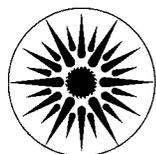


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# Energy & Environment Division



# Newsletter

Lawrence Berkeley Laboratory

December 1991

## LBL Seeks to Assist Homeowners After East Bay Fire

### E&E-Led Discussions Move Quickly

The October 20 fire destroyed over 3000 homes; most were literally burnt to the ground, with little of value remaining other than the land. As noted in the November 1 issue of LBL's *Currents*, three E&E staff members—**Bruce Birdsall**, **Silvia O'Haren**, and **Francis Rubinstein**—were among the 55 LBL employees who lost their homes. Many others were in the path of the fire but were spared. **Steve Selkowitz**, Leader of E&E's Building Technologies Program, "spent Sunday afternoon and most of Sunday night spraying [his] roof and backyard, and nervously watching the fire."

Upon his return to work, Steve began outlining the potential role LBL might play in assisting the rebuilding process—a role based on the Division's considerable expertise on energy efficiency in buildings. The types of assistance Steve envisioned included

- evaluating house designs and providing advice for improvements;
- advising on appliance selection;
- following-up during the construction stage, when homeowners tend to make on-the-spot decisions that affect the eventual energy use of the house.

Steve listed some potential benefits beyond the assistance itself, including lessons learned that would provide feedback to the Division's technical programs and that could be extended to other parts of California and to the nation. He also mentioned some potential risks, such as inadvertently appearing to be in competition with the private sector and promising more than we can deliver.

A series of meetings proceeded to take place in furtherance of the ideas Steve put forth:

- On Thursday, October 31, E&E's previously scheduled Building Energy Seminar was postponed in favor of an open discussion led by **Rick Diamond** of the Indoor Environment Program. (Unfortunately, Steve was sick at home, stricken with flu.) Rick discussed the contacts he had made with many of the organizations that will be involved in the rebuilding, and he expanded upon on the topics Steve had introduced. The discussion participants expressed general support for proceeding, with many of the attendees indicating a willingness to contribute technical expertise in particular areas.

- A November 4 meeting involved E&E and the Public Information Department (PID). PID's **Jeff Kahn**, who lost his house in the fire, gave a useful perspective on the situation from the standpoint of a homeowner intent on rebuilding as expeditiously as possible. **Brady Williamson** of E&E's Environmental Research Program discussed fire safety, and others presented information on the role of insurance companies and the Federal Emergency Management Agency (FEMA) in financing the rebuilding process, among

other topics. One recurring theme was that events are proceeding rapidly, with a narrow window of opportunity to influence the early design stage of the rebuilding.

- An E&E/CIEE working group—composed of **Steve Selkowitz**, **Rick Diamond**, **Mark Levine**, **Art Rosenfeld**, **Jim Cole**, and **Don Grether**—has been meeting regularly to develop a reasonably specific statement of a potential LBL role and the resources needed to carry out that role. By the date of this newsletter, we hope to have a good idea of whether we will be proceeding.

## Distinguished Fellow Will Study with CABET

**Ken Orvis**, who recently earned his PhD from Cal's Dept. of Geography, has received one of DOE/OHER's Global Change Distinguished Postdoctoral Fellowships for up to two years to study with **Ron Ritschard**, Acting Director of E&E's Center for Atmospheric & Biospheric Effects of Technology (CABET).

Dr. Orvis's research will use satellite and historical data to analyze surface water parameters of the California Current system that are important in mesoscale ocean-atmosphere coupling. Specifically, he will correlate West Coast Time Series data, covering the California Current and consisting of phytoplankton-correlate satellite imagery derived from Coastal Zone Color Scanner (CZCS), and measured data on biological and chemical processes acquired by Scripps Institution ships. In addition, he will assess comparatively a new ocean color sensor, the Airborne Ocean Color Imager being flown on NASA's ER-2 aircraft.

This research addresses a major goal of the ocean-related segment of DOE's global climate-change program: to determine the mean and fluctuating components of ocean primary productivity as a means of understanding the fate and flux of carbon dioxide.

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## Research Highlight

### Using High-Speed Laser Flame Tomography To Visualize and Characterize Processes of Turbulent Combustion

Consider the familiar flame of the bunsen burner on your lab bench: it seems to burn steadily, but if you could look down into that flame and really see what was happening, it would appear very different. A fuel-air stream flows upward into a chaotic, turbulent combustion region, beyond which a turbulently flowing gaseous stream carries away the combustion products. The combustion itself is not spread out throughout the combustion region, but actually takes place in a thin (<1-mm) layer, called the *flame surface*, that propagates as rapidly down the fuel stream as that stream flows upward to meet it. This flame surface is not at all smooth—it is highly wrinkled, rapidly fluctuating in the combustion region as a result of its turbulent surroundings.

Turbulent combustion processes play an important role in our everyday lives, appearing everywhere in burners that produce heat, and in automotive internal-combustion engines. Although there is a significant potential for improving the heat generation and pollution formation from combustion, the complexity introduced by the presence of turbulence is not understood well enough to realize this potential. To better understand the details of turbulent combustion, **Robert Cheng, Ian Shepherd,** and **Larry Talbot** in E&E's Environmental Research Program have developed a method—*High-Speed Laser Flame Tomography*—for visualizing and characterizing actual flame dynamics in real time.

High-Speed Laser Flame Tomography is an ingenious experimental implementation based on the simple underlying principle that to see something you just have to shine a light on it. It works like this:

A slice of light from a Cu-vapor laser beam that has been shaped into a thin flat plane using cylindrical lenses is shown through the flame (usually on a flame symmetry axis). This thin slice of laser light illuminates very small oil droplets that have been mixed into the flowing fuel stream. Because the oil droplets burn as they pass through the flame surface, the edge of the flame surface where it is cut by the slice of

laser light is clearly visible. The laser beam is actually pulsed like a strobe light and synchronized with a high-speed movie camera which takes pictures of the time-evolving flame at 2000 frames per second.

These movies can be played back at normal speeds to provide researchers with a slow-motion picture of the flame dynamics that can be further analyzed. In one type of analysis, individual movie frames are digitized, and the frozen image of the flame edge is geometrically characterized and related to the turbulence of the flame.

So far, analysis of hundreds of image frames has led to the important conclusions that turbulent combustion is closely linked to geometric properties of the flame surface—and further, that flame surfaces are fractal (thus the area of a flame surface is 2+ dimensional, and the edge through the flame surface cut by the laser slice is 1+ dimensional). Additionally, these tomographic measurements have been used to validate and guide the development of simplified statistical and deterministic combustion models.

In the future, Cheng and his colleagues plan to use their tomographic technique to characterize the time-evolution of the combustion process in greater detail and to further explore the entire flame surface with full 3-D measurements. They also plan to link their measurements with detailed hydrodynamic simulation models in an effort that is a candidate for inclusion in LBL's High-Speed Computing Initiative.

## E&E Scientists Win LBL Tech Transfer Awards

At a reception and awards ceremony held at LBL on November 20, the Lab officially recognized the technology-transfer contributions of 135 LBL employees, 28 of whom are members of the Energy & Environment Division.

The Lab's highest honor for accomplishments in technology transfer—the Technology Transfer Excellence Award—was awarded to 23 researchers, including the following E&E staff:

- **Arlon Hunt**, for work on aerogel insulating materials;
- **Michael Siminovitch**, for work on compact fluorescent fixtures;
- **Rudy Verderber & Oliver Morse**, for work on an efficient fluorescent light-

The *E&E Newsletter* is a vehicle for informing E&E staff about people and activities within (and otherwise of interest to) the Division. Send your news of awards, upcoming meetings, newly funded research projects, research discoveries, technology transfer activities, visitors—and any other items you'd like announced—to the editor, Lila Schwartz, any of the following ways:

- LBL mailstop: 90-3026
- electronic mail:  
LNSchwartz@lbl.gov  
Mac Quickmail
- phone: x4098
- in person: 90-3027A.

Black/white photos welcome.

To be considered for the next month's issue, materials must be received by the 15th of the current month.

ing system to be used on U.S. naval ships;

- **Greg Ward & Francis Rubenstein**, for developing the RADIANCE lighting-simulation program.

The Excellence Award acknowledges an investigator's outstanding contribution in at least one of the following areas: 1) impact on industry, 2) significant invention(s), 3) formation of a new business or firm.

In recognition of their achievements in enhancing the technology-transfer interactions between the Laboratory and industry, the following E&E researchers were awarded Certificates of Merit:

Dariush Arasteh	David Liu
Harvey Blanch	Frank McLarnon
Elton Cairns	Bill Nazaroff
Shih-Ger Chang	Antoni Oppenheim
Ashok Gadgil	Mike Rubin
Brent Griffith	Jennifer Schuman
Tony Hansen	Steve Selkowitz
C. Judson King	Bob Sullivan
Carl Lampert	Michael Wilde
Don Levy	David Wruck

Congratulations to this year's awardees!

# Responding to the Tigers

## Update on the Lab's Corrective Action Plan

As indicated in Elton's message in the November issue of the *E&E newsletter*, the Tiger Team Assessment's report is now in final form, and LBL's Corrective Action Plan (CAP) is now awaiting DOE approval. Meanwhile, LBL has been preparing to carry out the Plan.

The CAP includes some 409 Tasks (with 1570 Milestones) to be carried out by 91 "Task Masters." Although many of the Tasks are underway and some Milestones already completed, November 15 marked something of an official starting point: meeting together for the first time, the Task Masters heard a description of the systems to be used for tracking and managing the process.

The CAP will be administered by the newly formed LBL Office of Assessment and Assurance, headed by former E&E employee **Buck Koonce**. That Office reports to **Klaus Berkner**, the recently appointed Associate Laboratory Director for Operations, as do the Divisions and Departments primarily responsible for carrying out the Tasks (e.g., Environmental Health & Safety, Engineering, Construction & Maintenance, Plant Engineering).

Task Masters will report monthly on Milestones completed or rescheduled, costs incurred, problems encountered, and the like. This information will be entered into a database used to generate quarterly progress reports for DOE. In addition, a Project Management system like those used for construction projects is being set up to coordinate scheduling among Tasks. (The system has already uncovered sets of Tasks which violate causality, a cherished principle of physics; that is, Task A is scheduled to start before Task B, but a result from B is needed before A can begin. Such problems should be ironed out relatively soon!)

E&E's **Don Grether** has been serving as Task Master in charge of developing the Project Notebook, the Laboratory's

approach to carrying out quality assurance and other DOE Orders at the research-project level. Each Division identified two projects for a trial phase of using the Project Notebook format. This phase began on October 1.

The meaning of "project" varies from Division to Division, as it relates to each Division's organizational structure and the nature of the Division's research. E&E will generally consider a Group to be a "project" for the purposes of the Notebook. Our trial-phase projects are *Appliance Standards* (Jim McMahon) from the Energy Analysis Program and *Flue-Gas Chemistry* (Ted Chang) from the Environmental Research Program. The Notebooks are scheduled to be issued to all projects on June 1, 1992.

## E&E Scientist Joins Major Tech Transfer Group

Energy Analysis Program Leader **Mark Levine** has been invited to participate as a working group member of a major Atlantic Council program, *Technology Transfer and the Agenda for the Environment and Development*. This program will provide a basis for policy recommendations that will increase the flow of energy-efficiency technologies and pollution-reduction technology to developing countries.

The working group plans to hold a major briefing on the policy options that it will present to the United Nations Conference on the Environment and Development, to take place in June, 1992. The group's objective is to generate options on overcoming obstacles to technology transfer—taking into account the interests of both suppliers and users of the technology—with emphasis on energy-efficient, pollution-reducing technologies. Because participation of developing countries is essential to this effort, the group will include as participants international experts from the private and public sectors of developed and developing nations.

In addition to key experts from developing nations joining the working group, consultations will be held in Latin

America and Southeast Asia. The working group will benefit also from an exchange of views with members of the World Energy Congress Committee on Energy Issues in Developing Countries, which met last month in Washington, D.C.

Papers prepared under the program will cover such topics as "clean" coal, electric power generation, renewable energies, and energy efficiency. The Atlantic Council plans to publish a book of the working group's policy options and background papers. Some obstacles to be considered include restrictions on private sector/foreign investment; restrictions on trade; institutional issues in both developing and developed countries; planning and financing; and issues relating to the protection of intellectual property.

## International Energy Agency Shares Indoor Environment Program Goals

In what may be called an "offshoot" of E&E's COMIS workshop of 1988-89, a new annex—on multizone air flow modeling—has been adopted by the Executive Committee of the International Energy Agency's Energy Conservation in Buildings and Community Systems Programme. An IEA "annex" is an international working group whose research goal has been articulated and approved by member countries of the IEA. COMIS (Conjunction of Multizone Infiltration Specialists) was an international workshop hosted at LBL by the Indoor Environment Program's **Energy Performance of Buildings Group**, which does ongoing research in characterizing and modeling building ventilation systems.

The objectives of the annex are to study physical phenomena causing air-flow and pollutant transport in multizone buildings and to develop modules to be integrated into a multizone airflow modeling system. Special emphasis will be given to providing the data necessary for validating and using the system. Comparing the results of the model with results from *in situ* tests is an essential part of this task-shared annex.

One year after implementing the annex, the United States has volunteered to operate the annex, thus taking a leading role in interzonal airflow modelling.

(see IEA, back page)

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IEA (cont'd from page 3)

**Helmut Feustel** of the Energy Performance of Buildings Group has been appointed Operating Agent to lead the annex on behalf of the Department of Energy. (Helmut also initiated and led the COMIS workshop at LBL.)

The United States, Canada, France, Italy and Japan have already committed themselves to the 4-1/2-year-long working period, and the Netherlands, Norway, Sweden, Switzerland and the United Kingdom have shown an interest in joining the effort.

Each of the three expert meetings held to date (10/90 in Nice, France; 4/91 in Aachen, Federal Republic of Germany; and 9/91 in Ottawa) has included more than 20 attendees from around the world.

### Committee Update

#### Professional Staff Committee (PSC) Reconstituted

The PSC—a committee required by Laboratory policy—is composed of senior scientists appointed by the Division Director. The Committee develops Division policy with respect to the employment and advancement of scientists; and provides advice to the Division Director on 1) hiring into indefinite positions, 2) conversion from "term" status to "indefinite" status, and 3) promotions within the Staff Scientist series and from Staff Scientist to Senior Scientist.

The Committee was recently reconstituted with continuing members **Tony Nero** (Chair), **Mark Levine**, **Nancy Brown**, and **Joan Daisey**; and new members **Art Rosenfeld** and **Tica Novakov**. Division Director **Elton Cairns** is a non-voting member of the committee, and E&E's Personnel Administrator, **Jan Smith**, serves as staff.

Our thanks go to **Harvey Blanch**, **Les Packer**, and **Mike Wahlig** for their long terms of service on the PSC. Mike is especially thanked for the many years he served admirably as Chair of the Committee.

#### Publications Committee

Michael Wilde, a valued member of this year's Publications Committee, was inadvertently omitted from the list of committee members in last month's E&E Newsletter. (Sorry, Michael!)

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### Congratulations

The magazine *Popular Science* has named the Building Technologies Program's **gas-filled panel insulation** one of the 100 best new products or inventions of 1991. The material—called the year's best new product in the area of home technology—was developed at LBL by Building Technologies Program Leader **Steve Selkowitz**, **Dariusz Arasteh**, and **Brent Griffith**. The panels have varied potential applications, some of which the E&E scientists are discussing with representatives of the appliance and manufactured-housing industries.

The title Senior Scientist, Emeritus, has been conferred upon **Frank Asaro** of E&E's Environmental Research Program. As noted in a letter to Frank from LBL Director **Charles Shank**, the designation is "prestigious recognition of [Frank's] service to the Lawrence Berkeley Laboratory and to the University of California."

As noted in this publication last May, a planet at the innermost edge of the asteroid belt has been named after Frank. This honor recognized his years of research on the earth's "iridium anomaly" and his participation in developing the asteroid-impact theory of dinosaur extinction.

### Ukrainian Official Visits E&E

On November 8, E&E was visited by Dr. Uri Shcherbak, Minister of Environmental Protection, Ukraine.

On very short notice, an agenda of presentations and discussions was arranged by **Art Rosenfeld**, Director of E&E's Center for Building Science. The program included an open discussion of the role that energy efficiency can play in environmental improvement.

The Minister was also interested in the topic of government regulation as a mechanism for dealing with matters of energy and the environment.

### Walt Westman is Published Posthumously

*Ecology*, the journal of the Ecological Society of America, has published posthumously an article by **Walt Westman**, the Energy Analysis Program ecologist whose death earlier this year saddened us greatly and cut short a distinguished career in environmental science. Walt's article is entitled "Measuring realized niche spaces: Climatic response of chaparral and coastal sage scrub" (*Ecology* 1991; 72(5): 1678-1684). Reprints are available from the Energy Analysis Program.

The article constitutes part of Walt's work identifying the potential effects of global climate change on distributions of plant species. His field research took him around the world and extensively throughout California.

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