PUB-5102
c.1

RECEIVED
LAWRENCE
BERKELEY LABORATORY
FEB 9 1984
LIBRARY AND
DOCUMENTS SECTION

LAWRENCE BERKELEY LABORATORY TECHNOLOGY TRANSFER REPORT

October 1983

For Reference
Not to be taken from this room

Lawrence Berkeley Laboratory
University of California

Prepared for the U.S. Department of Energy under Contract No. DE-AC03-76SF00098

PUB-5102
c.1

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

PUB-5102

LAWRENCE BERKELEY LABORATORY

TECHNOLOGY TRANSFER REPORT

October 1983

Robert J. Morris
Office of Research and Technology Applications
Lawrence Berkeley Laboratory
University of California
Berkeley, CA 94720

Prepared for the U.S. Department of Energy
under Contract No. DE-AC03-76SF00098

Lawrence Berkeley Laboratory
Technology Transfer Report
FY 1983

A. OVERVIEW

During FY 1983, numerous technical developments from Lawrence Berkeley Laboratory were adopted by the public and private sectors. LBL-originated technology was used to prospect for deposits of petroleum and minerals, improve energy conversion, increase the efficiency of energy usage, provide advanced materials, and improve medical care.

In the future, the Center for Advanced Materials (CAM) to be established at LBL will produce research results of immediate interest to industry, as well as to others. Industry guidance is being sought for ways in which technology can be most effectively and swiftly transferred to potential users. On May 23, 1983, at an Industry Participation Workshop at LBL, research executives from several high-technology companies identified factors considered to be important in technology transfer. Temporary transfer of researchers from industry to the Laboratory was stressed, as was the selection of research projects relevant to industry needs. It was noted that technology transfer from a government laboratory to a heterogeneous industry is a difficult task.

In recent years, technology transfer at LBL has been enhanced by joint and cooperative research agreements with industry. However, there are severe policy constraints on the establishment of such agreements. This problem was discussed at a DOE Industrial Participation Conference held in Oakland, California, on June 14 and 15, 1983. The problem will become particularly acute with the start of CAM, when many cooperative research projects with industry will be formed.

Over the years, the Lawrence Berkeley Laboratory has emphasized the transfer of newly developed technology from the Laboratory to the private and public sectors, to educational institutions, and to other research laboratories. Throughout the Laboratory's existence, publication, conference participation, and graduate student training have been important means for moving newly developed knowledge to those who use it. With passage of the Stevenson-Wydler Technology Innovation Act of 1980, the LBL Technology Utilization Office became the present Office of Research and Technology Applications (ORTA). This Office acts as a focus for technology transfer activities at LBL and provides additional avenues for effecting the transfer of technology in cases where conventional transfer methods would not be effective.

LBL is committed to the active transfer of technology, both through conventional methods and through the development of new concepts needed to meet new situations.

B. ACCOMPLISHMENTS

Below is a list of technology transfers that occurred or were first noted in FY 1983. The name of the principal LBL researcher or contact appears in parentheses after each item. The sponsoring DOE program is indicated after the name, using DOE's B&R code; other sponsors are indicated by "WFO" (Work for Others).

1. An extensive joint research project to employ nuclear magnetic resonance (NMR) for in vivo spectroscopy and imaging is being conducted with IBM.
(T. Budinger) HB

2. Computer modeling studies on the partitioning and transport of hydrogen sulfide in the condensers and cooling towers of geothermal power plants predicted that improvements in H_2S partitioning could be obtained by modification of the condensers. Using data from the computer program (CNDSR), Pacific Gas & Electric modified its Geysers Unit 15. Savings for this power plant are estimated to be $300 per day.
(O. Weres) WFO

3. A digital signal processor was developed for use with electromagnetic exploration equipment to provide in-field data processing and on-site calculations in geophysical surveys. It is now being manufactured by EM Surveys, Inc. of Berkeley, California, and is used by several major petroleum companies. (H. F. Morrison) AM

4. A remote reference method for collecting and processing field magnetotelluric geophysical data is now an industry standard. It is commercially employed by Woodward-Clyde Consultants, Phoenix Geophysics Co., Terra Physics, Inc., and Argonaut Geophysics for mineral, oil and gas, and geothermal exploration. Additionally, the major oil companies use the method and its computer software in worldwide exploration operations.
(H. F. Morrison) AM

5. The computer code MULKON was developed to model geothermal and other reservoirs and to predict their long-term production behavior. At present, MULKON is used by over a dozen companies.
(P. A. Witherspoon) AM

6. Networks for interconnecting computers are being evaluated and compared by LBL computer scientists in a joint research project with the Digital Equipment Company of Maynard, Massachusetts.
(P. Hawthorn) KC

7. A computer program (Berkeley Combustion Program) for modeling combustion is being used in the design of automobile engines by General Motors. Other users are Volvo, NASA, and Sandia National Laboratory.
(A. Chorin) KC

8. Vortex methods for modeling fluid flow are being used by the Ford Motor Company, the Allison Division of General Motors, and Pratt and Whitney to

improve the design of diesel engines. The computer program is also used by the British Applied Ocean Research Corp. of Oxford, England in the design of oil drilling platforms with improved stability under wave action. (A. Chorin) KC

9. A random-choice numerical method for simulating two-phase flow in petroleum reservoirs is being used by Standard Oil of California and British Petroleum. (P. Concus) KC

10. Change in energy demand in developing countries with increase in development is being determined in research supported by ARCO, British Petroleum, EXXON, and Chevron. (J. Sathaye) WFO

11. An LBL-developed controlled-source electromagnetic prospecting system for geothermal exploration was tested for application in general situations where seismic surveys do not work. Joint research was conducted with Amoco and Shell. (N. Goldstein) AM

12. A generator for producing rubidium-82 for use in heart imaging is being produced by Squibb. Ten medical facilities are now using the generator. (T. Budinger) HB

13. Basic information developed at LBL concerning imaging by nuclear magnetic resonance (NMR) has been used by the U.S. Food and Drug Administration to develop its NMR imaging guidelines. (T. Budinger) HB

14. In a collaborative project with Bell Laboratories at Murray Hill, New Jersey, solid-state carbon-13 nuclear magnetic resonance characterized carbonaceous deposits on Fischer-Tropsch catalysts (used for coal liquefaction). (A. T. Bell) WFO

15. LBL surface diagnostic techniques characterized Pd/La_2O_3 and Pd/SiO_2 methanol synthesis catalysts for the Amoco Research Center, Standard Oil Company (Indiana) at Naperville, Illinois, and for Exxon Research and Engineering Laboratories, Linden, New Jersey. (A. T. Bell) WFO

16. The erosivity of particles obtained from the Exxon Donor Solvent (EDS) coal liquefaction pilot plant was determined in research for the Exxon Research and Engineering Laboratories, Florham Park, New Jersey. (A. V. Levy) WFO

17. Slurry erosion behavior of heat-treated valve-body steels was determined in research for Food Machinery Corporation, Fluid Control Division, Brea, California. (A. V. Levy) WFO

18. The sliding wear behavior of ceramic thermal barrier coatings on cylinder wall liners and piston rings of an adiabatic diesel engine was determined for Cummins Engine Company, Columbus, Indiana. (A. V. Levy) WFO

19. Plasma-sprayed ceramic thermal barrier coatings were refined for use in turbine diesel engines in a collaborative project with Turbine Components Corporation, Branford, Connecticut. (A. V. Levy) WFO

20. Over the last few years, LBL has conducted a cooperative research program with industries such as 3M and Optical Coating Laboratory, Inc. to characterize and develop new optical coatings for efficient window glazings. These include low emittance, transparent coatings to reduce heat loss and antireflective coatings to increase solar transmittance. Several of these new coatings have now advanced from a research phase to commercial availability. (S. Selkowitz) EB

21. Solid-state ballasts developed by LBL are now used to operate a compact fluorescent light bulb produced by North American Phillips Lighting and distributed throughout the United States. These bulbs provide light equivalent to a conventional 75-watt bulb but use only 18 watts. (R. Verderber) EC

22. Flat and curved anode, single-wire, gas-filled detectors are used in x-ray crystallography for such tasks as identifying contaminants in drugs, powder sampling, and extended x-ray fine-structure analysis (EXAFS) to identify chemical compounds. Used by Nicolet XRD Systems, Fremont, California, and S.T.O.E., Darmstadt, West Germany. (V. Perez-Mendez) KA

23. A new technique for processing electrical pulses from charged-particle detectors provides improved energy resolution and higher count rate performance than previously available. A number of companies, including Tennelec, Inc. of Oak Ridge, Tennessee, are using the technique to develop or produce new instruments. (F. Goulding) HA

24. Heat absorption panels to dissipate the intense heat loads generated by accelerated ion and neutral beams were designed and built cooperatively with McDonnell-Douglas Astronautics Company, St. Louis. Additional units may be produced for JET Joint Venture Laboratory in Culham, England, and the Max Planck Institute in Germany. (A. Paterson) AT

25. An antenna for a radiofrequency-heated plasma source is being developed jointly with TRW, Inc. (R. Pyle) AT

C. ISSUES

One of the most efficient methods for accomplishing technology transfer is to involve the future user of the technology (for instance, an industrial firm) with the producer of the technology (in this case, LBL) at an early stage of the research. A researcher who is aware of the problems and needs of the user is able to guide the research toward the relevant goals, and potential users can make early plans for practical utilization of the research results.

At present, opportunities to work cooperatively or jointly with industry are frequently lost because of difficulties in coming to a mutually agreeable and timely contract under the rules that presently govern such relationships. Firms are unwilling to support research when the perceived liabilities and costs that they would incur under these rules outweigh the benefits. Discussions of the problem are taking place between LBL and DOE/SAN. In addition, DOE/SAN hosted a DOE Industrial Participation Conference on June 14 and 15, 1983, for consideration of the problem. With CAM starting up, these difficulties in setting up satisfactory contracts will have more serious consequences since industrial participation is an important aspect of CAM. There is, therefore, an urgent need for progress on this issue.

D. INITIATIVES

As discussed in the Overview, the operation of the Center for Advanced Materials at LBL will require the development of special technology transfer methods. Industry representatives are providing recommendations on such methods.

Requests for information and assistance from industry usually come to the ORTA in the form of general questions, i.e., "What is LBL doing in the field of _____?" Industry representatives indicate that they dislike asking more specific questions because a competitor might be able to deduce the direction of their research and what new products are being developed. To overcome this fear and for general use in technology transfer operations, a Catalog of Research Projects at LBL has been created. Industry people and other potential users of LBL technology can then determine in detail the areas covered by LBL research. An index is included to assist in the identification of specific technologies. The Catalog was prepared late in FY 1983 and is now available.

APPENDIX A

ORTA PLACEMENT AND TECHNOLOGY TRANSFER PROCESSES

The contact for the Office of Research and Technology Applications is:

Robert J. Morris
B-80C
Lawrence Berkeley Laboratory
University of California
Berkeley, CA 94720

Telephone:
(415) 486-6502
FTS 451-6502

The Office is placed in the Public Information Department under the Deputy for Information Services of the Engineering and Technical Services Division. This Division provides support for all the research divisions and thus provides a broad base from which the ORTA can conveniently interact with and augment the transfer activities of any researcher in the Laboratory.

A substantial effort goes into satisfying the requirements of the Stevenson-Wydler Technology Innovation Act of 1980. Research activities are continuously reviewed by the ORTA for items of potential utility in the public and private sectors. After consultation with the originators of the item, an Application Assessment Report is prepared. This report is then distributed through several channels, including the DOE Technical Information Center, the Federal Laboratory Consortium, commercial marketing firms, industrial consultants, state and Federal governments, industrial assistance organizations, and some industrial firms. The Center for Utilization of Federal Technology in the National Technical Information Center receives the reports through the DOE Technical Information Center.

Requests for assistance that come to the ORTA from industry and from state and local government are handled by the ORTA directly or by referral to a cognizant LBL researcher. Researchers handle requests for assistance that come directly to them, sometimes with assistance from the ORTA.

Barriers to technology transfer occurring anywhere in LBL are analyzed by the ORTA and remedies sought.

APPENDIX B

FUNDING AND EFFORT FOR TECHNOLOGY TRANSFER

ORTA and LBL Funding and Staffing Levels: FY 1982-83 and Projections Through FY 1989.

Funding								
($ in thousands)	FY 1982	FY 1983	FY 1984[a]	FY 1985[a]	FY 1986	FY 1987	FY 1988	FY 1989
ORTA[b]	47	54	57	60	60	60	60	60
Other (Estimate)	2064	1957	2480	2620	2620	2670	2740	2850
Total Funding	2111	2011	2537	2680	2680	2730	2800	2910
Staffing								
(in FTE)								
Professional Staff								
ORTA[b]	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Other(Estimate)	17.9	18.4	23.3	24.4	24.4	25.0	25.8	26.8
Total Prof. Staff	19.0	19.5	24.4	25.5	25.5	26.1	26.9	27.9
Support Staff	6.8	6.9	8.6	9.1	9.1	9.2	9.5	9.9

[a]Escalation factor of 6%; FY 1986-1989 in constant 1985 dollars.

[b]Includes one full-time professional.

APPENDIX C

APPLICATION ASSESSMENTS

Application Assessment Reports Prepared During FY 1983

Report No.	Title	Prog.[a]	Potential Users: Government: Fed.	Government: St.	Government: Loc.	Industry: Sm.	Industry: Med.	Industry: Lg.	Cons.[b]
AF-1	Improved Heavy Ion (RFQ) Linac	KB				X	X	X	
CB-1	National Tritium Labeling Facility	NIH	X				X	X	
EE-13	Solid-State Ballast for Fluorescent Lights	EC	X	X	X	X	X	X	
EE-14	Energy-Efficient Incandescent Lamp	EC	X	X	X	X	X	X	
EE-15	Energy Modeling in Buildings (DOE-2)	EC	X	X	X	X	X	X	
EE-16	Air-to-Air Heat Exchangers (Residential Units)	EC		X		X	X	X	
EE-17	Photothermal Spectroscopy of Materials	USAF	X	X	X	X	X	X	
EE-18	Laser Ultratrace Remote Detection of Gases	HA	X	X	X	X	X	X	
EE-19	Photoacoustic Identification of Pollutants	HA	X	X	X	X	X	X	
EE-20	Liquid Crystal Applications	HA	X			X	X	X	
EE-21	Waveguide Laser	HA	X			X	X	X	
EE-22	Testing of Rechargeable Batteries	AL				X	X	X	
EE-23	Oil Shale Waste Treatment	AC				X	X	X	
EE-24	Heat Flow Meter	EB				X	X		
EE-25	Air Contamination in Buildings	HA	X	X	X	X	X	X	
EE-26	Predictive Air Infiltration Model	EC	X	X	X	X	X	X	
EE-27	Field Data Logger With Solid-State Memory	EC				X	X	X	
EE-28	Manual for Oil Shale Wastewater Analysis	AC	X	X			X	X	

Table continues on next page

Application Assessments, continued

Report No.	Title	Prog.[a]	Potential Users: Government: Fed.	Government: St.	Government: Loc.	Industry: Sm.	Industry: Med.	Industry: Lg.	Industry: Cons.[b]
ET-7	Aerosol Mass Measuring Instrument	EPA				X	X	X	
ET-8	Van de Graaff Facility	HA				X	X	X	
ET-9	Locomotive Dynamic Load Gauge	FRA						X	
MM-2	Plasma-Enhanced Deposition System	KC				X	X	X	
MM-3	National Center for Electron Microscopy	KC				X	X	X	
MM-4	Ammonia as an Automobile Fuel	AL					X	X	
MM-5	Thermodynamic Data Programs for Calculators	KC				X	X	X	X
MM-6	Improved Catalysts for Fuel Cells	EPRI				X	X	X	
MM-7	Rhenium Catalyst for Synthesis of Ammonia	KC				X	X	X	
MM-8	Method for Removal of Mercury from Brine	KC				X	X	X	
PC-1	Demographic and Socio-Economic Data Base	DOL	X	X	X	X	X	X	X
PC-2	Portable Electronic Mail System	KC	X	X	X	X	X	X	X
PC-3	Multiplicity Detector With Glow Discharge Memory	KA	X				X		
PC-4	Wire Tester	KA				X	X	X	

[a]"Prog." indicates the U.S. Department of Energy B & R code associated with the technology. An acronym is shown where the main support came from another organization. The acronyms are explained below. In some instances, there was support from more than one source.

NIH National Institutes of Health
USAF United States Air Force
EPA Environmental Protection Agency
FRA Federal Railroad Administration
EPRI Electric Power Research Institute
DOL Department of Labor

[b]"Cons." = consultants.

This report was done with support from the Department of Energy. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the Department of Energy.

Reference to a company or product name does not imply approval or recommendation of the product by the University of California or the U.S. Department of Energy to the exclusion of others that may be suitable.

TECHNICAL INFORMATION DEPARTMENT
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA 94720