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*The Division of Natural Sciences  
welcomes you to the 2003 Academic  
Festival!*

The Academic Festival has been a Natural Sciences tradition since 1995. Each spring we celebrate academic accomplishments of the past year with posters and oral presentations representing the outcomes of independent investigative learning, which over the past decade has become a hallmark of our division.

Those of us who have attended the festival over the years have been struck by the steady increase in the professionalism of our students. In part this can be attributed to mastery of technology that was not available before. But in no small measure the quality of the products reflects the sophistication of our students and their willingness to engage challenging problems.

This year, students from all six departments of the Natural Sciences Division, as well as students in the Environmental Studies Program, will present talks and posters. Included are many senior capstone presentations, as well as class projects. Naturally the presenters are key participants in the festival. The other key participants are those who attend and share in the excitement of a time devoted to celebrating scholarship.

A successful festival depends not only on student presentations and participation by the community, but also on careful planning and implementation. The Academic Festival Committee has worked for months to ensure that once again we will have a first-class celebration. We thank committee members Matt Smith (Biology), Duane Swank (Chemistry), chair Tosh Kakar (Computer Science and Computer Engineering), Rose McKenney (Environmental Studies), Brian Lowes (Geosciences), Jeffrey Stuart (Mathematics), Rich Louie (Physics), Matthew Hacker and Anita Wahler (both Natural Sciences), and Lindsey Yates (student assistant).

Have a wonderful time at the 2003 Academic Festival. Join with me in expressing your appreciation to our featured students and their faculty mentors, and to those who have so thoughtfully planned the festival.

Tom Carlson  
Dean of Natural Sciences





# *Natural Sciences Academic Festival*

## *2003 Schedule*

### *Friday, May 2, 2003*

- 12:00 PM to 2:30 PM.....Poster & Demonstration Check-In, *Rieke Science Center*
- 12:30 PM to 2:30 PM.....Oral Presentations
- 2:30 PM to 3:30 PM.....Poster Presentations, Demonstrations, and Break
- 3:30 PM to 6:00 PM.....Oral Presentations

### *Saturday, May 3, 2003*

- 8:30 AM to 10:30 AM.....Oral Presentations
- 10:30 AM to 10:45 AM.....Break
- 10:45 AM to 12:30 PM.....Oral Presentations
- 12:30 PM to 1:30 PM.....Lunch, *Rieke Science Center*
- 1:30 PM to 3:00 PM.....Oral Presentations
- 3:00 PM to 3:15 PM.....Break
- 3:15 PM to 5:00 PM.....Oral Presentations



## *Room Schedule*

<b>Friday, May 2<sup>nd</sup></b>		
<b>Time</b>	<b>Room</b>	<b>Department</b>
12:30 PM to 2:30 PM	RCTR – 103 (Leraas)	CSCE
	RCTR – 109	Environmental Studies
	RCTR – 210	Mathematics
2:30 PM to 3:30 PM	Posters and Demonstrations	
3:30 PM to 4:30 PM	RCTR – 109	Environmental Studies
3:30 PM to 6:00 PM	RCTR – 102	Biology
	RCTR – 122	Biology
	RCTR – 103 (Leraas)	CSCE
	RCTR – 220	Mathematics
4:30 PM to 6:00 PM	RCTR – 109	Geosciences

<b>Saturday, May 3<sup>rd</sup></b>		
<b>Time</b>	<b>Room</b>	<b>Department</b>
8:30 AM to 12:05 PM	RCTR – 109	Geosciences
8:40 AM to 12:00 PM	RCTR – 102	Biology
9:00 AM to 12:30 PM	RCTR – 103 (Leraas)	CSCE
	RCTR – 220	Mathematics
9:30 AM to 10:30 AM	RCTR – 210	Physics
12:05 AM to 12:30 PM	RCTR – 109	Environmental Studies
12:30 PM to 1:30 PM	Lunch	
1:30 PM to 5:00 PM	RCTR – 103 (Leraas)	CSCE
	RCTR – 109	Environmental Studies
	RCTR – 220	Mathematics

# *Oral Presentation Schedule*

## *Friday, May 2<sup>nd</sup>*

<b>BIOLOGY</b>
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Capstone Presentations.....Rieke 102

<b>Friday, May 2<sup>rd</sup></b>
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Time	Student(s)	Class	Topic
3:30 PM	Hillary Johnson	499	Noise in the Ocean: The Effects of Human-Made Sonar Systems On Cetaceans
3:50 PM	Paul Marquardt	499	Osmoregulatory Changes in Anadromous Salmon
4:10 PM	Michelle Smith	499	Co-Evolution of Malaria and the Human Genome
4:30 PM	Thea Maristuen	499	Gaze Following in Primates and the Evidence for its Mental Implications
4:50 PM	Aaron Lunday	499	The Effects of Hatcheries on Pacific Salmon Populations
5:10 PM	Lisa Forsberg	499	Why So Low? Attempts to Explain the Metabolic Rates of Deep Sea Fish

Capstone Presentations.....Rieke 122

<b>Friday, May 2<sup>nd</sup></b>
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Time	Student(s)	Class	Topic
3:30 PM	Susan Carnine	499	Estrogen: A Protective Factor in the Brain
3:50 PM	Tobin Northfield	499	Mating Disruption as a Focus in Integrated Pest Management in Insects
4:10 PM	Andrea Westby	499	Preserving Personal Space: Allelopathy and Its Implications in Agriculture
4:30 PM	Devin Pierce	499	Nicotine on the Brain

**Friday, May 2<sup>nd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
4:50 PM	Elizabeth Jerabek	499	The Effects of Fire and Clipping on Black Grama Grass ( <i>Bouteloua eripoda</i> ) Regrowth
5:10 PM	Angela Becker	499	The Physiology of Depression

**COMPUTER SCIENCE AND COMPUTER ENGINEERING**

Capstone Presentations..... Rieke 103 (Leraas)

**Friday, May 2<sup>nd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
12:30 PM	Megan Hurt Christy King	499	The King-Hurt Constellation Box
12:55 PM	James Sowell	499	The Efficiency of Error Correcting Codes and Compact Disks
1:15 PM	Laura Bangerter	499	Budgeting and Reporting Software
1:35 PM	Justin Vogt Karl Wood	499	SkipBo Implementation
2:00 PM	Richard Burk Loren Wilson	131	Remotely Activated Water Rocket
2:15 PM	Jonathan Hergert Erik Marubayashi Cameron Zettel	131	Air Cannon
2:30 PM	Poster Session		
3:30 PM	Kari Akin Allison Kanarr Robert VanGorkom	131	Ethics and “Accidents” in the National Aeronautics Space Administration (NASA)
3:45 PM	RB Blackshear Howard Smith	131	Understanding a Combustion Chamber
4:00 PM	Mark McCabe David Reime Josh St. Jacques	131	Helical Radio Telescope Antenna

**Friday, May 2<sup>nd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
4:15 PM	Derrick Gennrich Stacey Reiva Bennett Walker	131	Remote Control Vehicle
4:30 PM	Christopher Ellison Aaron Lahman	131	Introduction to Matlab
4:50 PM	Kira Mosher Benjamin Shadwick	499	Blame Jim

***ENVIRONMENTAL STUDIES***

Capstone Presentations.....Rieke 109

**Friday, May 2<sup>nd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
12:30 PM	Courtney Berner	499	Shrimp Farming: Searching for a Sustainable Future Amidst Troubled Waters
1:00 PM	Ryan Greco	499	Effects of Biosolid Application on Mature Douglas-Fir Stands in a Pacific Northwest Forest; Empirical Results from Pack Experimental Forest
1:30 PM	Natalie Gulsrud	499	An Ecofeminist Critique of Wendell Berry
2:00 PM	John Voigt	499	Permaculture Design and Alternative Structures
2:30 PM	Poster Session		
3:30 PM	Darren Alkire	499	The Potential Impacts of the Removal of the Elwha River Dams on the Environment and the Surrounding Communities
4:00 PM	Leah Sprain	499	Should I Buy Fair Trade? An Interdisciplinary Analysis of Coffee Certification

**GEOSCIENCES**

Capstone Presentations.....Rieke 109

**Friday, May 2<sup>nd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
4:30 PM	Erin Ricketts	499	Silicified trees in Yellowstone National Park
4:55 PM	Laura Medsker	499	Glacial Mass Balance and Hydrology in the Cascade & Nooksack Watersheds
5:20 PM	Abby Gray	499	Petrography and Sources of Glacial Boulders Near Anchorage, Alaska Cascades

**MATHEMATICS**

Capstone Presentations.....Rieke 210

**Friday, May 2<sup>nd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
12:30 PM	Bjorn Skinnes	348	Pricing Model for Diamond Stones Using Regression Analysis
1:00 PM	Kerri Fletcher & Dung Li	348	A Study of SAT Scores, High School Grades and Other Variables as Predictors of College Grades
1:30 PM	Bryan Greene	499	Random Number Generators: An Analysis
2:30 PM	Poster Session		

Capstone Presentations.....Rieke 220

**Friday, May 2<sup>nd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
3:30 PM	Lori Huijbregtse	499	More Than Just Pleasing to the Eye: Explorations of the Julia and Mandelbrot Sets
4:15 PM	Reid Wiggins	499	Algorithms in Graph Theory
5:00 PM	Megan Ossiander	499	Exploring a Hyperbolic Universe

## *Saturday, May 3<sup>rd</sup>*

### ***BIOLOGY***

Capstone Presentations.....Rieke 102

#### **Saturday, May 3<sup>rd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
8:40 AM	Ezra Kim	499	Androgenic Anabolic Steroids
9:00 AM	Jillian Foglesong	499	Regulation of Reproductive Hormones by Endogenous Opioid Peptides
9:20 AM	Greg Williams	499	Transcription Factors
9:40 AM	Tom Velickoff	499	Free Radicals and Homocysteine
10:00 AM	Antoinette Craig	499	Sickle Cell Anemia
10:20 AM	Break		
10:45 AM	Karen Allar	499	The Association of Human Herpesvirus-6 with Multiple Sclerosis and Other Possible Viral Causes
11:05 AM	Laura Stewart	499	Xenotransplantation and its Potential Use in the Treatment of Diabetes Mellitus
11:25 AM	Thea Petersen	499	Regulation of Human Telomerase in Normal and Tumor Cells
11:45 AM	Mikkel Lee	491	Commencement Bay Contamination

### ***COMPUTER SCIENCE AND ENGINEERING***

Capstone Presentations.....Rieke 103 (Leraas)

#### **Saturday, May 3<sup>rd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
9:00	Vaughn McNeill	499	Excel vs. SPSS
9:20	Hoa Duong	499	Big Math
9:40	Steven Walsh	499	Genetic Approach to Solving Logic Circuit Minimization
10:00	David Cowan Megan O'Neil	499	Intrusion Detection

**Saturday, May 3<sup>rd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
10:25 AM	Break		
10:45 AM	Stephen Hubbard	499	Terrain Based 3D Game
11:05 AM	Tobias Mann Ludvig Ungewitter	499	2D Soccer on an Indoor Arena
11:30 AM	Timothy Zwygart	499	Cloth Model: Particle and Spring
11:55 AM	Nathan Berg Jake Nelson	Alumni	High Speed Digital Electronics at XKL
12:30 PM	Lunch		
1:30 PM	Rob Rydberg	499	Automated Power Control System
1:50 PM	Robert Buchanan	499	The Electronic Key Master
2:15 PM	Bryan Greene Brandon Whitley	499	Musical Ear Trainer
2:40 PM	Benjamin Andrews Kenneth Keeler	499	BREEV2

***ENVIRONMENTAL STUDIES***

Capstone Presentations.....Rieke 109

**Saturday, May 3<sup>rd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
12:05 PM	Kim Smith	499	Gender Specific Methods of Environmental Education
12:30 PM	Lunch		
1:30 PM	Jens Olsgaard	499	What Would Salmon Do?
2:00 PM	Jenelle Santie	499	Urbanization in Action: The Tacoma Narrows Bridge Project
2:30 PM	Aaron Binger	499	Sustainable Home Design
3:00 PM	Break		

**Saturday, May 3<sup>rd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
3:15 PM	Eric Friesth	499	A Drip in Time: Water Audit and Survey of Environmental Attitudes of Students in Pacific Lutheran University Residence Halls
3:45 PM	Andrea McFarland	499	Wild Horses of the Western United States

***GEOSCIENCES***

Capstone Presentations.....Rieke 109

**Saturday, May 3<sup>rd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
8:30 AM	Chris Pitzer	499	Geologic and Environmental Influences on Big Beef Creek, Seabeck, WA
8:55 AM	Stacia Tellefson	499	Effects of the Diversion Dam on the White River
9:20 AM	Kim Mueller	499	Forest Thinning Effects in the Raging River Water Shed
9:45 AM	Andrew Orr	499	Hydrologic Change: Ingram’s Warm Spring, Idaho
10:10 AM	Gil Pepin	499	Beach Erosion in Puerto Rico
10:35 AM	Break		
10:50 AM	Eric Brandy	499	Eocene Depositional Environments of Southwest Washington
11:15 AM	Denise Thompson	499	Microbial Processes in Precipitation of Siliceous Sinter in Yellowstone Natl. Park
11:40 AM	Ben Morris	499	Implications of Shallow Subduction for the Pacific Northwest

**MATHEMATICS**

Capstone Presentations.....Rieke 220

**Saturday, May 3<sup>rd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
9:00 AM	Robert M. Allman III	499	Introduction to the Theory of Fourier Transformation
9:45 AM	Caroline Kishline	499	Angels and Devils: Tiling of the Poincare Disk
10:30 AM	Break		
10:45 AM	Christy King	499	Zooming in on Fractals
11:30 AM	James Sowell	499	The Efficiency of Error-Correcting Codes and Compact Discs
12:30 PM	Lunch		
1:30 PM	Bryce Bockman	499	Galois Theory: Abstract Algebra
2:15 PM	Nicole Uken	499	Getting Mathematically Set to Explore SET
3:00 PM	Break		
3:15 PM	Darrel Rohar	499	Iterative Eigenhunting with the QR Algorithm
4:00 PM	Charles Dorner	499	Pebbling and Graphs

**PHYSICS**

Capstone Presentations.....Rieke 210

**Saturday, May 3<sup>rd</sup>**

<b>Time</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
9:30 AM	Megan Hurt	499	Viscosity Measurements
9:50 AM	Megan Ossiander	499	Ttauri or not Ttauri: Calibrating a Spectrograph to Find Out
10:10 AM	Katy Briggs	499	Stress Caused by a Curing Epoxy

# *Oral Presentation Submitted Abstracts*

## **BIOLOGY**

### **Karen Allar: The Association of Human Herpesvirus-6 with Multiple Sclerosis and Other Possible Viral Causes**

Viruses are considered excellent candidates for the cause of MS. The human herpes viruses are especially interesting because they lie dormant within the human body for years. Results of viral studies are conflicting, and there are other viruses implicated. I will discuss the research performed on this topic and some of the conflicting results in the ongoing search for a cause of MS.

### **Angela Becker: The Physiology of Depression**

This talk will explore the proposed causes of depression. Besides examining the physiological aspects, I will also talk about possible treatments and discuss some of the social aspects involved with depression.

### **Susan Carnine: Estrogen: A Protective Factor in the Brain**

Long considered solely a reproductive hormone, estrogen has been shown to exert protective actions in a number of body tissues, including the brain. I will discuss what is known about the neuroprotective role of estrogen and allude to its possible mechanisms of action.

### **Jillian Foglesong: Regulation of Reproductive Hormones by Endogenous Opioid Peptides**

Among the most important hormones for reproduction are GnRH and prolactin. I will discuss how the endogenous opioid peptides interact with these neurohormones either directly or indirectly through neurotransmitters, such as dopamine, to regulate their secretion.

### **Lisa Forsberg: Why So Low? Attempts to Explain the Metabolic Rates of Deep-Sea Fish**

James J. Childress proposed what is known as the "visual interaction hypothesis" to explain the lower-than-predicted metabolic rates found in deep-sea fish. I will examine this hypothesis and the trends that are apparent in recent studies.

### **Elizabeth Jerabek: The Effects of Fire and Clipping on Black Grama Grass (*Bouteloua eripoda*) Regrowth**

I will discuss my recent research experience in which I investigated the possibility and severity of multiplicative effects of fire and subsequent grazing on the recovery of black grama grass.

### **Hillary Johnson: Noise in the Ocean: The Effects of Human-Made Sonar Systems On Cetaceans**

Concern has been raised about the effects of human-produced sound on whales. Evidence of the impact on mysticetes whales caused by low-frequency sonar used by the military and a scientific research project is reviewed.

**Mikkel Lee: Commencement Bay Contamination**

My presentation concerns the historical and current states of the contamination of Commencement Bay. It will discuss specific toxins, their discharge sources and the effects of contamination and propose a solution that emphasizes prevention and cleanup.

**Aaron Lunday: The Effects of Hatcheries on Pacific Salmon Populations**

Hatcheries have had many effects on salmon populations over the years, some positive, some negative. This presentation is a look at not only what we have done in the past, but also what we can do to improve our hatchery systems.

**Thea Maristuen: Gaze Following in Primates and the Evidence for its Mental Implications**

Extensive research has resulted in a detailed understanding of the neurophysiology, phylogeny, and social use of gaze following behavior in primates. This presentation will summarize the history of this research while focusing on the controversy over the mental significance of this behavior.

**Paul Marquardt: Osmoregulatory Changes in Anadromous salmon**

Physiological changes initiated by environmental cues allow salmon to survive as they adapt to higher salinity water. Osmoregulatory transformations occur predominately in the gills and kidneys of the fish during smoltification. I will discuss when and how these changes occur in the salmon.

**Tobin Northfield: Mating Disruption as a Focus in Integrated Pest Management of Insects**

Mating disruption causes little or no environmental or ecological damage so it is a great method of insect control. I will discuss how using mating disruption alone or in an integrated pest management program has been shown to reduce crop damage.

**Thea Petersen: Regulation of Human Telomerase in Normal and Tumor Cells**

Telomerase regulates the length of telomeres, and its activity leads to cell immortality. In normal somatic cells, this can cause cancer. For this reason, the mechanisms of telomerase regulation are of great clinical interest and may slow tumor progression.

**Devin Pierce: Nicotine on the Brain**

I will be discussing the effects of nicotine on the human brain, emphasizing on its interactions at acetylcholine receptors and cholinergic pathways.

**Michelle Smith: Co-evolution of Malaria and the Human Genome**

This is an analysis of the relationship and evolutionary consequences of the *Plasmodium Falciparum* and human interaction. Attributes that have evolved in each of the species due to selective pressure from the other will be considered.

**Laura Stewart: Xenotransplantation and its Potential Use in the Treatment of Diabetes Mellitus**

Xenotransplantation, referring to organ or cellular transplantation between two different species, is a potential therapy that may play a significant role in the treatment of a wide range of disorders that result from tissue loss or dysfunction including diabetes mellitus type one.

**Tony Velickoff: Free Radicals and Homocysteine In Coronary Artery Disease**

This talk will discuss the roles homocysteine and free radicals play in the physiological changes responsible for the premature development of coronary artery disease.

**Andrea Westby: Preserving Personal Space: Allelopathy and Its Implications in Agriculture**

Current research is seeking to find ways of using allelopathic crop varieties and natural chemicals or synthetic models as a means of agricultural weed management. This research and basic allelopathic principles are reviewed.

**COMPUTER SCIENCE AND COMPUTER ENGINEERING**

**Karin Akin, Allison Kanarr & Robert VanGorkom: Ethics and "accidents" in the National Aeronautics Space Administration (NASA)**

The presentation will review ethical issues and the history of NASA's Shuttle program, focusing on Columbia and Challenger. It is an analysis of the events leading up to Columbia's breakup over the United States.

**Ben Andrews, Ken Keeler: BREEV2**

BREEV2 is a complete rewrite of the contact resource manager for the National Bureau of Asian Research using .NET technology and the C# programming language. It features an n-tier design, with three tiers: GUI, business logic, and SQL2000 database.

**Laura M. Bangerter: Budgeting and Reporting Software**

Developed an application for financial statement reporting and the development of budgets. The application is written in VBA (Visual Basic for Applications) and consists of an Excel-based interface that interacts with Oracle's E-Business Suite.

**Nathan Berg, Jake Nelson: High Speed Digital Electronics at XKL**

After graduating from PLU, we have been designing hardware at XKL LLC. We will discuss one of our designs, from overall architecture to testing of the assembled PCB. The board includes a custom CPU and multi-gigabit optical network interfaces.

**RB Blackshear, Howard Smith: Understanding a Combustion Chamber**

The purpose of our project is to demonstrate what goes on inside of a combustion chamber by developing a model, which we will use to demonstrate how heat energy is converted into mechanical.

**Robert Buchanan: The Electronic Key Master**

An encrypted login keeper for the Palm Pilot platform and a synchronized desktop version of the same, which contains login information for different situations. Login information includes, locations, usernames, and passwords.

**Richard Burke, Loren Wilson: Remotely Activated Water Rocket**

This project is comprised of a 2-liter pop bottle as a rocket and is launched by compressed air and water propulsion. The launching mechanism is made from PVC piping, pressurized by a hand pump, and released by a 40 KHz 4 switch infrared remote.

**David Cowan Jr., Megan O'Neil: Intrusion Detection**

Our Project is the design of an Intrusion Detection System. We will research and develop audit trails. Then analyze the audit trail and set up rules for attacks. Finally we will imbed them into the system. Our goal is to find out what is involved in detecting bad network activity on a network.

**Hoa Duong: Big Math**

Factoring integers is a significant problem in both pure mathematics, and computer science. Scientists are always looking for the fast and more efficient ways to factor large integers.

**Chris Ellison, Aaron Lahman: Introduction to Matlab**

An introduction to Matlab beginning with matrices and culminating with three-dimensional graphic manipulations. Our product will be a self-instruction system for learning Matlab.

**Derrick Gennrich, Stacey Reiva & Bennett Walker: Remote Control Vehicle**

The Remote Control Vehicle is a Java program controlled car that is able to relay a video feed to the controller. Using simple radio technologies, the car can be guided via simple buttons in the program and will display the video.

**Jonathan Hergert, Erik Marubayashi, and Cameron Zettel: Air Cannon**

The air-compressed cannon will launch an object an estimated distance determined by the angle of the launcher and pressure. From this, we will determine the actual velocity and acceleration. The actual results will be compared to calculated results.

**Stephen Hubbard: Terrain Based 3D Game**

This project focused on the creation of a 3D game. Separate but related components have been created and applied to the overall game engine. Different techniques for achieving similar results will explored.

**Megan Hurt, Christy King: The King-Hurt Constellation Box**

In order to learn more about circuits and have more of a grasp on the construction of hardware, we are in the process of building a simple device that displays constellations with reference points in the sky through an LCD.

**Tobias Mann, Ludvig Ungewitter: 2D Soccer on an Indoor Arena**

This project designed and implemented a 2D indoor-soccer game from scratch using C++, OpenGL and QT. The game includes many of the standard soccer game features including a rudimentary AI that we designed for the computer-controlled players.

**Mark McCabe, Josh St. Jacque, and David Reime: Helical Radio Telescope Antenna**

To demonstrate how much astronomical information is available through radio data, we designed a radio telescope antenna, based on Dr. John Kraus's helical structure. This antenna is capable of observing the moon, sun, and the structure of the Milky Way galaxy.

**Vaughn McNeill: Excel vs. SPSS**

This project examines an expensive marketing software package SPSS, and compares it to an inexpensive package Excel. The second function of this project is to learn the programming language that SPSS was written in, and deliver a report on that language.

**Kira Mosher, Ben Shadwick: Blame Jim**

The goal of our project was to create a game for the Nintendo Game Boy. From beginning to end we had to learn new tools, understand new hardware, and gain an understanding of how to design and implement a fully functional game.

**Rob Rydberg: APCS – Automated Power Control System**

APCS is the core of a power distribution system. Modularity was used to simplify microcontroller development, allowing independent testing of an I<sup>2</sup>C bus, LCD interface and calendar system. This will be demonstrated by simulating a system via PC.

**James Sowell: The Efficiency of Error-Correcting Codes and Compact Discs**

We are living in a technical age where mass storage technology continues to become bigger and better. This project will examine the advantages and disadvantages of the error detecting and correcting techniques of linear block codes and cyclic codes. Then we will look at the application of similar correcting codes on compact discs.

**Steve Walsh: Genetic Approach to Solving Logic Circuit Minimization**

The objective of this project is to produce a minimized test set for the validation of a logic circuit through the utilization of a genetic algorithm and pattern recognition.

**Karl Wood, Justin Vogt: SkipBo Implementation**

We are creating a software implementation of the card game SkipBo. Our goal is to create a professional quality version of the game by including many features such as network play, graphics programming, and various levels of artificial intelligence.

**Tim Zwygart: Cloth Model: Particle and Springs**

The purpose of this project was to build a program that is a rudimentary cloth modeler, which is based upon the concept of using particles and springs to control the movement of the cloth.

***ENVIRONMENTAL STUDIES*****Darren Alkire: The Potential Impacts of the Removal of the Elwha River Dams on the Environment and the Surrounding Communities.**

The two Elwha River Dams built in the early 1900s blocked fish passage on the Elwha River. The removal of the dams is expected to restore the river ecosystem and fish populations due to the pristine quality of the river above the two dams.

**Courtney Berner: Shrimp Farming: Searching for a Sustainable Future Amidst Troubled Waters**

Over 30% of the globe's shrimp are produced using resource-intensive farming. Developing areas grow shrimp cheaply and sell them as luxuries to developed nations. Sustainable methods are vital for shrimp farming to be an equitable global food source.

**Aaron Binger: Sustainable Home Design**

This project investigates three specific aspects of sustainable home design: passive solar design and solar heating, water re-use systems, and building materials.

**Eric D. Friesth: A Drip in Time: Water Audit and Survey of Environmental Attitudes of Students in Pacific Lutheran University Residence Halls**

Student attitudes are an important part of change on our campus. Through my survey, I gained a glimpse into how PLU students use water and view the environment. With this, I explore future steps PLU may take towards sustainability.

**Ryan Greco: Effects of Biosolid Application on Mature Douglas Fir Stands in a Pacific Northwest Forest; Empirical results from Pack Experimental Forest.**

What happens when urban wastewater is applied to low productivity forestland? Inventory plots at Pack Forest show considerable growth. This nitrogen-rich organic fertilizer increases fir growth, but has it decreased the economic value of the wood?

**Natalie Gulsrud: An Ecofeminist Critique of Wendell Berry**

Wendell Berry writes on the links between land conservation and farming practices. If viewed through an ecofeminist lens, however, his work is missing the critical links between land preservation, sustainable farming, and social justice.

**Andrea McFarland: Wild Horses of the Western United States**

Wild horses in the United States are at the center of a conflict because they are viewed as cultural symbols of American heritage and as ecological pests. This is a complex situation that involves ethical, philosophical, and environmental issues.

**Jens Norman Olsgaard: What Would Salmon Do?**

Urban stream restoration at Puget Creek is an effort to restore salmon and reconnect humans with nature. This project explores the movement's religious dimensions, motivating ecological values, and the psychological processes it hopes to change.

**Jenelle Santie: Urbanization in Action: The Tacoma Narrows Bridge Project**

The Tacoma Narrows Bridge Project will increase access to Gig Harbor and cost 850 million dollars. Road access promotes urbanization that in turn impacts the environment. Is access worth the price in urbanization and environmental degradation?

**Kimberly Smith: Gender Specific Methods of Environmental Education**

This project investigates the hypothesis that gender specific methods of environmental education are effective for educating 1st through 5th grade girls. Girls will be questioned about their environmental understanding before and after instruction.

**Leah Sprain: Should I Buy Fair Trade? An Interdisciplinary Analysis of Coffee Certification**

Drawing on environmental field research in Central America and research on U.S. promotion campaigns, I examine the benefits and limitations of Fair Trade coffee. Certification guarantees small farmers a set price, regardless of market rates.

**John Voigt: Permaculture Design and Alternative Structures**

Human resource use is impacting the environment. The evidence is in degraded air, water, and soil quality. Through permaculture and alternative structures I will show systems of living that make it possible to live sustainably.

**GEOSCIENCES****Eric Brady: Research into the State of Science Concerning the Skookumchuck Formation of Southwest Washington**

Exploratory drilling by the Centralia Coal Mine has advanced understanding of the Eocene coastal environments of deposition and their tectonic history. Their coal-bearing units are vital to us.

**Abby Gray: Petrography and Sources of Glacial Boulders Near Anchorage, Alaska Cascades**

Petrography of erratic boulders sampled east of Anchorage may be adequate to trace source rocks lying upstream in the glacier path to the north. Granites and related types are the dominant lithologies.

**Laura Medsker: Glacier Mass Balance and Hydrology in the Cascade and Nooksack Watersheds, North Cascades, Washington**

Using mass balance measurements from South Cascade Glacier combined with Landsat-7 satellite imagery and GIS, the hydrologic contributions from glaciers to the Nooksack and Cascade watersheds will be calculated since 1999.

**Benjamin Morris: Flat Subduction: Known Cases and Applications to the Cascadia Subduction Zone**

Flat, or shallow, subduction is a somewhat uncommon form of subduction in which the subducting slab does not form a steep angle of subduction, but instead lies rather flat under the overriding plate. This is a possible model for the Cascadia Subduction Zone under Washington and parts of Oregon and British Columbia.

**Kimberly Mueller: Forest thinning in the Raging River watershed and its impact on surface water flow**

In 2001, 13% of the Raging River watershed was thinned to 11 trees per acre. Timber harvest can increase stream flow because of decreased evapotranspiration. Statistical analyses are used to quantify the impact of thinning on the Raging River.

**Andrew Orr: Hydrologic Change: Ingram's Warm Spring, Idaho**

In 1983 a warm spring in Idaho shut off after an earthquake and returned the next day flowing at greater velocity. Exploration of the regional geologic structures surrounding the spring will reveal the causes for this change.

**Gil Pepin: Beach Erosional Processes Operating through Time**

Several different types of beaches occupy different coasts of Puerto Rico, and their development over time reflects several processes, including commercial and residential development

**Chris Pitzer: Geologic and Environmental Influence on Big Beef Creek, Seabeck, WA**

A look at geologic conditions that influence a watershed and its indigenous salmon. The glacial origin of the underlying material predisposes the unconsolidated members to erode. Salmon thrive in gravels, and erosion of the till and silt directly affect salmon and salmon habitat.

**Erin Ricketts: Comparison of Dating Methods, and Yellowstone's silicified trees with other specimens of petrified wood.**

Dating techniques used on partially silicified wood have been evaluated. Also, the process of silification has been compared with wood from other localities

**Stacia Tellefson: The Effects of the Diversion Dam on the White River**

For almost a century the Diversion Dam on the White River has been diverting water to Lake Tapps Reservoir and thereby affecting the geomorphology of the river. By studying and comparing three different reaches of the river the effect the dam has had on the river can begin to be assessed.

<b><i>MATHEMATICS</i></b>
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**Robert M. Allman III: Introduction to the Theory of Fourier Transforms**

All waves, periodic or non-periodic, are composed of a series (or summation) of sine waves. This is the cornerstone of Fourier theory. We review the mathematical principles of the theory, derive the Fourier coefficients (amplitudes), briefly consider the Dirichlet conditions, and observe several Fourier pairs.

**Bryce Bockman: Galois Theory: Abstract Algebra Meets the Polynomials**

The question of exactly when a general polynomial is solvable by radicals was open until Evariste Galois made a deep discovery about the abstract algebraic structures that lie beneath. I will present Galois' fundamental theorem and, with time permitting, some applications of it.

**Kerri Fletcher and Dung Le: A Study of SAT Scores, High School Grades and Other Variables as Predictors of College Grades**

The ability of the Scholastic Assessment Test to predict college success has come into question in recent years. Our study looks at SAT scores and other characteristics of PLU students to measure their relationship to college GPA.

**Bryan Greene: Random Number Generators: An Analysis**

Often, in mathematics and computer science, quick and easily computable methods are needed to generate random numbers. This talk will analyze some of the methods used today with particular focus on the linear congruential method. It will also cover uses for these numbers, other methods, and ways of testing new methods for randomness.

**Lori Huibregtse: More Than Just Pleasing to the Eye: Explorations of the Julia and Mandelbrot Sets**

Have you wondered how fractal images were made? In order to understand the behavior at the complex level, we must first understand the analysis both graphically and algebraically at a more simplistic level. We will explore mappings, iterations, which will lead us to the Julia and Mandelbrot sets.

**Christy King: Zooming in on Fractals**

We present a brief introduction to the study of fractals including self-similarity and fractal dimension, with a special focus on the Cantor set, the Sierpinski triangle, and the Koch curve.

**Bjorn Larsen: Who is #1?**

In any tournament, there has to be a best team. How do you determine who is #1? This can be hard to determine when there are upsets or when you want to rank the rest of the players. With the use of linear algebra, matrices, the power method and the Perron-Frobenius Theorem, I will discuss how to rank the players.

**Megan Ossiander: Exploring a Hyperbolic Universe**

In a made-up 2-dimensional universe, the beings that inhabit it explore their home and the mathematics behind it. Through the mystery of mirror reversals, manifolds and strange triangles, they discover their universe's hyperbolic shape.

**Darrel Rohar: Iterative Eigenhunting With the QR Algorithm**

Although eigenvalues and eigenvectors contain all of the information about the action of a square matrix on  $n$ -space, there is no general way to find them algebraically. We will explore the QR method for finding them iteratively.

**Bjorn Skinnnes: Pricing Model for Diamond Stones using Regression Analysis**

We analyze the factors that determine the price of diamond stones, and predict the price of diamond stones by creating a pricing model using techniques of regression analysis.

**James Sowell: The Efficiency of Error-Correcting Codes and Compact Discs**

We are living in a technical age where mass storage technology continues to become bigger and better. This project will examine the advantages and disadvantages of the error detecting and correcting techniques of linear block codes and of cyclic codes. Then we will look at the application of similar correcting codes to compact discs.

**Nicole Uken: Getting Mathematically Set to Explore SET**

The popular card game SET is full of Mathematics! This talk will look at some of the implications of the game SET, especially in the fields of probability, combinatorics and algebra. It will also explore the impact of altering some of the game's parameters.

**Reid Wiggins: Algorithms in Graph Theory**

I will explore the use of Dijkstra's algorithm, the center of a graph algorithm, and some applications.

## ***PHYSICS***

### **Katy Briggs: Stress Caused by a Curing Epoxy**

This project explores the physical changes that occur during the curing process of epoxy materials. Specifically, the focus lies on quantifying the stress applied to circuit board samples from the thermal change and shrinkage that takes place during the curing process.

### **Megan Hurt: Viscosity Measurements**

This experiment determines the viscosity of common fluids using a Couette viscometer, a simple device with co-axial rotating cylinders.

### **Megan Ossiander: TTauri or not Ttauri: Calibrating a Spectrograph to Find Out**

The purpose of this project was to study the SBIG self guided spectrograph, fix any errors found, calibrate it, and use it to collect spectra readings on possible TTauri (newborn) stars.

# *Poster Presentations*

<b>BIOLOGY</b>
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Poster #	Student(s)	Class	Topic
1	Alayne Brown	499	Applications in DNA Technology
2	Corey Fish	491	Sequencing of the Fatty Acid Desaturase-2 Gene in Zucchini ( <i>Cucurbita pepo</i> )
3	Heath Bateman Peter Easter Holly Torgerson	403	Changes in the level of acid phosphatase in the regressing tail during metamorphosis of <i>Bombina orientalis</i> tadpoles, as revealed by a standard assay for acid phosphatase activity
4	Austin Gross Garrett Leuttgen Thea Maristuen Chris Thompson	403	Changes in the level of liver acid phosphatase in <i>Bombina orientalis</i> tadpoles as they progress through metamorphosis, as revealed by a standard assay for acid phosphatase activity
5	Heidi Lyman Casey Maynard Katie Pfister Lindsey Worthington	403	Changes in the level of acid phosphatase in the gut tube as it undergoes remodeling during metamorphosis of <i>Bombina orientalis</i> tadpoles, as revealed by a standard assay for acid phosphatase activity
6	Karen Allar Elaine Lee Stephanie Soriano, Rob Wargacki	403	Changes in the total <i>Bombina orientalis</i> protein population during early embryonic development (fertilized egg through late gastrula), as revealed by SDS-polyacrylamide gel electrophoresis
7	Christine Huynh Frank Jackson Ezra Kim Nichole Ottis	403	Changes in the total protein population in the <i>Bombina orientalis</i> gut tube while it is being remodeled during tadpole metamorphosis, as revealed by SDS-polyacrylamide gel electrophoresis

**CHEMISTRY**

<b>Poster #</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
8	Kjersta Larson Paul Christensen	336	Atom Transfer Radical Polymerization of Methymethacrylate and Styrene
9	Paul Clark McKenna Manion	336	Synthesis of p-Bromocinnamic Acid Through a Palladium Catalyzed Heck Reaction
10	Corey Fish Christopher Thompson	336	Synthesis of 3,4-Dihydro-3- (p-Methylphenyl)-1,3-2H-Benzoxamine
11	Austin Gross Lam-Phuong Nguyen	336	Radical Polymerization of Styrene using AIBN
12	Heath Bateman	338	HPLC Determination of Capcaicin in Peppers
13	Kendall Blair	338	How Much Calcium is Really in My Calcium Supplement?
14	Paul Clark	338	Determination of the Amount of Caffeine in Coca-Cola
15	Ken Daugherty	338	Calcium Determination in Powdered Milk
16	Garrett Luetgen	338	Determination of Calcium and Potassium in Sports Drink Using ICP-OES
17	Peter Easter	338	Spectrophotometric Comparison of the Concentration of Caffeine in Excedrin and Mt. Dew
18	Noah Frerichs	338	Gravimetric Measurement of Phosphorus in Plant Food
19	Megan Hockert	338	Calcium Determination in Gerber Oatmeal Through Standard Addition Techniques Using ICP-OES
20	Erin Hodge	338	Calcium, Magnesium and Zinc Content in a Generic Dietary Supplement

Poster #	Student(s)	Class	Topic
21	Lorraine Homen	338	Analysis of Calcium as a Constituent Element in Milk Powder by Inductively Coupled Plasma Atomic Emission Spectrometry
22	Nathan Klosterman	338	Determination of the Caffeine Content of Coffee Using Different Brewing Methods
23	Fredrick Larabee	338	Analysis of Lye in Oven Cleaner using an Acid-Base Titration
24	McKenna Manion	338	Gravimetric Determination of Phosphorus in Phosphate Rocks
25	Dustin Moye	338	Spectrophotometric Analysis of a Mixture: Caffeine and Benzoic Acid in a Soft Drink
26	Lam-Phuong Nguyen	338	Spectrophotometric Determination of Iron in Carbonyl Iron and Ferrous Sulfate in Dietary Supplements
27	Marianne Silveira	338	Analysis of the Neutralizing Capacity of Various Antacids
28	Chris Thompson	338	Microscale Spectrophotometric Measurement of Iron in Foods by Standard Addition
29	Jenny Schlies	338	Spectrophotometric Determination of an Iron Pill
30	Julie Smith	338	Content Analysis of Brand Name and Store Name Calcium, Magnesium and Zinc Mineral Supplements
31	Stephanie Soriano	338	Analysis of Vitamin C Content in Fruit Using Iodimetric Titration
32	Laura Steward	338	Spectrophotometric Determination of Iron in a Vitamin Tablet
33	Kjersti Germar	342	A Computational Model of Ozone Destruction by $\text{Cl}_2\text{O}_4$
34	Andrew Romberg	342	$\text{Cl}_2\text{O}_4$ Project
35	Eric Barta	344	The Relationship Between the Energy Transitions and the Box Length for Three Biphenyl Compounds

Poster #	Student(s)	Class	Topic
36	Valerie Landwehr	344	Comparison of Semi-Empirical Computational Methods for Predicting the IR Spectra of Pain Relievers
37	Gary Jensen	344	Can Molecular Mechanics Predict Configurations of Protein Linked Pain Relievers?
38	Floyd Bangerter	403 & 405	Structural Analysis of an Unknown Dipeptide
39	Melinda Bjerstedt	403 & 405	The Structural and Functional Relationship of Conformational Change in PrP Protein from PrPc isoform to PrPsc and its Resulting Neurological Consequences
40	Alayne Brown	403 & 405	Kinetic Analysis of Tyrosinase
41	Ken Daugherty	403 & 405	Bovine Spongiform Encephalopathy
42	Sara Hockert	403 & 405	Isolation and Characterization of Alpha-Lactalbumin Using Sephadex
43	Patrick Pastor	403 & 405	Uncoupling Proteins: Thermogenesis Through Regulated Uncoupling of Oxidative Phosphorylation
44	Brett Phillips	403 & 405	Antioxidant Response of Respiratory-Deficient Mutants of <i>S. Cerevisiae</i> to Oxidative Stress
45	David Runquist	403 & 405	Electron Absorption and Transfer in Cytochrome Complex
46	Floyd Bangerter	435	Raman Spectroscopy
47	Devin Busse	435	Trends in IR Absorption by Carbonyls in Aldehydes and Ketones
48	Alayne Brown	435	Uv-Vis Absorption Analysis of Cobalt (II) Nitrate and Nickel (II) Nitrate
49	Sara Hockert	435	Determining Analgesics Using Raman Spectroscopy
50	Patrick Pastor	425	Substituent Effects on Carbonyl Absorption Frequency in the Infrared
51	Brett Philips	435	Raman Spectroscopy of Analgesics

Poster #	Student(s)	Class	Topic
52	David Runquist	435	2-D NMR Spectroscopy
53	Julie Smith Lam-Phuong Nguyen	Research	The Interplay of Entropy and Enthalpy Upon the Binding of Spheroidal Molecular Capsules in Methanol

### ***ENVIRONMENTAL STUDIES***

Poster #	Student(s)	Class	Topic
54	Aaron Binger	325	Sustainable Home Design
55	Jennifer Halaas	325	Why is Rainwater Collection Important?
56	Kendall Looney	325	Why Install a Composting Toilet?
57	Karen Morris	325	Earthworms and Ecology
58	Erin Muske	325	Building with Rammed Earth
59	Chris Pitzer	325	Disaster Due to an Introduction of a Non-native Species: Bufo marinus
60	Emily Prest	325	What is Solar Power?
61	Carly Seabaugh	325	Aboriginal Issues in Australia
62	Christen Spencer	325	Natural Pest Control
63	Karen Morris, Jessie Ham Patrick Grenko	350	Clover Creek: Economic Activity
64	Amanda McCarty Leah Proctor	350	Clover Creek: Land Use
65	Mike Henson Heidi Lyman Ryan Nabors	350	Clover Creek: Population

<b>Poster #</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
66	Collette Foley Beth Crippen	350	Clover Creek: Resources
67	Kate Dunlap Lara Koger Morgan Forrey	350	Clover Creek: Biology
68	Shelly Eisenbarth Chris Anderson Erin Burgess	350	Clover Creek: Chemistry
69	Ryan Puzzuto Stephen Vaughn	350	Clover Creek: Geology/Physical

<b><i>MATHEMATICS</i></b>
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<b>Poster #</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
70	Malena Hansen Leanna Lookabill	348	Campus Safety?
71	Mark Westland Reid Wiggins	348	Stock Value Predictions Using Multiple Regression

# *Demonstrations*

<b>COMPUTER SCIENCE AND COMPUTER ENGINEERING</b>
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<b>Time</b>	<b>Room</b>	<b>Student(s)</b>	<b>Class</b>	<b>Topic</b>
Fri: Poster Session Sat: During Breaks	222	Rob Rydberg	499	Automated Power Control System
Fri: Poster Session	Foss Field	Jonathan Hergert Erik Marubayashi Cameron Zettel	131	Air Cannon
Fri: Poster Session	Foss Field	Richard Burk Loren Wilson	131	Remotely Activated Water Rocket

# *Poster Presentation and Demonstration Submitted Abstracts*

## ***BIOLOGY***

### **Alayne Brown: Applications in DNA Technology**

This poster presents summaries of various active research areas in DNA technology including edible vaccines and gene therapy.

## ***ENVIRONMENTAL STUDIES***

### **Aaron Binger, Jennifer Halaas, Kendall Looney, Karen Morris, Erin Muske, Chris Pitzer, Emily Prest, Carly Seabaugh, and Christen Spencer: ENVT 325 – Crystal Waters**

Students from the “Ecology, Community and Culture in Australia” course examine sustainability issues, including sustainable issues of building design, water supply, waste disposal, energy sources, agriculture, and aboriginal issues in Australia.

### **Chris Anderson, Erin Burgess, Beth Crippen, Kate Dunlap, Shelly Eisenbarth, Collette Foley, Morgan Forrey, Patrick Grenko, Jessie Ham, Mike Henson, Lara Koger, Heidi Lyman, Amanda McCarty, Karen Morris, Ryan Nabors, Leah Proctor, Ryan Puzzuto, and Stephen Vaughn: ENVT 350- Clover Creek: A Watershed Assessment**

We assessed the health of Clover Creek watershed using human activity and data from the creek. Chemical, physical, and biological data for the creek as well as population, land use, economic activity and resource data in the watershed are presented.

## ***MATHEMATICS***

### **Mark Westland and Reid Wiggins: Stock Value Predictions Using Multiple Regression**

We aim to predict the factors that relate to the value of stocks of major corporations. We will use hypothesis testing, multiple coefficient of determination values, and other regression tools to determine these factors.