



## Feasibility of Biodiesel Production Facility to be Studied

Interest in grease trap & waste cooking oils remains high as feedstock for biodiesel production. A CRADA will bring the Naval Air Weapons Center and Biodiesel Development Corporation ("BDC") together to evaluate the feasibility of establishing biodiesel production facilities in Nevada and California utilizing grease trap and high free fatty acid used cooking oils as feedstocks. The investigation will focus on three areas of feasibility: (1) technical, (2) marketing and, (3) legal. The objective is to assess the suitability and availability of feedstocks relative to receptive biodiesel markets with favorable legal and regulatory environments, and ultimately to determine viable locations for biodiesel production facilities using high free fatty acid degraded vegetable oils as feedstocks.

Under the terms of a recently executed CRADA, this project will be undertaken in cooperation with the

Naval Air Weapons Center at Point Mugu, CA with Dr. Mike Sullivan as the Navy's designated project liaison.

The grant recipient, Biodiesel Development Corporation ("BDC"), has acquired the exclusive license for a continuous flow process (commonly known as the "Phaster" process) for producing biodiesel from very high free fatty acid ("hffa") feedstocks. The Phaster process has been successfully demonstrated on a bench scale and BDC has begun construction of a process demonstration unit (PDU) in cooperation with the inventor of the process, Dr. David Boocock, at the University of Toronto. As part of the CRADA with the US Navy, BDC will be operating the PDU at Pt. Mugu and will attempt to scale the PDU for military use as a deployable biodiesel production facility.

Successful implementation of the Phaster process will eliminate one of the principal barriers to market acceptance of biodiesel by substantially lowering its price and improving emission characteristics.

The market place barrier is not unique to biodiesel and has been recognized by the U.S. Department of Energy as an impediment to alternative fuels generally; as a corollary, they have also recognized the beneficial effects of equalizing the price between traditional and alternative fuels.

"An oil price rise could well cause dramatic changes in relative prices between gasoline and a number of alternative fuels, resulting in natural

### From the Regional Coordinator's Desk



The annual meeting for the Far West Region will be held in Bellevue, WA. As usual Training will be a major part of the meeting. Our meeting/training will be held in conjunction

with: The Fall National SBIR Conference, The 11<sup>th</sup> Annual Technology 2000 Conference & Expo, and The 3<sup>rd</sup> Annual Small Business Tech Expo. What a combination to achieve the leverage and the interfacing that ORTAs and laboratory members need to network and experience to maximize their performance and resources.

The FLC Far West Regional Fall Training Workshop—Client Development: Marketing & Sales—Relationships & Results, will be conducted by Art Mortell of Dynamics of Human Potential on Wednesday, November 1, 2000 in the afternoon. This workshop will show you how to build positive client relationships by developing new marketing strategies and selling skills. By improving your performance and raising your activity level you will increase your results. I will conduct a short Far West Region business meeting on Wednesday in the morning.

In conjunction with the National SBIR Meeting and the Small Business Tech Expo, the Region will staff the Far West Regional display booth. Some unique technologies will be demonstrated. Also the Region will have a

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# NASA DEVELOPING "SNAKEBOT" TO EXPLORE AND BUILD IN SPACE

**N**ASA Ames Research Center engineers are developing an intelligent robot snake that may help explore other worlds and perform construction tasks in space. The robot serpent, able to independently dig in loose extraterrestrial soil, smart enough to slither into cracks in a planet's surface and capable of planning routes over or around obstacles, could be ready for space travel in five years, NASA engineers predict.



"The snake will provide us with flexibility and robustness in space," said Gary Haith, lead "snakebot" engineer at NASA's Ames Research Center located in California's Silicon Valley. "A snakebot could navigate over rough, steep terrain where a wheeled robotic rover would likely get stuck or topple."

"One of our first steps was to make a simple mechanical test snake, and we constructed it in less than a day thanks

to previous work at other labs," said Haith. "It is a direct model of a 'polybot' developed by Mark Yim of Xerox Palo Alto Research Center, Palo Alto, CA, with whom we are cooperating. We have slightly different electronics in our version."

Robotic serpents can "inchworm" ahead, can flip themselves backward over low obstacles, can coil and can side-wind, Haith said. "Future work will enable the snake to become a mast or a grasping arm. A rover would need to have a dedicated mast and arm that would cost extra weight, money and time."

"The key part of what we are striving for in the second snakebot version and beyond is sensor-based control in which the robot uses its sensors to decide what to do," Haith said. "In coming years, we hope to make snakebot

muscles out of artificial plastic or rubber materials that will bend when electricity is applied to them," he added. "This design change will reduce the snake's weight considerably, and the robot would be very robust, like an automobile tire."

**For more robotic snake information:** <http://ic-www.arc.nasa.gov/ic/snakebot/>

**Contact: John Bluck (650) 604-5026**

## AFRL and DOE Team For Cleaner Air

**T**he Air Force Research Laboratory and the Department of Energy will soon be working together on fuel research to reduce pollutants in the air. AFRL's Propulsion Directorate's Fuels Branch will sign a Memorandum of Understanding with DOE's National Energy and Technology Laboratory (NETL) to research, develop and demonstrate clean aviation fuels to reduce pollutant emissions. Research will be conducted on the effects of sulfur on particulate (smoke and soot) formation; strategies such as additives and new fuel blends to reduce these particu-

lates; and the impact of these strategies on the cost of making cleaner jet fuels.

The research will be done as part of the DOE's Ultra Clean Transportation Fuels initiative. The Ultra Clean Transportation Fuels initiative is a \$100 million national effort develop fuel technologies that will enable ground vehicles, marine vessels and aircraft to significantly reduce their pollutant emissions. The collaboration between AFRL and DOE includes aviation turbine fuels.

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# Laboratory Profile

## NASA Jet Propulsion Laboratory

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 Success Stories: [http://technology.jpl.nasa.gov/news/news\\_index.html](http://technology.jpl.nasa.gov/news/news_index.html)

### About

The Jet Propulsion Laboratory is a major national laboratory, with an obligation to serve society by providing significant technological innovations where our special skills can make a contribution. JPL technology research programs enrich the success of space missions. Besides this work for NASA, we also conduct a wide range of activities for other sponsoring organizations. The American public and U.S. industry greatly benefit from JPL developed technologies that are transferred into healthcare, the environment, education, communications, transportation, computers and other fields.

### Background

The Jet Propulsion Laboratory (JPL) has been a NASA Field Center since NASA was created in 1958. JPL, an operating division of the California Institute of Technology (Caltech), performs research, development and related activities for NASA. The people of JPL share a common objective: research and development in the national interest.

### Mission

Three characteristics shape JPL's philosophy, mission and goals: As part of Caltech, JPL pursues the highest standards of scientific and engineering achievement. Excellence, objectivity and integrity are the guiding principles. As NASA's lead center for unmanned exploration of the solar system, JPL directs unmanned planetary missions for the United States. JPL helps the US solve technological problems and performs research, development and spaceflight activities for NASA and other agencies.

### Areas of Expertise

- Solid state electronics
- Detector Systems
- Opto-Electronics
- Optics
- Optical and Digital Image Processing
- Telecommunications
- Concurrent and parallel computers
- Fault tolerant computers
- Neural Networks
- Real-time systems
- Information system architecture and engineering
- Autonomous systems
- Energy conservation, storage and power
- Chemical systems and processes
- Materials
- Mechanical and Thermal Systems
- Control systems, applications, analysis and design
- Propulsion
- Astrodynamics and spaceflight navigation
- Operations Technology
- Integration and Test Engineering
- Mission Design
- Systems Engineering
- Environmental compatibility engineering
- Reliability engineering
- Spacecraft and space instrument system safety
- Aerospace nuclear safety and launch approval engineering
- Metrology

### Facilities and Resources

JPL occupies approximately 165 acres of land at the central laboratory as well as several off-site facilities. Approximately 190 separate buildings house laboratories that support every facet of the development of unmanned spacecraft existing at the central laboratory facility. Over 5500 persons are currently employed in the pursuit of the laboratory efforts.

Laboratories are generally available to US private sector interests on a non-interference basis with ongoing mission activities. A first-come, first-served uniform treatment of private US interests prevails for the limited laboratory resources on a cost-reimbursable basis.

### Meet the NASA Representatives

Visit with representatives from NASA JPL and other NASA Centers at Booth #101 in the **Technology 2000 Exposition**. Of special interest will be their joint presentation with the Ames Research Center and the Dryden Flight Research Center on NASA's "Golden Triangle" of Technology. The three elements of the "Triangle" are biotechnology, nanotechnology and information technology. Don't miss this presentation!

# Universities & INEEL Announce Collaborative Research Projects

**T**hirteen research projects have been selected for initial funding as part of the first joint collaborative effort between the Inland Northwest Research Alliance and the Department of Energy's Idaho National Engineering and Environmental Laboratory.

This research is oriented toward gaining a better understanding of subsurface conditions and various contaminants present at the INEEL site 50 miles west of Idaho Falls, as well as other Department of Energy facilities. The goal is to develop environmental cleanup methods that can be used in a variety of applications.

INRA funding for the projects will total about \$3 million over three years and fund Ph.D. and postdoctoral researchers who will work on collaborative projects, and the various INRA member institutions will contribute another \$1 million toward the success of the projects. These young researchers will spend time on their projects at the INEEL

and at the various INRA institutions. These collaborative projects are designed to stimulate additional collaborations between the faculty at the INRA member institutions and the researchers at the INEEL, and to prepare a new work force for the INEEL.

"We hope to use these projects to help build the science base for the laboratory, as well as new funding opportunities for our institutions," says James Petersen, interim executive director of INRA.

Seven universities formed the Inland Northwest Research Alliance (INRA) in the spring of 1999. The member universities include Boise State, Idaho State, University of Idaho, Montana State, University of Montana, Utah State and Washington State.

**Contact: Teri Ehresman, (208) 526-7785**

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## Zuccarelli's Holophonics Spin-Offs For Governmental Applications To Be Shown At Seattle Expo

**T**he next generation of the Holophonics Technology will be spin-offs that are the first wearable Virtual Reality (VR) acoustical sensors for applications described below. The spin-offs are non-binaural and non-head-transfer-function 3D sound hologram designed to realistically reproduce the cognitive sensorial response of the human hearing system. Holophonics spin-offs can be heard in certain cases, by the hearing impaired and in other extra-ordinary cases, by the profound deaf.

A live demonstration of a Holophonics spin-off recording will be performed at the FLC Far West Region Booth #608 at Technology 2000, Seattle, WA. Holophonics inventor Hugo Zuccarelli will be available to answer questions. He is also negotiating a CRADA with Dr. Mike Sullivan, Naval Air Warfare Center – Weapons Division.

Zuccarelli Advanced Technologies of Woodland Hills, CA, the company that introduced the revolutionary technology in the 80's to the British Record Industry (Pink Floyd, Roger Waters, etc.) announced a new version of its Holophonics pick-up device, designed as a wearable detector. This device is now known as the Virtual Reality

Sound Monitoring Device (VRSMD).

A long list of immediate Spin-on and Dual-use applications exist in areas of Medical Bionics, Safety, Intelligence, Robotics, Public Safety, Battlefield Safety Human Resources, Training and Education. Some specific examples include: Tri-dimensional hearing aids restoring the sense of normal hearing to a variety of deaf subjects, including hearing problems associated with the so-called "cocktail party effect;" Earthquake detection system for advance warning; VR Modeling and Simulation to enhance the realism on the virtual environment, such as in-flight simulators, battlefield conditions, and civilian transportation; Navigational systems for blind persons that can transform radar or laser information into 3D blips of sound; and 3D Sonic Periscope for tanks and armored vehicles.

For more information on Holophonics and the many applications contact:

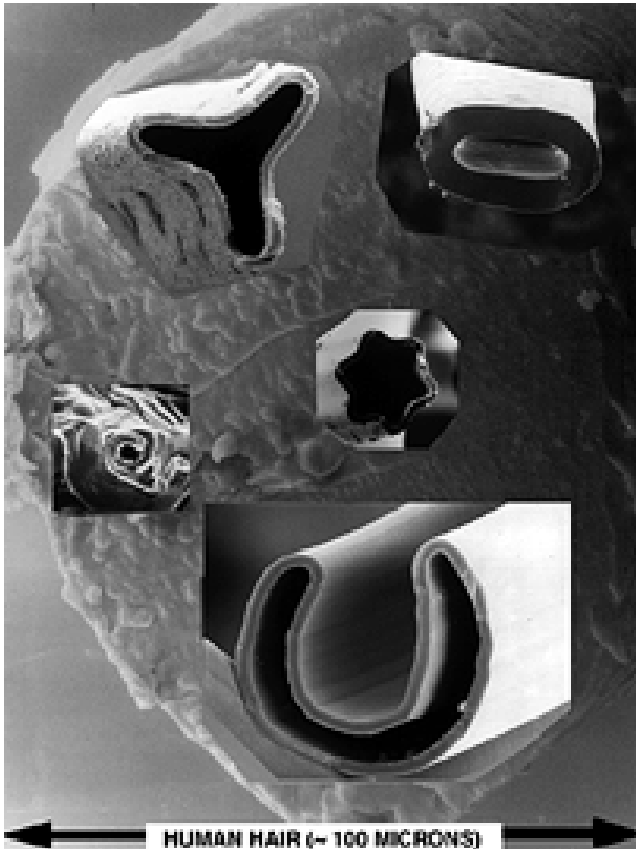
**Hugo Zuccarelli at [Zuccarelli@Yahoo.com](mailto:Zuccarelli@Yahoo.com)**

**Contact: Dr. Mike Sullivan at (805) 989-9208**

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# Microtube Technology has Diverse Applications

Dr. Wes Hoffman at Edwards AFB, CA, in the Propulsion Directorate, developed microtube technology and has been issued five patents. One advantage of this technology is that tubes can be crafted rather inexpensively out of practically any material in a variety of precise cross-sectional and axial



shapes. Microtubes have significant potential for both the warfighter and commercial industry. It is not hard to envision a microscopic world filled with mechanical devices, such as the accelerometer manufactured as a sensor for air-bag actuation, micro-fluidic devices, biosensors for glucose, and disposable blood pressure sensors that are inserted into the body.

Microtubes are so small that dozens can fit into the diameter of a single hair strand of human hair. In contrast to tubing currently available on the market, microtubes can be crafted from almost

any material with precisely controlled composition, diameter, and wall thickness in a range of lengths. To date, tubes ranging in sizes from 0.5-410 microns have been made from metals, such as copper, gold, and platinum; ceramics, such as carbon, sapphire, and silicon nitride; glasses; polymers; alloys; and layered combinations. The application of microtubes works equally well for high and low temperature materials.

The microtube process does not involve pultrusion, extrusion, or drawing, but rather a simple fugitive tube-forming process. This allows for cross-sectional shapes and wall thickness to be accurately controlled to a fraction of a micron, something not possible with other available processes. It also allows the fabrication of tubes with almost any axial geometry. The maximum length of the tubes is yet to be determined, depending on many variables. However, for most applications conceived to date, the length need only be a few centimeters.

Contact: Ranney Adams (661) 275-5465

# Sensors Monitor White-Hot Aircraft Brakes

"Too hot to handle" is no mere cliché for Air Force pilots and ground crews when an F-16 comes in for a landing. Heavy braking stops the plane in time but can produce high temperatures that risk rupturing tires or igniting fuel during refueling for quick turnaround missions.

Early warning of such risks soon will be possible with a sensor system under development at the Department of Energy's Pacific Northwest National Laboratory (PNNL). The prototype sensor system will allow ground crews to measure an F-16's brake temperature as it lands and help the crew and pilot prepare for the worst if brakes approach 1,800 degrees Fahrenheit, which could produce a hot brake emergency.

"Pilots need to know the level of risk they face during a landing so they can determine if they should taxi away from other aircraft," said Jim Skorpik, PNNL chief engineer. "And once a fighter plane is safely down, if ground crews need to refuel for the next mission, they can check the sensor system to see if the brakes have cooled sufficiently."

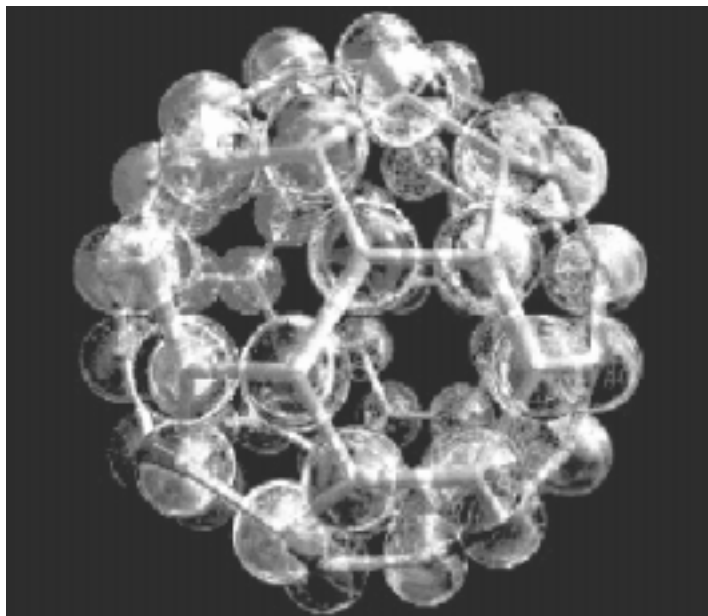
The sensor system addresses these risks by coupling a temperature sensor that can detect temperatures up to 2,000 degrees Fahrenheit with a radio-frequency tag.

Contact: 1-888-375-PNNL or e-mail: [inquiry@pnl.gov](mailto:inquiry@pnl.gov)

# Buckyballs Are Back In The News

The following is an excerpt from the Berkeley Lab Currents article: "First Transistors from Single Buckyballs Made at Berkeley" by: Lynn Yarris

The first transistors to be fashioned from a single "buckyball" — a molecule of carbon-60 — have been reported by a team of Berkeley Lab and UC Berkeley researchers.



Taking advantage of a phenomenon that is largely viewed as a problem by the electronics industry, the research team created a separation between two gold electrodes that was about one nanometer (one billionth of a meter) across. This tiny gap could accommodate the insertion of a single buckyball in order to create a molecular-sized electronic device.

"Nature long ago solved the problem of making electronic devices on a molecular scale, and we're now beginning to learn how to do things the way nature does," says Paul McEuen, a physicist who holds joint appointments with Berkeley Lab's Materials Sciences Division and UC Berkeley's Physics Department.

McEuen was one of the coauthors of a paper in the Sept. 7 issue of the journal *Nature* that described this research. The other authors were Hongkun Park, Jiwoong Park, Andrew Lim, Erik Anderson, and Paul Alivisatos.

The ability to use individual molecules as functional electronic devices is a much coveted prize in the computer industry because of the potential for dramatically shrinking the silicon-based microelectronic systems of today.

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## High Tech Defense Laboratory to Remain an Economic Engine in the Sacramento Region After Base Closure

The Defense Microelectronics Activity (DMEA) has opened their new Flexible Foundry that will enable the laboratory to make semiconductor based integrated circuits. These devices will ensure that the Department of Defense, other government organizations, and the nation's allied countries will be able to maintain the systems that depend on microelectronics.

Microelectronic technology plays a vital role in our nation's weapons systems, yet it is so dynamic and now obsolesces itself every 18 months. Continuing legislative support for approved projects will enhance DMEA's ability to keep pace with the rapid

changes occurring in the commercial semiconductor industry. The DMEA projects will provide great opportunities for public-private ventures and help add to the already significant contributions that are being made to the community.

DMEA will remain in place after McClellan Air force Base closes it gates July 13, 2001. Support by congressional and community leaders will enable this organization to serve as an economic engine as new businesses are attracted to the base property that is being redeveloped.

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### *Feasibility of Biodiesel Production*

fuel switching if the conditions enabling motorists to switch fuels are in place. Comparative historical movements in relative prices for alternative fuels and their feedstocks show clear divergences in price movements from crude oil and gasoline, particularly for electricity, ethanol, and methanol."

The implied negative "divergence" of alternative fuel prices in the above citation may be reversed with regard to biodiesel for the benefit of consumers by using the Phaster process.

**Contact:**  
**Dr. Mike Sullivan at (805) 989-9208**

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# Lawrence Livermore Lab Pioneers Advanced Radiation Treatment for Cancer

**M**ankind will soon have another weapon in the 4,000-year fight against cancer. Clearance has been granted by the U.S. Food & Drug Administration for an advanced method for targeting tumors with radiation treatment developed by researchers at the U.S. Department of Energy's Lawrence Livermore National Laboratory.

Dubbed Peregrine — after the patron saint of cancer patients — the technology could eventually save thousands of lives each year by helping doctors direct more radiation at tumors, with minimal damage to surrounding healthy tissue. NOMOS Corporation, a leading supplier of radiation treatment technologies located in Sewickley, PA recently received U.S. Food & Drug Administration clearance to produce and market Peregrine systems to the medical community.

Secretary of Energy Bill Richardson made the announcement October 6 at NOMOS headquarters. "Peregrine could change the way cancer is treated in America," said Secretary Richardson. "This technology was developed through advances resulting from nuclear weapons research

and with the multidisciplinary scientific expertise of a Department of Energy national laboratory. This is an excellent example of turning swords into plowshares."

Peregrine has been under development at Lawrence Livermore since 1994, in collaboration with researchers at the University of California, San Francisco and other academic institutions.

## More Radiation Where It's Needed

Peregrine is a computer-based system for calculating, in three dimensions, where radiation goes in the body, and how much of it is striking tissue, bone or empty cavities. Peregrine will allow doctors to more accurately target tumors with radiation, permitting physicians to increase the dose needed to destroy tumors without increasing damage to healthy surrounding tissue.

To find out more about NOMOS and its treatment planning and delivery products, visit the NOMOS website at [www.nomos.com](http://www.nomos.com)

**Contact: Susan Houghton (925) 422-9919**

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# INEEL Nuclear Engineer Receives American Nuclear Society Women's Achievement Award

Kathryn McCarthy, INEEL manager of the Nuclear Engineering Design and Research Department in the Advanced Nuclear Energy Directorate, has been nominated to receive the 2000 American Nuclear Society Women's Achievement Award. The presentation will be made at the ANS awards luncheon Nov. 14 in Washington, D.C.

The award recognizes outstanding personal dedication and technical achievement by a woman for work she has performed in the fields of nuclear science, nuclear engineering, research and education.

McCarthy came to the Idaho National Engineering and Environmental Laboratory in 1991. With a Ph.D. in nuclear engineering, she has worked in the INEEL Fusion Safety Program focusing on examining the behavior of the materials in the plasma facing components of proposed fusion reactors. She also leads a number of important experimental projects that have contributed to an understanding of the consequences of fusion reactor accidents. She became a department director in 1998.

She has worked at the Kurchatov Institute in Moscow, the Efremov Institute in Leningrad and the Latvian Academy of Sciences in Riga, and has participated in numerous national and international fusion energy conferences and symposiums and authored or co-authored more than three-dozen journal articles.

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continued from page 1: **From the Regional Coordinator's Desk**

one-on-one table which will allow the ORTAs and laboratory personnel to meet with hundreds of business representatives who will be attending the conferences.

This is the joint conference to attend this fiscal year to optimize your tight operating and travel budgets. New technologies will be demonstrated and hundreds of potential partners will be attending the co-located events.

The CORE 21 project is winding down. Surveys and questionnaires have been returned.

Matching company needs with laboratory and academic resources and technologies is taking place and referrals will be made to the companies. During FY 2001 companies will be surveyed in the following greater metropolitan areas: Seattle, San Francisco,

Los Angeles, San Diego, Tucson, and Phoenix. The needs of the companies will be matched with the Far West laboratory's technologies, resources, and assets. It is important for the ORTAs to position their labs with accurate information to help in the matching process.

Rick Shindell from our regional support staff (DelaBarre & Assoc., Inc.) is the person to interface with to emphasize the areas that you would like your lab to market or stress in the matching process. The Region is working with the Department of Commerce to complete the survey, study, and matching. Also the Region is working with Small Business Development Centers (SBDC) to assist companies and laboratories who want to do business with overseas customers and partners.

## Upcoming Events

*November 8-11, 2000*

### 2000 Conference of State Sponsored Seed and Venture Funds

*Honolulu, HI  
403-843-6550 \* admin@nasvf.org*

*November 28-30, 2000*

### Inventing, Patenting, and Licensing

*Los Angeles, CA  
www.unex.ucla.edu/shortcourses/fall2000/  
inventing\_patenting\_fa00.htm*

*February 15-20, 2001*

### 2001 AAAS Annual Meeting and Science Exposition

*San Francisco, CA  
www.aaas.org/meetings*

*April 30-May 4, 2001*

### "FLC & Beyond" — the FLC 2001 National Meeting

*Burlington, Vermont  
856-677-7727 \* snacci@utrsmail.com*

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