Agenda

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16:15	New systems from optical MEMS devices **David Horsley, BSAC**
16:45	Roundtable: "Nanotechnology: Relevance to Microsystems/MEMS?" Moderator: **Roger T. Howe**, **Dorian Liepmann, Jean-Christophe Eloy, Bernhard E. Boser, Jorg Kuehnholz**
17h45	Conclusion / Adjourn

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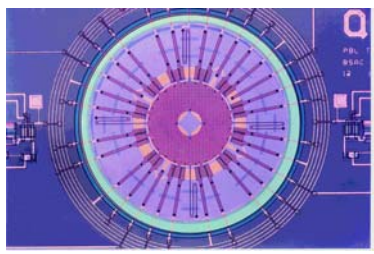
BSAC Munich Symposium Introduction

John Huggins, Executive Director



BSAC Summary

Center Statistics

Collaboration Vehicles

Technical

Refer to State of Center Report for Details

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Sponsorship

Munich Symposium
& IAB

Promotion

Munich Symposium

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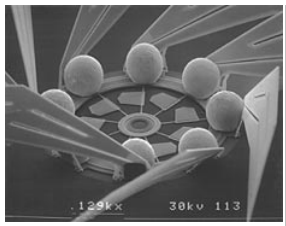
What is BSAC?

- Research Consortium on MEMS, BioMEMS, & NEMS at the ***University of California, Berkeley***.

- BSAC is also The National Science Foundation I/UCRC on MicroSensors & MicroActuators
  - Industry/University Cooperative Research Center.
  - Pre-commercial, "Enabling" Research
  - Rapid Research Adoption by Industrial Members.
  - Founded BSAC in 1986; Added ***University of California, Davis*** in 1998.

Some BSAC Achievements



MEMS Processing and Materials

-Surface Micromachining of Polysilicon
-Low Temperature Integrated Silicon-Germanium Process
-Anti-Stiction Surface Treatments and Dimpled Structures

Micro Electro Mechanical Devices and Structures

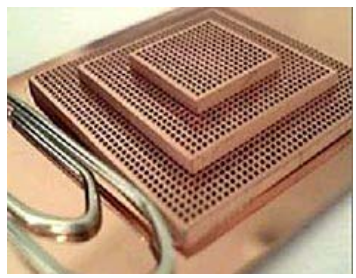
-Integrated Digital Accelerometer
-Integrated Digital Gyroscope
-Comb-Driven Electrostatic MEMS Actuator
-Lamb Acoustic-wave Sensors and Actuators
-Pin-Jointed Micromachined Gears, Cranks, and Springs
-MEMS Micro-Vibromotors
-Hinged, Pop-up Micromachined Out-of-plane Structures

MEMS Systems and Subsystems

-MEMS Microfluidic Mixing/Dispensing System
-MEMS Based Free-Space Optics
-Multi-level PolySi Micromechanics w/on-chip Activation
-Integrated x,y Rastered Real-Time Projected Display
-Piezoelectric Biomimetic Directional Diaphragm Microphone
-MEMS-Scanned Barcode Reader
-Microfluidic Host-Fueled Glucose Microbial Power Cell

BSAC Disciplines

- Directors of BSAC
  - *Electrical Engineering*
  - *Computer Science*
  - *Bio Engineering*
  - *Mechanical Engineering*
- BSAC Affiliated Faculty
  - *Materials Science*
  - *Chemistry and Chemical Engineering*
  - *Microelectronic Process and Fabrication*

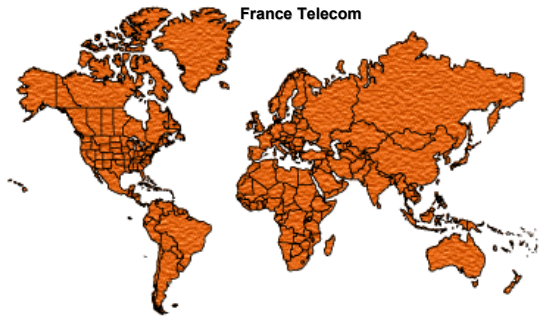


Berkeley Sensor & Actuator Center

Industrial Members (35) circa Fall '04

Alza (Johnson & Johnson)
Analog Devices
Ardesta
Chevron Texaco
Corning Corporation
Draper Labs
Discera
Eastman Kodak
Gillette
Harris
Honeywell
HRL Laboratories
*IBM
Intel
Livernore Nat'l Labs
Nortel Networks
QUASAR
Raytheon
Sandia Nat'l Labs
Textron
Therafuse
Timken
Zyvex

Bosch
Suss MicroTec
Siemens
GlaxoSmith Kline
France Telecom



Omron
Samsung
Sharp
Sony
TDK
Yamatake
*Rohm

*Fall 2004

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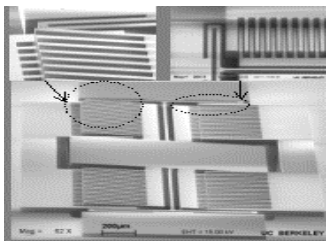
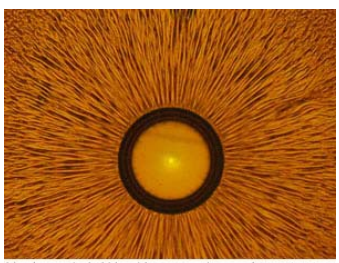
BSAC Personnel & Project Statistics





big photoresist bubble with newtons rings photo: Matt Last

People & Projects

- 117 Graduate Researchers
- 20 Post-Doctoral & Research Leaders
- 25 Faculty Directors & Faculty Affiliates
- 35 Industrial Members
- 108 Reported Projects
- Research Area: *(# Projects)*
- *Devices, Processes, Packaging (11)*
- *Wireless & RF Devices (23)*
- *BioMEMS & Microfluidics (29)*
- *Power/Energy Generation (17)*
- *Sensors, Actuators, Robotics (17)*
- *MicroPhotonics (8)*
- *CAD, Other (3)*
- *Nano-Micro Transduction/ Interfaces*

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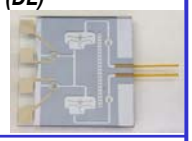
Outstanding IAB Papers (Past Year)

Best Research Papers Fall 03

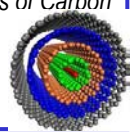
- **Jeremy Frank *(APP)* & Stefan Zimmerman *(DL)***

"MEMS Positive Displacement Liquid Pump"



- **Dane Christensen *(LWL)***

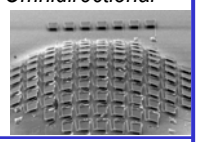
"Room Temperature Synthesis of Carbon Nanotubes"



Best Research Papers Spring 04

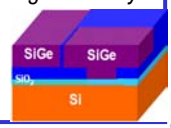
- **Paul Hung (LPL)**

"Biomemetic Imager as Omnidirectional Sensor ("BIOS")"



- **Dr. Emmanuel Quevy (RTH)**

"Damascene Process for Integrated Poly-SiGe RF MEMS"



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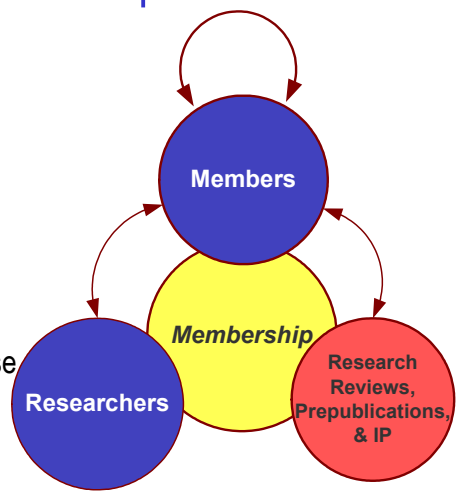
Collaboration-Membership

- Members-Researchers
  - Personal
  - Summer Internships
  - Hiring
- Member-Member
- Information Dissemination
- Intellectual Property License



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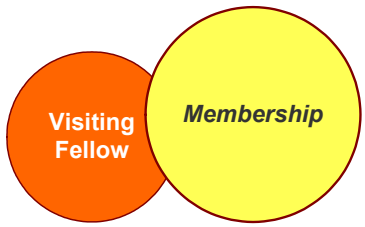
Visiting Industrial Fellow

- With Consent of Faculty Sponsor
- In Research Group
- On Private Research Project
- Microfabrication Access
- Campus "Contacts"
  - Other centers
  - Seminars
  - Audited Courses



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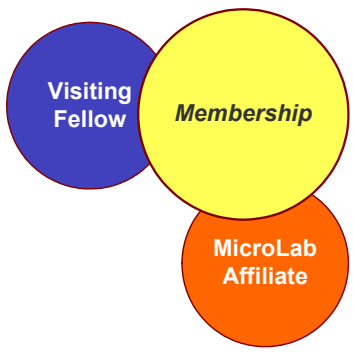
Microlab (microfabrication facility) Affiliate

- Equipment Evaluation
  - DRIE Centura/STS/Alcatel
  - Flip Chip Bonder Suss
  - Etc
- Process Module Development
  - SiGe (MEMS on CMOS)
  - SiC (Harsh Environment)
  - BioCompatible Microprocesses
- Product Development



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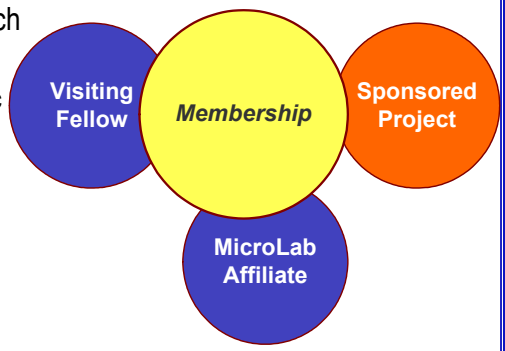
Sponsored Projects

- Built on pre-existing research
  - Specific PI (Faculty)
  - Specific Student or Post-Doc
- Prenegotiated Goals
- Prenegotiated Deliverables
  - Reports
  - Prototypes
- Prenegotiated IP
  - Options to Patents



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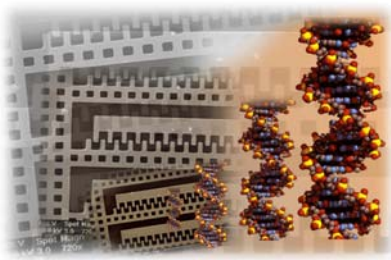
BSAC Regional IAB's and Symposia

Tokyo Japan May 29-31 2003
Regional IAB & Symposia

Berkeley California March 11-12, 2004
Joint Berkeley-KAIST BioMEMS Symposium

Munich Germany June 29-30 2004
Regional IAB & Symposia

Tokyo Japan December 2-3 2004
Regional IAB



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