MEMORANDUM

To: T. King Liu, Associate Dean for Research
M. Wu, Microlab Faculty Director
From: **K. Voros**, Operations Manager
Subject: 2009 Year-End Report
Date: 23 March 2010

I. INTRODUCTION

Microlab operations began to move to the new facility around the middle of 2009. Staff activities revolved around planning and executing the move, with the goal of maintaining operations in both locations. We are on target financially. Grand opening of the CITRIS Headquarters in Sutardja Dai Hall was held on 27 February 2009; we received access for preparatory work of the empty space of the Marvell Nanofabrication Laboratory in June 2009.

This is the 23rd Year-End Report that I am submitting.

II. MANAGEMENT OF RESOURCES

Facilities

Microlab

Bob Hamilton, Equipment and Facilities Manager, and Safety Officer of the Microlab, managed upgrades, installations, facilities maintenance and development. Safety issues and HazCom improvements were also addressed.

Notable in 2009:

- A successful, major upgrade of our nitrogen gas delivery system was completed, to provide service for the new lab, also in anticipation of separating Cory building service from the labs.
- We purchased a good used truck from Academic Facilities when they closed shop.
- Three process tools had significant upgrades: pqecr for deposition of amorphous Si, the ultek e-beam evaporator equipped with new 3-hearth gun and scanning capability, and a metal etch and resist strip chamber addition was competed on the Centura.
- The Crestec e-beam writer was the first tool to move to the new lab. The Leo SEM was the second to move, after which it received a major upgrade (~$100K).

In October 2009 the Microlab experienced major equipment loss due to a duct fire in the VLSI area. All furnaces had to be shut down; 3 lam etchers were damaged beyond repair because of the deluge created by the fire sprinklers. Lab clean up was completed in a few days but operations were limping along for the rest of the month until the remaining exhaust duct was approved by the FM. Since the furnaces could not be turned on without the exhaust duct, plans were formed to move them to the new lab immediately. Thus, our well prepared plans for the execution of the lab move were turned upside down and basically a new moving plan had to be developed. Loss claims were submitted; Risk Management approved facilities repairs and replacement tools for the Lam etchers.

Sia Parsa reports on Process Engineering activities as these continued in high gear throughout the year.

Notable in 2009:

- Equipment characterized and processes developed for aluminum etch in the Centura; high temperature oxide (HTO) process developed in tystar17; tin oxide (ITO) films were deposited by evaporation and compared to those prepared by sputtering, with excellent results; new I-line resist and developer introduced and standard processes established.
- **CMOS Baseline:** a new run included process improvements, more aggressive design rules and new drop-in chips; report published, available at

  http://www.eecs.berkeley.edu/Pubs/TechRpts/2009/EECS-2009-163.html
- Wet sinks designs and specifications submitted (CAD layouts and .pdf) for the new lab; two newly installed sinks tested and cleaning processes characterized; student work-storage inventory made; standard runs made on evaporators and sputterers for comparison with runs after the move.

Rosemary Spivey, Administrative Manager reports on our financial status, accounts, members administration, purchasing, and inventory management. Recharge rate proposals were submitted on time for both the Microlab and the Machine Shop and the accounts scrutinized throughout the year by the Campus Recharge Rate Committee.

Notable in 2009:

- The Microlab's recharge income, $3.3 M, within budget, again in compliance, for the 22nd year in a row.
- Preparation and submission of job descriptions for new Career Compass job titles for non-represented career Microlab staff.
- Development of an eight-year, $1.2M deficit recovery plan for projected Microlab/ Nanolab transition, included in the Fiscal Year 2009/2010 Microlab Recharge Rate Proposal.
- Development of plans for the move of office staff, inventory and administration related activities.

Todd Merport, Computer Operations Manager describes systems maintenance, operational improvements and upgrades. Our computers and lab control software were maintained at the highest levels of uptime and integrity.

Notable in 2009:

- With the move of two tools into the new lab, Mercury passing real time implementation with flying colors; seamless acceptance by labmembers.
- Refining of Mercury client-server communication speed by a factor of two.
- Mapping and synchronizing system to pull data from the Microlab activity table into the Mercury database and processing of data with the Mercury accounting system; administrative staff highly satisfied with the new, unified accounting system.
- Migration of shared information from the Microlab website to the Marvell Nanolab website and new information for the Nanolab; fully functioning Nanolab site.

New Laboratory, http://nanolab.berkeley.edu/

Partial beneficial occupancy for the Marvell Nanofabrication Laboratory was granted in June 2009, meaning that utilities, such as power, cooling water, exhaust ducting, specialty gases distribution to planned machine locations could start. This turned out to be a huge job, although completely of our choosing. Besides value engineering demands, the motivating factor in managing fit up with Microlab and Machine Shop staff, was the flexibility we needed in making last minute changes in tool locations. In spite of the enormous additional work load on staff, this was a good decision because, as we suspected, changes were needed to be made from the original tool layout almost from the beginning. Additionally, 14 new tools, with high utilities demands and complex installation needs, not specified early in the design process, had to be accommodated. The biggest hit we took from value engineering was the elimination from the construction plans of the 12 sinks and their installation. This was a hard decision, because the other option was to give up outfitting of the gas vaults with gas delivery systems meeting the latest code requirements.

By the end of 2009 the Marvell Nanolab, with two tools, the Crestec e-beam writer and the Leo SEM, was open for operations. A new Marvell lab orientation program, in addition to the standard Microlab orientation, was instituted for lab members who were qualified on these two tools. As fit up progressed, slowly other equipment were moved in; thus, since last December we are operating two labs. Our plans are to close the doors of the Microlab in Cory Hall in December 2010, 27 years after they were opened and 48 years after the first integrated circuits processing lab started in Cory Hall.

Machine Shop, http://mshop-erso.berkeley.edu

The Machine Shop completed 338 jobs for 56 PI's in FY 2008/2009. Financially it rebounded, made up the accumulated deficit and finished the FY on target. This was possible because of the steady stream of jobs coming in conjunction with the Micro/Nanolab move, and available staff recharge time was fully booked all year. One staff was added to concentrate on the lab move; on the occasions of major equipment moves, the entire Machine Shop staff is mobilized. Without the Shop we could not have taken on the new lab fit up and Microlab move.

S t a f f

Microlab staff groups are organized along functional lines as described below. The Machine Shop operates independently, under the Microlab Operations Manager (see Staff Organizational Chart - Effective January 2009).

The Microlab has been successful in retaining and developing staff well tuned to the laboratory's needs. Cross-training, back-ups and multiple responsibilities in all positions ensure that lab operations have broad coverage and problems are attended on a timely manner.

Microlab Operations Staff (26.5 FTE)
Katalin Voros, R&D Engineering Mgr 2, Operations Manager

1. Equipment & Facilities (11 FTE)
Bob Hamilton, R&D Engineer 5, Manager
Joe Donnelly, R&D Engineer 3
David Lo, R&D Engineer 3
Michael Martin, R&D Engineer 1
Jay Morford, R&D Engineer 3
Danny Pestal, R&D Engineer 3

Evan Stateler, R&D Engineer 4
Phill Guillory, R&D Engineer 4, Supervisor
Alan Briggs, Development Technician
student assistant, 0.5 FTE
Mike Linan, R&D Engineer 3, Supervisor
Brian McNeil, Development Technician

2. Process/Baseline (7 FTE)
Sia Parsa, R&D Engineer 5, Manager
Kim Chan, R&D Engineer 2
Jimmy Chang, R&D Engineer 4
Marilyn Kushner, R&D Engineer 2
Laszlo Petho, Associate Specialist – baseline
4 student assistants, 0.5 FTE each

3. Administration (4.5 FTE)
Rosemary Spivey, Administrative Officer 4
Nancy Peshette, Administrative Assistant III (0.5)
Susan Kellogg-Smith, Buyer II, Procurement Manager
Eric Chu, Administrative Assistant II
Adrienne Ruff , Administrative Assistant III

4. Computer Support (4 FTE)
Todd Merport, Applications Programmer 4, Supervisor
Susan Calico, Information Systems Analyst 2
Madeleine Leullier, Computer Resources Specialist II (0.75)
Olek Prokurowski, Applications Programmer 3
Changrui Yin, Information Systems Analyst 3 (0.5)

5. Marvell Nanolab Management – Technology Management
Bill Flounders, R&D Engineer 5, Manager
Xiaofan Meng, R&D Engineer 4 – cryoelectronics
Matt Wasilik, R&D Engineer 4 – BSAC

► **Machine Shop** (4.5 FTE)
Ben Lake, Engineering Technical Supervisor 2
Bob Amaral, Development Technician V
Edward Hester, Development Technician IV
Joe Gavazza, Principal Laboratory Mechanician
Alan Peterson, Development Technician V
Nancy Peshette, Administrative Assistant III (0.5)

Financial Resources

Recharge accounts under Microlab management continued to be closely monitored for budgetary requirements throughout the year. Rosemary Spivey's report shows details and financial analysis for each unit (ee Table 3 below).

Table 3 - Recharge Accounts Summary
30 June 2009

Unit Billed	Income	Expenditures	Performance	No. of PIs
Microlab	$ 3,269,871	$3,261,756	0.25%[+]	93
Machine Shop	$ 303,964	$ 304,806	0.28%[-]	58

Both units are financially stable and again closed the fiscal year within recharge operation specifications.

III. COMMUNICATIONS & CONTROL

Management

As the Chief Scientists for CITRIS, Banatao Institute@CITRIS Berkeley, **Prof. Ming Wu** continues to be the Faculty Director of the Microlab and now also the Nanolab. The Marvell Nanolab is a research facility of CITRIS, Center for Information Technology Research in the Interest of Society, (http://www.citris-uc.org/research/emphases/nanotechnology) located in the new Sutardja Dai Hall, CITRIS Headquarters.

Dr. W. A. Flounders is the Manager of the Marvell Nanolab and was involved with it since the start of the design phase. He worked closely with campus and construction project management and saw to it that our plans and requests were taken into consideration all through design and construction. Bill participated in a series of difficult value engineering (i.e. cost cutting) negotiations, discussing available options with Microlab management. He was involved with acceptance and contributed to the punch list concerning the lab. Finally, mid-year we were allowed in to start fit-up activities and now Bill has his own lab to manage. Phill Guillory and his staff, providing most of the electrical and plumbing installations, were transferred, along with Mike Linan, specialty gas lines designer and installer, under Bill's supervision. This was the first step in staff transfer. Next, as we started to move process equipment, Bob Hamilton and his equipment engineering staff were transferred to Bill, early in 2010.

In the mean time, the Microlab, under my management in Cory Hall, is sustaining operations as usual, providing recharge income for both labs. Engineering staff supports both labs, retaining equipment and process responsibilities as these were before the move. Three additional temporary staff and extensive use of Machine Shop staff allows us to operate and move simultaneously. Systems remain in place until the site in the new lab is prepared and are taken down only for the move and process testing afterwards. In spite of periodic equipment shut downs lab use remained close to previous levels and we were able to meet our financial goal: closing the fiscal year in compliance with Recharge Committee rules.

Membership & Training

Microlab monthly membership remained over 300 this past year, same as in preceding years. Overall, we dealt with 512 members during FY 2008/2009. Number of Industrial members, BMLA, in January 2010 – 18.

As soon as the new lab opened, a Nanolab orientation seminar was initiated, which all active members had to attend before admittance. This was offered every two weeks at first, then as needed, to allow students to work in both labs.

The Microlab's operating manuals have been updated and transferred to the Nanolab website, http://nanolab.berkeley.edu/labmanual/labmantoc.html, along with the transfer of equipment.

Outreach

During the Summer of 2009 we had three students participating in our High School Summer Internships program. They worked under the guidance of Jimmy Chang, Senior Development Engineer, Daniel Queen, a graduate student labmember, and Jay Morford, R&D Engineer. The final reports can be seen at http://microlab.berkeley.edu/text/MLOutreach.html.

IV. SUMMARY

The year of 2009 saw the opening of the new Nanolab while operations continued as usual in the Microlab. Support from our PIs was strong throughout the year, which meant that we were able to end the fiscal year on target. We are looking forward to complete the move of the Microlab into the Marvell Nanolab by the end of 2010.