

Lawrence Berkeley National Laboratory

Recent Work

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Author

Hunter, S.

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BUSINESS HIGHLIGHTS

Lab in CRADA with Intel

The Berkeley National Laboratory has entered into a two-year CRADA with Intel to develop new tools at the Advanced Light Source that support the future needs of the semiconductor industry. This collaboration is especially noteworthy for its match with industry-wide needs as outlined in the Semiconductor Industry Roadmap developed by the Semiconductor Industry Association. The industry needs high quality, defect-free, and extremely clean silicon wafers and gate oxides; and lithographies near 0.1 micron. This CRADA addresses metrologies in both areas. The partners will use the surface characterization capabilities of the ALS to measure distributed surface, and femtogram particle contamination, while the Center for X-Ray Optics will develop metrologies needed for EUV lithography systems. In this way, the CRADA links DOE capabilities with future manufacturing needs of a key industrial sector. The Laboratory and DOE will also gain new knowledge of industrial state of the art surface characterization techniques, and benefit from working closely with an industry leader engaged in a highly competitive arena. The techniques to be studied have

applications not only to semiconductor problems, but also to studying other complex materials. Thus, the Laboratory's general materials research capabilities will benefit from the CRADA.

At this time there is no established method for making the measurements needed to maintain the level of purity, surface finish and freedom from particle contaminants necessary for the next generation of devices. The Advanced Light Source, the premier U.S. third generation soft x-ray synchrotron radiation source, is a unique resource and opens the possibility for microscopy and interferometry using soft x-rays with unprecedented resolution.

As the minimum feature size of integrated circuits shrinks, the measurement of local chemical information becomes more critical, but also more difficult. Measurement efforts will focus on two situations common to semiconductor manufacture with shrinking fea-

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3M Trade Fair

On behalf of Berkeley National Laboratory, the Technology Transfer Department attended a conference at 3M headquarters in St. Paul Minnesota. The invitation-only conference was billed as the 3M Technology Transfer Fair. The Laboratory was one of 40 universities and national laboratories from around the country to attend this first-ever science and technology gathering. The goal of the fair was to identify specific products, processes, development-stage technologies and research projects of possible mutual interest to 3M and the participating universities and federal government laboratories. The two day event provided an opportunity for face-to-face discussions between about 400 senior scientists representing 3M's fifty divisions and technology transfer offices of the university and government labs. Joel Ager spoke with 3M scientists on behalf of work performed within the Materials Science Division; TTD's Glen Dahlbacka answered

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Mission Statement

- Build new partnerships with industrial and nontraditional government partners where capabilities and technologies derived from Berkeley National Laboratory's research activities can be applied to solving important customer problems.
- Provide stewardship of technology and intellectual property developed through publicly funded research to gain maximum value for the national economy and the public good.
- Strengthen business relationships and establish Berkeley National Laboratory as a preferred business partner through high-integrity, reliable business practices and by delivering on agreements and commitments.
- Increase business volume to create income that can be applied to the pursuit of Berkeley National Laboratory's strategic objectives.
- Strengthen ties with our many constituents in the community, state, region, and nation and secure their ongoing commitment to Berkeley National Laboratory

Rod Fleischman, x. 7444, fax 6866, rmfleischman@lbl.gov

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Licensing Highlights

IGP

Business

Highlights

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Earnest Orlando Lawrence Berkeley
National Laboratory
1 Cyclotron Road
Berkeley, CA 94720

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Du Pont License and Option Agreement

Berkeley National Laboratory has licensed non-exclusively to E.I. du Pont de Nemours and Company a technology that may lead to a viable substitute for a major environmental hazard. The Laboratory also has granted du Pont an option for an exclusive license to that technology. Industry must develop substitutes for chlorofluorocarbons (CFCs) as refrigerants and chemicals because of CFCs' adverse health effects (ozone depletion and other effects). Hydrochlorination is a valuable catalytic process for the preparation of a variety of hydrofluorocarbons. Du Pont seeks to develop new molecules for commercialization as well as to improve existing processes with the assistance of Gabor Somorjai's group in MSD under a related CRADA.

Fusion License

Berkeley National Laboratory has licensed to Fusion Lighting, Inc. of Rockville, Maryland, an amazingly small but powerful lamp. Prototypes have produced up to 15,000 lumens at 100 watts of input power. Researchers in EED's Lighting Group (George Gabor, Thomas Orr, Charles Greene, Douglas Crawford, Samuel Berman) invented a technology for radio frequency driven electrodeless sulfur lamps. These lamps are expected ultimately to provide extremely energy efficient office and residential lighting. In the short term, the Laboratory technology may also find application in Fusion's microwave driven sulfur lamps. The national press has widely reported that Fusion's Solar 1000 will soon efficiently light large spaces such as shopping centers, aircraft hangars, factories, and sports stadia and potentially even provide lighting suitable for agriculture. Berkeley National Laboratory, together with Fusion Lighting, and DOE, won a 1995 R&D 100 award for the Solar 1000 and the sulphur lamp technology.

Eli Lilly License and Bailment Agreement

The contract with Eli Lilly and Company is Berkeley National Laboratory's first bailment agreement. Eddy Rubin's group in LSD developed the transgenic mice expressing human apolipoprotein B 100 that Berkeley National Laboratory "bailed". This bailment allows Eli Lilly to use the transgenic mice and their progeny for research while the Laboratory retains ownership of the mice. (Think of a bailment as akin to a lease.) These special mice will enable the analysis and study of compounds affecting low density lipoproteins (LDL) or "bad cholesterol."

OEA Software License

A small Silicon Valley start-up company, OEA International Inc., has exclusively licensed software developed by Simon Royer and Mario Aranha of the Berkeley National Laboratory Engineering Division's Microelectronics Group. Their PGP Solver software enables electronic circuit simulation that previously was prohibitively slow. The analysis software is useful in the design and testing of printed circuit boards, multichip modules and similar electronic assemblies.

Symyx License and Stock Purchase Agreements

Symyx Technology, a California start-up corporation, has licensed a fundamental breakthrough in the synthesis and screening of advanced materials such as phosphor materials for flat-panel displays and medical imaging and superconductors. The procedure invented by Peter Schultz and Xiao-Dong Xiang of MSD's Center for Advanced Materials may speed up the synthesis and screening of those materials by more than a factor of four orders of magnitude. This will be the core technology for the start-up firm. In another first for Berkeley National Laboratory, Symyx has issued shares of its common stock to the Laboratory as part of its payment for the license.

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Laboratory Wins '95 R&D 100 Award

Berkeley National Laboratory's Van Jacobson and Steven McCanne of the Information and Computing Science Division won a *R&D 100 Award* for development of a software toolpack that enables multi-party audio and visual conferencing via the MBone (Multicast Backbone).

The MBone is a subset of the Internet capability of multicasting. That is, instead of "unicasting" one packet to one destination, the network copies each packet of information from the source for delivery to each destination that has requested it.

Unlike traditional broadcast methods, the MBone is totally interactive. The software toolpack created by Jacobson and McCanne, which includes the "white board," session directory, video conferencing, and video audio tool software, enable real-time audio-video conferencing, with a shared white board, over the Internet. It lets participants share text, images and sketches.

MBone's audiovisual conferencing capabilities were developed to provide scientists with an easy way of sharing information over long distances in a manner similar to their normal interactions—and in their normal workplace. It was also developed to prove the potential of this kind of interaction on a scale provided by the Internet and to help set the standards that would guide its development.

Multicasting gained international attention and made rock-and-roll history when it was used to carry 20 minutes of the Rolling Stones' "Voodoo Lounge" concert tour. The concert was carried to some 200 workstations around the world that were connected to the Internet. Another example of its potential is a recent surgeons' conference at the University College in London. Approximately 100 doctors in London and Sweden watched as a surgeon in San Francisco performed a complex liver operation. As he worked, viewers asked questions about the procedure. No other communications tool can reach as many people for interac-

Symyx signs equity deal with Berkeley National Laboratory



Isy Goldwasser, CFO of Symyx, with Viviana Wolinsky, Contract & Licensing Manager, Technology Transfer Department, Berkeley National Laboratory. Symyx, a California start-up business, licensed a new method for combinatorial synthesis of materials. (see Page 2)

tive communication. Relatively short-term advances in hardware and software design will bring MBone communications to millions.

Considered a major indicator of successful technology transfer by Energy Secretary Hazel O'Leary, the R&D 100 Awards program is the only competition in the world that recognizes the 100 most technologically significant new products in the past year. The international competition has a twofold purpose: 1) to recognize innovators and organizations for outstanding practical technical developments and 2) to identify significant technological advances. *R&D Magazine* has honored inventors and scientists around the world with the R&D 100 Awards since 1963.

The Laboratory's entries are coordinated through the Technology Transfer Department. If you have any questions about en-

New IGP Assignments

Martha Luehrmann has joined TTD as a licensing executive, reporting to Viviana Wolinsky. She will be negotiating licenses and other intellectual property agreements for the Lab.

New assignments in the Contracts & Licensing Office include: contract assistant Ron Sabaroff, reporting to Nancy Saxer and Cole Cannon, supporting AFRD, ENG, LSD, and CRADA transactions; contract assistant Heather Pinto, reporting to Phyllis Gale of LSD and Phil Balough of C&L, supporting Admin, ICSD, NSD, CSD, EH&S, OPD and LSD; and contract assistant Christina Reno, reporting to Rich Wilson and

Technical Assistance Program

Berkeley National Laboratory now offers a Technical Assistance Agreement (TAA) program to help small businesses solve short-term technical problems by providing an opportunity to obtain technical assistance from the Laboratory. This program is part of the DOE's overall mission to aid small business. "Small business" is defined by number of employees, and is in most cases 500 or less. The Laboratory can only provide this assistance if it is not available from private business on an independent, convenient or timely basis or at a reasonable cost. Provided that the request meets the TAA Program qualifications, the Laboratory will make every effort to provide the short-term technical assistance.

The maximum the Laboratory expenditure under a TAA is \$4,000. This includes salaries, payroll burdens and appropriate overheads for the Laboratory researcher or scientist. The requester generally bears other costs, such as travel and accommodation, if required.

Technical Assistance Agreements are appropriate for: technical consultation, participation in design reviews, education, and providing technical information. Generally the TAA involves the use of existing technology and no intellectual property is created. The TAA may include (limited) sample testing.

Berkeley National Laboratory has already awarded 8 grants under this program:

■ **Aurora Technologies, Inc.**

Participate in design review and identify problems in novel integrated circuits for use in a new solid state imaging system.

■ **Power-Tek, Inc.**

Interface the EPICS software package to a host running on Windows NT.

■ **Radon Abatement Systems, Inc.**

Analysis of selected water samples and interpretation and integration of results with other characterization techniques.

■ **Quality Control Braze**

Advise on ways to improve of Electro-Spark Deposition metal surface finishing process.

■ **Pacific Supercomputing Systems**

Determination of current carrying ability of a joined aligned superconductor crystal.

■ **OMNI Interests, Inc.**

Recover lactic acid and succinic acid from ethanol fermentation.

■ **Histotox**

Demonstrate a Laboratory technique related to cyrostate microtomy, employed for evaluating the progression of atherosclerosis in a mouse model system.

■ **HDC Corporation**

Frequency determination for the RF catheter locator unit.

For more information or to apply for this program contact Chris Kniel, x5566.

Economic Impact Study

Did you know that the Berkeley National Laboratory is the second largest employer in Berkeley and the ninth largest in Alameda county? These are some of the initial findings from a new study being conducted for the Laboratory by Community Relations. This is the first-ever analysis of the Laboratory's economic impact on Berkeley, the East Bay, and the US.

With an annual budget of over \$270 million and a workforce that exceeds 3500, the Laboratory is also a major customer of numerous local and small businesses for various goods and services. In addition, the Laboratory annually plays host to hundreds of visitors using Laboratory facilities or attending Laboratory-sponsored conferences.

See Study, Page 5

Seagate Display



DOE Helps Disk-Drive Manufacturer Remain Competitive





DOE's Lawrence Berkeley Laboratory has contributed its materials sciences expertise to a partnership with Seagate, a US manufacturer of disk drives. LBL and Seagate have teamed up to better understand the disk surface, allowing the manufacturer to make higher-density, more reliable drives. As a result of the collaboration, Seagate is saving jobs and maintaining profitability in a highly competitive, technology-driven industry.



TTD has developed a portable display to help tell the Seagate Partnership story. It shows the rapid change in disk technology. The height of the disk represents the data density, while the scale from left to right is based on cost per megabyte. Today's 1.9" disks cost about \$0.25 per megabyte, and store over 70 mb per square inch. The display was designed and fabricated by Jonathan Slack of EED, with machining help from Al Harcourt, Michael Dickinson and Rudy Robles of ENG.

Intel*From Page 1*

ture sizes: 1) where a defect (such as a contaminant particle) has occurred and chemical information is required in order to localize the defect's origin in the fabrication process, and 2) where a material used in fabrication alters its behavior when localized in ever smaller areas. In each of these cases, traditional laboratory instrumentation is becoming increasingly limited, but the new capabilities and techniques of spectromicroscopy may provide a way forward.

For particle analysis, the partners will use zone plate focusing to provide beam sizes of 50 nanometer and acquire images by scanning of the sample and measurement of response functions, such as X-Ray Absorption Near Edge Structure (XANES), and energy resolved photo emission spectra (ESCA) to obtain chemical information. In addition to zone plate focusing, the partners will use the technique of x-ray photoemission microscopy (X-PEEM) to give full field x-ray absorption information at submicron resolution. These techniques will be applied to a range of problems where chemical state information is required, for example gate oxides, dielectric and metal surfaces, passivation layers and particle contaminated surfaces.

The Laboratory's Center for X-Ray Optics will fabricate a monochromator for at-wavelength extreme ultraviolet (EUV) interferometry at the ALS. The interferometer will be used to test the surface material properties of multilayer coated optics and optical systems, crucial elements in the EUV lithography process proposed to fabricate 0.1 micrometer feature size integrated circuits. This new information will enhance the Laboratory's x-ray optics program as well as Intel's future lithography plans.

The Principal Investigators at the Laboratory are Howard Padmore and David Attwood. The funding for this CRADA includes \$100K from the DOE's Energy Research-Laboratory Technology Transfer program, \$115K in programmatic funding from the ALS, and a total of \$531K from Intel. In choosing to work on major problems identified by a whole industrial sector, as re-

flected by the SIA Roadmap, the partners are ensuring that the CRADA mechanism pay maximum dividends to both partners. "The reason this CRADA was funded was due to the focused attention of the ALS & CXRO staff and their regular communication with Intel about their problems", said Glen Dahlbacka of the Technology Transfer Department. "This is a good start on problems of strategic interest to an entire industrial sector."

3M*From Page 1*

questions regarding the ALS and its capabilities; and Bruce Davies from TTD addressed the Laboratory's technologies available for licensing and collaboration.

Study*From Page 4*

Beyond payroll and procurement, the Laboratory's study will also examine the effects of the "re-spending" of these direct Laboratory payments in the economy. Further, the Laboratory's technology transfer efforts have created new business opportunities, saved consumers money, and improved national industrial competitiveness.

While these impacts are impressive, not all of the Laboratory's contributions to the community and the nation can be measured simply in dollars and cents. Thus, the Laboratory will be reviewing community outreach activities, such as in education and technical advising, as part of this comprehensive assessment. The Laboratory expect to have a draft of the economic report available by Fall 1995.

Mbone*From Page 3*

tering next year's program, please contact Bruce Davies on extension 6461; e-mail at sbdavies@lbl.gov.

Assignments*From Page 3*

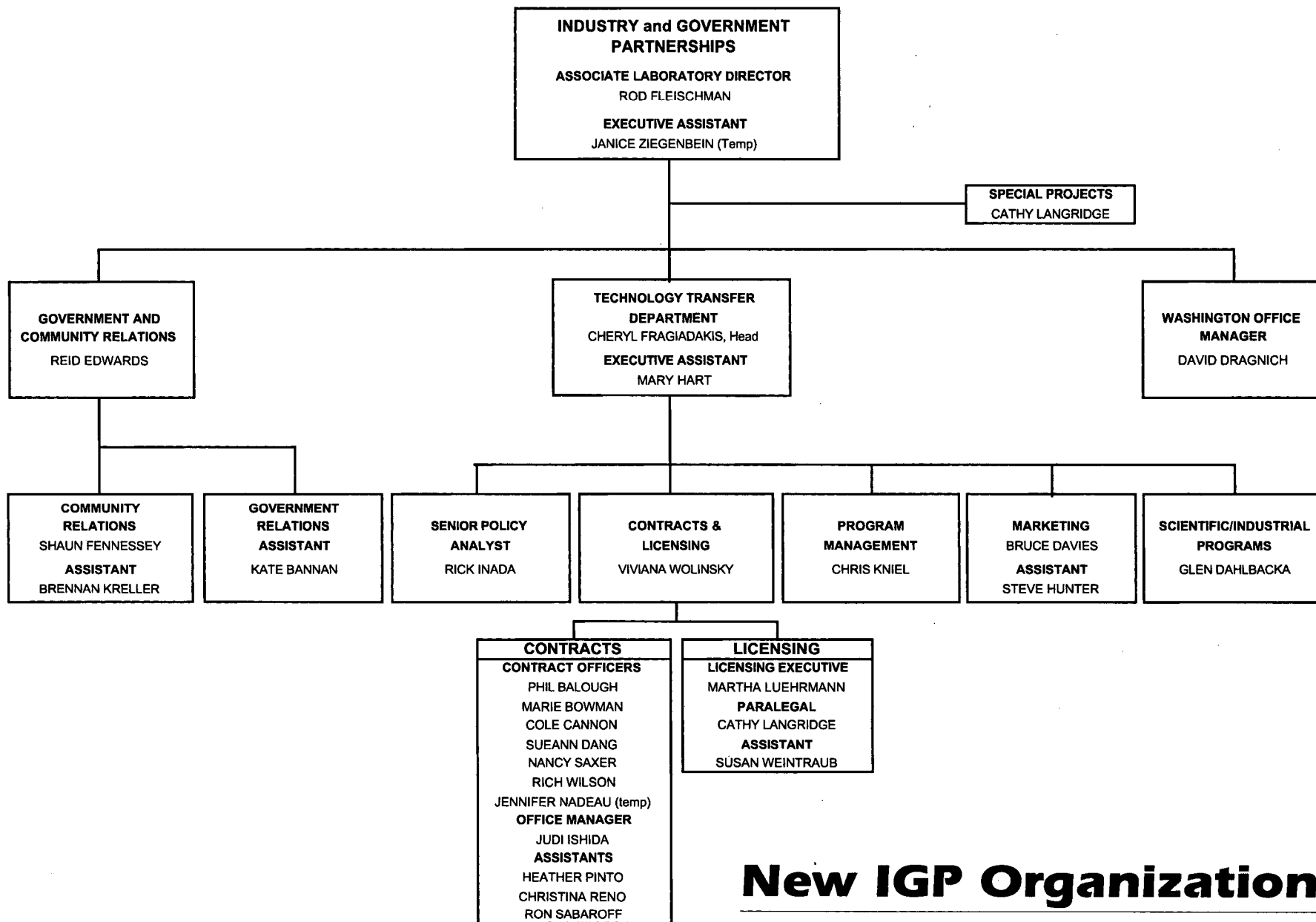
Sueann Dang, supporting EED, SBD, Physics and ESD.

Two interns are also helping out this summer. The Technology Transfer and Patent Departments will share John E. Wehrli as part of a summer internship program with the Haas School of Business at UC Berkeley.

The other intern, John Andrews, of the UC Berkeley Graduate School of Public Policy, is conducting an economic impact study for Community Relations. (See related story, page 4.)

Upcoming Events

- **Technology 2005**
October 24-26 Chicago, IL
Contact: Bruce Davies
- **Open House**
October 28, 1995



New IGP Organization

IGP has reorganized since the last newsletter, so we are including the updated organization chart in this quarter's newsletter.