

summer 2007



Colorado Center for  
Biorefining and Biofuels



## NEW SPONSOR COMMITMENTS BOOST C2B2

The Colorado Center for Biorefining and Biofuels (C2B2) recently received commitments from 16 new sponsors, giving the organization a big boost in its quest to become the world's leading center in biorefining and biofuels research and education.

C2B2 is unique in its research pool, combining as it does the research skills of three universities — the University of Colorado (CU), Colorado State University (CSU), Colorado School of Mines (CSM) — and one national research laboratory — National Renewable Energy Laboratory (NREL).

The business community has recognized the potential impact of tapping into this wealth of knowledge, and has signed on at an unprecedented rate. With 27 sponsors, C2B2 has the largest number of business sponsors of any biofuels research center in the U.S.

This unique combination of sponsors, ranging from chemical and energy

industry heavyweights to smaller bioenergy companies, makes for an effective mix. Each organization pays to join and in return becomes both a sponsor and a partner with C2B2, receiving a variety of valuable opportunities, including:

- **Center Sponsorship:** Sponsors pay a set fee to join and participate in the center. Fees are used to fund shared, precompetitive research. Center sponsors are provided with the opportunity to access, on a non-exclusive basis, right-to-practice Intellectual Property (IP) rights.

- **Directed Sponsored Research:** Sponsors may also choose to fund competitive research through C2B2. The Center provides a mechanism for one-stop shopping; expertise at the four institutions is accessed through a single point of contact, facilitating interdisciplinary projects.

According to Alan Weimer, C2B2's executive director, "C2B2's four

institutions combine their faculties and laboratory resources to provide sponsors research and development in biorefining/biofuels on a scale that no university in the world can manage on its own." Add to that the resources of sponsors and C2B2 stands positioned as a cooperative research and educational center second to none and able to capitalize on research thrusts in the following areas:

- Plant Biotechnology and Crop Sciences
- Biochemical Engineering
- Process Engineering
- Thermochemical Engineering
- Product Engineering
- Systems Analysis

C2B2 is off to a flying start. On September 11 and 12, members and sponsors will set the course for the coming year by engaging in seed grant proposal evaluations and strategic planning (see related article on page 3). The growing list of new sponsors adds momentum to the organization and brings Colorado one step closer to becoming an international hub of biofuels research.

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For more information on becoming a sponsor of C2B2, please contact:  
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Colorado Center for Biorefining and Biofuels  
E-mail: [c2b2@colorado.edu](mailto:c2b2@colorado.edu)  
Phone: 303-709-8929

### C2B2 Sponsors

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Solix Biofuels  
Suncor  
UOP  
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# C2B2 GOES BIOPROSPECTING FOR RENEWABLE TREASURES

Natural gas wells and oil field discoveries have provided the American West with a colorful history of humans mining treasures from the earth. As these finite sources become more scarce, modern pioneers, including a group of bioprospectors from C2B2, now search for renewables that could be converted into biofuels.

Under the direction of Matthew Posewitz, research professor at the Colorado School of Mines (CSM) and visiting research scientist at the National Renewable Energy Laboratory (NREL), a group of scientists recently traveled to the Great Salt Lake as part of the initial thrust of a C2B2 research project titled "Biofuel Production Using Microalgae with High Photosynthetic Conversion Efficiencies."

What they found was promising. "We found, brought back and are currently evaluating 20 strains of microalgae," says Posewitz.

Microalgae represent a particularly intriguing option for the biofuels industry because these photosynthetic organisms have the capability of accumulating biomass with high yields and low water requirements. Add in the fact that these organisms were found in highly saline conditions and you have a huge upside.

"The opportunity exists to take fresh water out of the equation, saving this precious resource for other uses," adds Posewitz.

## Microalgae a Hot Topic

Studied from 1978 to 1996 by the U.S. Dept. of Energy (<http://www.nrel.gov/docs/legosti/fy98/24190.pdf>) for its potential as a renewable transportation fuel, microalgae have recently become a hot topic as evidenced by the growing number of calls and e-mails on the subject received by Posewitz.

Microalgae are capable of using photosynthesis to fix CO<sub>2</sub> into energy-rich organic molecules. Several species grow under saline conditions. Microalgae have some of the highest photosynthetic conversion efficiencies reported and contain the enzymatic machinery for CO<sub>2</sub> fixation, anaerobic fermentation, and H<sub>2</sub> production. With a flexible and versatile metabolism, microalgae are able to store carbon and energy in the form of starch and/or lipids.

Algae have advantages over vascular plants as a bioenergy crop, including yield and water use. Additionally, microalgae, unlike seasonal vascular plants, can be harvested year round.

## A C2B2 team effort

Other C2B2 members working on the microalgae project include:

- Barbara Demmig-Adams, William Adams and Diana Nemergut, University of Colorado (CU).
- Ken Reardon, Colorado State University (CSU).
- Scott Cowley, Kent Voorhees and John Spear, Colorado School of Mines (CSM).
- Pin-Ching Maness, Michael Seibert and Paul King, National Renewable Energy Laboratory (NREL).

Researchers from the University of Hawaii and representatives of the Utah Department of Natural Resources are helping as well.

For Posewitz and his team of bioprospectors, the species found in the Great Salt Lake represent just the beginning of an ongoing hunt for microalgae capable of transforming the biofuels world.

## NEW STATE OF THE SCIENCE REPORT BY C2B2 INVESTIGATORS

A new report entitled *Bioengineering for Pollution Prevention Through Development of Biobased Materials and Energy*, authored by Dr. Dianne Ahman and CSM C2B2 Site Director John Dorgan is now available at the EPA's research home page (<http://www.epa.gov/ncer>).

This document provides an overview of the state of science in the areas of biobased materials and fuels and suggests areas for future research. Specifically, the report reviews the science in the areas of biotechnological platforms (including genetic engineering, bioreactor technologies, and bioseparations and bioprocessing), biomaterials (including polylactides, polyhydroxyalkanoates, and starches, proteins, plant oils and cellulose) and biofuels (including bioethanol, biodiesel, biohydrogen and the biodesulfurization of fossil fuels).

Bioprospecting for Microalgae at the Great Salt Lake



## Meeting Agenda

**September 11, 2007**

### Chautauqua Park

6:30 p.m. .... Dinner  
Networking Event  
*Chautauqua Dining Hall*

7:30 p.m. .... Dinner  
Chautauqua Dining Hall  
**Guest Speaker:**  
Dan Arvizu, Director, NREL

**September 12, 2007**

### Hotel Boulderado

8:00 a.m. .... Breakfast

9:00 a.m. .... Seed Grant  
Project Investigator Pitches

11:30 a.m. .... Seed Grant Voting

12:00 p.m. .... Lunch

1:00 p.m. .... C2B2  
Planning Session

2:00 p.m. .... C2B2  
Strategy Session

3:00 p.m. .... Departure  
for Airport

3 - 4:00 p.m. .. Steering Committee  
Final Seed Grant Decisions

4:00 p.m. .... Dinner  
Sponsored Research Meeting  
Arranged at the Request of Sponsors



# FIRST C2B2 MEETING

## SEPTEMBER 11 & 12 IN BOULDER

C2B2

Boulder, Colorado will be the site of the first meeting of the Colorado Center for Biorefining and Biofuels (C2B2) on September 11 – 12, 2007.

The event is expected to draw researchers from the four member institutions, many of the sponsors who support the organization, government officials and site directors at C2B2.

This meeting comes on the heels of a flurry of C2B2 activities, including:

- **March 19:** C2B2 formation announced on State Capitol steps.
- **June 7:** Prospective new member meeting held at CU-Boulder.
- **June 15:** Sponsors identify twenty large-scale topic areas for sponsored research.
- **July 24:** Thirty-five seed grant topic areas for shared research options identified by sponsors and sent out to member institutions as an RFP.
- **August 20:** Sixty-three seed grant proposals received.

The meeting starts on Tuesday evening, September 11 with a networking event and dinner at the lovely Chautauqua Dining

Hall in Chautauqua Park at 900 Baseline Road. Highlighting the evening will be an after dinner speech by Dan Arvizu, director with National Renewable Energy Laboratory (NREL).

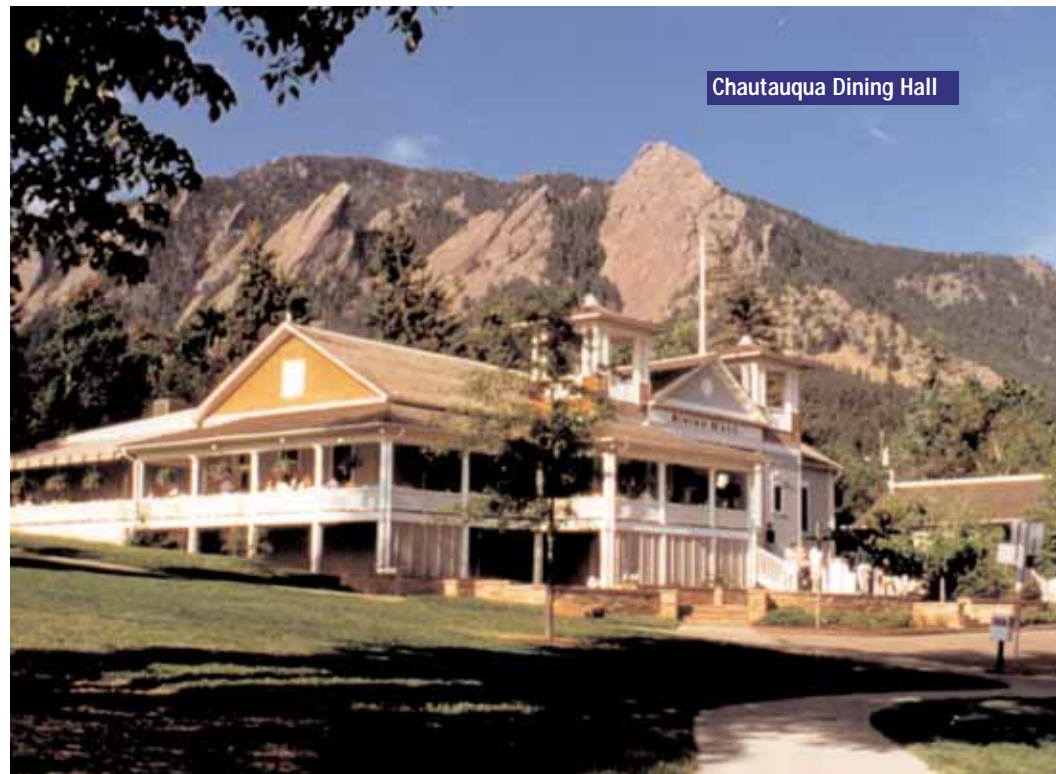
On Wednesday, the agenda includes a full slate of activities at the Hotel Boulderado, 2115 Thirteenth St. C2B2 members will have the opportunity to share details of their seed grant proposals, participate in seed grant voting, and attend C2B2 strategic planning sessions. A sponsored research meeting will cap the day's events.

#### CHAUTAUQUA PARK

900 Baseline Rd.  
Boulder, Colo 80302  
303-442-3282  
[www.chautauqua.com](http://www.chautauqua.com)

#### HOTEL BOULDERADO

215 13th Street  
Boulder, Colo 80302  
303-442-4322  
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| <b>Blue Sun Biodiesel</b>                 | <b>Korth O'Neil<br/>Engineering</b> | <b>Shell Global Solutions</b>                     |
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# CONTACT INFORMATION

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C2B2 is a cooperative research and educational center devoted to the conversion of biomass to fuels and other products, supported by state, institutional, and industry funds. The mission of C2B2 is to become the world's leading center in biorefining and biofuels research and education.

We provide private industry with one-stop access to researchers, laboratories, students, and educators from four innovative institutions, each having unique strengths in biofuel and biorefining application areas.

### *Colorado Renewable Energy Collaboratory*

Created to develop energy technologies for rapid commercialization, the Collaboratory consists of the following institutions:

#### *University of Colorado at Boulder*

Ranked in the top 25 nationally in Chemical and Biological Engineering, Molecular and Cellular Biology, and Biochemistry.

#### *Colorado State University*

Ranked in the top 10 nationally in Agricultural Sciences with an internationally renowned Engines and Energy Conversion Laboratory.

#### *Colorado School of Mines*

One of the few universities uniquely focused on energy research.

#### *National Renewable Energy Laboratory*

The only national laboratory dedicated to renewable energy and energy efficiency research and development (R&D).



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