

University of Idaho
Engineering
design
expo
2005

explore, challenge, dream

Planetary Exploration

April 29, 2005

**Expo Design Exhibits
Student Union Building**

**NASA Mars Rover Challenge
Kibbie Dome & Memorial Gym**

College of Engineering

Itron

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National Institute for Advanced
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American Nuclear Society

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 **ATI Wah Chang**
Allegheny Technologies





Greetings and welcome to the University of Idaho's Engineering Expo!

On behalf of the University of Idaho, it is my pleasure to welcome you all to the 2005 Engineering Design EXPO, "Explore, Challenge, Dream," with a focus on planetary research. It is my first year at this premier event, and I am genuinely thrilled to see such a showcase of student ingenuity and enterprise.

The more than 300 engineering students involved in 75 some senior projects and team inventions are truly impressive. They represent months — in some cases years — of student, faculty, staff, alumni and industry partners executing joint vision and innovation.

Engineering EXPO exemplifies UI's emphasis on student-centered learning, our priority to promote science and technology research and development, and our efforts to catalyze invention and tech-transfer to the world outside the university.

As you stroll through the displays, please stop and question the exhibitors and join in the learning. Hear for yourself how quiet the Clean Snowmobile is, see the mind-boggling cosmos in digital arrays, understand how nano-technology virtually can perform on the head of a pin, and how inventions for planetary exploration also help us Earthlings.

I extend special thanks to the industry representatives who sponsored projects and the overall event. This is the Land-Grant University in action and at its finest.

See you in the SUB Ballroom, on the SUB porches, on the engineering research lab tours and in the Kibbie Dome for a day that will transport you into the future.

Sincerely,

Timothy P. White
President



University of Idaho College of Engineering



The University of Idaho offers one of the largest engineering educational centers in the Northwest with a complex that encompasses two colleges and eleven structures, housing over 400,000 square feet of classroom and laboratory space in the five communities of Moscow, Idaho Falls, Twin Falls, Coeur d'Alene and Boise. World-class faculty, progressive curriculum, state-of-the-art facilities, and outstanding students combined with our alumni and industry partnerships set the UI apart from engineering programs at other universities.

September 2, 2004, marked the first public viewing of the new Idaho Water Center in Boise. The building is now the new home base to the UI College of Engineering Boise. It is the region's unique facility for graduate education, collaborative research and programs focusing on river and water quality issues. Modern laboratories house state-of-the-art experimental and computational equipment which support our engineering programs, including the Bio-energy Research Group, the Ecohydraulics Research Group, the Manufacturing Improvement Group, TechHelp, and the professional development program.

Charles Peterson,
Interim Engineering Dean
College of Engineering

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National Institute for Advanced Transportation Technology

Our mission is to work with industry, government and research institutions to develop, evaluate and market technologies that will improve the design and operation of transportation vehicles and systems.

<http://www.webs1.uidaho.edu/niatt/>



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Engineering
Design Expo 2005**

**Planetary
Exploration**

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Chris Anderson
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ENGINEERING DESIGN AT IDAHO

The annual Engineering Design EXPO illustrates why the University of Idaho is "the design experience of choice" in the Pacific Northwest. We are proud of the level of industry interaction you see here today, the wide range of undergraduate student involvement in all phases of product development and the unique involvement of graduate students mentoring undergraduate students during this design experience.

Engineering programs offered through the University of Idaho, at undergraduate and graduate levels include: Biological and Agricultural Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Computer Science, Electrical Engineering, Environmental Engineering, Environmental Science, Geological Engineering, Materials Science & Engineering, Mechanical Engineering, Metallurgical Engineering and Nuclear Engineering. We offer additional graduate opportunities in Engineering Management, Environmental Engineering, Geological Engineering and Systems Engineering.

With the engineering expertise here at the UI, I want to assure all present that the College of Engineering continues to build on its strength in design education and to expand its joint cooperation with industry partners. The projects you see today demonstrate the results from this partnership of our faculty, students and industry. An additional unique feature

of the UI engineering design experience is the increasing level of interdisciplinary collaboration. Look closely and you will see design teams such as mechanical engineers, electrical engineers and a few business students working as a team to bring a project to completion.

This year, we are focusing on planetary exploration, a research field in which many of our undergraduate and graduate students and their professors have had hands-on experience and research success. You will hear student interns with the NASA Jet Propulsion Laboratory give a presentation of their experiences with the space industry. Researchers such as David Atkinson's Huygens/Titan Probe Doppler Wind Experiment on NASA's Saturn exploration mission; and Herb Hess's Flyback Converter with Voltage Control Mode on Chip for Portable Applications are just two of nine planetary exploration projects being presented.

Many opportunities and discoveries are available to us whether we are engineers or members of the general public. I encourage you to take advantage and appreciate the work behind the presentations and research designs that Engineering Design EXPO 2005 has to offer you throughout the day.

Charles Peterson,
Interim Engineering Dean
College of Engineering



NASA Idaho TECH: Mars Rover Challenge

You are invited to visit the ASUI Kibbie Dome today in order to see fifth and sixth graders from across Idaho, Northern Utah and Eastern Washington in action as they participate in the ninth annual Idaho TECH: Mars Rover Challenge!

Sponsored by the NASA Idaho Space Grant Consortium, Idaho TECH is a science and technology competition that enables student teams to design and construct Mars Rover models that they test in preliminary design competitions. These were held in Idaho Falls on April 16 and Boise on April 23. The Moscow competition is being held today in the ASUI Kibbie Dome and the Memorial Gym. An all-state competition later in the day in the Memorial Gym provides the opportunity for selected participants to meet and speak with a special guest from NASA.

Each Idaho TECH engineering team is required to develop a Mars Rover from provided Lego® kits. The teams then bring their Rovers and supporting documentation for competition in seven areas: (1) speed; (2) rock collection; (3) blind driving; (4) hill climbing; (5) weight; (6) presentation; and (7) lab notebook. Rovers are driven on a mock Martian landscape developed by students in the UI College of Engineering.

NASA Student Interns

NASA Jet Propulsion Laboratory Student Internship Presentations

11:00 AM Borah Theater

Imagine, as an undergraduate, working on electronic devices that will explore Mars; testing deep space transponders to insure communications with space craft missions; or getting to know personally, the organizational structures and people that operate JPL. These are opportunities that await University of Idaho engineering students. Learn more about the exciting research tackled by our recent interns and explore the possibility of you too having one of these opportunities in your own future.



Kellin Lang-Gillming



Danielle Ator



Jeremy Duff



Erica Lively

Kellin Lang-Gillming worked at JPL in Pasadena, California. His project involved working on the *Deep Space 2 Follow On* project. He specifically worked on verifying that onboard electronics of the Mars Polar Lander probes would withstand decelerations of 60,000g's.

Danielle Ator worked on *Reliability Assessment of Organic and Inorganic Embedded Passives in Substrates* with the Electronic Parts and Packaging Department at JPL.

Jeremy Duff built a webpage for JPL's *Project Control Systems* section and groups. In this unique non-research role, he was exposed to the people, organization, and business of JPL more than most interns.

Luke Curtis worked in the *Telecommunications Development Laboratory* at JPL. His primary function was to be part of a team that tested and characterized small deep space

transponders. These radios were flight equipment and testing results helped mission operations, radio science, and the operators of the deep space network to predict and anticipate the communications behavior of the spacecraft during the mission. Luke also worked on automating lab performance tests.

Erica Lively's internship in *Quantum Computing Technologies* at JPL was on a theoretical project developing equations to describe the security of ring networks using Quantum Key Distribution. She also conducted an experiment to determine the efficiency of two single-photon sensitive photo-detectors.

Jessica Malecha worked at NASA Jet Propulsion Laboratory in the *Radio Science* department. The Radio Science team was in charge of communications between the space craft Cassini and the NASA center.



Founded in 1991 through a NASA initiative, the NASA Idaho Space Grant Consortium (ISGC) is one of 52 national consortia. It focuses on providing NASA research and educational opportunities across the state of Idaho. The ISGC is comprised of Idaho's nine colleges and universities, and the Idaho National Laboratory, Idaho Academy of Science, Idaho Museum of Natural History, Discovery Center of Idaho, Idaho Mobile Space Station, Craters of the Moon National Monument and Preserve, Bruneau Sand Dunes State Park, Division of Aeronautics, Palouse Discovery Science Center, Idaho Science Teachers Association, Idaho Department of Education, TenXsys Inc., and the Warhawk Air Museum & NASA Space Place. The UI College of Engineering coordinates the program in cooperation with the UI College of Education.



University of Idaho Planetary Exploration

University of Idaho researchers have been involved in planetary exploration for a number of years. The recent Cassini mission to Saturn has brought renewed attention to the depth of the UI's involvement in exploration outside of our own planet. Please take time to explore these projects, some of which are presented here today.

Reconfigurable Computing Platform for Space BR2I

Space exploration relies on advanced sensing and computing technology to probe remote planetary environments, and to guide and control exploration vehicles. We can't just put off-the-shelf electronics in space, however. Space electronics must be compact, rugged and reliable, tolerant to radiation, and consume very little power. The Reconfigurable Platform addresses these goals through a computing architecture the "rewires" itself on the fly to optimize it for the computing problem at hand. Reconfiguring the hardware for different tasks gives us plenty of computing power, but no space or energy is wasted. This project builds on the Field Programmable Processor Array reconfigurable computer chip being developed at the University of Idaho. It adds reconfigurable memory, interconnect and control to demonstrate reconfigurable computing on two real-world spacecraft instrument problems: apodization (cleaning up an optical signal), and pixel nonuniformity correction.

ECE Senior Design Team,

Bill Walker

John Geidl

Paul Jaskowski

Advisors: Greg Donohoe

Detection of Extraterrestrial Life BR Stage

It is possible to detect a chemical signature of life by observing the presence of an electron transport chain (ETC). The method employs respiratory dyes such as 2,3-bis(2-methoxy-4-nitro-5-sulphophenyl)-2H-tetrazolium-5-carboxanilide inner salt (XTT) or 2,3-dichlorophenol indophenol (DCIP) to intercept electrons as they are passed down an ETC. Reduction of the dyes is observed as a simple color change. This technology may be used to remotely detect extraterrestrial life forms, or when the dyes are used in media containing antibiotics, one can also remotely detect genetically modified antibiotic-resistant microorganisms that might be intentionally released into the environment, robotic device for carrying out this analysis is described.

Ingrid Erwin, Microbiol MolecBiol Biochem

Bruce Barnes, Electrical Engineering

Janice Strap, Environmental Research Institute

Lisa Allenbach, Environmental Biotechnology Institute

Ronald Crawford, Environmental Research Institute

Microbiological Quality of Water within the Internal Thermal Coolant System Onboard the International Space Station BR Stage

The Internal Thermal Coolant System (ITCS) aboard the International Space Station (ISS) maintains appropriate ambient cabin temperatures. The microbial community of ITCS fluid was examined using heterotrophic plate counts and molecular techniques including adenosine triphosphate (ATP) and *Limulus* Amebocyte Lysate (LAL) assays, direct microscopic examination, and restriction fragment length polymorphism (RFLP) analyses of 16S rDNA genes from the community metagenome. The microbial bioburden determined were method dependent. Total average microbial population concentrations varied from 4.0×10^2 to 4.5×10^4 cells/mL depending on the technique used. RFLP analyses identified nine and eight distinct bacterial groups, indicating significant diversity amongst the 171 clones and 26 cultivable organisms, respectively.

James Benardini, Microbiol MolecBiol Biochem

Kasthuri Venkateswaran, Jet Propulsion Laboratory

Ronald Crawford, Environmental Research Institute

Deposition and Stability of Surrogate Martian Dust on Spherical and Inclined Surfaces BR Stage

Long-term robotic and manned exploration of Mars will be confronted by dust deposition in periods of atmospheric calm and violent wind storms. Although many exploration tools will be challenged by coating, adhesion, abrasion and possible chemical reaction of deposited, wind blown and actively disturbed Martian dust, solar cells are thought to be of primary concern. Recent modeling work of power output by gallium arsenide/germanium solar cells was validated by the Pathfinder Lander data and showed power output decreases of 0.1 to 0.5 percent per Martian day. A major determinant for the optimal positioning angle of solar panels employed in future missions is the angle of repose of the settling dust particles that is dependent on a variety of physical and chemical properties of the particles, the panel surface, and the environmental conditions on the Mars surface. While the effects of many of these factors are well understood qualitatively, quantitative analyses, especially under physical and chemical conditions prevailing on the Mars surface are lacking. We present measurements of the angle of repose for different Martian dust surrogates on inclined and spherical surfaces that were conducted in an environmentally controlled chamber simulating atmospheric conditions on the Mars surface. Effects of particle and panel surface properties on the angle of repose are discussed.

Lucas Möller, Moscow High School

Markus Tuller, Plant, Soil and Entomological Sciences/PSES

Kim Kuhlman, NASA Jet Propulsion Laboratory

Mohammed R. Islam, Plant, Soil and Entomological Sciences/PSES

Method for Improving the Radiation Hardness of a Boost Converter BR Stage

MOSFETs used in space are subject to exposure to natural radiation in space. In this project, total-dose effects in switching ac/dc Boost converter are examined using SPICE simulations. Then a new circuit design for an open loop dc/dc Boost converter that is much less sensitive to radiation is proposed.

Huadian Pan, Electrical & Computer Engineering;

Herbert Hess, Electrical & Computer Engineering

Bogdan Wilamowski Director, Alabama Microelectronics Science and Technology Center, Auburn University, Alabama

Flyback Converter With Voltage Control Mode On Chip For Portable Applications BR Stage

Planetary exploration missions require electrical power management and control systems. DC/DC converters are widely used in power management, conditioning, and control of space power systems. Flyback converter is a DC/DC converter. Research work includes Flyback converter with control system to generate constant output voltage.

Sri Lakshmi Nalla, Electrical & Computer Engineering
Herbert Hess, Electrical & Computer Engineering

Huygens/Titan Probe Doppler Wind Experiment BR Stage

The Huygens probe Doppler Wind Experiment is one of six instruments on the European Space Agency Huygens probe that entered and descended for nearly 2.5 hours through the atmosphere of Titan on 14 January 2005. The primary goal of the Doppler Wind Experiment is to measure the profile of the zonal (east-west) winds in Titan's atmosphere from an altitude of approximately 150 km to the surface. The Doppler Wind Experiment was designed to be conducted by measuring the Huygens'

telemetry frequency on the Cassini orbiter. Unfortunately, the orbiter did not receive the probe Doppler Wind signal because the Cassini receiver was not properly programmed into the critical probe radio relay sequence. All the DWE measurements and probe telemetry at the orbiter were therefore lost. However, the probe Doppler Wind signal was successfully received at many radio telescopes on Earth. The precision of the Earth-based Doppler measurements is roughly equivalent to that which had been expected from the measurements on board Cassini, and the measurement of Titan's zonal wind profile was therefore successfully retrieved.

Bill Clabough, Electrical Engineering
David Atkinson, Electrical Engineering

A Neptune Vision Mission Using Nuclear Electric Propulsion BR Stage

The Neptune Vision Mission using Nuclear Electric Propulsion is a one year study funded by NASA to study the deep Neptune atmosphere to pressures approaching 1000 bars, as well as the rings, Triton, Nereid, and other satellites of Neptune; power would be provided using nuclear electric propulsion (NEP). This ambitious mission requires that a number of technical issues be investigated,

including: (1) giant-planet atmospheric probe thermal protection system (TPS) design, (2) a trajectory design allowing probe release on a trajectory to impact Neptune while allowing the spacecraft to achieve a polar orbit of Neptune, and (3) technologies to achieve maintain probe vessel integrity and a communications link for probe depths of several hundred to possibly several thousands of bars. Another driving factor in the design of the Orbiter and Probes is the necessity to maintain a fully operational flight system during the lengthy transit time from launch through Neptune encounter, and beyond.

Bernie Bienstock, Boeing
David Atkinson, Electrical Engineering
Kevin Baines, Jet Propulsion Laboratory
Paul Mahaffy, NASA Goddard Space Flight Center
Paul Steffes, Georgia Institute of Technology
Sushil Atreya, University of Michigan; Alan Stern, Southwest Research Institute
Michael Wright, NASA Ames Research Center

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Expo Lab Tours 2005

These tours leave from the Expo Registration Desk, 1st floor SUB
— Meet 10 minutes prior to departure

Magnetic and Electronic Materials Research Laboratory – 9:30 AM

Magnetic and Electronic Materials Research Lab focuses on the magnetic properties of nanometer films and sub-micrometer structures, particularly for information data storage applications including non-volatile random access memory devices, magnetic tape, magnetic hard disk and also ferrite films for microwave communication devices. You will see the introduction of research projects by Ph.D. students and demonstration of some experiments including characterization.

Bioinformatics Supercomputing Facility/Fabrication of Nanomaterials and Devices & Clean Room - 10:00 AM

Consists of machine room tour of cluster computing facility including a discussion of what hardware is available. Student involvement is in design, construction and maintenance.

Wind Tunnel & Design Suite/Small Engine Tour – 10:45 AM

At the wind tunnel you will have a close-up look at the large, "user-friendly" wind tunnel that has been developed to support lower-division design and experimental projects. In the Design Suite you will experience the physical environment that has been created for students to support capstone design and experimental projects.

NIATT Tour – 11:15 AM

The Center for Traffic Operations and control has as its mission the development, testing and evaluation of technology products supporting advanced traffic control systems. Activities in this center focus on a traffic control system testbed that includes five components: traffic detection, control, surveillance, simulation and optimization.

Alternative Energy/Chassis Dynamometer Tour – 12:00 PM

(Vandal Trolley Transportation)
Ride the university's Biodiesel powered trolley over to the James Martin Lab where this fuel is produced. See how seeds are crushed to produce oil and have a hands-on experience of producing a sample of biodiesel. Also see where demonstration vehicles are tested on the chassis dynamometer for testing efficiency and engine wear using biodiesel.

Exhibit Judging Criteria

Awards will be presented to the exhibits, posters and technical sessions that address selected criteria that are important in engineering accreditation. Exhibits will be judged based on interviews with team members. Specific criteria include thoughtful use of design methodology, knowledge of appropriate engineering standards and constraints, awareness of potential project impact on society and development of life-long learning skills in the course of the project. Posters and technical sessions will be judged on the ability to communicate concepts to a technical audience. Specific criteria include clear statement of purpose, organization of supporting content, appropriate style/format of presentation and use of visual aids.

One People's Choice Award will be presented. This award is based on votes cast by all Expo registrants (including exhibitors) and has no specific criteria.

Design Expo Awards

Booth Awards

Four awards given \$200

Poster Awards

Four awards given \$200

Technical Session Awards

Three awards given \$200

People's Choice Award

\$200

Idaho Research Foundation

Innovation Award

\$150

Two awards given

ESAC BBQ

As a thank you for all the support shown throughout the year, the engineering students activities committee (ESAC) is holding a BBQ at Ghormley Park 5:00 – 6:00 pm following EXPO. Expo participants, alumni, industry representatives, engineering students, faculty and staff are welcome to come, relax, socialize and celebrate another successful Engineering Design Expo. The usual BBQ menu will be provided.



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Technical Sessions

Biological & Agricultural Engineering sponsored by UI National Institute for Advanced Transportation Technology, University of Idaho

Appaloosa Room 9:15 AM to 10:45 AM

Enhanced Weather Chart Digitizer

The Enhanced Weather Chart Digitizer (EWCD) project is to further develop the Weather Chart Digitizer (WCD) previously developed. EWCD provides support for additional weather chart types and improves the systems usability.

Presenters:

Johnson, Audra
McConaghy, Andrew
Smith, Shane
Wilker, Dimetri

Sponsor: Myron Molnau, Idaho Climate Services
UI Advisors: Bill Junk, Computer Science

Indoor Grey Water Purification System

With the depletion of potable water resources, a more sustainable method for water use needs to evolve. Using a multiple step purification process devised by K.D. Waters, grey water from bath and shower sources will be treated to water standards suitable for selected secondary use.

Presenters:

Colyar, Kendra
Routt, Duch

Sponsor: K.D. Waters
UI Advisors: Tom Hess

RABIT - Robotic Apparatus for Burrow Imaging and Tracing

A mechanical robot with position-sensing capabilities was constructed to maneuver through the burrows of the endangered pygmy rabbit. The position data is processed into a 3-D map of the burrow systems, which is necessary for conservation biologists to understand the pygmy rabbit's habitat and preserve this fragile ecosystem.

Presenters:

Ellison, Karen
Samuel, Fauna
Tafoya, Jesse

Sponsor: Janet Rachlow
UI Advisors: Tom Hess

The Dynamic Prosthetic

Due to a child's constant growth, current lower-limb prosthetics—which are adjusted by replacing parts—will properly fit for only a short time. The Dynamic Prosthetic with its unique epiphyseal plate design and automated control system will maintain proper skeletal alignment for two years before replacement is necessary.

Presenters:

Neibling, Jen
Pedrow, Chelan
Plaisted, Matt

Sponsor: Hanger Orthopedic Group, Inc
UI Advisors: Tom Hess, Barbara Smith and Dev Shrestha

Chemical Engineering sponsored by Micron Technology, Boise, ID

Silver Room 10:45 AM– 12:45 PM

Metal Hydride Hydrogen Storage

A design was developed to store enough H₂ in metal hydrides for a vehicle to travel at least 100 miles before refueling in an economical, efficient and safe manner.

Presenters:

Arritt, Sean
Dorgan, Brian
Ricondo, Eli

Sponsor: Idaho National Laboratory
UI Advisors: David Drown

Carbon Dioxide Separation from Flue Gases; Clathrate Formation and Subsequent Sequestration Options

A bench-scale separation technique utilizing clathrates was developed to reduce carbon dioxide emissions from power-generation facilities. Carbon Dioxide gas is encapsulated inside water crystals at high pressures and low temperatures. Clathrates can be stored in the ocean at a depth below 800 meters or

dissociated to obtain carbon dioxide gas.

Presenters:

Eby, Brenda
Haney, Bryan
Moore, Felicia
Wagner, Aaron

Sponsor: Environmental Research Institute (ERI);
Dept. of Chemical Engineering
UI Advisors: David Drown

Uranium Extraction from Molten Salt

Spent fuel rods are melted in an electrorefiner where uranium fines build up on the cathode. The uranium that is taken off of the cathode consists of 90 wt% salt and 10 wt% uranium. A process was designed to extract the uranium from the salt in a semi-continuous fashion in order to obtain a high purity uranium product.

Presenters:

Jeffreys, Kevin
Weaver, Ryan

Sponsor: Idaho National Laboratory
UI Advisors: David Drown

Methanol Recovery During Bio-diesel Production

Pacific Bio-diesel® has developed a manufacturing process to produce market-ready bio-diesel from waste restaurant frying oil. The primary expense of the process is methanol reagent, and too much is currently wasted for the process to be economically feasible. This project experimentally obtained needed data and designed a full scale methanol recovery process that will be integrated into the pre-existing Pacific Bio-diesel® facilities. The design maximizes the methanol recovery with a minimum of capital investment and operating cost to Pacific Bio-diesel®.

Presenters:

Custer, Amy
Mc Vicars, Chad
Tan, Meng



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Townsend, John
Woodland, Travis
Sponsor: Pacific Bio-diesel®
UI Advisors: David Drown

Chem-E Car

The AIChE Chem-E-Car contest consists of building a shoebox sized car that is powered from a chemical reaction. A required load and distance is given to each team one hour prior to the start of the performance competition. Teams are allowed to adjust only "fuel" or reactants used in the car's chemical reaction. The UI team uses a hydrogen fuel cell to power their car

Presenters:

Berggren, Dusty Rose
Eby, Brenda
Hunt, Joshua
Jeffreys, Kevin
Miles, Andrew
Miller, Jeff
Russell, James
Tan, Meng
Weaver, Ryan

Sponsor: Dept. of Chemical Engineering; UI Parents Advisory Board; Associated Students UI; College of Engineering; ChE Alumni
UI Advisors: David Drown

Removal of I37Cs from Spent Nuclear Fuel to Increase the Capacity of Long-Term Storage Sites

Cesium is one component of spent nuclear fuel; its radioactive decay generates significant heat over a short time. Heat production is the major factor that limits capacity of long-term waste repository designs. A process is developed for removing Cesium I37 from commercial spent nuclear fuel prior to electro refining.

Presenters:

Mosby, Robert
Tong, Andrew
Wolverton, Daren

Sponsor: Idaho National Laboratories
UI Advisors: David Drown

Electrical & Computer Engineering & Computer Science sponsored by Schweitzer Engineering Laboratories, Pullman, WA

Borah Theater 9:15 AM to 10:45 AM

Reconfigurable Computational Platform for Space

The Reconfigurable Computational Platform project serves as a step toward a full proof of concept that is required of the NASA funded FPPA chip design team. The project will deliver working hardware, which will demonstrate both appodization and image pixel correction.

The hardware will consist of data path logic, memory units, an interconnect, and control logic.

Presenters:

Walker, Bill
Geidl, John
Jaszowski, Paul

Sponsor: NASA GSFC
UI Advisors: Greg Donohoe

Self-Powered Wireless Sensor Network

Our objective is to develop an ultra-low power wireless sensor network that is powered entirely by energy scavenged from vibrations in the sensors' environments. The network is "ad-hoc," meaning that sensors are added to and removed from the network as they pass in and out of range.

Presenters:

Arthur, Mike
Machacek, Jason
Victorino, Ty

Sponsor: CAMBR
UI Advisors: Greg Donohoe

High-Voltage High Slew-Rate MOSFET Op-Amp Design

The goal of this project is to explore ideas for the design and physical implementation of high-voltage high slew-rate MOSFET Operational Amplifiers.

Exhibitors:

Mentze, Erik
Phillips, Jennifer

Sponsor: Apex Microtechnology
UI Advisors: Herb Hess

Evaluation of Silver Electrodes Manufactured by the Powder Metallurgy Process- Materials & Science Engineering

A metallographic evaluation of silver PM electrodes has been made. The four supplied samples were made using a vibratory compaction/graphite mold approach. Variables evaluated included the raw powder material and the atmosphere utilized during the sintering process (Hydrogen versus dissociated ammonia). The study involved looking for differences in the sintered structures for the four materials; in particular optimum bonding (small rounded pores) of the powder particles was desired. The goal of the program is to produce an acceptable manufacturing process for a commercial company, Western Sintering Co., Inc. of Richland, WA.

Presenters:

Harmon, Caleb

Sponsor: Western Sintering Inc.
UI Advisors: Sam Froes

Mechanical Engineering/Electrical & Computer/ sponsored by Itron, Spokane, WA

Silver Room 9:15 AM to 10:30 AM

Reed Gouger Apparatus

Gouging is the process of shaving down a strip of bamboo to the desired thickness so that it may be made into a bassoon reed. Current gouging methods are labor-intensive. The goal of this project is to create a user-friendly machine that can quickly gouge high quality reeds.

Presenters:

Drew, Daniel
Gallup, Lloyd

Sponsor: UI Music Department
UI Advisors: Steve Beyerlein

Vandal Racing (Current Car)

Racecar Engineering is the focus of the Vandal Racing team. Our goal is to create a top place finisher in the 2006 Formula SAE Competition. Most of the systems on the car, including the chassis, suspension, drivetrain, intake, exhaust, and on-board data acquisition systems were designed and manufactured by UI engineering students.

Presenters:

Anderson, Scott
Auer, Brian
Bair, Aaron
BeDunnah, Jayson
Bingham, Josh
Bliss, Ryan
Christensen, Victor
Daniels, Scott
Harper, Mike
Kovanda, Ben
Leachman, Jake
Maughan, Mike
McKeehan, Kameron
Miller, Brett
Oden, Greg
Thompson, Luke
Welling, Doug
Winn, Alex
Zimmerman, Sam
Zmuda, Jay

Sponsor: College of Engineering
UI Advisors: Edwin Odom

Technical Sessions continued on page 14

	BALLROOM	REGISTRATION DESK	BORAH THEATER	SILVER ROOM	APPA
8:00		Register 7:30-8:30			
8:30					
8:45	Opening Ceremonies Ralph Budwig, Expo Chair Charles Peterson, Engineering Dean Tim White, UI President Moscow Chamber of Commerce 8:45 Student Designs Booth & Poster , SUB Ballroom Foyer & Patio 9:00-3:30 Corporate Sponsors Booths 9:00-3:30	Public Tours These tours leave from Expo Registration Desk, 1st floor SUB Meet 10 minutes before departure	Electrical Engineering, Computer Engineering, & Computer Science Technical Sessions Borah Theater 9:15-10:45	Mechanical/Electrical Engineering Technical Sessions Silver Room 9:15-10:30	Biolo Techn Appal
9:30		Magnetic & Electronic Materials 9:30			
10:00		Bio Informatics/ Super Computing/ Nanomaterials & Clean Room 10:00		Chemical Engineering Technical Sessions Silver Room 10:45-12:45	
11:00		Wind Tunnel Tour/Design Suite/ Small Engine Lab Tour 10:45	NASA JPL Student Internship Forum 11:00-12:00		
11:30		NIATT Remote Access Traffic Controller Lab 11:15			
12:00		Alternative Energy/Chassis Dynamometer Tour JML 12:00 (Vandal Trolley transportation) 11:50 in front of the SUB			
12:30					
1:00					
1:30					
2:00					
3:00					
3:30	Awards Reception 3:30-4:30				
4:00					
5:00					
6:30					

Expo Door Prize Drawings Compliments of Vandal Athletics



DESIGN EXPO 2005 SCHEDULE OF EVENTS

APPALOOSA ROOM	GOLD ROOM	CHIEFS ROOM	ASUI KIBBIE DOME	
	Judges Forum 8:15	Judges & Sponsor Coffee Break 7:30		8:00
				8:30
Biological Engineering Technical Sessions Appaloosa Room 9:15-10:45			North Idaho Mars Rover Competition 9:00-3:00 Window on the Universe UI College of Education Hands-On Science Activities Palouse Discovery Science Center	8:45
			Bus Service between SUB & Kibbie Dome every 40 minutes/Vandal Trolley every 20 minutes 9:00-2:30	9:30
				10:00
				11:00
		Judges & Sponsor Lunch 11:30-1:30		11:30
	Mechanical Engineering Luncheon 12:00-1:00 "Mindworks" Lab Presentation			12:00
				12:30
				1:00
		Golden I Alumni Dessert with the Dean 1:45-2:45		1:30
				2:00
			NASA Special Guest 3:00	3:00
				3:30
			North Idaho Awards 4:00	4:00
		ESAC Sponsored Picnic for Engineering Alumni, Expo Sponsors, Judges, Faculty and Staff Participants 5:00-6:00 Ghormley Park	Mars Rover Final Competition Memorial Gym 5:00	5:00
			Mars Rover Final Awards Memorial Gym 6:30-7:00	6:30
			Vandal Silver & Gold Football Game 7:00	7:00

Hydraulic Helpin' Hybrid

The objective of this project is to redesign a hydraulic assist system on a Ford F-350 truck as a prototype for a commercial garbage truck. The redesign incorporates improved safety, brake-life, noise control, component durability, and control system functions that combines to increase gas mileage of the vehicle.

Presenters:

Amato, Michael
Bertovich, Seneca
Hake, Eric
Morey, Andrea
Shurtliff, Michael
Stobie, Joel

Sponsor: NIATT

UI Advisors: Frank Albrecht and David Egolf

Xstream Team - Small Scale Hydropower Optimization

Our team has redesigned a micro-hydropower system used for residential heating. This system is powered by the spring run-off of Randall Creek on Moscow Mountain team. The goal of this project was to increase the mechanical and electrical efficiency of the system and demonstrate this through laboratory testing.

Presenters:

Arpke, Phil
Jobes, Kelly
Juhasz, Jamin
Krohmer, Karl
Nieborsky, Jill

Sponsor: John Law

UI Advisors: Ralph Budwig, David Egolf and Steve Beyerlein

Booth Exhibits

900 MHZ BPSK Transceiver BR23

Our project is to design and build a wireless 900 MHz transmitter and receiver for Simply Test, LLC. The transceiver will conform to the IEEE 802.15.4a standards for Low Rate, Wireless Personal Area Networks (LR-WPAN) and utilize Quadrature Phase Shift Key (QPSK) modulation, a new platform wireless digital data communications. The end result will be a working simulation of the transmitter and receiver circuits in PSpice and a testable prototype PCB.

Exhibitors:

Hess, Matthew
Oman, Jason
Young, Sam

Sponsor: Simply Test, LLC

UI Advisors: David Egolf and Ken Noren

Airbag Automaton BR14

We have created a manufacturing workstation that accommodates a variety of folding tools, making one platform capable of folding several different airbags. The workstation supports rapid changeover between tools, tool identification, and uploading of operating instructions.

Exhibitors:

Bailey, John
Canaday, Jason
Gallup, Wayne
Harwood, Jason
Hiatt, Hattie
Low, Chun Hau

Sponsor: Autoliv

Mentor: Sam Zimmerman

UI Advisors: Steve Beyerlein and Greg Donohoe

Airbag Inflator Test Stand BR15

Design, build, and test an experimental method to measure the rate of work produced by an airbag inflator.

Exhibitors:

Johns, Martin
Osiensky, Brant
Puopolo, Greg

Sponsor: Takata

Mentor: Andrew Dubuisson

UI Advisors: Karl Rink and Steve Beyerlein

ASCE Concrete Canoe Competition Foyer 39

Civil engineering students tested their skills by designing, building, and testing a concrete canoe capable of holding 4 people and participating in a race.

Exhibitors:

Anderson, Cort
Auch, Alysia
Ferguson, Tim
Madrigal, Guillermo
Miramontes, Esther
Reed, Ryan
Strom, Karen
Walters, Geoffrey
Young, Bryan

Sponsor: Civil Engineering

UI Advisors: Ed Schmeckpeper

ASCE Steel Bridge Competition Foyer 38

Civil engineering students tested their skills by designing, building, and testing both a one-tenth scale steel bridge capable of holding 2500 lbs.

Exhibitors:

Berg, Mitch
Chipman, Rachel
Dickie, Jocelyn
Stillman, Amy
Vosti, Lacy

Sponsor: Civil Engineering

UI Advisors: Ed Schmeckpeper

Biodiesel Demonstration Vehicles P41

Biodiesel research has been conducted by the Biological & Agricultural Engineering Department since 1979. The 2001 1.9 liter TDI, VW BioBug and 1999 Dodge 24-valve electronic injection Cummins engine ¾ ton pickup have been running on 100 percent biofuels grown and produced at the UI Moscow campus since coming off the showroom floor. The Vandal Trolley, used for special events, is also running on a 20 percent blend of biofuels produced on campus.

Exhibitor:

Thompson, Joe
Burn, Scott
Singh, Arvinder
Wang, Paul

Sponsor: Biological and Agricultural Engineering
UI Advisors: Jon Van Gerpen, Brian He and Dev Shrestha

Blockhead Engineering BR5

Design of two 8400 square foot CMU warehouses, and two 1400 square foot structural clay brick offices.

Exhibitors:

Dickie, Jocelyn
Sansotta, David

Sponsor: R&D Masonry

UI Advisors: Ed Schmeckpeper and Roger Ferguson

Chem-E Car BR8

The AIChE Chem-E-Car contest consists of building a shoebox sized car that is powered from a chemical reaction. A required load and distance is given to each team one hour prior to the start of the performance competition. Teams are allowed to adjust only "fuel" or reactants used in the car's chemical reaction. The UI team uses a hydrogen fuel cell to power their car.

Exhibitors:

Berggren, Dusty Rose
Eby, Brenda
Hunt, Joshua
Jeffreys, Kevin
Miles, Andrew
Miller, Jeff
Russell, James
Tan, Meng
Weaver, Ryan

Sponsor: Dept. of Chemical Engineering; UI Parents Advisory Board; Associated Students UI; College of Engineering; ChE Alumni
UI Advisors: David Drown

Common Authentication Project BR6

There exist many different methods for authenticating a user's identity when they access computer systems. Most use username and password verification, but used more commonly in varying security architectures. This project

standardizes the security architecture verifying users and adds smart card authentication.

Exhibitors:

Blue, Ryan
Brown, Aaron
King, Kyle
Rossebo, Bryan

Sponsor: US Department of Defense

UI Advisors: Bill Junk

CSC DirectDrive P36

A custom gear drive has been created to increase the mechanical efficiency as well as the under-hood space in the UI Clean Snowmobile.

Exhibitors:

Harris, Ty
Schiermeier, Russell

Sponsor: National Institute for Advanced Transportation Technology

Mentor: Nate Bradbury

UI Advisors: Karen Den Braven

Data Acquisition System for a Clean Snowmobile P35

The goal of "Project Clean Machine" is to design a high-speed data acquisition system for monitoring of a high-RPM snowmobile engine. Data parameters to be gathered include temperatures and pressures from sensors located throughout the engine and exhaust. The acquired data from the system will be used to create engine maps for minimizing unburned

hydrocarbons created during combustion.

Exhibitors:

Kingma, Lee-Anne
Orr, Amber
Quirl, Brice

Sponsor: NIATT

UI Advisors: David Ego

Dewpointers: Building a Low Power Dew Point Sensor BR 19

This project involves the design of commercial dew point sensor. The project is sponsored by Decagon Devices, Inc. a scientific manufacturer based out of Pullman, Washington. The primary specifications included battery operation, high accuracy, and low parts cost.

Exhibitors:

Cook, Bryce
Walden, Ben

Sponsor: Decagon Devices, Inc.

UI Advisors: David Ego

Dynamic Prosthetic (The) BR13

Due to a child's constant growth, current lower-limb prosthetics--which are adjusted by replacing parts--will properly fit for only a short time. The Dynamic Prosthetic with its unique epiphyseal plate design and automated control system will maintain proper skeletal alignment for two years before replacement is necessary.

Exhibitors:

Neibling, Jen
Pedrow, Chelan
Plaisted, Matt

Sponsor: Hanger Orthopedic Group, Inc.

UI Advisors: Tom Hess, Barbara Smith and Dev Shrestha

Electrolife - Teststand for an Electrosurgical Device BR16

Our goal is to create a test fixture for electrosurgical devices used in arthroscopic surgery. The test apparatus should follow reproducible cutting patterns, log temperature data, require minimal operator training, support quick set-up, and require infrequent maintenance.

Exhibitors:

Curtis, Scott
Dafae, Kathryn
Gust, Derek
Ross, Will
Simmons, Benjamin

Sponsor: ArthroCare

Mentor: Jen Bell

UI Advisors: Steve Beyerlein and Greg Donohoe

Engine Performance and Emissions Testing of an Aquanol Fueled Transit Van P25

Catalytic ignition systems allow combustion initiation over a much wider range of stoichiometry and water composition than traditional spark ignition systems. The platform explored in this research is a transit van previously converted to operate on either gasoline or aqueous ethanol. Chassis dynamometer tests are underway to compare thermal efficiency, NOx, CO, and hydrocarbon emissions from aqueous ethanol mixtures with gasoline.

Exhibitors:

Cordon, Dan
Olberding, Jeremy

Sponsor: NIATT, Valley Transit, and ITD

UI Advisors: Steve Beyerlein and Judi Steciak

Enhanced Weather Chart Digitizer BR17

The Enhanced Weather Chart Digitizer (EWCD) project is to further develop the Weather Chart Digitizer (WCD) previously developed. EWCD provides support for additional weather chart types and improves the systems usability.

Exhibitors:

Johnson, Audra
McConaghy, Andrew
Smith, Shane
Wilker, Dimetri

Sponsor: Myron Molnau

UI Advisors: Bill Junk

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Filthy Filters P37

Idaho National Laboratory challenged our team to create a nuclear grade HEPA filter disassembly station. This device must dismantle contaminated filters and separate them into metals and filter media. This process must take place in a remote hot cell environment.

Exhibitors:

Coburn, Tom
Kincaid, Ian
Loewe, Kevin

Sponsor: Idaho National Laboratory

Mentor: Sam Zimmerman

UI Advisors: Steve Beyerlein

Hot Cell End Effector BR4

Due to the limitations of the robotic manipulator arm used in the hot cells at Hanford, an end effector tool is needed to detach and attach fluid couplings. This end effector must perform to specific compliance requirements to ensure that the operator can make a connection to the couplings with some degree of misalignment.

Exhibitors:

Hallock, Chris
Robson, Matthew
Severance, Mike

Sponsor: Bechtel

Mentor: Brian Auer

UI Advisors: Steve Beyerlein

Hydraulic Helpin' Hybrid P32

The objective of this project is to redesign a hydraulic assist system on a Ford F-350 truck as a prototype for a commercial garbage truck. The redesign incorporates improved safety, brake-life, noise control, component durability, and control system functions that combines to increase gas mileage of the vehicle.

Exhibitors:

Amato, Michael
Bertovich, Seneca
Hake, Eric
Morey, Andrea
Shurtliff, Michael
Stobie, Joel

Sponsor: NIATT

Mentors: Jeremy Boles and Russ Glass

UI Advisors: Frank Albrecht and David Egolf

MekElektroniks - Lithium Ion Battery Charger BR3

In the process of developing their next generation of hand held meter reading devices, Itron has developed a new, more efficient battery pack. The purpose of this project is to design a next generation battery charger for the new battery pack.

Exhibitors:

Cote, Joe
Franklin, James
Olson, Rory
Solum, Lee

Sponsor: Itron

Mentor: Scott Anderson

UI Advisors: Steve Beyerlein and David Egolf

Miniaturization of the EarTalk Wireless Communication System BR12

The goal of this project is to design and implement a low-power, compact wireless circuit to transmit speech from the user's ear to a re-transmitter approximately 5 to 8 inches away from the ear. This circuit should be small enough to fit within an earplug.

Exhibitors:

Lively, Erica
Martin, Mark
Woolstenhulme, Bryan

Sponsor: National Institute for Occupational Safety and Health (NIOSH)

UI Advisors: Dave Egolf

Platoon of Miniature Autonomous Submarines BR11

A development environment has been created for a platoon of autonomous underwater vehicles. The miniature 'yellow subs' use an ethernet network as the pathway between the communications, sensors, 'brain', and controls nodes. On the surface, the submarines are wirelessly teleoperated. While underwater, acoustic modems provide external communications.

Exhibitors:

Beidler, Geoffrey
Canning, John
Cuff, Troy
Flack, Todd
Huska, Sarah
Reeder, Chris

Welling, Doug

Sponsor: Office of Naval Research

UI Advisors: Dean Edwards, Richard Wall and Michael Anderson

Plug and Play Sensors for Traffic Control BR2

By using "smart sensors" connected by a network we can increase the safety, versatility, and reliability of traffic control

Exhibitors:

Huska, Andrew

Sponsor: NIATT

UI Advisors: Richard Wall and Brian Johnson

RABIT - Robotic Apparatus for Burrow Imaging and Tracing BR18

A mechanical robot with position-sensing capabilities was constructed to maneuver through the burrows of the endangered pygmy rabbit. The position data is processed into a 3-D map of the burrow systems, which is necessary for conservation biologists to understand the pygmy rabbit's habitat and preserve this fragile ecosystem.

Exhibitors:

Ellison, Karen
Samuel, Fauna
Tafoya, Jesse

Sponsor: Janet Rachlow

UI Advisors: Tom Hess

Real time data acquisition and compression BR1

Manning Applied Technology (MAT) has developed a series of instruments for polymer rheo-optical measurements and pioneered in the area of very-rapid-scan FT-IR spectrometry. MAT currently faces limitations of the quantity of data that may be obtained from a spectrometer. They wish to have a way to bring the data onto a computer hard drive to allow for more data to be retained. We will design a high-speed data acquisition and compression device to transfer the data from the spectrometer to the hard drive of a computer.

Exhibitors:

Curtis, Luke
Mijatovic, Zeljko
Peterson, Brian

Sponsor: Manning Applied Technology

UI Advisors: Greg Donohoe

Real-time Performance Monitoring Solutions P30

Telemetry system development for Formula SAE race team.

Exhibitors:

Bingham, Richard
Helseth, Nick
Holmes, Dan

Sponsor: Edwin Odom

UI Advisors: David Egolf

Reconfigurable Computational Platform for Space BR21

Space exploration relies on advanced sensing and computing technology to probe remote planetary environments, and to guide and control exploration vehicles. We can't just put off-the-shelf electronics in space, however. Space electronics must be compact, rugged and reliable, tolerant to radiation, and consume very little power. The Reconfigurable Platform addresses these goals through a computing architecture that "rewires" itself on the fly to optimize it for the computing problem at hand. Reconfiguring the hardware for different tasks gives us plenty of computing power, but no space or energy is wasted. This project builds on the Field Programmable Processor Array reconfigurable computer chip being developed at the University of Idaho. It adds reconfigurable memory, interconnect and control to demonstrate reconfigurable computing on two real-world spacecraft instrument problems: appodization (cleaning up an optical signal), and pixel nonuniformity correction.

Exhibitors:

Walker, Bill
Geidl, John
Jaskowiak, Paul

Sponsor: NASA GSFC

UI Advisors: Greg Donohoe

Reed Gouger Apparatus BR20

Gouging is the process of shaving down a strip of bamboo to the desired thickness so that it may be made into a bassoon reed. Current gouging methods are labor-intensive. The goal of this project is to create a user-friendly machine that can quickly gouge high quality reeds.

Exhibitors:

Drew, Daniel
Gallup, Lloyd

Sponsor: UI Music Department

Mentor: Mike Harper

UI Advisors: Steve Beyerlein and Russ Porter

Self-Powered Wireless Sensor Network BR10

Our objective is to develop an ultra-low power wireless sensor network that is powered entirely by energy scavenged from vibrations in the sensors' environments. The network is "ad-hoc," meaning that sensors are added to and removed from the network as they pass in and out of range.

Exhibitors:

Arthur, Mike
Machacek, Jason
Victorino, Ty

Sponsor: CAMBR

UI Advisors: Greg Donohoe

Shot In the Dark - Automated Visual Inspection System BR22

Our interdisciplinary team was recruited by ATK to design, build, and test a high speed automated visual inspection system for police grade 9mm ammunition. The inspection system will detect and remove defective cartridges at the rate of 600 per minute, with a maximum false rejection rate of 0.2%.

Exhibitors:

Devorak, Brad
Hefter, Karl
Roderick, Katie
Simmons, Mike

Sponsor: ATK

Mentor: Doug Welling

UI Advisors: Greg Donohoe and Steve Beyerlein

UI Clean Snowmobile Challenge P34

The UI CSC team has taken a 2003 stock Polaris Pro-X snowmobile and incorporated a direct injection two stroke engine, a catalyst exhaust treatment, an after-market silencer, various sound absorbing materials, and a custom gear drive. The result is a cleaner running, fuel efficient, quieter trail snowmobile.

Exhibitors:

Armstrong, Ben
Bradbury, Nathan
Calvert, Brady
Devorak, Brad

Harker, Nickolas
Harris, Ty
Johnson, Justin
Loughmiller, Stan
Nedrow, Scott
Pentzer, Jesse
Schiermeier, Russell
Steinhilber, Benjamin
Van Patten, Erik

Sponsor: National Institute for Advanced Transportation Technology

UI Advisors: Karen Den Braven

Using Ultracapacitors to Start an Internal Combustion Engine P31

When compared to conventional battery technology, ultracapacitor cells deliver more power, last longer, operate more reliably, require less maintenance, and reduce environmental issues associated with disposal. Ultracapacitor cells will be used to start the engine of a 2002 Ford Explorer reducing the vehicle's dependence on lead-acid batteries.

Exhibitors:

Jessup, Fred
Jessup, Erin
O'Neil, Benton

Sponsor: NIATT

UI Advisors: David Egolf, Joe Law and Frank Albrecht

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Vandal Racing (Current Car) P33

Racecar Engineering is the focus of the Vandal Racing team. Our goal is to create a top place finisher in the 2006 Formula SAE Competition. Most of the systems on the car, including the chassis, suspension, drivetrain, intake, exhaust, and on-board data acquisition systems were designed and manufactured by UI engineering students.

Exhibitors:

Anderson, Scott
Auer, Brian
Bair, Aaron
BeDunnah, Jayson
Bingham, Josh
Bliss, Ryan
Christensen, Victor
Daniels, Scott
Harper, Mike
Kovanda, Ben
Leachman, Jake
Maughan, Mike
McKeehan, Kameron
Miller, Brett
Oden, Greg
Thompson, Luke
Welling, Doug
Winn, Alex
Zimmerman, Sam
Zmuda, Jay

Sponsor: College of Engineering

UI Advisors: Edwin Odom and Russ Porter

Vandal Racing (Next Generation Car) P40

Planning is underway for modifications to the existing FSAE racecar as well as technology for future generation vehicles. This exhibit features a variety of systems that have been recently redesigned as well as packaging schemes for future vehicles.

Exhibitors:

Dvoracek, Kristen
Gauss, Adam
Hardman, Jeff
Harper, Mike
Hersert, Matt
Honsinger, Ryan
Johnson, Justin
Kleppen, Shane
Leachman, Jake
Maughan, Mike
McCombs, Jared
Okerlund, Brandon
Sagen, Jason
Sanders, Naomi
Sawer, Eric
Schiweck, Vaughn
Scott, Shaun
Shore, Becki
Smith, Henry
Thompson, Mike

Tinsley, Taylor

Sponsor: College of Engineering

UI Advisors: Edwin Odom

Wild Stamm - Soil Temperature Meter for Wildfires BR30

This project responds to a need by forest researchers to monitor soil temperatures during a wildfire. A rugged, easily deployed device has been created that can log soil temperatures for up to two weeks and then download data to a personal computer after recovery.

Exhibitors:

Bowen, Zack
Feavel, Vance
Hermano, Brian
Maloney, Pat
Ragan, Ken

Sponsor: Forest Service

Mentor: Jeremy Olberding

UI Advisors: Steve Beyerlein

Xstream Team - Small Scale Hydropower Optimization BR9

Our team has redesigned a micro-hydropower system used for residential heating. This system is powered by the spring run-off of Randall Creek on Moscow Mountain team. The goal of this project was to increase the mechanical and electrical efficiency of the system and demonstrate this through laboratory testing.

Exhibitors:

Arpke, Phil
Jobes, Kelly
Juhasz, Jamin
Krohmer, Karl
Nieborsky, Jill

Sponsor: John Law

Mentor: Jeremy Olberding

UI Advisors: Ralph Budwig, David Egolf and

Steve Beyerlein

Poster Exhibits

Biological & Agricultural Engineering

Indoor Grey Water Purification System BR100

With the depletion of potable water resources, a more sustainable method for water use needs to evolve. Using a multiple step purification process devised by K.D. Waters, grey water from bath and shower sources will be treated to water standards suitable for selected secondary use.

Exhibitors:

Colyar, Kendra
Routt, Duch

Sponsor: K.D. Waters

UI Advisors: Tom Hess

Chemical Engineering

Carbon Dioxide Separation from Flue Gases; Clathrate Formation and Subsequent Sequestration Options BR200

A bench-scale separation technique utilizing clathrates was developed to reduce carbon dioxide emissions from power-generation facilities. Carbon Dioxide gas is encapsulated inside water crystals at high pressures and low temperatures. Clathrates can be stored in the ocean at a depth below 800 meters or dissociated to obtain carbon dioxide gas.

Exhibitors:

Eby, Brenda
Haney, Bryan
Moore, Felicia
Wagner, Aaron

Sponsor: Environmental Research Institute (ERI);

Dept. of Chemical Engineering

UI Advisors: David Drown

Uranium Extraction from Molten Salt BR201

Spent fuel rods are melted in an electrorefiner where uranium fines build up on the cathode. The uranium that is taken off of the cathode consists of 90 wt% salt and 10 wt% uranium. A process was designed to extract the uranium from the salt in a semi-continuous fashion in order to obtain a high purity uranium product.

Exhibitors:

Jeffreys, Kevin
Weaver, Ryan

Sponsor: Idaho National Laboratory

UI Advisors: David Drown

Civil Engineering

Structural Design of Custom Home in Jefferson County, CO BR300

Full design of structural members for 6200 sq. ft. custom home in Colorado. Includes design of roof trusses, floor joists, interior and exterior load bearing walls, columns, foundations, door/window/garage headers, etc.

Exhibitors:

Carter, Steve
Drennen, Jesse

Sponsor: Summit Structural

UI Advisors: Ed Schmeckpeper and Roger

Ferguson

Structural Design of Custom Home (Severence, Colorado) BR301

The structural design of a large custom home (6,000-7,000 ft²) is the objective of the project. Specific topics that need to be addressed are:

- Beams and columns
- Roof, deck, and floor joists
- Foundations and basement walls
- Preparation of structural details and sections
- Possible design/detailing of expansive soils
- Design alternatives

Exhibitors:

Shaw, Mike
Ward, Ben

Sponsor: Summit Structural

UI Advisors: Roger Ferguson and Ed Schmeckpeper

Computer Science

An Architecture for Netcentric Information Assurance on the Global Information Grid BR400

The MILS project at the University of Idaho is working with many private and public sponsors to create a certifiable operating system for high-assurance deeply-embedded systems. The component presented in this poster is the non-bypassable communication mediator, allowing application level message control in a networked environment. This message router enforces the system's security policies, making covert channels, eavesdropping and other types of data manipulation impossible.

Exhibitors:

Holland, Austin
Hoover, David
Miller, Chris

Sponsor: Center for Secure and Dependable Systems

UI Advisors: Nadine Hanebutte

Double Auction Book Exchange System BR401

This project developed a web based book auctioning system. The application uses a double auction method to match sellers and buyers. It includes special features such as ISBN and book title lookup as well as buyer and seller feedback. Double auction is an economically efficient mechanism to match buyers and sellers in markets with common information. This approach is novel in that it allows both buyer and seller to place bids.

Exhibitors:

Apfelbeck, Michael
Bianco, Jim
Shu, Yang
Skoro, Vedran
Webb, Nick

Sponsor: Cody Tews

UI Advisors: Bill Junk

Fast Smart Comment Stripper BR402

During Fall 2004 Team 29 developed a Smart Comment Stripper. SCS uses a heuristic approach to determine the type of file being processed and then applies an appropriate set of rules to strip the comments. Although functionally effective, SCS as implemented suffers from performance problems that preclude its use in a large-scale production environment. This project produced a re-engineered version of SCS that runs in substantially less time.

Exhibitors:

Faler, Brad
Nadler, David
Shikashio, Doug
Triplett, Terry

Sponsor: Hewlett-Packard Co., Boise, ID

UI Advisors: Bill Junk

Project Reporting System BR 403

The Project Reporting System (PRS) is a web-based tool that supports the management of team software development projects undertaken in CS 481 at the University of Idaho. PRS automates the reporting, maintaining, and displaying of project effort data associated with CS 481 projects for a specified set of project activities. Students enter data for themselves, and PRS consolidates the data for each team. PRS gives the administrator the capability to add students, assign students to teams, add activity categories, and clear the system for a new semester.

Exhibitors:

Barrett, Brandon
Johnson, Sam
Kim, Sung-Ung
Schmidt, Jeannine
Schwenk, Brian

Sponsor: UI Computer Science Dept.

UI Advisors: Bill Junk

Smart Comment Stripper BR404

The Smart Comment Stripper tool is a robust tool to strip comments from C/C++ and Perl shell files to facilitate code turmoil reporting. It dynamically determines the type of file it is parsing and strip the appropriate comments from the file.

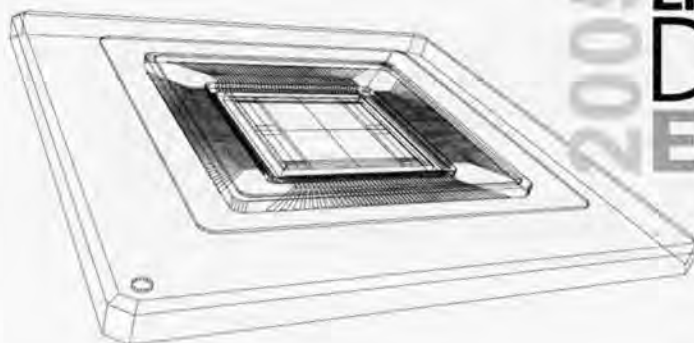
Exhibitors:

Boggs, Justin
Gonzalez, Jesse
Hanlon, Ryan
Kirkendall, Bryan
Sager, Jeff

Sponsor: Hewlett-Packard Co., Boise, ID

UI Advisors: Bill Junk

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WaveRay - Distributed Optical Ray Tracer BR405

This project extended the prior work on the Optical Ray Tracer (ORT) to allow the computations to be distributed over multiple processors or multiple computers.

Exhibitors:

Booth, Ann
Henry, Kevin
Mosby, Fred
Mues, Brad
Phillabaum, Adam

Sponsor: Cody Tews

UI Advisors: Bill Junk

Weather Chart Digitizer BR406

This project developed an application that scans a pen recorder weather chart and then digitizes the trace on the chart. Digitized data can then be stored in a database for analysis or recall.

Exhibitors:

Ambrose, Pat
Dehghan, Arash
Lowry, Adam
Lund, Layne
Schafer, Kevin

Sponsor: Myron Molnau

UI Advisors: Bill Junk

Electrical & Computer Engineering

High-Voltage High Slew-Rate MOSFET Op-Amp Design BR500

The goal of this project is to explore ideas for the design and physical implementation of high-voltage high slew-rate MOSFET Operational Amplifiers.

Exhibitors:

Mentze, Erik
Phillips, Jennifer

Sponsor: Apex Microtechnology

UI Advisors: Herb Hess

Materials & Science Engineering

Biodegradable Fishing Equipment by Powder Metallurgy BR600

We mixed powdered Mater-Bi with iron powder in varying percentages, pressed the mixed powders, and sintered them at different temperatures. The different fabrication conditions will yield different strengths and other properties. The results identify which mixture will maximize density and strength. These parameters were investigated further to examine loss of strength with increase of density.

Exhibitors:

Gallagher, Lance
Mackowiak, Brady

Sponsor: Western Sintering

UI Advisors: Sam Froes

Diffusion of In into Ni/Cu substrates BR601

Researchers will perform a quantitative analysis of the thickness of Indium diffusion into Ni/Cu substrates as a function of aging time and temperature. We will also calculate the corresponding diffusion rate, time exponent (n), and diffusion mechanisms.

Exhibitors:

Bates, Nathaniel
Essiam, Kobina
Guifarro, Walther
Hasz, Torin
Mackowiak, Brady
Miller, Kelsey
Ramere, Kabelo

Sponsor: Honeywell

UI Advisors: Keith Prisbrey

Evaluation of Silver Electrodes Manufactured by the Powder Metallurgy Process BR602

A metallographic evaluation of silver PM electrodes has been made. The four supplied samples were made using a vibratory compaction/graphite mold approach. Variables evaluated included the raw powder material and the atmosphere utilized during the sintering process (Hydrogen versus dissociated ammonia). The study involved looking for differences in the sintered structures for the four materials; in particular optimum bonding (small rounded pores) of the powder particles was desired. The goal of the program is to produce an acceptable manufacturing process for a commercial company. Western Sintering Co., Inc. of Richland, WA.

Exhibitors:

Harmon, Caleb

Sponsor: Western Sintering Inc.

UI Advisors: Sam Froes

Flexible Keyboards Utilizing Piezoelectric Materials BR603

Our objective was to classify flexible piezoelectric materials. Pressure on a piezoelectric material would produce a signal to the computer. The procedure was to grow crystals and measure the piezoelectric signal strengths. The results were the growth of Sodium Potassium Bi-Tartrate crystals. The conclusions were that flexible keyboards are possible.

Exhibitors:

Bates, Nathaniel L.

Sponsor: Materials & Science Engineering

UI Advisors: Keith Prisbrey

Growth and magnetic properties of c-axis oriented barium ferrite film on (111) MgO underlayer BR604

C-axis oriented barium ferrite (BaFe₁₂O₁₉, BaM) film for monolithic microwave integral circuit (MMIC) applications was developed using an MgO (111) underlayer on a silicon substrate.

Exhibitors:

Gee, Sung Hoon
Lyle, Andy
Stuck, William

Sponsor: Office of Naval Research

UI Advisors: Yang-Ki Hong

Roll Up Keyboards Utilizing Piezoelectric Materials BR605

Our objective was to classify flexible piezoelectric materials. Pressure on a piezoelectric material would produce a signal to the computer. The procedure was to grow crystals and measure the piezoelectric signal strengths. The results were the growth of Sodium Potassium Bi-Tartrate crystals. The conclusions were that flexible keyboards are possible.

Exhibitors:

Bates, Nathaniel

Sponsor: Materials & Science Engineering

UI Advisors: Keith Prisbrey

Mechanical Engineering

Acoustical Intake Manifold Testing P29 (located with vehicle)

An acoustical analysis of the FSAE intake manifold has been conducted to determine natural frequency, increase volumetric efficiency, and broaden the power band.

Exhibitors:

Kleppen, Shane
Watson, Ryan

Sponsor: College of Engineering

UI Advisors: Dan Cordon

Analytical Suspension Design P26 (located with vehicle)

This project was undertaken to determine the optimum suspension design for the University of Idaho Formula SAE car based on roll center migration, and camber gain.

Exhibitors:

Hixson, Andrew
Johnson, Justin
Sagen, Jason

Sponsor: College of Engineering

UI Advisors: Dan Cordon and Edwin Odom



FSAE Frame Rigidity P27 (located with vehicle)

We have conducted an experiment to determine the rigidity of the 2005 FSAE Formula race car. Particular attention was given to the influence that the engine and the seat have on the rigidity of the frame.

Exhibitors:

- Bliss, Ryan
- Dvoracek, Kristen
- Kovanda, Ben

Sponsor: College of Engineering

UI Advisors: Edwin Odom

FSAE Suspension Performance Testing P28 (located with vehicle)

Our team tested different suspension adjustments to determine their contribution to overall vehicle performance. This involved use of an on-board data acquisition unit that measures lateral and longitudinal forces when the car is driven over a specified course.

Exhibitors:

- BeDunnah, Jayson
- Daniels, Scott
- Luke, Rust
- Robinson, Tyler
- Zmuda, Benjamin

Sponsor: College of Engineering

UI Advisors: Dan Cordon and Edwin Odom

Learning Leadership - Advanced Vehicle Concepts Team BR701

AVCT is a multidisciplinary team with students at all levels as members. This project has been a study of how to lead as well as manage a team of students, amidst busy schedules and challenging projects.

Exhibitors:

- Stobie, Joel

Sponsor: NIATT

UI Advisors: Frank Albrecht

Graduate Students All Disciplines

Bacterial Spore Transport and Tension through Unsaturated Porous Media BR800

Bacillus cereus spores (similar to the spore that causes anthrax disease and often used as a terrorist bio-weapon) will be used in sand column experiments to generate both a breakthrough curve and spore depth distribution profile. This data will be used to calibrate an existing mathematical model called HYDRUS 1D for unsaturated colloid transport.

Exhibitors:

- Scherling, Elizabeth

Sponsor: INL (INEEL)

UI Advisors: Barbara Williams

Development of a Monopropellant Micro-Nozzle in Low Temperature Co-Fired Ceramic Tape BR801

Micro-satellites are capable of the same tasks as a full-size satellites but require smaller thrusters for 'station-keeping'. This work describes the development of a hydrogen peroxide powered micro-propulsion device using Low-Temperature Co-Fired Ceramics (LTCC). The design has been modeled in CFD and validated with experimental data using cold nitrogen gas.

Exhibitors:

- Plumlee, Don

Sponsor: NASA Idaho SpaceGrant

UI Advisors: Judi Steciak and Amy Moll

Engine Performance and Emissions Testing of an Aqueous Ethanol Fueled Transit Van PL25

Catalytic ignition systems allow combustion initiation over a much wider range of stoichiometry and water composition than traditional spark ignition systems. The platform explored in this research is a transit van previously converted to operate on either gasoline or aqueous ethanol. Chassis dynamometer tests are underway to compare thermal efficiency, NO_x, CO, and hydrocarbon emissions from aqueous ethanol mixtures with gasoline.

Exhibitors:

- Cordon, Dan
- Olberding, Jeremy

Sponsor: NIATT, Valley Transit, and ITD

UI Advisors: Steve Beyerlein

Investigation on Optical Toner Level Sensing & Toner Flow Modeling BR802

Design of Experiments was applied to investigate the factors that have significant impact on the variation of Optical Toner Level Sensing (TLS) signals. Discrete Element Method (DEM) was proposed to model toner flow.

Exhibitors:

- Ren, Hong

Sponsor: LaserJet Supply R&D, Hewlett Packard

UI Advisors: Larry Stauffer

Poster Exhibits continued on page 22



*The Idaho Section of the American Nuclear Society—
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Nuclear Science, Engineering, and Technology*



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Utilizing DOE Strategy to characterize tolerance stacking issues on products manufactured overseas BR803

Abstract Characterizing a product that is manufactured overseas creates many new challenges for the manufacturing engineer. The engineer must face not only the typical challenges of a designed experiment of what to vary, but must face many additional challenges that engineers with local part manufacturing don't. Understanding how to overcome the barriers of cultural differences, miscommunication, visualization of the manufacturing process without first hand knowledge, evaluating the challenges of the manufacturing process, understanding the relationship of manufacturing to design tolerance, and executing the designed experiment within a reasonable time frame are some of the challenges presented in this article. This article will detail the methodologies used to overcome the challenges of characterizing tolerance stacking issues on a manufactured part and will detail the results of the designed experiment.

Exhibitors:

Philipps, Becky

Sponsor: UI Engineering Boise

UI Advisors: Larry Stauffer

High School

Solar Powered Plane BR900

In this project a glider was built to be launched from an electromagnetic device. To sustain flight the plane is powered by a solar cell that runs a small electric motor. The objective was to use alternative fuel sources to launch and fly a simple airplane.

Exhibitors:

Blount, Pat

Physics Class, Moscow High School

Stuck, William G.

Sponsor: Rotary

UI Advisors: Keith Prisbrey

Expo 2005 Awards Reception Student Union Building - Ballroom

3:30 pm Social

4:00 pm Awards

Special Recognitions

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Poster Awards

Technical Session Awards

People's Choice Award

Innovation Award — Idaho Research Foundation

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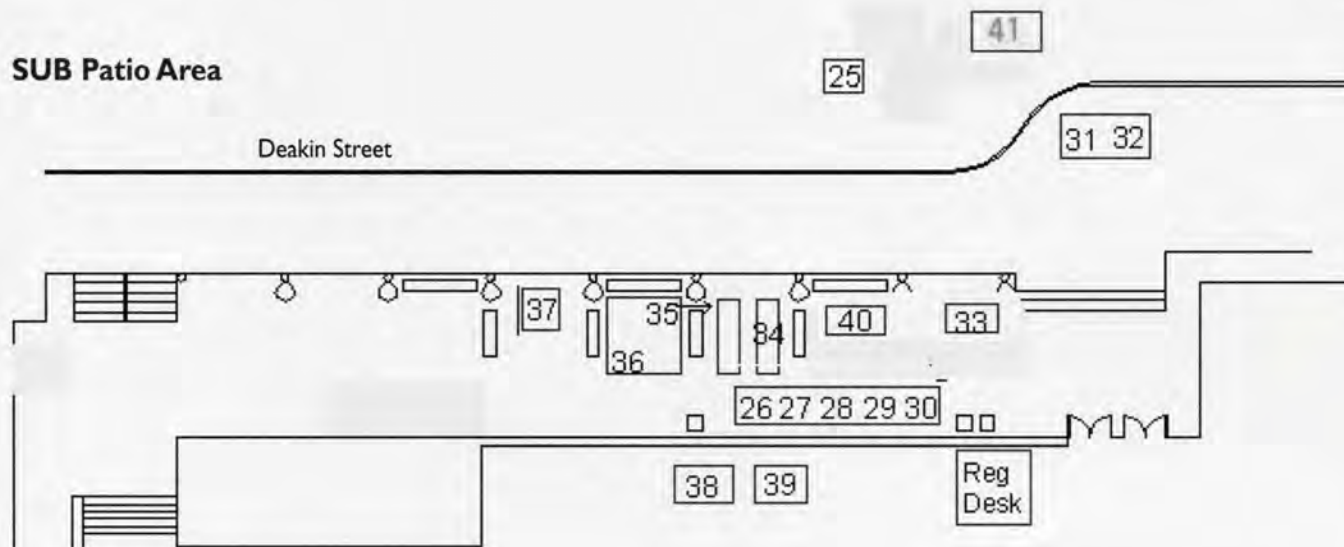
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Wagstaff Engineering

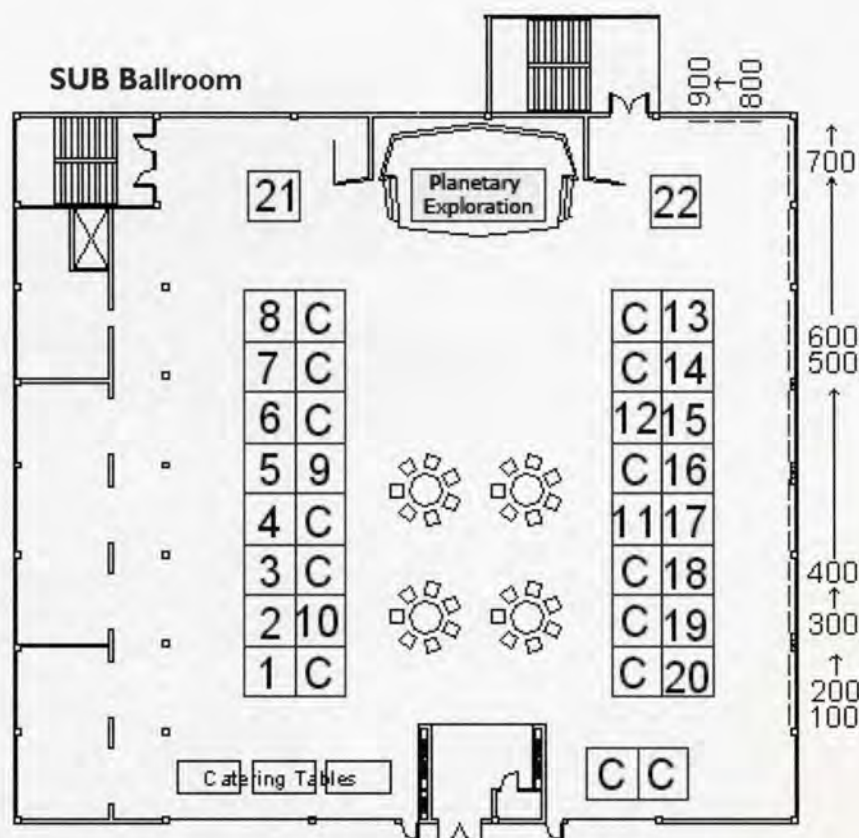
Spokane, WA



SUB Patio Area



SUB Ballroom



Exhibitors

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Post Falls, ID
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Coeur d'Alene, ID
TechHelp
University of Idaho, Boise, ID
College of Agricultural & Life Sciences
University of Idaho
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200: ChemE	500: Electrical	800: Graduate
300: Civil	600: Materials Science	900: High School

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