell populations were re-cultured on OP9 cells and observed under phase-contrast microscopy. Only the AML1 positive population could differentiate into hematopoietic cells. In this population, shown on the right, you can even observe erythrocytes and erythrocyte precursors, which have a slightly reddish hue due to production of hemoglobin.

Immunocytochemistry:

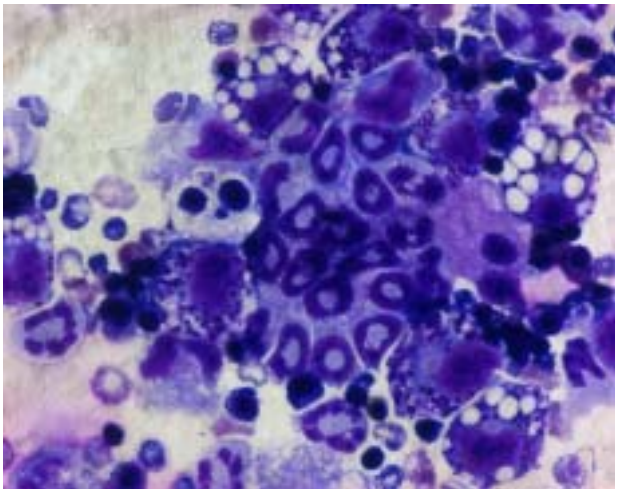
The re-cultured cells were also analyzed by immunocytochemistry. After sorting for VE cadherin+/AML1- and VE-cadherin+/AML1+ cells, these two populations of cells were plated separately onto OP9 dishes and incubated for an additional 9 days at 37^{0}C in a CO_2 incubator. The cells were fixed and then stained with antibodies to Flk-1, VE-cadherin, and CD45 (hematopoietic cell marker). It was confirmed that although both the AML1 positive and AML1 negative cells expressed mesodermal (Flk-1) and endothelial (VE-cadherin) markers, only the AML1 positive cells differentiated into CD45 positive cells. This experiment confirms that indeed only the cells expressing AML1 are able to differentiate into the hematopoietic lineage. In addition, it is interesting to note that the AML1 positive cell culture showed decreased expression of Flk-1. This indicates that the AML1 positive cells, which are committed to a hematopoietic fate, downregulate the expression of Flk-1 as compared to the AML1 negative population.

Immunocytochemical phenotyping of the sorted cell populations grown on OP9 cell layers for 9 days.



The culture was supplemented with the cytokine mix (Epo, IL3, G-CSF, SCF, VEGF) two days after seeding.

Gimza Staining of AML1 Positive Cells Re-cultured on OP9 for an Additional 9 days:

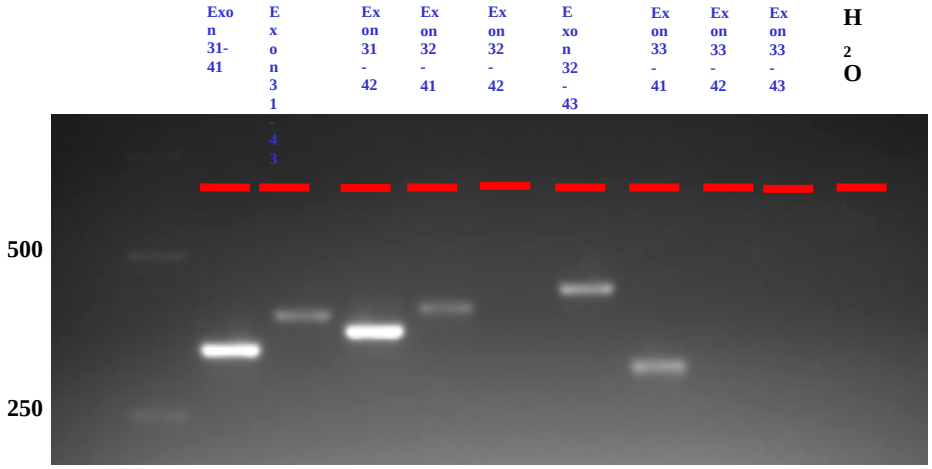


Here you can see that the AML1+ cells have differentiated into erythrocytes, macrophages, basophils, and neutrophils

RT-PCR:

RT-PCR was performed on the AML1 positive and AML1 negative cell populations to check for the level of AML1 transcripts. In the following gel, it was confirmed that the population that we selected as AML1 positive, did indeed express high levels of AML1 mRNA.

AML1 RT-PCR from Venus+ cells



In the above gel, we tested several sets of primers to find the primer which would amplify the AML1 construct the best. This gel also confirms that the population that we selected as AML1 positive, was indeed expressing the AML1 construct.

Collection of Cells for DNA Chip Analysis:

The remainder of the cells from sorting were collected in Trizol and stored at -80 C. When enough of these cells have been collected, they will be used for analysis via Affimatrix DNA chip. The purpose of this future study will be to compare the expression profiles in the AML1 positive and AML1 negative endothelial cell populations.

3. Perspective of Research after this Program:

With groundbreaking research being conducted at institutions across the nation, Japan has already become a world leader in the field of stem cell biology. I am glad to have the opportunity to study here, and develop ties with researchers in the research field which excites me the most. Although there are many Japanese researchers who are studying abroad, there are relatively few American researchers who are working in Japan. As collaboration and communication works best through mutual understanding, I feel that my experience here has motivated me to build connections between my fellow researchers in the US, and those who I have become acquainted with here in Japan. Thus, in the future, I hope that exchange between the two countries will be more even-sided The Nishikawa lab has been very supportive in my training, and the skills I have learned here will be of great value when I return to my home institution. It would not have been possible to learn some of the techniques which I gained had I not trained at the Nishikawa lab. In addition, I am quite excited at the possibility of coming back to work at RIKEN CDB in the near future.

4. Advisor's Remarks:

Thanks to good communication in the months prior to the start of the program, we were able to design a project which would meet both of our expectations, yet could be completed in such a short time frame. Neal worked very had on his project and was rewarded with good fortune - the experiments were successful, and excellent results were achieved. Neal worked well with his fellow colleagues, and it was a lot of fun to have him visit our lab.

RESEARCH REPORT

Name:	**Affiliation (University):**
Neelanjan Ray	Vanderbilt School of Medicine
Research Advisor:	**Host Institution:**
Dr. Koichi Matsuo	Keio University School of Medicine
Research Subject:	
Microbiology/Immunology	

1. Research Description:

We focused on examining the role of *Fos*, part of the dimeric transcription factor AP-1, in host inflammatory response. Our research was based on a mouse model-- we challenged peritoneal macrophages from *Fos* knockout mice with LPS and compared the response to that of wild-type mice.

2. Research Activities:

My regular activities included doing background literature research, attending lab/group meetings, planning and conducting various experiments, and analyzing data. In addition, I had several opportunities to present my work, both to my colleagues, and to other research groups with whom we wanted to consult or collaborate.

3. Perspective of Research after this Program:

My experience through EASI this summer has been very positive. As a result, my interest in both bio-medical research and in spending more time in Japan have increased. In fact, I have received funding from my own medical school to continue working on this project with Dr. Matsuo through next year. Overall, I have developed greater perspective on bio-medical research through this program, and this has strengthened my commitment to pursuing research as part of my career in the future. I have also gained experience with a variety of new lab techniques which will prove useful in these future research endeavors. Furthermore, the program has also allowed me to gain perspective on research environments outside of the United States, and has deepened my interest in being involved in international scientific collaborations in the future.

4. Advisor's Remarks:

It has been a pleasure to work with Neel during the EASI Program this summer. We have made good progress in our research, produced some solid data, and come up with many possible directions to explore in the future. As a researcher in our lab, Neel has been able to work efficiently and autonomously from the beginning, willing to take on responsibility for various experiments. Even in this short time, he has been quite productive. In addition, Neel has come up with several creative ideas that are worthy of exploration as we move along on this project. Neel has also contributed to the “international” atmosphere of our lab- - many members of the lab have become more interested in and made an effort to use English now that they have the opportunity to interact with a native speaker on a regular basis. Overall, having Neel in lab has been a good experience for all of us, and we look forward to continuing to work with him during this next year.

RESEARCH REPORT

Name:	Affiliation (University):
Todd Reynolds	Purdue Univerisity
Research Advisor:	**Host Institution:**
Prof. Inui	Kyoto University
Research Subject:	
Ruthenium Aluminide Eutectics	

1. Research Description:

Ruthenium aluminide (RuAl) is a high temperature intermetallic with unusually good toughness. The combination of high temperature and toughness makes it a good candidate to replace current superalloys in structural applications. Through arc-melting processing, aluminum vapor loss results in a RuAl/Ru eutectic film at the grain boundaries. This film has been shown to increase the ductility of the alloy due to the ductile metal phase surrounding the brittle intermetallic. This effect should make the RuAl/Ru eutectic alloy have a good toughness. The eutectic forms at the composition of Ru-24Al (at%), but ruthenium is an expensive element, so it would be advantageous to alloy it with less expensive elements. Both molybdenum and chromium can be added to decrease the amount of ruthenium while still maintaining the RuAl and Ru phases. Molybdenum additions have been shown to have good fracture toughness, and addition of chromium has been shown to increase oxidation resistance.

2. Research Activities:

Eutectics of RuAl/Ru that contained Mo or Cr were produced with a directionally solidifying floating zone furnace. Tensile bars and compression specimens were electrical discharge machined from the directionally solidified samples. The tensile bars were tested to find ductility of alloys. Single phase, single crystal ruthenium was attempted to be grown with the floating zone furnace. This ruthenium that was produced contained same composition as the ruthenium in the RuAl/Ru eutectic. Single crystals of ruthenium were desired to find the properties of the individual phase of the composite. If single crystals were made, compression specimens will be cut out so that only specific deformation can take place. The results from these tests will be used to find the deformation mechanisms of these compositions of ruthenium.

3. Perspective of Research after this Program:

Prior research has been in RuAl eutectics, and research at Kyoto University in RuAl/Ru eutectics was done in response to earlier promising findings. Research in RuAl/Ru eutectics will be continued after leaving Kyoto University until further conclusions have been made of this composite.

4. Advisor's Remarks:

Much progress was accomplished in the area of RuAl eutectics here at Kyoto University. The program was good for students from different countries to be able to collaborate and discuss ideas.

RESEARCH REPORT

Name:	**Affiliation (University):**
Victoria L. Rubin	Syracuse University, Syracuse, NY
Research Advisor:	**Host Institution:**
Pr. Noriko Kando	National Institute of Informatics (NII), Tokyo
Research Subject: Relational Classification Model for (Un)certainty Identification in Texts	

1. Research Description:

(Un)certainty is recognized as an element of subjectivity in the natural language processing, and subjectivity tagging is listed as one of the tasks especially relevant for news reporting (Wiebe et al, 2001).

Our study concentrates on analyzing the multidimensional nature of the concept of certainty expressed in written texts. Certainty is defined in its sense of the quality or state of being certain or free from doubt, especially on the basis of evidence. We developed a three-dimensional relational classification model of (un)certainty and collected preliminary data to support the model that categorizes certainty in terms of its perspectives (writer's, involved party's, and expert's certainty), its foci (abstract or factual information), and levels (average confidence, above or below).

Initial analysis of 111 English sentences from four New York Times articles (the AQUAINT Corpus of English Texts, 01/01/2000) showed that at least 19% of the sentences indicated certainty below average level of confidence, 48% of which was attributed to writers' certainty, 47% - to the third parties directly involved in the narrative (e.g. victims, witnesses), and 5% - to in directly involved third parties (e.g. experts or authorities). We believe that these preliminary figures depend on newspaper article genre (e.g. news report, editorial, special features), thus further data collection and analysis per text genre is needed.

The qualitative study results (i.e. certainty expressions and patterns) can be used for certainty identification and tagging, as well as an input data for machine learning algorithms for subjective information extraction.

2. Research Activities:

- Conducted literature review with attention to building definition of "(un)certainty" and identifying appropriate research methodologies;
- Conducted linguistic text analysis for patterns and clue phrases to support the model;
- Presented and had a fruitful discussion at NII Summer Institute Seminar;
- Attended the 2nd NII Open Forum on Informatics, NII, Tokyo;
- Attended 41st Annual Conference for the Association for Computational Linguistics (ACL2003), Sapporo, Hokkaido;
- Had meetings and brainstorming sessions with Pr. Noriko Kando and her doctoral students Norio Nakayama, Yohei Seki and with Pr. Koji Eguchi, Pr. Akiko Aizawa, NII, Tokyo; and Pr. Makiko Miwa, the National Institute for Media Education, Karuizawa;
- Presented at Pr. Nakagawa's Language Informatics Laboratory, University of Tokyo;
- Presented at Pr. Isahara's Computational Linguistics Group at the Communications Research Laboratory (CRL), Kyoto.

3. Perspective of Research after this Program:

Submitting a paper to the AAAI—EAAT 2004 Symposium; maybe will be a part of dissertation

4. Advisor's Remarks:

Research in text processing has been concentrated to "fact" in the texts. Study on non-factual information in texts like point-of-view, attitudes, subjectivity, etc. is recently arisen and has been quickly attracted attention from various parties. Ms Rubin picked "certainty identification" as a new and unique research topic along with this stream of research, and developed an elaborated model. She has been highly motivated to tackle to this unexplored topic with many original ideas.

RESEARCH REPORT

Name:	Affiliation (University):
Daniel Grobe Sachs	University of Illinois at Urbana-Champaign
Research Advisor:	**Host Institution:**
Hiroyuki Morikawa	Tokyo University
Research Subject:	
Wireless sensor networks	

1. Research Description:

My research was assisting in the development of a wireless sensor node called the U^3, which is intended to report environmental conditions, such as air temperature, room illumination, and human motion. These small, battery-powered nodes form an ad-hoc network to report their measurements back to a central computer.

2. Research Activities:

My role in this work was the implementation of power management primitives. Specifically, I wrote low-level code that allows higher-level application code to power down the device's radio, media access layer, and communication between the MAC and application microcontrollers, the combination of which draws accounts for much of the total energy consumption of the microprocessor. I also wrote code which automatically powers down the user-application microcontroller during idle time periods, while allowing it to automatically wake up when it is time to execute the next task.

These primitives allow a significant reduction in the system's energy consumption when the devices in an "operating" state. They may even negate the need for a separate "sleep" state entirely by automatically sleeping whenever the device is otherwise idle.

3. Perspective of Research after this Program:

Sensor networks are not my main topic of research in the United States, but it is a topic that I have worked in as a side project for several years. The knowledge I gained developing software that manages these U^3 nodes may be directly applicable to a sensor network project I am involved in at the University of Illinois, in which we may need to design and build sensor nodes similar to these nodes.

The research experience also provided me with the cultural experience of working in a Japanese laboratory, and contact with both Japanese researchers and students and the international community at Tokyo University. In addition to the lab that I worked in, Prof. Morikawa is well connected in the Japanese research community, so I had the opportunity to visit several research labs in Yokosuka and another in Kyoto as part of the program. I also had the experience of working with several students here who spoke little English, which greatly improved my Japanese ability.

4. Advisor's Remarks: (Yoshihiro KAWAHARA)

"Otsukare sama deshita" for your research.

I think you have contributed a lot even in such an short visit. You could find research task and its solution for the collaboration of you and us, which should be one thing I can appreciate. Another thing is you could successfully completed your tasks with your good knowledge of computer programming.

RESEARCH REPORT

Name: Pooya Sarabandi **Affiliation (University):** Stanford University

Research Advisors: Prof. Fumio Yamazaki and Dr. Masashi Matsuoka
Host Institution: Earthquake Disaster Mitigation Research Center (EDM), Kobe

Research Subject:
Shadow Detection and Radiometric Restoration in High-resolution Satellite Images (shadow characteristics in urban area)

1. Research Description:

In almost all cases, optical satellite images are contaminated with shadow. In order to perform successful change detection using time-series of images or use a single image to extract information, it is quite important to first identify shadow regions and then enhance those areas (eliminate or minimize shadow's effect). This is particularly important in case of damage detection (either change detection or using only post-disaster images) or in building inventory compilation, using high-resolution images of dense urban areas. Since not many people have looked at shadow's characteristics in high-resolution images of dense urban areas, Professor Yamazaki, Dr. Matsuoka and I decided to focus on this subject.

2. Research Activities:

My research was an analytical investigation on shadow characteristics in urban areas. I looked at several high-resolution images taken by IKONOS and QuickBird satellites. Running everything on computer, I tried to extract some indices to quantify differences between shadow and non-shadow regions in image. Using this information, I started working on shadow detection problem. By introducing a new transform on RGB color-space and applying a nonlinear edge detector filter subsequently, I was able to detect shadow's boundaries quite well. However, these boundaries are not in form of closed polygons. I will continue working on this interesting, but yet challenging subject, as compliment of my research, when I get back to the States.

3. Perspective of Research after this Program:

This study will be continued after returning to the States. I am hopping further research on this subject, yields to a publication very soon. I also would like to mention that my summer research in Japan was an invaluable experience, which introduced me to Japanese researchers whom I'm going to continue my collaborations with them in future.

4. Advisor's Remarks:

Above-mentioned research was conducted from 1 July through 20 August. The handlings of the satellite data and image processing have been carried out successfully, and some valuable results have been obtained, even in the short stay. This challenging work will be continued further at Stanford University and be a steppingstone to his academic dissertation. We sincerely thank him for joining our research group and exchanging ideas and experiences. We are looking forward to continue our collaborations with him in future.

RESEARCH REPORT

Name: Seth Schran
University: The Pennsylvania State University College of Medicine

Research Advisor: Naotoshi Shibahara, M.D., Ph.D.

Host Institution: The Institute of Natural Medicine
Toyama Medical and Pharmaceutical Univeristy

Research Subject: Kampo (Traditional Japanese) Medicine

1. Research Description: The summer research experience consisted of two projects:

The first project involved testing the effect of various reheating methods on the concentrations of Glychrrizin and Paeoniflorin in decoctions of the traditional Kampo prescription "Keishi-to." This prescription formula, often used for a common cold with headache, chills, and sweating, is made by boiling 5 freeze-dried plants for 40 minutes. The liquid is then strained off for oral administration. The Ingredients include Cinnamomi cortex (*Keihi* or cinnamon bark*)* 4 g, Paeoniae radix (*Shakuyaku* or white peony root) 4 g, Zizyphi fructus (*Taiso* or Chinese date*)* 4g, Glycyrrhizae radix (*Kanzo* or licorice root*)* 2 g, and Zingiberis rhizoma (*Shokyo* or dried ginger) 1 g. (Warning from Dr. Shibahara: using the incorrect Kampo prescription for your medical condition could result in further complications)

To save time for patients using boiled-type prescriptions, a bottle of the prescription is normally prepared and stored in a freezer. A microwave is then used to reheat daily dosages as needed. Yet, the microwave is a modern addition to Kampo medicine preparation, whose effect had not been previously studied. Using HPLC, we found that there was no significant change in the concentrations of these chemicals when heating by microwave versus hot-water bath to the body`s temperature. The study supports that microwaves can be used to reheat Kampo medicines safely, although only 2 of the numerous chemical compounds in the crude drug prescription were monitored. Even before reheating, variations in the chemical concentrations of these compounds were found in the boiled liquid. Because the mass of crude drug ingredients was the same for each decoction, variations may come from other sources, such as the season of harvest, the processing methods used, and the varying surface areas of crude drug components (Toriizuka *et* al, 1988.) These factors should be considered when attempting to adminster consistent drug dosages to patients. Further studies on the effect of reheating methods are indicated on standard solutions of the chemical compounds.

The second project involved examining the traditional diagnositic concept of Kampo medicine "stasis of body fluid." Because of the fundamental differences in diagnostic concepts between oriental medicine and allopathic medicine, modern methods of research continue to be used to examine traditional concepts. For example, one study showed the correlation between KI disorder and the reduction of CD16 and CD158b cells (Kogure, 2003.) While modern research has not fully explained the concepts of oriental medicine, it has provided windows into the process.

Traditionally, stasis of fluids implies disturbance of all non-red fluids of an organism, such as disturbances in water metabolism. Symptoms include edema, pleural effusion, ascites, dizziness, vertigo, motion sickness, tinnitus, headache, thirst and swollen joints. Associated conditions also include imbalances of secretion resulting in serous rhinitis, serous sputum, enhanced salivation, oliguria, and watery diarrhea. A patient experiencing dizziness and/or vertigo is often treated by a Kampo prescription for stasis of body fluids. Since the function of balance can be negatively affected, this study seeks to clarify the relationship between this diagnosis and the ability to maintain static balance. For evaluation of the pathological state, the widely recognized Kampo diagnostic criteria of Terasawa was used (1993.). Futhermore, patients can be grouped into "non," "mild," or "severe" stasis of fluids categories depending on the nature of the prescription that is indicated for the patient. For example, a "severe" patient

would take a prescription only for stasis of fluids. A “mild” patient needs a prescription treating stasis of fluids in combination with other pathophysiological processes. A “non” patient would take a prescription for only other conditions besides stasis of fluids.

The Balance Master 2000 was used to quantify the subject`s ability to stand as still and straight as possible. Natural movements, called “sway,” occur during the maintenance of static balance, and sensors in the Balance Master forceplate report the degree of sway to a computer. 3 trials were taken for 20 s each. One trial with eyes open, one with the eyes closed, and one with feedback provided about the subject`s center of gravity in space on the computer screen. Output data included target sway, reported as the % of the maximum possible area for the center of gravity to move around a target. We found that subjects classified as “severe stasis of fluids” performed significantly worse with regard to target sway, $p<0.05$, than subjects classified as “non” and “mild.” This effect was not present during the closed eye trial, indicating the involvement of visual clues.

While this study suggests a possible link between Kampo`s diagnosis of stasis of body fluids and the function of static balance, further studies are needed to strengthen this conclusion. For example, the test-retest reliability of the grouping method and of Terasawa`s scoring system should be assessed. This study could also be attempted in the double-blind manner.

References used in these research summaries:

Kogure, T., Mantani, N., Tahara, E., Shintani, T., Shimada, Y., Tamura, J., & Terasawa, K. An immunological analysis into KI-disorder based on the traditional Japanese oriental diagnostic system. *J Trad Med* 20: 16-21, 2003.

Terasawa, Katsutoshi M.D., Ph.D. *Kampo: Japanese Oriental Medicine, Insights From Clinical Cases.* K.K. Standard McIntyre: Tokyo, 1993. (Out-of-print, please contact the Institute of Natural Medicine if interested in obtaining this book)

Toriizuka, K. Takahata, H., Hiraki, T., Horikoshi, I., & Terasawa, K. Pharmaceutical studies on the medicinal prescription used in traditional sino-japanese medicine- changes of the components in keishibukuryo-gan prepared in the hospital pharmacy. *Shoyakugaku Zasshi* 42, 89-93: 1988.

2. Research Activities: In addition to the research activities summarized above, opportunities for observing Kampo medicine in outpatient and inpatient clinical settings were provided.

3. Perspective of Research after this Program: I was grateful for the opportunity to learn from experts in oriental medicine. In the USA, a good number of patients are interested in complementary and alternative medicine, and in oriental medicine. Therefore, it is important for physicians to be aware of these practices and to continue to research them.

4. Advisor's Remarks: Mr. Seth Andrew Schran has been in our department, which is clinical laboratory of Kampo (Japanese oriental) medicine, Institute of Natural Medicine, Toyama medical and pharmaceutical university, from 1 July to up to date.
He is very excellent and energetically. In spite of his visiting period has been very short, he has acquired the basic concept of Kampo medicine and carried out two researches. He is evaluated with that the very marvelous result is left.
He appears to enjoy his life in Toyama and I think that he has taken an excellent experience and absorbed many things from his stay in Toyama medical and pharmaceutical university during this summer program.

RESEARCH REPORT

Name: Reid Senescu **Affiliation (University): Univ. of California, Berkeley**	
Research Advisor: Masayoshi Nakashima **Host Institution: Kyoto University, Uji**	
Research Subject: Numerical Algorithms for Pseudo-Dynamic Testing	

1. Research Description:

Pseudo-Dynamic testing is a method of evaluating the response of a structure to a specific earthquake without the expense and size limitations of a shake-table test. Furthermore pseudo-dynamic testing can be applied quasi-statically in a testing laboratory while still considering dynamic forces. It can also be implemented in real-time to test structural materials whose response depends on the loading rate. The testing is especially applicable to component testing, such as specific base isolation systems. As a short example, imagine that a simple, but large structural frame whose behavior is well understood sits on top of a base isolation device with very complicated and rate-dependent behavior. Pseudo-dynamic testing allows for the large structural frame to be modeled in a computer while the base isolation system is modeled in a full-scale experiment. The computer simulates a ground acceleration by inducing a displacement to the base isolation system through a dynamic force actuator. Instruments detect how the base isolation system responds and then predicts how the structure above will respond to the base isolation response. The computer then induces another displacement to the base isolation system, which both takes into account the predicted frame behavior and the specific ground motion.

2. Research Activities:

In the past various numerical algorithms have been used to determine what displacements must be induced on the base isolation system. The behavior prediction from the numerical algorithm must be accurate, stable, and must not involve iterations that would slow the computer processing time. The numerical algorithm must also not be too sensitive to small experimental errors caused by the inability to control actuators exactly. Nakashima-sense's research group will be performing two pseudo-dynamic tests in the fall. During my summer in Uji, I compared various numerical algorithms to determine which method is most applicable to the type of tests the research group will be conducting. I also observed and contributed to the test of a full-scale 2.5 story steel structure, which was tested quasi-statically and pseudo-dynamically. I also edited several articles that were written for the Taiwanese Special Issue of the International Journal of Earthquake Engineering and Engineering Seismology. The issue outlines strides made in Japanese structural research and design since the 1995 Kobe Earthquake.

3. Perspective of Research after this Program:

By participating in the 2.5 story full-scale experiment, I learned about the differences and more often than not similarities between Japanese and American experimental techniques. I also saw first hand that Japanese society is very group oriented in that every student helped with the project, even though some were not directly involved. Through the experiment and by editing several papers I also gained a better perspective on how the Japanese and American research communities responded differently to the 1995 Kobe and 1994 Northridge Earthquakes.

4. Advisor's Remarks:

My group enjoyed very much the company of Reid Senescu during the summer period of 2003 here in Kyoto. Reid is a decent, sincere, and charming young fellow, and his positive interaction with the students of mine was of a great benefit on my side. I assigned him to work on the three issues during his stay with us. One is to read and edit several papers all of which describe post-Kobe seismic analysis and design in Japan. I hope that this helped Reid obtain an idea about the post-Kobe approaches in Japan and how they are different from those adopted in the U.S. Another is to participate in the full-scale seismic loading test being conducted by our group. He worked very nicely with my graduate students and contributed to the progress of the large, unique test. He also had a chance to witness how a Japanese steel frame behaved in earthquakes. Last is to work on numerical integration algorithms that suit the implementation of pseudo dynamic testing. He did write a program code by himself and examined how the "explicitness," "stability," and "accuracy" are affected by the choice of integration algorithms. I understand that this subject may be associated with his future Ph.D. dissertation topics. All in all, he did an excellent job during his stay with us and has created many friendships with my students. I hope the very best of a good luck on his study and life, and it will be a great pleasure of mine if his learning in Kyoto is of any assistance in his pursuing a doctoral study.

RESEARCH REPORT

Name: Benjamin Severtson
Affiliation (University): University of Minnesota

Research Advisor: Prof. S. Kono
Host Institution: Kyoto University

Research Subject: Performance Based Design of Reinforced Concrete Columns Under Seismic Loading

1. **Research Description:** Previous research completed at Kyoto University involved the laboratory testing of 16 column specimens of several different geometries subjected to uni and bi-axial loading in the transverse direction as well as constant and variable loading in the axial direction. The aim of this line of research is to further develop the knowledge of how different levels of damage effect the structural performance of reinforced concrete columns. My research consisted of modeling the column specimens using the computer program IDARC-2D as well as determining the equivalent viscous damping provided by the column as the testing progressed.

2. **Research Activities:** Using Microsoft Excel with Visual Basic scripting I created a spreadsheet and subroutines to aid in the analysis of the data recorded during the experimental testing of the 16 column specimens. This spreadsheet first uses the experimental displacement and loading data to determine the precise loading history to be used in analysis performed with IDARC. Using this information I was then able to run analytical simulations of the experimental testing. After calibrating the IDARC model to match the experimental behavior it results can be placed into the spreadsheet I created for further analysis. The spreadsheet will also determine the equivalent viscous damping provided by the column for each loading cycle the column was subjected to for both the experimental and analytical loading histories. Further the spreadsheet will determine the cumulative damage of the column predicted by the IDARC results.

3. **Perspective of Research after this Program:** Through my research I have learned a great deal about the behavior of reinforced concrete columns under seismic loading. This research was in a different area then my previous research work at the University of Minnesota and it was very enjoyable to expand my research background. Although I do not plan on continuing my education to receive my Ph.D. at this point, I do believe the experience I have had working on this research will be a valuable asset to me as I enter the work force due to the importance of seismic design in structural engineering.

4. **Advisor's Remarks:** I am happy with Mr. Severtson's work this summer in our research lab. He simulated the behavior of 16 cantilever column specimens under multiaxial loading conditions and computed equivalent damping factors with different computer programs. The results will be used to revise the mathematical model of the plastic hinge behavior of reinforced concrete columns. He summarized the work in the final report so that we can easily refer to his computation later. I also appreciate his friendship with our graduate students. We are very pleased with his stay in our university and wish him the best.

RESEARCH REPORT

Name:	Affiliation (University):
J. Randall Short	Harvard University Divinity School
Research Advisor:	**Host Institution:**
Dr. Seizo Sekine	University of Tokyo
Research Subject:	
Biblical / Canonical Studies	

1. Research Description:

"Towards a Reconstitution of Classical Studies"「古典学の再構築」was a five-year research project (1998-2002) subsidized by MEXT's Grant-in-Aid for Scientific Research on Priority Areas. This massive project—there is none in the field heretofore that matches its magnitude and scope—brought together Japanese (and a few Western) scholars of the major religious and philosophical traditions in order to (1) consider the contemporary value of the "classics," (2) sum up scholarly research and methodology of the past half century, (3) exchange results across disciplines, and (4) pave the way for future research by discussing new methodologies and the role of technology as applied to these ancient texts. My intent this summer was two-fold: first, to survey the results of this collaborative and inter-disciplinary project in order to stimulate my own research in the field of Biblical Studies with fresh insights regarding the historical and contemporary significance of the world's canonical/classical texts; and second, to get a general understanding of the past, present, and future of advanced Biblical research and education in Japan by identifying and meeting with prominent scholars, identifying major issues of research, etc.

2. Research Activities:

My most pleasurable research activity this summer, and the one from which I gained the greatest benefit, was my personal contact and exchange with two university presidents, two seminary presidents, one divinity school dean, six professors, and six graduate students. This gave me a general sense of the history, current state, and future direction of research and pedagogy in Biblical Studies at institutions of higher education in Japan. Through these various contacts, and especially with the unceasing help of Prof. Sekine, I gathered and perused a wealth of bibliographical materials, articles, and research reports related directly to the Classical Studies project and to my own field of Biblical Studies. Though some of these materials were available to me in English and German, most are only in Japanese. A considerable aspect of my research activities, therefore, involved the painstakingly slow but fully necessary and highly profitable exercise of working directly with the Japanese materials.

3. Perspective of Research after this Program:

The number of Japanese Biblical scholars with expert training in linguistic, literary, historical, sociological, archaeological, and other requisite tools is increasing. However, while Japanese scholars have benefited from the flow of ideas and resources "from West to East," the language barrier—faced both by Japanese seeking to publish abroad and non-Japanese scholars unable to access the growing body of research in Japanese—has often prevented Japanese scholars from reversing the flow and transmitting the fruits of their scholarship "from East to West." The opportunity granted to me this summer has allowed me to make a step towards overcoming this barrier. Not only has this experience boosted my confidence and ability to access and benefit directly from the work of my senior colleagues in Japan, I have been strongly impressed by their high level of scholarship, their spirit of collaboration and exchange within and across disciplines, and their high sense of accountability to the public. As I return to complete my dissertation and begin my own career in teaching and research, I will look to Japan with great expectations for fresh insights and new developments in technology for studying the Bible and other ancient literary treasures of the world. I hope, then, that I can follow in the footsteps of my gracious host, Prof. Seizo Sekine, and be a conduit for the flow of ideas in my field in *both* directions.

4. Advisor's Remarks:

I found Mr. Short to be an extremely gifted and friendly person, and he made a wonderful impression on me, those in my research department, and several specialists in my field of Biblical and Christian Studies. He energetically interviewed a number of these specialists to survey the state of Japanese scholarship, and he conducted independent research and gathered many materials for his project. From his specialized perspective, Mr. Short also contributed significantly to my research on "the Prophet Jeremiah and the Deuteronomist." I only regret that his research visit began just before the summer break. This limited him in the number of seminars and lectures he could audit, made it difficult for him to make appointments with graduate students and other university professors, and prevented him from participating in any scholarly society meetings. However, perhaps this was for the best after all since it freed Mr. Short to use the library and other facilities and to advance his own research.

RESEARCH REPORT

Name:	Affiliation (University):
Jordanna D. H. Sprayberry	University of Washington
Research Advisor:	**Host Institution:**
Dr. Toshiki Nagayama	Hokkaido University

Research Subject:
Neurobiology

1. Research Description:

My research at the University of Washington focuses on how sensory processing mediates flight behavior in *Manduca sexta*. I have two investigative approaches to this problem: 1. electrophysiology, recording from descending visually sensitive neurons that are pre-motor; and 2. behavior, looking at the flower tracking flight in *M. sexta*. In hopes of better understanding how descending sensory information is linked to the motor output driving behavior, I wanted to study in a lab working with local reflex or motor circuits. Dr. Nagayama's lab focuses on escape behavior in crayfish and the associated neural circuitry. I felt that a two month internship in his lab would help me better understand and interpret my research. During my tenure at Dr. Nagayama's lab, I have been investigating the behavior of the lateral giant (LG) neuron. This is the command neuron for tail-flip escape behavior. When mechanosensory hairs on the tail are stimulated they excite LG and a tail flip is initiated, which pulls the animal up and away from danger. This behavior can be habituated by repeated stimulation; if the mechanosensory hairs are repeatedly stimulated, LG will stop firing and the escape behavior will not be initiated. I have been investigating the effect of serotonin, a neurotransmitter, on this habituation behavior. Serotonin plays a strong role in crayfish behavior and social interactions. Serotonin directly impacts LG's threshold, but its effect on habituation is unknown. It is believed that serotonin's effect on the LG neuron involves a cellular cascade that includes cyclic AMP. This investigation into how serotonin affects LG habituation is part of Dr. Nagayama's and his graduate student Araki Makoto's ongoing research.

2. Research Activities.

Methods: I removed the ventral nerve cord from the tail of a crayfish (*Procambarus clarkii*) and pinned it in a recording dish filled with ringer solution. I placed a hook electrode on nerve roots 1-4 on one side of the terminal ganglion, allowing direct electrical stimulation of sensory nerves. I then placed an extracellular suction electrode on the dorsal surface of the ventral nerve cord between the 4^{th} and 5^{th} ganglia. This allowed me to monitor the spiking responses of LG. After the threshold of LG was determined (the voltage of stimulation required to elicit an LG spike), I collected a habituation curve. Habituation curves were obtained by repeated stimulation of the sensory nerves with the threshold voltage at interstimulus intervals of 5 seconds. Stimuli were applied 40 times or until the cell habituated. LG was considered habituated if it did not fire after 5 consecutive stimulations. Habituation curves were collected under four conditions: 1. control (ringer solution only), 2. nerve in a bath of 5uM serotonin, 3. nerve in a bath of 10uM serotonin, and 4. nerve in a bath of SQ22536 (antagonist to cyclic AMP) and 5uM serotonin.

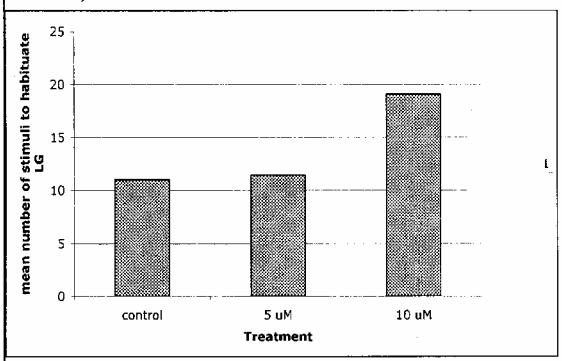


Figure 1. Mean number of stimulations needed to habituate LG for each treatment.

Results: Serotonin's effect on the habituation behavior of LG appears to be concentration dependent. Preparations treated with 5 uM 5HT showed no difference with control preparations (fig 1,2). However, preparations treated with 10 uM serotonin showed both a decrease in the likelihood of habituation (fig 2), and an increase in average number of stimulations required to habituate LG (fig 1). Unfortunately, I only had time to collect data on the effect of SQ22536 in five preparations, an insufficient number to draw a habituation curve.

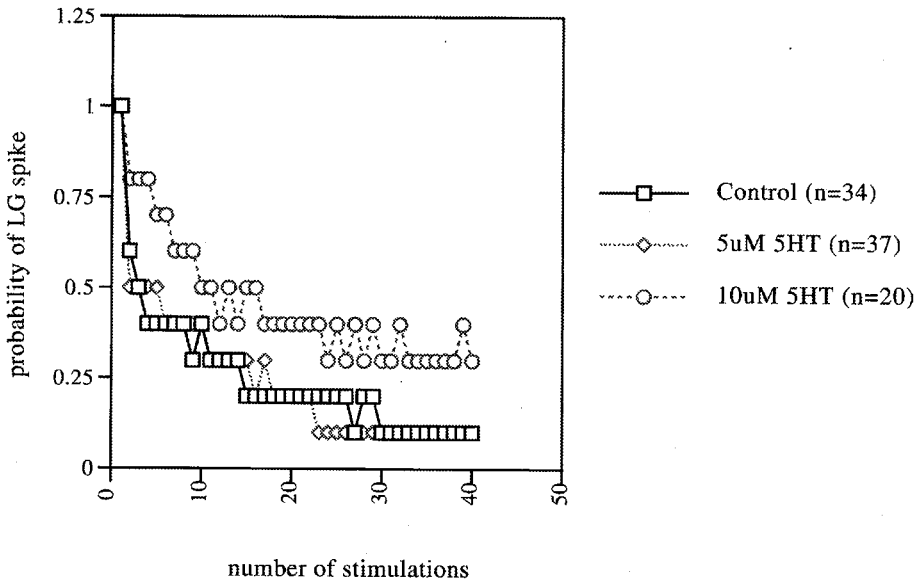


Figure 2. Habituation curves for control, 5 uM and 10uM treatments. The 10 uM habituation curve shows significantly higher firing probability ($p < 0.01$).

3. Perspective of Research after this Program:

The techniques I learned in Dr. Nagayama'slab will prove very useful in design of multi-site recording experiments in *Manduca sexta*. Through these experiments I hope to develop a better understanding of how descending sensory nerve behavior affects motor neuron behavior. Regardless of whether or not my tenure in Japan proves immediately useful to my thesis research, the experience I have gained here is valuable training for me as a neurobiologist and researcher.

4. Advisor's Remarks:

It has been a pleasure to have Jordanna D. H. Sprayberry join my laboratory for 2 months as a part of the JSPS summer program. During that period, she took part in a collaborative project analyzing the effect of serotonin upon the habituation of LG-mediated escape reaction of the crayfish. She has worked hard and taken nice data to understand the effect of serotonin upon LG habituation. I believe that she has learned new approaches and techniques that she can take back with her and to use in the remaining time for her own PhD research project.

Her visit has also benefited my graduate student immensely, as he collaborated with Jordanna on this project. It has given him the opportunity to work with, and discuss science with, someone from outside Japan.

This JSPS summer program has benefited us and I hope that it has also given Jordanna insights into Japan, its people and University life.

RESEARCH REPORT

Name:	**Affiliation（University）:**
Eric Sribnick	Medical University of South Carolina
Research Advisor:	**Host Institution:**
Takaomi Saido	RIKEN Brain Science Institute
Research Subject:	
Kainic acid and the induction of protease activity in the spinal cord of mice.	

1．Research Description:

Within the central nervous system (CNS), normal activity is regulated by excitatory and inhibitory neurotransmitters. The most common excitatory neurotransmitter in the CNS is glutatmate; however, in high concentrations, glutamate can induce cell death, and this phenomenon is referred to as excitotoxicity. Several glutamate agonists have been developed, and these activate specific glutamate receptors. One such agonist is kainic acid. At the laboratory of Dr. Takaomi Saido, the current project of graduate student Jiro Takano examines the effects of intraperitoneally injected kainic acid on hippocampal neurons. High levels of systemic kainic acid are known to cause damage to specific areas of the hippocampus, leading to convulsive effects.[1] It is strongly believed that both caspases and calpains are involved in kainic acid-induced hippocampal cell death.[2] Calpains and caspases are proteases (enzymes that degrade proteins).[3]

Kainic acid has also been shown to cause neuronal injury in the spinal cord. While the majority of research examining kainic acid-induced pathology in the spinal cord has utilized a direct injection method,[4] there is reason to believe that intraperitoneal injection may also lead to spinal cord damage.[5]

Furthermore, it has been noted that different strains of mice have different susceptibilities to kainic-acid induced cell death, and FVB mice demonstrate an acute response.[6] In my host lab, here at RIKEN, this difference in susceptibility has been demonstrated using FVB and C57/BL6 mice. For example, photomicrographs (figure 1) of cresyl violet-stained hippocampus from FVB mice at 7 days post-injection basically show ablation of the CA3 region, as compared to a phosphate-buffered saline (PBS) control.

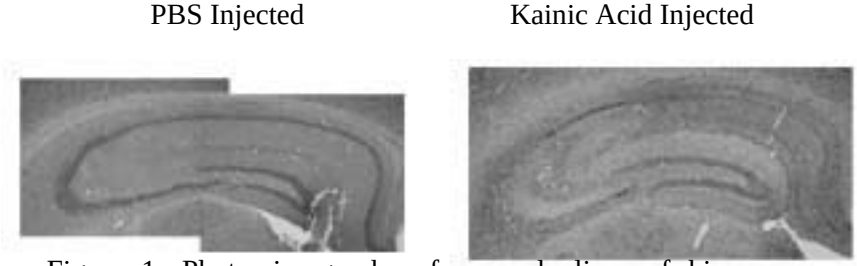


Figure 1: Photomicrographs of coronal slices of hippocampus stained with cresyl violet to elucidate changes in cell morphology.

The work that I did with my lab was to examine whether intraperitoneal injection of kainic acid also causes damage to spinal cord neurons.

2．Research Activities:

The basic paradigm for this research was to administer kainic acid (15-30 mg/kg) by intraperitoneal injection and then to harvest the tissue 7 days post-injection, examining it for pathology using staining techniques (i.e. hematoxylin/eosin and cresyl violet) and the TdT-medi- ated dUTP nick end labeling (TUNEL) assay. Immunohistochemical analysis was done

to examine calpain activity (via calpain-specific spectrin breakdown product), caspase activity (via caspase-3-specific actin breakdown product), pro-apoptotic Bax protein, and anti-apoptotic Bcl-2 protein. Overt pathology was not observed in any of the treatment groups: cresyl violet staining revealed no morphological changes (figure 2) and TUNEL staining did not reveal increased cell death.

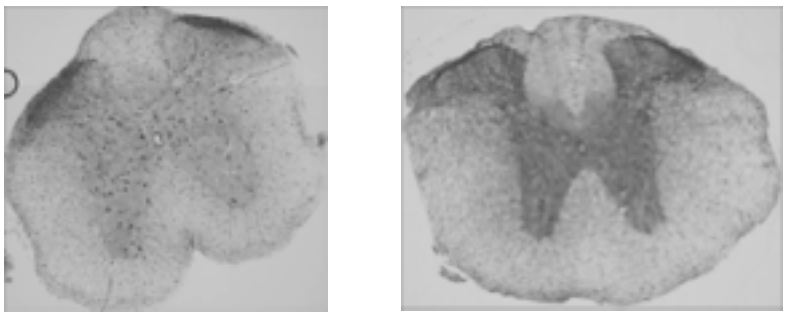


Figure 2: Thin cross-sections of spinal cord were stained with cresyl violet to elucidate any kainic acid-induced changes in cell morphology.

Immunohistochemical analysis did not reveal increased caspase-3 or calpain activity, even when FVB mice were compared with control. However, there was a limited upregulation of Bax and Bcl-2 proteins, indicating the possibility of sublethal pathology induced by systemic injection of kainic acid.

3. Perspective of Research after this Program:

While the results of the project that I was working on here in Japan were largely negative, they were consistent. Furthermore, we are currently developing an injury model whereby kainic acid will be directly injected into the spinal cord. This has been shown to cause predominantly gray matter loss[4] and will serve as an excellent comparison to the mechanical disruption injuries that my home lab is already performing. The long-term goal of both labs is to examine the involvement of proteases in CNS injury and the possibility of using inhibitors to limit pathology following injury.

1. de Vera, N., F. Artigas , J. Serratosa, and E. Martinez. Changes in polyamine levels in rat brain after systemic kainic acid administration: relationship to convulsant activity and brain damage. *Journal of Neurochemistry*. **57**(1):1-8, 1991.
2. Rami, A., R. Agarwal, G. Botez, and J. Winckler. Micro-calpain activiation, DNA fragmentation, and synergistic effects of caspase and calpain inhibitors in protecting hippocampal neurons from ischemic damage. *Brain Research*. **866**: 299-312, 2000.
3. Wang, K.K. Calpain and caspase: can you tell the difference? *Trends in Neurosciences*. **23**(1): 20-6, 2000.
4. Magnuson, D. S., Trinder, T. C., Zhang, Y. P., Burke, D., Morassutti, D. J., and Shields, C. B.Comparing deficits following excitotoxic and contusion injuries in the thoracic and lumbar spinal cord of the adult rat. *Experimental Neurology* **156**, 191-204, 1999.
5. Scarisbrick, I. A., Towner, M. D., and Isackson, P. J. Nervous system-specific expression of a novel serine protease: regulation in the adult rat spinal cord by excitotoxic injury. (1997) *Journal of Neuroscience* **17**, 8156-8168, 1997.
6. Royle, SJ., F.C. Collins, H.T. Rupniak, J.C. Barnes, R. Anderson. Behavioural analysis and susceptibility to CNS injury of four inbred strains of mice. *Brain Research*. **816**(2):337-49, 1999.

4. **Advisor's Remarks:** Eric Sribnick's research activity in our laboratory has led to the following four fruitful achievements. (1) He experienced the major experimental procedures developed in our laboratory for the research of calpain-calpastatin system. (2) He and we were able to observe that excitotoxicity-induced neurodegeneration accompanies calpain activation. (3) He provided us with the latest knowledge of spinal cord injury research. (4) He developed good human relationships with a number of scientists inside and outside of our laboratory in our institute. I am confident that these achievements will lead to more international collaborations and to scientific/medical discoveries, from which the society will benefit, in the very near future.

RESEARCH REPORT

Name:	Affiliation (University):
Donovan Steutel	University of Hawai'i
Research Advisor:	**Host Institution:**
Makiko Ohtake	NASDA

Research Subject:
Topography Dependent Photometric Correction of SELENE Multispectral Imagery

1. Research Description:

Japan's SELENE mission to the Moon—scheduled for launch in 2005—will include the Multiband Imager (MI) and Terrain Camera (TC) instruments. TC images will be used to construct a global digital elevation map (DEM) for the Moon. Calibration of the MI data must include photometric correction which normalizes the images for the effects of lighting geometry which in turn depends on the topography of the surface being imaged. The DEM produced from TC imagery will be used to calibrate MI images. However, it will take years to fully analyze the TC data set. I have worked on evaluation of the degree of photometric correction as a function of lighting geometry and on a technique to determine which regions on the lunar surface will require the greatest amount of photometric correction, so TC data analysis can be prioritized to maximize the scientific return from MI data during the first years of data analysis.

2. Research Activities:

This work draws heavily on the experience of NASA's 1994 Clementine mission to the Moon which included imaging instruments very similar in wavelength observation but inferior in resolution and sensitivity to MI. To perform simulated photometric correction of SELENE MI data, I used the photometric correction technique developed for Clementine data analysis. Over the range of lighting angles under which MI will image the lunar surface, I have produced quantified charts showing the degree of photometric correction required for a variety of topographic slopes. For any given set of local slopes, the extent of correction required can be determined. No appropriately high-resolution topographic data of the Moon exists, so the topography data required for SELENE must be modeled. I have performed a fractal analysis on existing topographic data and extrapolated the surface roughness to the scale of the MI cameras. I have produced a map of the lunar surface showing the regions of steepest slope which will be the priority regions for TC data analysis.

3. Perspective of Research after this Program:

This has been my first opportunity to work on a planetary mission prior to launch as well as my first direct exposure to the Japanese space program and lunar exploration program. I have learned a great deal about the science involved in my research, but I have also received an invaluable firsthand introduction to how Japan performs and plans lunar research. I have met many Japanese planetary scientists with similar interests, and I expect to continue our relationships for many years into the future. I strongly hope for the success of SELENE and for the opportunity to use the vast data sets SELENE will collect in my future research.

4. Advisor's Remarks:

His work on photometric correction greatly helps our pre-launch planning of MI data analyses and time estimation of the analyses. Results of his work are not only important to MI itself but also include scientifically interesting findings. Therefore, I strongly recommend him to publish them in near future. I would like to add to this that his good personality and good attitude for the research continuously has brought a nice effect to all of our laboratory members during his stay. I hope we can continue our relationships in future.

Topography Dependent Photometric Correction of SELENE Multispectral Imagery

Donovan Steutel[1] and Makiko Ohtake[2]

[1]Hawai'i Institute of Geophysics and Planetology, University of Hawai'i, Honolulu, HI, USA.
[2]Lunar Mission Research Center, National Space Development Agency of Japan, Tsukuba, Ibaraki-shi, Japan.

Introduction:

The Multiband Imager (MI) instrument on SELENE *[Haruyama et al., 2003]* will collect visible (VIS) and near-infrared (NIR) imagery of the lunar surface. Part of the photometric correction calculation for MI data will include the topography of the lunar surface at the resolutions of the VIS and NIR cameras (20m and 62m, respectively). The high resolution topographic data set which will be used for this photometric correction will come from the Terrain Camera (TC) instrument, a visible panchromatic stereocamera with 10m spatial resolution. The ~1TB (10^{12} bytes) of TC data will take years to reduce. Until the unique high-resolution lunar topographic data set which will be produced by TC is completely reduced, complete topography-dependent photometric correction of MI data will rely on the traditional and substantially less accurate assumption of a spherical lunar surface. We present a method for prioritizing topographic analysis of TC data so MI topography dependent photometric correction can be applied at the earliest time to the regions of the lunar surface where it is most important.

The Role of Photometric Correction:

The calculation of photometric correction depends on incident (i), emission (e), and phase (g) angles which are determined by the geometry of the light source (the Sun), the surface being imaged (the Moon), and the observer (the lunar satellite [e.g., SELENE] cameras). Different lighting geometries causes different observed brightnesses for any given spot on the lunar surface (Figure 1). Accurate and consistent interpretation of lunar spectral imaging depends on consistent lighting geometry. (The standard is to photometrically correct lunar imaging data to i=30°, e=0°, and g=30°). For the Clementine *[Nozette et al., 1994]* mission, topographic data was (and is) not available on a global scale at the 100-200m resolutions of the multispectral cameras. Clementine multispectral imagery was photometrically corrected under the assumption of a spherical Moon (i.e., no topography) so that the lunar surface is modeled as a flat plane tangent to a sphere at the point of interest. However, this approach can lead to significant errors in photometric correction— as high as 5% and 4% absolute in standard calculations of FeO and TiO_2, respectively for local slopes of 30° *[Robinson & Jolliff, 2002]*. The ranges of FeO and TiO_2 on the lunar surface are about 5-20% and 0-11%, so the errors which result from ignoring the role of topography in photometric correction are very significant.

Calculation of Photometric Correction:

In order to determine a general quantified relationship between local topographic slope and degree of photometric correction, we have calculated the dependence of photometric correction on incidence angle, emission angle, phase angle, wavelength (VIS only), and local topographic slopes. To calculate photometric correction we use the method *[McEwen 1996; McEwen et al. 1998]* used for Clementine with the following corrections: The factor of 2 is included in the X_L function *[see McEwen et al., 1998]*, P(alpha, g) = (1-g^2) / (1 + g^2 + 2gcos(alpha))^1.5 (here, alpha is phase angle and g is a general constant), and g1 = D * R_30 + E. Also, we do not use a separate phase function at phase angles less than 3 degrees; the SELENE imaging plan is such that narrow phase angle images will not be collected. The degree of photometric correction is represented by the RMS (root mean squared) error between the photometrically corrected VIS spectra with and without inclusion of topographic effects (Figure 2).

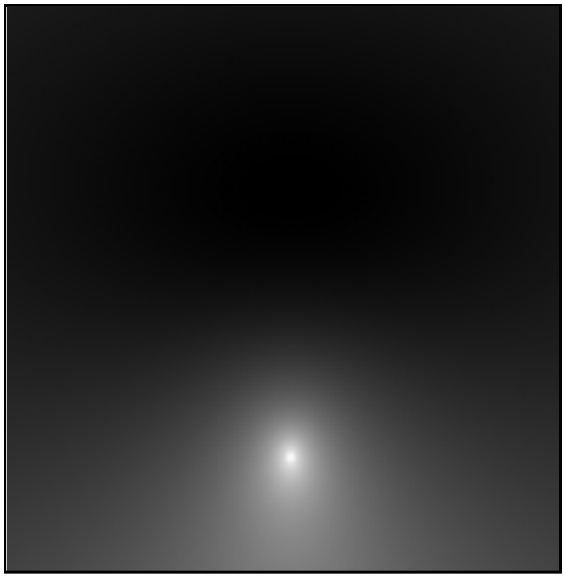


Figure 1. An example diffuse surface. The actual reflectance of the artificial surface depicted here is 10%. However, the photometric effects of lighting geometry vary the observed intensity by a factor of ±2.

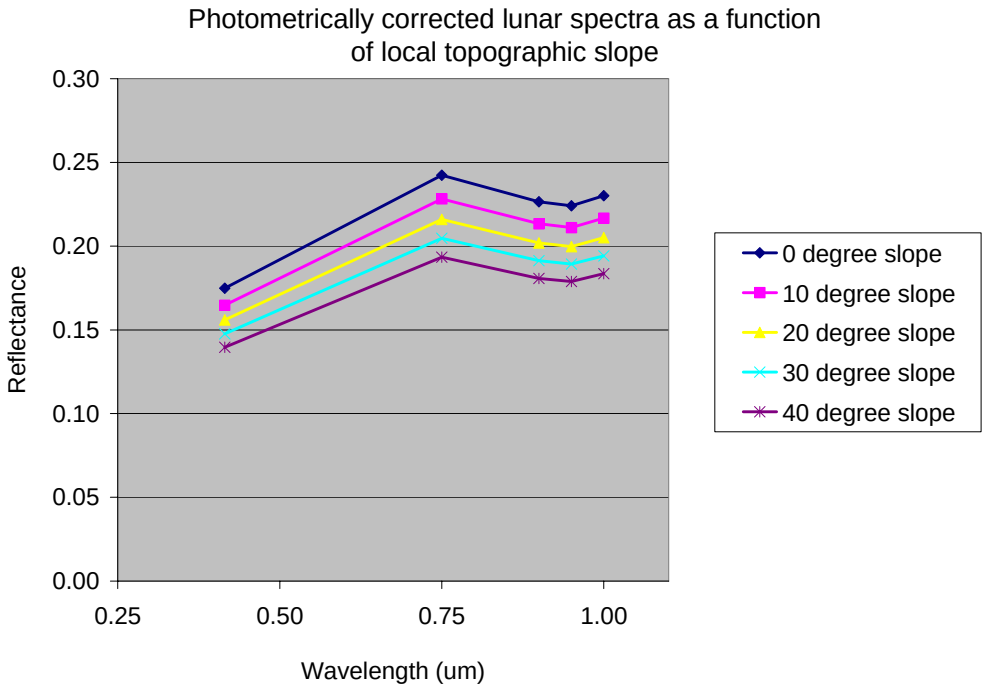


Figure 2. The effect of topographic slope on photometric correction of lunar spectra. An actual spectrum from the Clementine mission is shown in dark blue (0 degree slope). If the local topographic slope is 0°, then no additional photometric correction is necessary. However, the effect of a 40° slope can cause a change of 5% absolute in reflectance. This is highly significant for spectral interpretation.

Photometric Correction Results:

We present plots of the degree of photometric correction required (RMS difference) as a function of the two dimensions of local slope (one in the principle plane containing the emission and incident lines-of-sight, one normal to the principle plane) and incident angle to a spherical surface (Figure 3). The emission angles to a spherical surface are fixed by the design of the SELENE cameras, varying slightly (-5 to 5 degrees) for different bands.

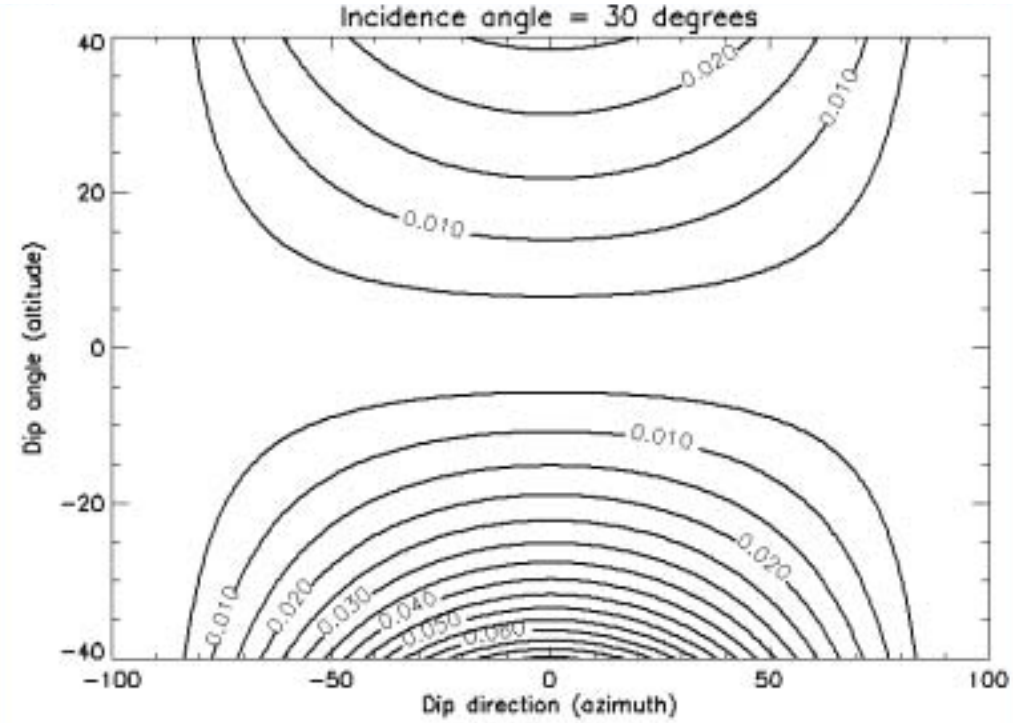


Figure 3. Example plot of photometric correction dependence on local topographic slope for i=30°. Z-axis is RMS difference between a photometrically corrected lunar spectrum with and without consideration of effects of topography. Many areas on the Moon have slopes steeper than 30° at 20m resolution. The effect of topography in these areas is very significant, up to 4% absolute reflectance (see also *Robinson and Jolliff [2002]*).

Lunar Topography Analysis:

To predict the 20m and 62m scale topography of the Moon to determine the regional distribution of local slopes, we performed a fractal analysis *[Shepard et al., 1997; Shepard and Campbell, 1998]* on existing topographic data derived from Clementine LIDAR *[Smith et al., 1997]*, Earth-based radar of Tycho crater *[Margot et al., 1999]*, and Apollo surface-based stereoimagery *[Helfenstein and Shepard, 1999]*. Clementine stereoimagery of the poles *[Cook et al., 2000]* can also be used, but data gaps make fractal analysis non-trivial, so these data sets were not included at this time.

Lunar Topography Results:

Plots of log(RMS height) versus log(length) show a break in slope at a baseline of ~75km, indicating that different geologic processes control the roughness at scales larger and smaller than ~75km. The Hurst exponent, H, which describes the relationship between scale and roughness, is calculated to be 0.36±(<0.01) at the >75km scale and 0.65±0.02 at the 20-75km scale based on Clementine LIDAR, 0.64±0.01 at the 150m-1.5km scale from Earth-based radar, and 0.69±0.06 *[Helfenstein and Shepard, 1999]* at the 0.1-10mm scale from Apollo ground-based stereophotos. *Shepard et al. [1995]* determined a value of H=0.78 from radar data, but radar studies find H values to vary from 0.60-1.00 *[Simpson and Tyler, 1982]*. Based on the similarity in H at scales of $10^{(-8)-(-6)}$m, 10^{2-3}m, and 10^{4-5}m, we calculate that the Hurst exponent of lunar surface roughness is relatively constant from mm-km scales at H=0.65±0.03 (average weighted by proximity of aforementioned scales to the 10^{1-2}m scale) and can therefore be used to calculate surface roughness at the 10^{1-2}m scale of the VIS and NIR cameras (Figure 4).

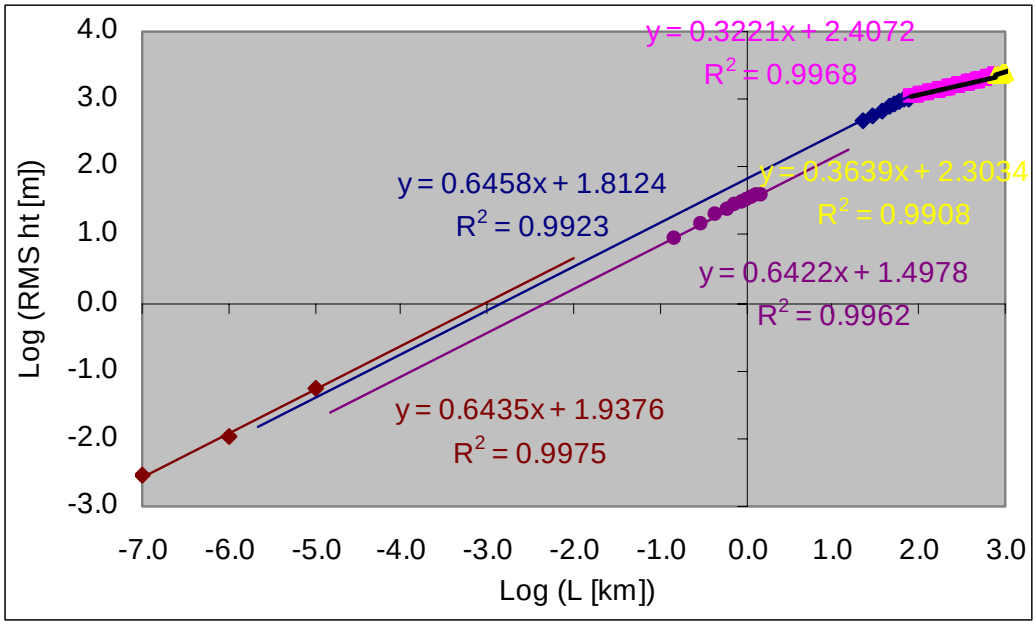


Figure 4. Fractal analysis of different lunar topographic data sets. Blue data is from Clementine LIDAR *[Smith et al., 1997]*, purple data is from Earth-based radar of Tycho crater *[Margot et al., 1999]*, and brown data is from Moon-based Apollo stereophotos *[Helfenstein and Shepard, 1999]*. The slope, H, is remarkably consistent between the data sets and is used to calculate lunar surface roughness at 20m and 62m resolutions.

The H parameter describes the relationship between scale and roughness—the "gain" of the fractal nature of the surface. A second parameter describing the extent of roughness at a given scale—the "offset" of the surface's fractal nature—is necessary to predict slopes at a given region on the Moon. Clementine LIDAR data at 0.25 degree (7.5km) scale is used to determine the offset parameter for overlapping 3x3 degree segments over the lunar surface. We predict local topographic slopes at the 20m and 62m scales at 0.25 degree increments from the offset parameter determined for that pixel and a gain parameter of 0.65 (from above).

We present a maps of the Moon of 95%ile steepest slopes at 20m (Figures 5 and 6) and 62m scales at 7.5 kilometer horizontal spatial resolution. Δht = RMS height * 1.645 (1.645σ is the 95th percentile for normally distributed data); Δlength = 7.5km; slope = $\tan^{-1}(\Delta ht/\Delta length)$.

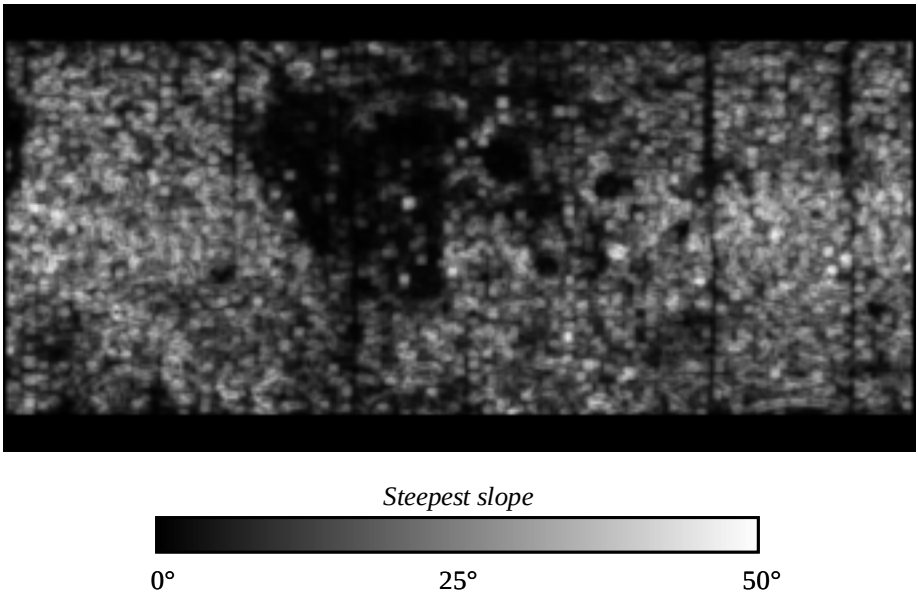


Figure 5. 95%ile steepest slope at 20m resolution. Map is an orthographic projection from -60° to +60° latitude.

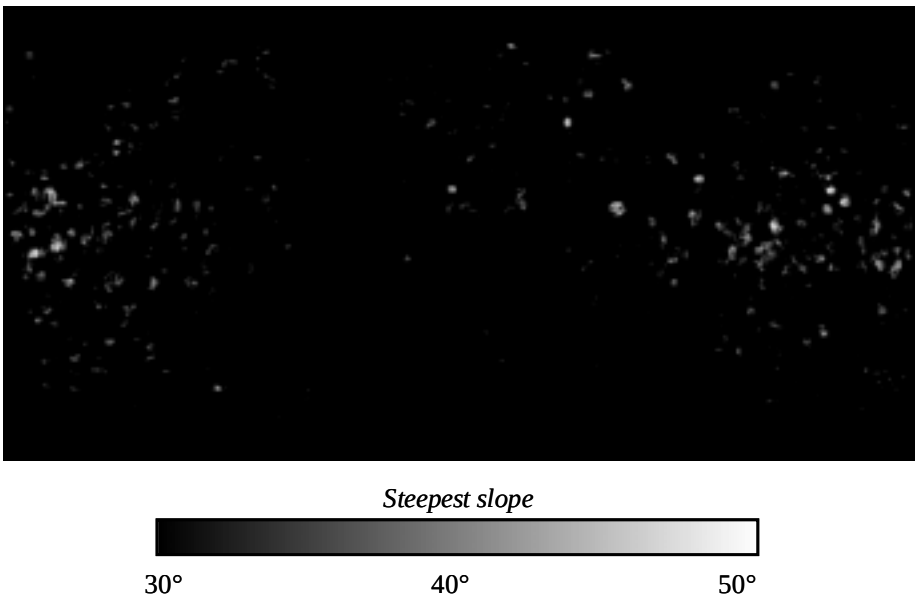


Figure 6. Like figure 4, but contrast is stretched to highlight areas with 95%ile steepest slope greater than 30°.

Conclusions:

Taken together, the plots of degree of photometric correction based on local topography and the regions of steepest slopes can be used to determine which TC data are most necessary to reduce so MI photometric correction can be done most accurately. Both the relationship between photometric correction and topography and the regional analysis of local topographic slopes are quantified, allowing us to assess the quality of any MI calibration performed without accounting for topography and to determine cut-off criteria for prioritizing TC data analysis.

Initially, all MI imagery may be calibrated without corrections for topography. Five years after the completion of the mission (ca. 2011) when the TC data are completely analyzed and high-resolution topography becomes available, all MI imagery may be calibrated with corrections for topography. During the interim period (2005-2011), the work presented here will allow for prioritization of TC analysis to maximize the scientific benefit of SELENE multispectral imagery.

This work was supported by the Japan Society for the Promotion of Science and the National Science Foundation East Asia Summer Institutes.

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RESEARCH REPORT

Name: Mark Stone Affiliation (University): Washington State University	
Research Advisor: Dr. Norihiro Izumi Host Institution: Tohoku University	
Research Subject: Equilibrium cross-section geometry of rivers	

1. Research Description:

This research aims to expand on the theoretical description of equilibrium cross-section geometry of coarse-bedded rivers carrying suspended sediments. These rivers are often described as "gravel-bed sand-bank morphology." The theoretical model considered in this research is a combination of two classical theories describing gravel-bed and sand-bed streams. Dr. Izumi extended the sand-bed river theory to include the case of a gravel-bed partially covered with fine sand. The final theory predicts the location of sand deposits as a function of center depth, slope, sand size, and the fraction of sand on the surface.

2. Research Activities:

Research conducted this summer was intended to improve the above theory through field observations. The field data could be used to confirm assumptions made through the development of the theory and to verify theoretical predictions. Do to my inexperience with this particular topic; a large portion of the summer was spent gaining understanding of the theoretical model. To verify the model assumptions and predictions, a complete description of the streams particle size distribution was needed. Do to the complex nature of collecting sediment across several size ranges, a unique sampling procedure was developed and sampling equipment was manufactured. Site collection was complicated due to the intense level of development surrounding rivers in Japan. Data collection was further complicated by persistent rain in the region; making it unsafe to enter the streams for much of the program. In the end, a successful dataset was not collected in Japan. However, the methods developed through this program will be utilized upon my return to the United States and Dr. Izumi and I will continue to collaborate on this research.

3. Perspective of Research after this Program:

This research exposed me to a different aspect of river engineering than that of my dissertation topic. The knowledge gained through this program will improve not only my current research, but the quality of work throughout my career. Further, the relationships developed through this program will be valuable for future collaboration. Additionally, exposure to the academic and cultural aspects of Japan has provided priceless professional and personal growth.

4. Advisor's Remarks:

Mr. Stone achieved many things here in my laboratory regardless of his short stay. He developed a new method for sediment sampling. Though the data sampling that he performed in a river in Sendai were not as successful as he expected because of bad weather etc., I believe that his achievement was satisfactory. I found him an active doctoral student who shows great initiative in research.

RESEARCH REPORT

Name:	**Affiliation（University）:**
Kate M. Syfert	State University of New York at Buffalo
Research Advisor:	**Host Institution:**
Masa-aki Yamanashi, PhD	Kyoto University
Research Subject: Japanese Women in the Geographic Information Science Workforce	

1．Research Description:

In this project, I investigated the experiences of Japanese women who are working in the Geographic Information Science (GIS) field. GIS are computer programs that help the user store, analyze, and display spatial data. These programs are used for many purposes in Japan, such as natural hazards research and urban planning. In the United States, women are more involved in the GIS field than other computer based fields. In Japan, women also show a strong presence in GIS. The questions of my research focused on the educational and workplace experiences of these women, and how they felt they were able to pursue high-level, technical careers in a culture that places many demands on women (family, elder care, school activities, etc.) and historically has not emphasized higher education for women in science and computer fields.

2．Research Activities:

During the eight weeks I spent at Kyoto University, I was able to conduct interviews with several women in the GIS field. I was also able to interview relatives of these women, and female students in this field. To gain a more comprehensive picture of Japanese women, I interviewed several women working in other fields and female graduate students pursuing other majors.

3．Perspective of Research after this Program:

My main research interest is the intersection of technology and society, specifically ethnographic studies of women working in scientific fields. I am currently doing research for my dissertation, a study of women in the western New York region working with GIS. The perspectives I gained in Japan will surely benefit my research in the United States, and I plan to return to Japan throughout the course of my career.

4．Advisor's Remarks:

Ms. Kate Syfert and I completed our research as we had planned.

Masa-aki Yamanashi
Kyoto University

RESEARCH REPORT

Name:	Affiliation (University):	
Adam M. Taylor	Oregon State University	
Research Advisor:	Host Institution:	
Dr. Kunio Tsunoda	Wood Research Institute, Kyoto University	
Research Subject: Variations in the natural resistance of heartwood to attack by Formosan termites.		

1. Research Description:

Formosan termites (*Coptotermes formosanus*) are serious pests of wooden structures in Japan and the southern United States. The heartwood of some tree species is naturally resistant to termite attack, due to the presence of secondary chemical compounds ("extractives"). There is significant variation in the natural termite resistance of individual pieces of wood of the same species and this may be due to naturally-occurring variations in the heartwood extractives present in the wood. This research has two goals: 1) To identify the heartwood extractive fractions responsible for the Formosan termite-resistance of western redcedar (*Thuja plicata*) and Alaska cedar (*Chamaecyparis nootkatensis*); and 2) To correlate natural variations in extractive chemistry in these wood species with variations in resistance to attack by Formosan termites.

2. Research Activities:

At the Wood Research Institute, two experiments were conducted. In the "natural resistance bioassay", samples of wood from redcedar and Alaska cedar – taken from a variety of trees with different growth rates and from two locations within the tree, and thus expected to vary in extractive contents – were exposed to termites in a standardized, no-choice test. In the "extraction effect" test, matched pieces of wood from the two species were treated prior to termite exposure in one of the following four ways: air-drying; air-drying and hexane extraction; air-drying, hexane and methanol extractions; or 4control (no treatment). Each of these treatments removes a different class of chemical compounds form the wood. After treatment, the pieces were exposed to termite attack in the standard no-choice test. In both cases, wood appearance, wood mass loss, termite mortality and termite gut protozoa populations were assessed after three weeks exposure. Some interesting results were obtained which can be used to analyze the natural termite resistance of the two wood species in relation to extractives.

3. Perspective of Research after this Program:

After returning to the United States, I will conduct chemical analyses of the wood extractives. Matched samples of those exposed to termites will be ground to flour, extracted, and the extracts analyzed using gas chromatography (GC). From the results of the "extraction effect" termite test, and the chemical analysis of the matched samples, I will be able to identify which compounds are important in conferring termite resistance to these two wood species. From the termite "natural resistance bioassay", and the chemical analysis of the matched samples, I will attempt to correlate the naturally-occurring variations in heartwood extractive chemistry with the differences in Formosan termite resistance that were observed.

4. Advisor's Remarks:

Since Adam Taylor joined our group, he has been working well after discussions with us to conduct experiments efficiently along the research purposes. Results obtained look promising to support his theoretical emphasis on the role of minor heartwood components (extractives) in the natural resistance of durable timber species to biological agents such as subterranean termites and decay fungi. I wish he could complete the PhD work and come back to us in the future. We, all of our laboratory members were pleased to have his stay.

RESEARCH REPORT

Name: Michael Terry Affiliation (University): Georgia Tech	
Research Advisor: Kumiyo Nakakoji Host Institution: University of Tokyo	
Research Subject: Supporting Experimentation in User Interface Design	

1. Research Description:

Many problems do not have a single, perfect solution. Instead, they can be solved in a number ways, with each solution possessing its own unique set of strengths and weaknesses. For example, there is no single "best" design for a car - each car design has its own unique set of benefits and drawbacks compared to other car designs. We term these types of problems *open-ended tasks*. Open-ended tasks are typically found in the design disciplines, such as industrial design or architecture, but can also be found in common activities, such as writing a paper. Though the goals differ from problem to problem, all open-ended tasks require experimentation to solve well: problem solvers must develop multiple, potential solutions to the problem to find the best solution.

The focus of this research effort is to improve the ease with which people can experiment with solutions using computer-based tools. This research is within the domain of *human computer interaction*: improving software interfaces to make them better tools for accomplishing specific tasks.

Current computer interfaces provide some rudimentary support for experimentation, but our research suggests that there are many areas in which they can be improved. For example, before experimenting with a new solution, users often save a copy of their document in a new file, so that both versions (old and new) are available if the experiment does not work out. However, such ad-hoc approaches have their limitations. In the case of saving different versions in separate files, users must remember which file contains which specific version. Furthermore, comparing the different versions is cumbersome: users must open each file, arrange the windows so they can compare the differences, and so on. The goal of this research, then, is to make it easy to:

- create multiple solutions,
- compare those solutions, and
- edit the multiple solutions at the same time.

For example, users should be able to create multiple variations for a paper's abstract, keep these variations within the document itself (rather than in separate files), and compare and contrast those variations.

2. Research Activities:

The research activities this summer can be broadly categorized into three areas: design work, theory construction, and research exchange.

Much of the work this summer was focused on the design of new user interface tools to more fluidly support experimentation. Ironically enough, this design work was conducted primarily using pencil and paper: we covered tabletops with large sheets

of paper, and sketched design alternatives on tracing paper that was layered on the large sheets of paper (Figure 1). This choice of media helped us generate a number of possible designs quickly, but also inspired our actual designs for computer interfaces.

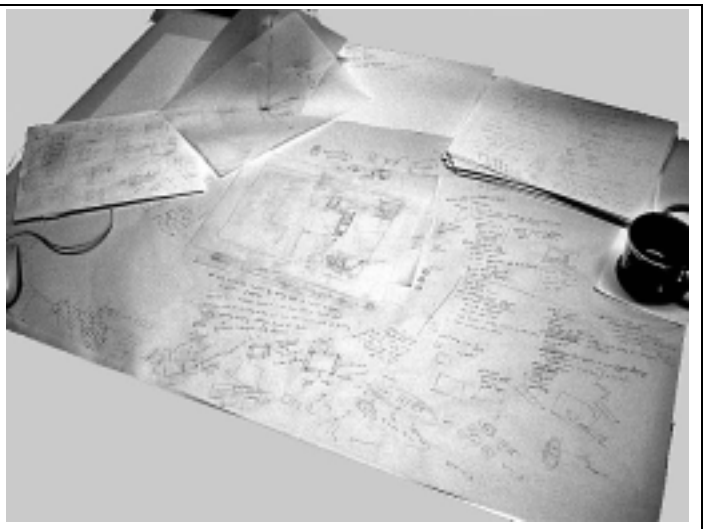


Figure 1. Design workspace: A tabletop covered with sheets of paper and tracing paper.

As the designs gelled, we developed a more general theory to guide the development of future computer interfaces so that they better support experimentation. This theory forms the cornerstone of the research results obtained this summer.

Finally, throughout the summer I gave a number of presentations of this work to both academic and industrial research labs. On these occasions, I also had the opportunity to learn about each lab's research. These visits were extremely valuable because they created new connections between individuals (myself and others) and between institutions (their lab and my research lab and school).

3. Perspective of Research after this Program:

As mentioned, some of the most valuable experiences over the summer were the many visits to other labs, and the discussions that followed. These discussions afforded me unique and new perspectives on research and how it can be conducted. The value of the summer program was being exposed to these perspectives on a daily basis, which helped me to understand their methodology at a deeper level, and to better integrate their methods into my own research paradigm.

4. Advisor's Remarks:

The program provided a valuable opportunity to collaborate on a common problem, and exchange research perspectives and methodologies. We are excited by the results developed over the summer, and view it as the beginning of a larger, and longer-term working relationship.

RESEARCH REPORT

Name:	Affiliation (University):
Dustin Thoman	University of Utah
Research Advisor:	**Host Institution:**
Dr. Hirofumi Koishi	Kobe University
Research Subject:	
Social Psychology	

1. Research Description:

The research project for the 2003 summer program aims to examine the role of cross-cultural stereotypes and their impact on education and academic test performance. Data was collected in Kobe, Japan during the program dates, and data from a U.S. comparison group will be collected in the fall of 2003.

U.S. and Japanese college females will take a math achievement test after being made aware of the gender-math stereotype. This stereotype will be presented either as ability-based (i.e. men are inherently better at math) or effort-based (i.e. men are better because they work harder). We will then compare their performance on the test with the performance of females who are not made aware of the stereotype before the test, as well as of females who are reminded of the stereotype but also told that research has found the stereotype to be untrue (stereotype nullified). Thus, the study is a 2(Country: Japan, U.S.) X 2 (Stereotype condition: ability vs. effort) X 3 (Threat condition: threat, nullified, or control) between subjects design. The study will also include individual difference measures such as goal adoption strategies, domain identification, and theories of intelligence to test for possible mediators and moderators. If the findings in the U.S. are replicated, threatened participants will perform significantly worse on the math test than the other groups. Differences in domain identification and group-identity will likely produce increased stereotype threat effects in Japanese females compared to the U.S. sample. In addition, we hypothesize that participants who report a fixed theory of intelligence will be more affected by the ability stereotype, and participants with a malleable theory of intelligence will be more affected by the effort stereotype.

2. Research Activities:

Before data collection all research materials were translated and back translated from English to Japanese. All language and/or cultural incongruities were thoroughly discussed and appropriately corrected in the translated versions. Research activities in Japan consisted primarily of data collection. One hundred and one female students at Kobe University participated voluntarily for this research. All data has now been entered into the SPSS statistical analysis software with the exception of a few open-ended questions waiting translation and coding. However, data analysis cannot be properly conducted until all questions have been translated and coded. We expect to analyze the data within the next month.

3. Perspective of Research after this Program:

Although results of the study are not yet available, all goals for the 2003 summer program were fulfilled. Dr. Koishi and his department were quite efficient in recruiting participants, as two months is often not enough time for collecting data from over one hundred participants. Also, rough examination of the data (note that full statistical analyses have not yet been conducted) points to several potential directions for future cross-culture research and continued collaboration, suggesting that this collaboration and program have been very successful. I also plan to maintain communication with Dr. Koishi, his students, and other researchers to whom Dr. Koishi introduced me for possible continued cross-cultural collaborations.

4. Advisor's Remarks:

Mr. Dustin Thoman has been conducting research on “stereotype threat” in sex, which may affects in math achievement test. He conducted a cross-cultural research on stereotype threat both in the US and in Japan on whether females are stereotyped as under- performing in math compared to males.

Over 100 Japanese female students as participants completed the “background” questionnaire, which is the domain identification measure for the research. Although the research was contacted during the end of the term before summer vacation, it was able to be completed within 3 weeks under the great cooperation of Kobe University. From now on, we are ready to work on experiments for such tasks as we did with Mr. Dustin Thoman this autumn.

During the period of staying in Japan, Mr. Thoman introduced his research to the Japanese students and discussed it with them. And it was also great for him to have quite a few chances to communicate with other students.

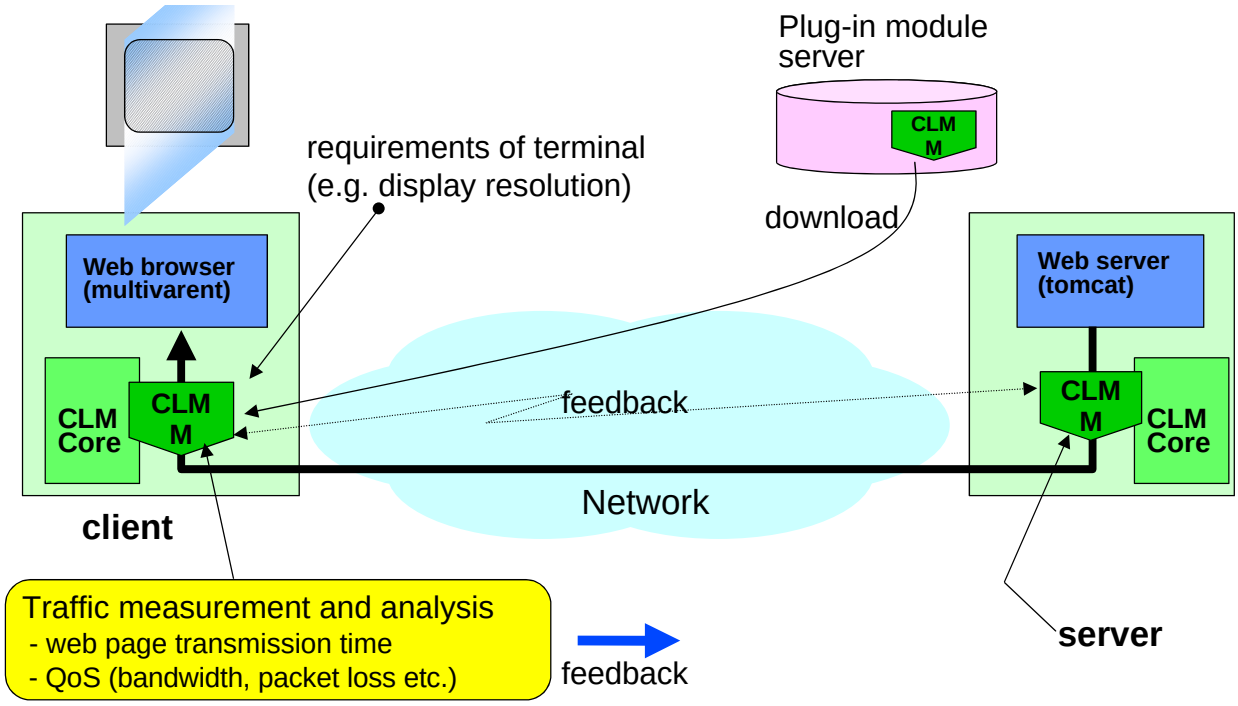
And he also visited high schools and elementary schools, during which he could have been acknowledged concretely about education condition in Japan. Besides, he traveled around Japan in his spare time and this is great for his understanding of Japanese culture.

RESEARCH REPORT

Name: Tavaris Thomas Affiliation (University): Florida State University (USA)	
Research Advisor: Ryutaro Kawamura Host Institution: Nippon Telegraph and Telephone Corporation (NTT) Cyber Solutions Laboratories	
Research Subject: CSC Traffic Measurement and Protocol Analysis	

1. Research Description:

CSC or Communication Service Concierge is project located at the NTT Cyber Solutions: Home Network Innovations Laboratory. CSC is middleware designed to provide a coupling between systems and devices in a heterogeneous network communication environment. The goal of this coupling is to improve end user network communication through adaptive and distributed resource coordination. CSC software components contain network communication semantics, which are downloadable, replaceable and customizable. The CSC framework contains two schemes, CRM and CLM, Communication Resource Management and Communication Logic Management respectively. CRM improves communication by coordination of network resources and component access. Alternatively, CLM interacts directly with network communication protocols. CLM modules can be inserted in the path of data flow to and from a communication socket. From this point, CLM modules can perform functions such as encryption, shaping, compression, QoS monitoring, and dynamic transcoding of video data. Nomadic computing is based on client devices such as mobile phone, PDA, desktop PC, and notebook PC connecting to servers. The bandwidth allocated to these devices can vary and seamless usage is a priority during client movement and terminal change. Within the CLM framework, my project was to create CLM module(s) for traffic measurement and protocol analysis. The following figure details the description of my project. **Note multivalent and tomcat are GPL software web client and server applications.



2．Research Activities:

There were a number of development steps involved with CLM module development:

1st) Installation and configuration of JAVA based web server and client. As well as current NTT JAVA CSC components. (NTT proprietary code)
2nd) Learn the CLM module developers manual
3rd) Install Ethereal for data traffic packet analysis between tomcat and multivalent
4th) Create client side algorithm for traffic measurement. Since we are not able to see the TCP information between the client and server. The CSC module must extract the http 1.1 protocol packet information from the socket stream.
5th) Based upon http analysis record the time it takes to transfer each object from web server to client.

3．Perspective of Research after this Program:

The longest stage of the research activities involved the learning of CSC developer's manual and its use in creating plug in modules for CSC. While the details of my code are not given here, the traffic analysis portion was completed at the end of my visit to the NTT Cyber Solutions Laboratories. This analysis determines the transfer time (in milliseconds) of any object contained in a webpage. From this step a number approaches can be developed. For example, if movie data was being transferred from the web server to the client, the information gained from the traffic analysis could then be used to determine the dynamic transcoding of the data. Step 5 of the research activities was the key step for future CSC modules.

4．Advisor's Remarks:

Even though Tavaris' visit to the Cyber Solutions Laboratories was only a few months, he worked very hard in the amount of time given. He was given a traffic measurement and analysis project, which is a module in the CSC project mentioned above. More specifically Tavaris was able to determine the amount of time to transfer an object from a web server to client. In this setting, an object represented any representation of data from a webpage (e.g. text, image, sound, etc). Tavaris was a welcomed and enjoyable member of the lab and I would like to work with him again at NTT in the near future.

RESEARCH REPORT

Name: Damon Toth **Affiliation: University of Washington**	
Research Advisor: Yoh Iwasa **Host Institution: Kyushu University**	
Research Subject: Age-structured populations in a periodic environment	

1. Research Description:

For my dissertation research, I am studying the mathematics of age-structured population models with time-periodic parameters. Such models would be appropriate for studying the dynamics of populations living in environments that vary seasonally. In addition, age-structured models are closely related to models of life-history evolution, and this was the focus of my research during the summer of 2003. We considered various possibilities for extending mathematical life-history models to the case of environmental periodicity. We also worked on a model of diapause, a phenomenon observed in insects in which they enter a dormant life stage, presumably triggered by seasonal cues. I worked on various model scenarios to determine the theoretical optimal timing of this behavior in age-structured populations.

2. Research Activities:

I spent my time this summer learning about life-history evolution and related topics from Professor Iwasa and members of his laboratory. After presenting my research ideas to the group early in the summer, I engaged in discussions with individual members about their own work and their recommendations for avenues of exploration. I learned about a variety of topics, and eventually settled on modeling the diapause phenomenon described above. Professor Iwasa and I discussed numerous theoretical scenarios in an attempt to create a biologically realistic model that is mathematically tractable. I obtained preliminary results to three different models.

I was also able to meet with professors, researchers, and students from outside my host institution. Our laboratory co-hosted the 5th annual meeting of the Japan Society of Evolutionary Studies, at which I attended lectures and met researches from around Japan and other countries. In addition, I visited Professor Fugo Takasu at Nara Women's University, Professor Norio Yamamura at Kyoto University, and Professor Hirohisa Kishino at Tokyo University. They are important mathematical biologists in Japan, and I learned much from discussions with them and their colleagues about my and their research.

3. Perspective of Research after this Program:

I feel that the potential of my research has broadened as a result of my experience this summer. The enthusiasm of Professor Iwasa and others for my ideas has given me confidence that I can contribute something meaningful to the field. I was also thrilled to meet so many researchers who were interested in sharing their work with me. I am excited to continue collaborations after leaving Japan, and I have a newfound enthusiasm for seeking out people from around the world with whom to discuss my ideas.

4. Advisor's Remarks:

In Kyushu University, Mr Damon Toth has been working on mathematical models for age or size structured populations. He considered the life history evolution under seasonal environment, and succeeded in deriving the optimal date for start producing diapausing eggs which will overwinter and emerge in the following year. This will be a very good start point for his future research in mathematical ecology. In addition to this research activity, he also gave a seminar in mathematical biology group, Kyushu University, and also made a trip to Center for Ecological Research, Kyoto University and Nara Women's University, in both of which he gave a talk on the age structured population dynamics in a seasonal environment. He also have involved in many social activities with many graduate students in Japan. Hope Damon has enjoyed his visit to Japan supported by this Monbusho program. (by Yoh Iwasa)

RESEARCH REPORT

Name:	**Affiliation (University):**
Joanna Shaofen Wang	University of Idaho, Moscow, Idaho 83844, USA
Research Advisor:	**Host Institution:**
Dr. Youichi Enokida	Research Center for Nuclear Materials Recycle, Nagoya University, Japan
Research Subject: Characterizations of the "x" and "y" values in TBP(acid)$_x$(H_2O)$_y$ complex	

1. Research Description:

Tributylphosphate (TBP) is a highly CO_2-soluble Lewis base. It can react with inorganic acids such as nitric acid (insoluble in CO_2) to form a hydrogen bonded complex, TBP(HNO_3)$_x$(H_2O)$_y$, which is highly soluble in supercritical fluid CO_2(SC-CO_2). This CO_2-soluble Lewis acid-base complex provides a method of dispersing nitric acid in SC-CO_2 for effective dissolution of uranium dioxide, lanthanide oxides and metal oxides. This is well documented in the literature. Many organic acids are not soluble in SC-CO_2 perhaps because they are polar. For instance, lactic acid and citric acid are important fermentation products but have low solubility in SC-CO_2. TBP can form complexes with these organic acids which enhance their solubilities in SC-CO_2. The chemical structure of the TBP-acid complex and the behavior of TBP(acid)$_x$(H_2O)$_y$ in SC-CO_2 are not well known. Our purpose is to characterize the structure of the TBP(acid)$_x$(H_2O)$_y$ complex. Because TBP has a strong absorbance in the UV/Vis region, the determination of x and y values in TBP(acid)$_x$(H_2O)$_y$ complex can not be carried out by spectroscopic methods. These x and y values can be determined by acid-base titration in order to fully understand the mechanisms and behavior of the TBP-organic acid complex. The value of x from organic acid in TBP phase can be determined with an automatic titrator (Com-450, Hiranuma, Japan), and the value of y from H_2O in the TBP phase can be measured by Karl-Fischer titration using an Aqueous Counter AQ-7 instrument (Hiranuma, Japan).

2. Research Activities:

Organic acids including acetic acid, benzoic acid, citric acid, lactic acid and oxalic acid, can react with TBP to form non-polar organic complexes, which can be soluble in SC-CO_2. The formation of these complexes, TBP(acid)$_x$(H_2O)$_y$, is complicated. Experimental data suggest that there are two kinds of TBP(acid)$_x$(H_2O)$_y$ complexes. The type one complex rapidly reacts with an organic acid in the TBP phase until a 1:1 ratio of organic/TBP is reached. Above that point the incorporation of organic acid into the TBP phase becomes slow. The acidity of these organic acids can be determined by titration with an automatic titrator and sodium hydroxide standard solution. The densities for both organic and aqueous phase were also measured. The water contents in this TBP(acid)$_x$(H_2O)$_y$ complex were measured as well by the Aqueous Counter AQ-7 instrument. The results were informative for both research groups. I was so amazed that there are several experimental techniques that are available in the Research Center of Nuclear Materials Recycle and I took the opportunity to learn and use them.

3. Perspective of Research after this Program:

Solubilities of TBP(acid)$_x$(H_2O)$_y$ for the different organic acids should be measured in SC-CO_2 at different pressures and temperatures. The phase behavior should be studied using a high pressure view cell system and a video camera as well through the visual observation. In addition, NMR spectrometer should also be used for the proton NMR measurement. These experiments, hopefully, could be finished by the end of November and by the end of year, a joint paper could be submitted for possible publication.

4. **Advisor's Remarks:**

During the time Ms. Joanna Shaofen Wang has subsequently spent in my laboratory, I have formed a high opinion of her ability to compile lots of valuable experimental results for a new research area in a short period. She set a very clear goal of the study on complex formations of tributylphosphate with some organic and inorganic acids, which leads to future investigation of material purification and chemical synthesis in supercritical carbon dioxide. I hope a scientific paper including the experimental results gained in this summer will be published soon.

RESEARCH REPORT

Name:	Affiliation (University):
Gordon P. Warn	State University of New York, University at Buffalo
Research Advisor:	**Host Institution:**
Professor Kazuhiko Kawashima	Tokyo Institute of Technology

Research Subject:
Performance of seismic isolation system in a Japanese seismically isolated bridge subjected to multiple components of earthquake excitation

1. Research Description:

After the damaging 1995 Hyogo-ken Nanbu earthquake a large number of bridge structures in Japan were constructed with seismic isolation systems in order to minimize or eliminate damage during severe ground shaking. Seismic isolation systems are composed of seismic isolation bearing which are vertically stiff and horizontally flexible elements located between the superstructure (bridge deck) and the substructure (bridge pier or bent). The seismic isolation systems implemented after the 1995 Kobe earthquake were design based on Japanese Menshin design procedures. However, since 1995, new knowledge about near-field ground motions (ground vibration in close proximity to the fault) suggests that displacement demand across the isolation interface could be significantly larger than the displacement for which these systems were designed. This increase in displacement could result in pounding between adjacent spans, damage to the seismic isolators, or damage to the supporting substructure during near-field type earthquake excitation. For this research a mathematical model of a Japanese isolated bridge structure was developed and subjected to several near-field ground motions using numerical simulation. The mathematical model is based on an example Japanese isolated bridge structure designed according to the Menshin design procedures. Results of the numerical simulation were mined to determine maximum isolator displacements. Conclusions regarding the performance of the seismic isolation system were drawn based on maximum isolator displacement statistics.

2. Research Activities:

A mathematical model of an example Japanese isolated bridge structure was developed to perform dynamic response-history analysis using Opensees (Open system for earthquake engineering simulation). The bridge model is based on an example bridge specified in Part V of the Japanese bridge design code and consists of a two span continuous composite steel/concrete bridge deck resting on five lead-rubber seismic isolators at each support (fifteen in total). The supporting substructure consisted of two reinforced concrete piers with spread footings and one abutment also on a spread footing. For the mathematical model, seismic isolators were characterized using a bilinear force-displacement relationship and modeled using a coupled plasticity formulation with circular yield function. The substructure and superstructure components were modeled using finite elements. Parameters for the coupled plasticity model were determined based on the properties of the given lead-rubber bearings, i.e., yield strength and size of the lead core, area and thickness of individual rubber layers, and, shear and compression modulus of the natural rubber material. Properties of the specified reinforced concrete sections including: the number and size of longitudinal reinforcement, size and spacing of transverse reinforcement, stress-strain relationship of the concrete and steel were used to develop the parameters of the finite element models.

Dynamic response-history analysis was performed using 29 earthquake ground motion records. Twenty six ground motions were recorded from earthquake events. The remaining 3 ground motions are Japanese design ground motions simulated from earthquake design response spectra. Each record consists of three components of excitation with the exception of the Japanese design ground motions which contain two horizontal components. Results of the response-history analyses were mined to determine maximum horizontal isolator displacements. This data was statistically organized to access maximum isolator displacements in an isolated bridge structure subjected to near-field earthquake excitation.

3. Perspective of Research after this Program:

A mathematical model of an isolated bridge structure with a seismic isolation system designed using Japanese Menshin design procedures was developed. However the methodologies for the design of seismically isolated structures in Japan and the United States are significantly different. Future research could involve modifying the mathematical model developed here to represent an isolated bridge structure designed using the codes of practice in the United States. Using the same suite of ground motions, dynamic response-history analysis could be repeated. From these analyses the performance of seismically isolated bridges constructed in Japan and the United States could be compared providing valuable insight regarding the different design methodologies and the resulting performance under earthquake excitation.

4. Advisor's Remarks:

Mr. Gordon P. Warn was involved in a research to evaluate the seismic performance of a Japanese isolated bridge based on a numerical simulation. This research was jointly conducted with another summer student, Kevin R. Mackie. A US computer software called “Opensees” was used for this purpose. The analysis revealed an interesting difference as well as similarity between US and Japan in the seismic performance of the isolated bridge. Major difference was the large relative deck displacement. This is inherent in the difference of design concept between two countries. I found that this is an interesting research for evaluating the seismic response of isolated bridges in both US and Japan. Mr. Gordon P. Warn worked enthusiastically to get an interesting result within a short period of stay. He also joined several research activities in our research group. He was always friendly to other members. It is my surprise that he climbed Mt. Fuji with Kevin R. Mackie.

RESEARCH REPORT

Name:	Affiliation (University):
Brad D. Weldon	Uniiversity of Notre Dame
Research Advisor:	**Host Institution:**
Toshimi Kabeyasawa	Earthquake Research Institute University of Tokyo
Research Subject:	Structural Engineering Systems

1. Research Description:

At the Earthquake Research Institute (ERI), I worked with students on an ongoing project were I was able to assist in the set-up and testing of a shear wall specimen. This test was being performed statically in order to compare its results with previous dynamic tests performed earlier. The results from this and future tests may help pave the way for a new ductility design code in Japan.

2. Research Activities:

While at ERI, I had many great opportunities to explore the depths of research currently underway in Japan. I was able to travel with my lab group to the Japan Concrete Institute Conference in Kyoto. I talked with professors and students at ERI and other institutes about their research interests and current projects. My main project for the summer was to assist in the set up and testing of a Static Shear Wall Test at Toyahashi University of Technolgy. This was a great opportunity for myself as I got to work hands on with setting up the project and then assist in the actual testing of the shear wall. The experience was great as I got to interact directly with other graduate students, learn about Japanese testing procedures and see the outcome of the experiment. These activities gave me a wide view of the research being conducted, while still allowing me to get involved in a project as well.

3. Perspective of Research after this Program:

All my experiences during the summer, gave me new insight into the kind of research that is being done in Japan. I had the chance to learn about several projects that various students and professors are working on. This helped to demonstrate the type of work that is going being done throughout Japan. While the opportunity to actually participate in a laboratory set up and experiment showed me the quality of work that these project entail. Many projects that I learned about promise to be influential to the civil engineering community while getting to observe/assist in the set-up and testing of a specimen showed that this work is done in a very professional manner with great attention being paid to the details. I look forward to seeing the results of the project I assisted with as well as future projects coming from both ERI and TUT.

4. Advisor's Remarks:

Brad stayed for about two months in our laboratory at ERI as a visiting graduate student. While in our lab, Brad's performance was more than satisfactory. He was serious about his study and research, and demonstrated a high degree of competence in experimental work at TUT. Although personal communication with me might not be enough for him due to my busy schedule, I am sure that he has enjoyed academic and cultural exchange with Japanese as well as international students in our lab and TUT. I hope he will be still more active in research towards PhD degree with memory of this Program and have chances to lead research collaboration between US and Japan in the near future (*Toshimi Kabeyasawa, Advisor*).

RESEARCH REPORT

Name:	**Affiliation (University):**
Christian Westring	University of Denver Molecular Neuroendocrinology
Research Advisor:	**Host Institution:**
Dr. Akihisa Urano and Dr. Hironori Ando	Hokkaido University
Research Subject:	
Neuropeptides in the HPA(I) axis of Masu Salmon	

1. Research Description:

Reproduction and senescence in teleost fish follow one of two pathways. The reproductive strategy of the majority of fish is iteroparity, which allows fish to spawn repeatedly and undergo gradual senescence. In semelparity, the alternative strategy employed by Pacific salmon, sexual maturation is followed by rapid senescence and death. Both strategies lead to sustainable populations but little is known about the molecular genetic regulation of the neuroendocrine circuits responsible for these contrasting reproductive strategies. Here, the salmonid genus *Oncorhynchu*s, which includes both iteroparous trout and semelparous Pacific salmon, presents an ideal context to begin to investigate the underlying molecular mechanisms responsible for the morphological and physiological changes associated with sexual maturation.

The hypothalamus-pituitary-adrenal (interrenal) axis [HPA(I)] is a neuroendocrine network responsible for modulating a broad range of physiological functions from reproductive activity to chronic stress response. Within this network, corticotropic cells in the anterior lobe of the pituitary express proopiomelanocortin (POMC), a precursor protein from which the polypeptide hormone, adrenocorticotropin (ACTH), is post-translationally released. ACTH is well established as a critical link in the network. Neurons in the hypothalamus secrete corticotropin releasing hormone (CRH), which induces the secretion of ACTH from the anterior pituitary. ACTH, in turn, stimulates the adrenal gland to synthesize and release cortisol, which is the final hormone in the chronic stress response cascade. Fluctuations in the production and/or regulation of CRF, ACTH or cortisol can have serious consequences with respect to the survival of an organism. While it had previously been thought that the stress of marine to freshwater migration was responsible for the post-spawning demise of these fish, studies have now implicated overproduction of cortisol during sexual maturation as the factor which ultimately leads to the demise of spawning Pacific salmon.

Hypotheses Being Tested – The focus of the current research is to investigate the role of the HPA(I) axis as a modulator of chronic stress response mechanisms. It is hypothesized that a failure of these mechanisms is responsible for the post-spawning demise of Pacific salmonids. Recognizing the multitude of HPA(I) regulatory components that could be examined, the focus of the proposed EASI research will be the hypothalamic neuropeptides (CRH and AVT), proopiomelanocortin (POMC), *i.e.*, the hormone precursor that encodes ACTH), and Isotocin I. The benefit of focusing on these core components of the HPA(I) axis leading to hypercorticism are likely to either arise from, or ultimately lead to changes in the levels of gene transcripts for hypothalamic neuropeptides and/or POMC.

1. The HPA(I) axis in semelparous Pacific salmon *(O. maso*u) is altered such that the ACTH surge at sexual maturation results from increased expression and/or stability of POMC transcripts in corticotropic cells of the anterior pituitary.

2. The HPA(I) axis in semelparous Pacific salmon *(O. maso*u), is altered such that the surge of ACTH at sexual maturation result from increased expression and/or stability of CRH and/or AVT transcripts in the hypothalamus which regulate the production and secretion of ACTH.

2. Research Activities:

The research proposed for the EASI program tested hypothesis number two by quantifying changes in the mRNA transcript levels of the core components of the HPA(I) axis over the life cycle of masu salmon *(i.e.*, both spawning and non-spawning masu salmon). Dr. Takashi Kitahashi of Hokkaido National University collected these tissues at monthly intervals during the past two years. cDNA stocks were made using 200 ng of total RNA from brain tissue using a standard reverse transcription protocol. Transcript levels were quantified for CRH and Isotocin I for 310 samples in duplicate by QRT-PCR using the ABI7700 instrument and optimized protocols developed in Dr. Urano's laboratoy. In all of these assays, sample-to-sample variation was normalized by coamplification of an internal standard developed in the laboratory. Preliminary work at my home institution has already resulted in the cloning of cDNA sequences for POMC, CRH and AVT from masu salmon. These cDNA sequences were used to design the primers and fluorogenic probes required to quantify CRH and Isotocin I levels in the hypothalamus by real-time QRT-PCR. Due to time constraints, we were not able to measure transcripts levels for POMC and AVT. However, we were able to design primers and fluorogenic probes required to quantify these genes at a later date.

3. Perspective of Research after this Program:

By examining the role of the hypothalamus-pituitary- interrenal system in the regulation of cortisol production and secretion throughout the salmonid life cycle, the research performed at Hokkaido University complements the research interests of Dr. Urano's research team. Dr. Urano studies the role of neurohormones in the homing migration of mature adults for reproduction and is a preeminent scientist with over 30 years of research experience, scores of publications and awards. His laboratory has linked the innate homing behavior of Pacific salmon to the coordinated function and transcriptional regulation of secreted hypothalamic neurohormones including gonadotropin releasing hormone, vasotocin, and isotocin. Similarly, the preliminary results of research conducted at my home institution have implicated a loss of regulatory control over cortisol-associated stress response cascade in the physiologic degeneration of home-migrating Pacific salmon. The collaboration made possible through the EASI program made it possible to complete these important analyses thereby advancing our understanding of both the post-spawning demise of these species (my research) as well as the factors involved in triggering salient events in salmonid migration (Dr. Urano's research).

4. Advisor's Remarks:

Despite his short stay in my laboratory, Chris has done a lot of work concerning on neuroendocrine control of stress and reproductive function in salmonids. Particularly, using a real-time PCR technology, he examined annual and gonadotropin-releasing hormone-induced expression of corticotropin-releasing hormone and isotocin-I genes in masu salmon. He found that the basal expression levels of both genes changed significantly, depending on season and reproductive stage. These achievements are undoubtedly based on his highly motivated scientific mind. I hope to continue our collaboration in the future. So, I think that his stay here during the summer program was very much a success.

RESEARCH REPORT

Name: Steven Williams **Affiliation (University):** Washington University in St Louis	
Research Advisor: Osamu Yoshida **Host Institution:** Obayashi Corporation	
Research Subject: Fault tolerant structural control in civil structures	

1. **Research Description:** My research focused on the effects of a failure in a semiactive control system for two structures. One is a six story model, and the second is a nine story plan-irregular building located in Japan. The full size building is one that Obayashi Corporation is working with. My focus was on the effects of actuator failure in the control system and investigation into the best passive failsafe mode for the system to fall back to in case of failure.

2. **Research Activities:** The activities which occupied my time in the lab consisted mostly of running simulations on my computer. I enjoyed a few technical tours, but mostly I simulated earthquake inputs to the structures considered.

3. **Perspective of Research after this Program:** The research conducted during my stay at Obayashi will actually be used in my Masters Thesis. To continue the fault tolerant studies, detection of faults should be considered as well as different types of faults. Also, my research focuses on semi-active control: other types of control could be considered.

4. **Advisor's Remarks:**

Mr. Williams worked hard on his research project as well as our research project. He has done some simulation examining the effect of failure in the semiactive control systems. He presented his work for the research engineers in our campus. He also helped our research project by simulating the control performance of semiactive control systems. And he experienced some technical tours, including on-going practical size experiments in our campus and a couple of construction sites, where new construction technologies are used.

I was also very impressed with his ability to adjust to new living environment, which is quite different from his own. I hope this whole experience help his promising future career.

RESEARCH REPORT

Name: Andrew Yang **Affiliation** (**University**)**:** Duke University	
Research Advisor: Dr. Osamu Sakura **Host Institution**: University of Tokyo	
Research Subject: Sociology & Philosophy of Science (Biology)	

1. **Research Description:**

The goal of this project has been to examine the factors that have contributed to the unique development of evolutionary biology in Japan, in terms of both the community of scientists engaged in its development as well as their views on specific biological concepts. The research of Dr. Osamu Sakura has shown that Darwinian natural selection and related theories have had a very different historical development & trajectory in Japan compared to western countries. Through the use of a focused surveying of both the Japanese and US/European evolutionary biology communities, (supplemented by interviews & literature research) I hope to contribute to a fuller understanding of the cultural and historical factors that shape the practice of science and its regional/international character.

2. **Research Activities:**

- ■Developing a survey questionnaire to examine the views held by evolutionary biologists on a number of important and controversial concepts
- ■Collaborating with Dr. Sakura and his graduate students to develop a Japanese-language version of the survey
- ■Distribution of 250 copies of the survey to attendees of the 5th Annual Meeting of the Japanese Society for Evolutional Studies held at Kyushu University; to date there are ~75 respondents.
- ■Preliminary analysis of the responses from the initial survey distribution
- ■Reading of primary literature in my field

3. **Perspective of Research after this Program:**

After these two months I've come to a better understanding of, and developed new connections with, the Evolutionary Biology community in Japan. Furthermore, I have become aware of novel aspects of my study questions that may be pursued. This was especially true in attending the Japanese Evolution Meetings as well as from preliminary analyses of the data I collected. For example, the results so far indicate that while the literature available in translation has likely influenced which persons Japanese biologists view as important figures in the field, this has not necessarily resulted in bias in terms of the particular evolutionary concepts those biologists tend to hold. Furthermore, evolutionary biology as its own academic subfield in Japan is still relatively young such that there is a possibility to track how this discipline establishes itself into the fabric of the Japanese scientific community and its previous intellectual traditions (e.g. the anti-Darwinian views of Imanishi Kenji), as well as its integration into the wider international scientific community.

I am deeply grateful to Dr. Sakura and his students for so graciously hosting, helping and exchanging with me during this program and look forward to collaborating with them in the future.

4. **Advisor's Remarks:**

All of Mr. Andrew Yang's work was excellent. He planned and designed well his research before coming to Japan, prepared efficiently after arrival, then smoothly carried out the questionnaire research. His collaboration with my students was superb as well, and that was surely helped by his open and gentle character. Hosting him has been great experience for my students, as well for myself. I hope he has also enjoyed the stay and the "seeds" of his study should grow largely in near future. I am very grateful to JSPS and NSF for making this opportunity.

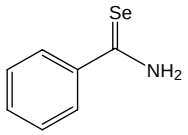
RESEARCH REPORT

Name:	Affiliation (University):
Brian S. Zelakiewicz	Georgetown University, Washington D.C.
Research Advisor:	**Host Institution:**
YONEZAWA Tetsu	University of Tokyo, Department of Chemistry
Research Subject:	Metal Nanoparticles : Dioctyl diselenide synthesis to incorporate as a protecting ligand on gold nanoparticles for ^{77}Se NMR characterization

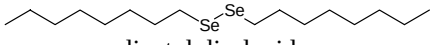
1. Research Description: Gold and silver nanoparticles <10 nm hold unique characteristics, different from their bulk metal properties, which introduce them to a wide range of applications such as microelectronics, catalysis, and biosensors. However, in order to control nanoparticle size and homogeneity during synthesis it is inherent that the characteristics of the bonding relationship between the metal core and the protecting ligand are well understood. Already, through the novel use of a $^{13}C_1$ labeled 1-octanethiol, which is a labeled carbon next to the sulfur head group bound to the metal surface, we have revealed a never before seen carbon-13 nuclear magnetic resonance (^{13}C NMR) shift that moves in accordance with different core diameters (JACS, 2003). This is an effect of both the metal core properties and geometric relationships being sensed by the NMR observable and the first ever indication that the $^{13}C_1$ of the octanethiol can be used as an effective probe to study such metal ligand effects due to changing core dimensions.

Since the $^{13}C_1$ is still two atoms away from the metal surface, a much better indication of metal-ligand effects would be afforded by a NMR probe directly attached to the surface of the metal itself. Since sulfur is not an atom easily observed by NMR techniques we propose to instead observe the NMR active selenium (^{77}Se) of an octane*selenide* in which the selenium is directly bound to the metal surface. This would allow the selenium to be probed by ^{77}Se NMR and greater sense any metal-ligand effects induced by core dimension changes.

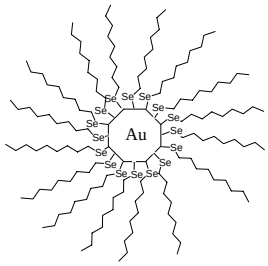
The most crucial part of this research is the synthesis of this non-commercially available selenium ligand. However, given the very toxic nature and difficulty of production of this compound it warrants the techniques affordable in an experienced organic synthesis laboratory. It is through Professor Yonezawa's shared interest in nanoparticle research and his successful organic/inorganic synthesis laboratory that offers a great opportunity for collaboration in this branch of nanoparticle research. This will provide with the much-needed skill and training to produce the dioctyl diselenide compound needed for further nanoparticle NMR studies.



Selenobenzamide



dioctyl diselenide



gold octaneselenide protected nanoparticle

2. Research Activities: The production of dioctyl diselenide involves two major steps. The first is the two-day synthesis of selenobenzamide from elemental selenium, both very toxic compounds. The second is the production of dioctyl diselenide, which utilizes selenobenzamide as one of its initial reagents and requires three days for the reaction and further purification of the crude product. Resulting from careful planning and handling, the ^{1}H NMR characterization of the final compound has proven the synthesis to be successful. The process was repeated multiple times to improve efficiency and technique and to provide a healthy amount of ligand for the continued work on Au and Ag alkylselenide protected nanoparticles.

Also, a preliminary experiment with selenide protected gold nanoparticles has also shown that the dioctyl diselenide does indeed bind to the surface of the gold, the Se-Se cleaving to form a monolayer of octyl selenide, much like the case of dioctyl disulfides. This is a great success lending to heightened anticipation of the future of the project.

3. Perspective of Research after this Program: The selenide ligand will continued to be used to protect gold and silver nanoparticles (~2-4 nm diameters) forming an octyl selenide monolayer about the metal core. Through ^{77}Se NMR it is hoped that the observed selenium will sense different environments induced by differences in metal core size. If successful, this will be a first ever NMR probe of a metal nanoparticle directly attached to the metal surface which will bring great insights to the dynamics and characteristics of the metal-ligand interaction and open new doors for understanding and controlling such systems.

4. Advisor's Remarks:

We have tried to prepare dioctyldiselenide via two steps as well as gold nanoparticles stabilized by this ligand. The preparative procedure was not so easy for the first time but Mr. Zelakiewicz made much effort to obtain the product.

In fact, the yield of the product was not high enough the first time, but we repeated the syntheses several times and obtained enough amount of the final product in order to prepare several dispersions of noble metal nanoparticles. A stable dispersion of gold nanoparticle could also be obtained.

We will try to get ^{77}Se NMR spectra of the noble metal nanoparticles stabilized by this ligand and obtain new information on the surface condition of nano-size metals.

I (TY) thank JSPS and NSF for their financial support, and also I thank Prof. Y. Y. Tong for sending Mr. Zelakiewicz to our laboratory.

RESEARCH REPORT

Name:	Affiliation (University):
Raffi Kamalian	University of California at Berkeley
Research Advisor:	**Host Institution:**
Hideyuki Takagi	Kyushu Institute of Design
Research Subject: Optimized design of MEMS by Evolutionary Multi-objective Optimization with Interactive Evolutionary Computation	

1. Research Description:

Microelectrical Mechanical Systems (MEMS) is an emerging field of research for application in a wide variety of areas such as RF communications, optical networking, and environmental sensors. Currently CAD tools for MEMS design are rudimentary and much of current design is based on engineering experience and 'back of the envelope' calculations. We have developed automated synthesis tools that allow for the creation of complex devices with desired performance, optimized for a number of design constraints and competing performance goals.

One of the limitations of our current Evolutionary Multi-objective Optimization (EMO) approach is that it depends on simulation software to evaluate design quality; there are many non-simulatable design issues however, that can not be detected by the software but are clearly visible to a human user (who need not necessarily be an expert). Therefore we proposed to combine the EMO approach with the Interactive Evolutionary Computation (IEC) techniques developed by Professor Takagi's lab. IEC utilizes evolutionary optimization to evolve a group of designs similar to EMO, but instead relies on a human being to subjectively rate each design based on performance and shape. This allows the human's judgment and preference to further shape which designs are developed, avoiding such potential design flaws as stress concentrations and dynamic collision.

2. Research Activities:

The first two weeks of the summer at KID were spent setting up our existing MEMS design and simulation software and discussing the best way to incorporate IEC with our current EMO tools. Due to time limitations for the summer, we decided to perform IEC after EMO was complete rather then interspersing the two. Graphical data selection is used to choose a subset of the EMO output to create the initial IEC population, and then the user is presented with groups of designs to rate based on their shape and performance values. Their scores are then used to evolve the next generation of designs.

After a roadmap was set up, I spent about one week each working on separate components – IEC initial population selection, IEC GUI and Integration with EMO. We budgeted an extra week for debugging and testing, but this ended up taking longer an extra week, not allowing for the further GUI enhancements we had hoped to add before the end of the summer.

The initial results are positive however. The EMO+IEC tool is able to cull the designs evolved by the EMO, collecting the best designs and slightly improving upon others until the user is satisfied with the population and terminates the program. We look forward to testing the tool with human test subjects (Berkeley Graduate Student MEMS designers) in the coming months and collecting definitive data about the tool's performance.

3. Perspective of Research after this Program:

I enjoyed the summer research experience a great deal. Not only has this research project added to my PhD thesis, but I have also gained new perspectives on design optimization and artificial intelligence, due in part to the fact that my host and lab mates are from a computer science background. We intend to continue work on this project in the Fall and hope to submit a joint paper for an upcoming conference. I have also gained new insight into the research environment, culture and geography of Japan. I am considering pursuing the JSPS post-doc programs next year after graduation to return and continue my

work here. If I were to return I would like to also collaborate with some Japanese experts in the MEMS field as well to further strengthen the research experience.

4. Advisor's Remarks:

As we have well-discussed before he came to Japan, his work at my lab was very well-organize. We discussed about this research topic in last October at UC Berkeley including his supervisor, Prof. Alice Agogino, and had discussed on his research here in detail though e-mails. Almost detail research was figured out before he came.

The detail of our scheduling is in the above. He had worked every weekday, and his progress was almost along with our scheduling made in early July except some days for debugging. My most concerning was if he starts preliminary evaluation of our IEC-based MEMS design system. Thanks to his effort, we observed capability of the idea to incorporate human domain knowledge into MEMS design with IEC technique. This preliminary evaluation encouraged us to continue further development and evaluation as he mention.

As a conclusion, I observed his research through JSPS Summer Program was quite useful for not only his Ph.D. research but also my IEC research.